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LARSA - ʻOUEILI ANNUAL REPORT 2022-2023

PRELIMINARY REPORT ON THE RESULTS OF THE XVIIITH & XIXTH CAMPAIGNS AT LARSA AND THE XITH CAMPAIGN AT TELL EL ʻOUEILI

Régis VALLET
C.N.R.S. - Institut Français du Proche-Orient (I.F.P.O.)

The bridge of King Sin-iddinam south of the Grand Canal of Larsa, seen from the east. In the foreground, the canal quay. In the centre, the eastern pile of the bridge. In the background, the ziggurat (photo R. Vallet, 2023).

STATE BOARD OF ANTIQUITIES AND HERITAGE
REPUBLIC OF IRAQ

2024

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Contents

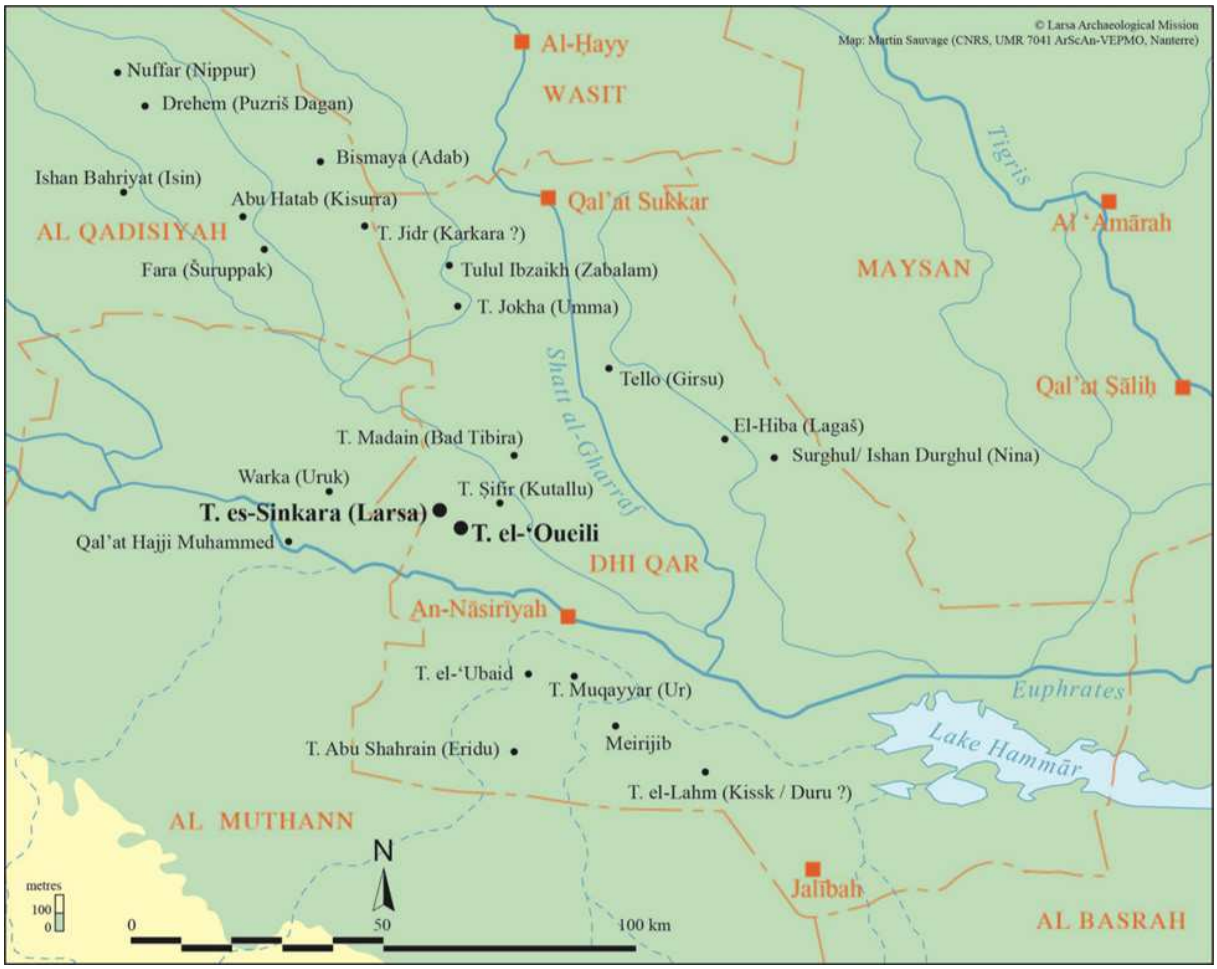

***Fig. 1** – Map of Dhi Qar governorate showing the location of Larsa and Tell el-'Oueili.*

Introduction

Régis Vallet

The 18th campaign at Larsa (Fig. 1) lasted from the 29 October to 25 November 2022. The team counted, under the direction of Régis Vallet (CNRS-IFPO), 12 researchers and engineers from France, Iraq and Italy, by alphabetic order: Mikael Atton (Mike Air Exploration), Johnny Baldi (CNRS-IFPO), Lucie Cez (Paris IV University), Dominique Charpin (Collège de France), Lionel Darras (CNRS), Antoine Jacquet (Collège de France), Haider Kazim (SBAH), Rym Khazal-Ahmad (Ecole Nationale Supérieure d'Architecture de Paris), Saud Sehud (SBAH), Emanuelle Vila (CNRS) and Mélania Zingarello (Roma La Sapienza University).

The logistic team was composed by Awad Abd-el-Hussein (SBAH), Alwan Awad Abd Hussein (sites keeper), Yasser Abed Khalaf, Abbas Ori Nafel (drivers), Taha Hussein Mohammed, Mohammad Hani Hamid (cooks) and Hessam Hassam Eissa (house steward).

The 19th campaign at Larsa and the 11th campaign at Tell el 'Oueili lasted from the 2 to the 30 November 2023, the director being on site from the 23 October to set up the house of the mission. The team gathered counted, under the direction of Régis Vallet (CNRS-IFPO), 23 researchers and engineers from France, Iraq, Italy, Germany, UK and the Czech Republic, by alphabetic order (Fig. 2): Camille Abric (Paris 1 University), Zaman Cuma (SBAH), Rateb al-Debs (Damascus University, currently in Germany), Johnny Baldi (CNRS-IFPO), Emmanuel Baudouin (Paris-Nanterre University), Régis Bernard (INRAP), Lucie Cez (Paris I University), Antoine Cocoual (Rennes 2 University), Costanza Coppini (Freie Universität Berlin), Lionel Darras (CNRS), Sébastien Dohr

(INRAP), Caroline Douché (Oxford University), Yves Gallet (CNRS), Antoine Jacquet (Collège de France), Mohaned Karim (SBAH), Mohaned Mnather (SBAH), Claire Padovani (Paris 1 University), Giulia Russo (Freie Universität Berlin), Haneen Salem (SBAH), Paola Vertuani, Matisse Vobauré (Montpelier 3 University) and Mélania Zingarello (Czech Academy of Sciences).

The logistic team was composed by Awad Abd-el-Hussein (SBAH), Alwan Awad Abd el-Hussein, Ghalib Abd el-Hussein (sites keeper), Yasser Abed Khalaf, Abbas Ghani Abed, Hussein Chnewa (drivers), Taha Hussein Mohammed and Moqtada Abed (cooks).

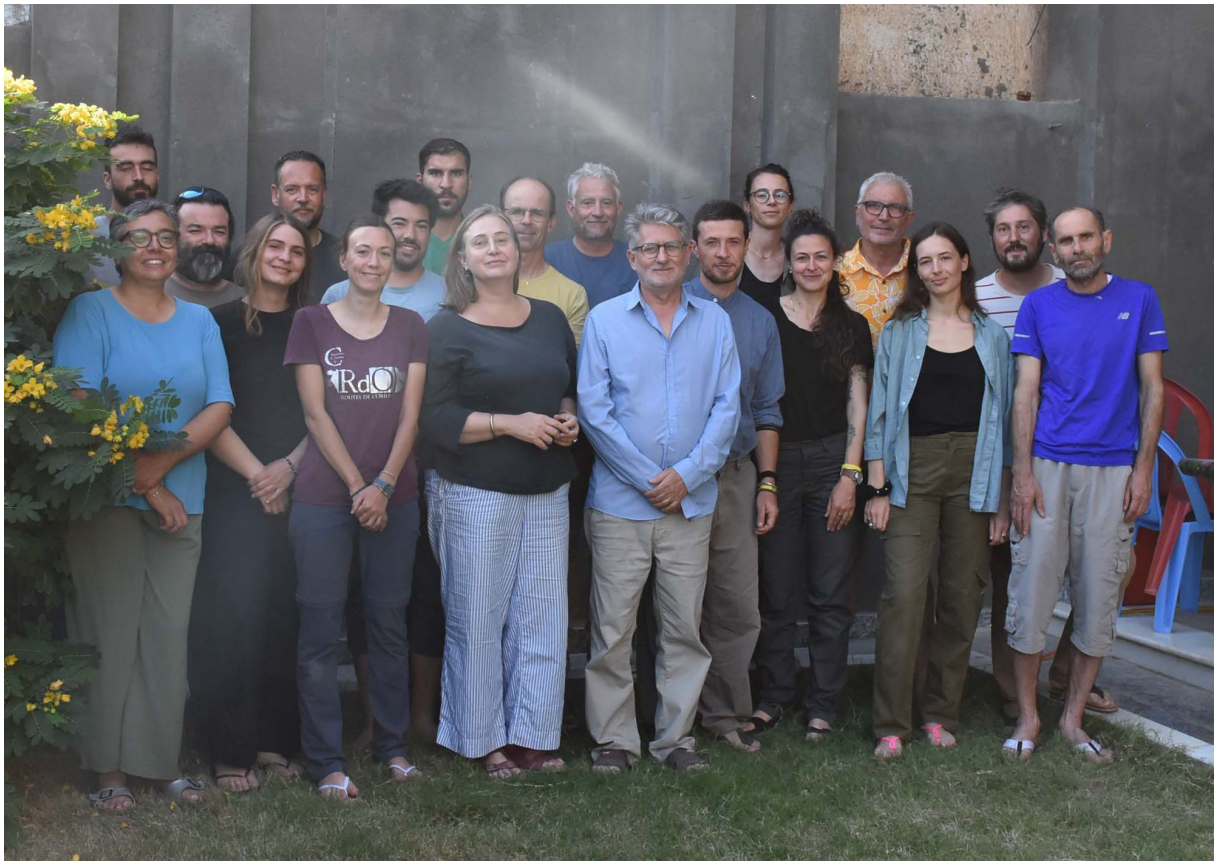

***Fig. 2** – Part of the 2023 Larsa-'Oueili team, from left to right: Matisse Vobauré, Costanza Coppini, Antoine Cocoual, Camille Abric, Sébastien Dohr, Carolyne Douché, Emmanuel Baudouin, Moqtada Abed, Paola Vertuani, Lionel Darras, Yves Gallet, Régis Vallet, Johnny Samuele Baldi, Lucie Cez, Melania Zingarello, Régis Bernard, Claire Padovani, Antoine Jacquet, Rateb al-Debs.*

As always, the mission found a very warm welcome and was tremendously helped by all our Iraqi friends and colleagues. We would like to express our warmest thanks to Dr Laith Hussein (Chairman of the SBAH), Ali Obeid Shalgam (Director of Excavations at the SBAH) and Ms Luma Joda (SBAH) in Baghdad, whose help was crucial. In Nassiriya, to Chamil Ibrahim (Head of the SBAH in Dhi Qar) and Haider Kazim (SBAH), as well as to Mohaned Mnather (SBAH), Mohaned Karim (SBAH), Zaman Cuma (SBAH) and Haneen Salem (SBAH), who worked with us on the field and helped us on a daily basis. In addition to our excavation training, we had the pleasure of introducing ceramology and ceramic drawing to these last two colleagues (Fig. 3). Needless to say, the mission wishes to develop future cooperation and training initiatives, in France and within the

mission, for our SBAH colleagues, initiatives for which specific support from our diplomatic post and supervisory ministry is required[1].

***Fig. 3** – Zaman Cuma and Haneen Salem with Awad Abd-el-Hussein on the field (left) and introduced to ceramics by Costanza Coppini (right).*

We wish to address a special thanks to Taher Queen Aneed (SBAH), who continued to help setting up our accommodation in Nassiriya. We wish also to express our gratefulness to the cultural department (SCAC) of the French Embassy in Baghdad (Pascal Roos), that continued to support the project through a specific funding (FSPI "Revitaliser la valorisation du patrimoine de l'Iraq") and to the department of archaeology and ancient history (DAHA) of the IFPO (Carole Roche-Hawley). In 2023, several institutions joined and supported the project, in particular the Collège de France and the Société pour l'Étude du Proche-Orient Ancien (SÉPOA), through our colleagues Dominique Charpin and Antoine Jacquet, the National Research Agency (ANR) through the 'FACT.WORKS' (Johnny Baldi) and 'EVOSHEEP' (Emmanuelle Vila) programmes, and the National Centre for Scientific Research (CNRS) through the 'Archéomag' SEPIA programme (Yves Gallet, Régis Vallet), in collaboration with the Paris Institute of Earth Physics (IPGP). Since 2023, our work on hydraulics has also been supported by the Sustainable Common Future (ACD) programme 'Water policies in the Near East, from Sumer to the present day' (Valérie Matoïan, Dominique Charpin, Henri Laurens, Régis Vallet) of the Collège de France Foundation.

In 2024, EVEHA became a partner in the mission to launch an anthropological programme (Pauline Jaccard) on the numerous tombs (forming a necropolis?) identified west of Larsa in the 1980s. As we currently only know of a handful of tombs, most of which are empty and scattered throughout the settlement, we have high expectations for this new programme. Also in 2024, TOTAL Energies became a partner in the mission, supporting all of our work.

[1] In 2024, with the assistance of the cultural department of the French Embassy in Iraq (Pascal Roos) and Paris-Nanterre University (Emmanuel Baudouin), the mission organised a workshop entitled 'Current archaeological research in Iraq' at the Maison de l'Archéologie (MSH-Mondes) in Nanterre, which made it possible to invite three Iraqi colleagues to France. In the same year, it participated in the stay of a dozen colleagues from the SBAH in Paris for training.

Finally, we would like to thank Ali Obeid Shalgam, Chairman of the SBAH, for exporting our samples in 2024, which had been blocked for three years for obscure reasons. Several colleagues at the SBAH also deserve our gratitude for the successful outcome of this matter, including Ms Luma Joda, Chamil Ibrahim, Haider Kazim and Taher Queen Aneed, with the assistance of Professor Rajwan al-Mayali (Al-Qadisiyah University).

In 2022, we had the pleasure of welcoming a film crew, led by Olivier Julien (Gédéon production), sent by the ARTE channel to shoot the film 'Mesopotamia, discovering the treasures of Iraq', which is regularly broadcast on the ARTE channel and website. The success of the film, which has won several awards, confirms, if confirmation were needed, the immense public interest in Iraq's exceptional heritage. In 2023, the mission's work was rewarded with the 1st CLIO Prize for archaeological research, then in 2024 with the label of the Académie des Inscriptions et Belles-Lettres (AIBL).

We would like to take this opportunity to thank all those who contributed to the success of our missions.

* * *

In autumn 2022, the mission found itself between two rounds of funding, which meant that the excavation trenches could not be reopened. The ongoing geophysical and geo-archaeological surveys were continued, and some specialised studies were completed: the study of the last sets of tablets (just under a hundred in total) and envelopes from the archive room of building B49, the residence of Grand Vizier Etellum (D. Charpin, A. Jacquet), and that of our faunal remains, of which E. Vila gives a first glimpse here. We took advantage of the resources available to carry out a survey north of Larsa, on a strip of land approximately 200 m wide and 2.5 km long, from the Tells known as the 'Mahmudiyat' in the east (see p. 38, fig. 1), to Tell F11 in the west of the site (J. Baldi, M. Zingarello, H. Kazim). The aim was to resume the examination of an area to the north of the site, which was known to have been occupied during the Early Dynastic I period, possibly also by a cemetery dating back to the Djemdet Nasr period (based on a single tomb, David 2003), but where test excavations had yielded no results (Calvet 2003a).

To the east, the two largest Tells of Mahmudiyat are occupied and largely made up of two large, regular constructions in fired brick from the Isin-Larsa period. This had already been noted (Huot, Rougeulle, Suire 1989: 38), but it can now be suggested that these were certainly official buildings related to traffic on the great canal C1 (Vallet, Cez, Darras 2022: 77), which passes right in front of them. The entire Mahmudiyat area (eight hills in total, six of which are very low) is criss-crossed by secondary canals. In a second phase, still at the beginning of the 2nd millennium (probably in the 18th century), it was entirely devoted to the manufacture of fired bricks (the two large buildings recycled into brickworks). In general, it can be observed that all the hills north of the city were topped with kilns for firing either bricks or ceramics at the beginning of the 2nd millennium.

However, the most interesting discoveries are found to the north of the city. The cemetery reported in studies from the 1980s (Suire 2003: 13) has only about fifteen graves in the middle of a residential area and must be reattributed, like the grave excavated by H. David, to the Early Dynastic I period, based on its material and in accordance with its context.The entire strip of land,

several hundred metres wide (at least 200 m), surrounding the site to the north is densely occupied by dwellings from the beginning of the 3rd millennium. In this part of the ancient city, the 6-metre-high Tell F11 stands out clearly. It housed a monumental building whose oval (or circular) enclosure is visible on the surface. We therefore decided to resume its exploration (Fig. 4).

Fig. 4 – General plan of Larsa showing the location of the excavation trenches (2023).

In 2023, all the work undertaken since 2019 was resumed, with the addition of three new operations: a second excavation site (H1) on the Grand Canal C3, the opening of Tell F11 (Fig. 4) and a programme on the archaeomagnetism of fired bricks (Y. Gallet), the first results of which are expected in autumn 2025.

The multidisciplinary programme on the Larsa hydraulic network (R. Vallet, L. Cez, L. Darras) was continued both in the city and the surrounding plain. Geophysical prospecting now covers 73 hectares in four sectors, and drone imaging covers more than 2,000 hectares at different resolutions. There have been numerous discoveries. Here are the most important ones. To the east of the city, the complex system set up to inject water into the city at water-gate B65 has been fully mapped. An essential section was missing, at the narrowing point of the C1 canal. The layout of the system has therefore been established, and we have a general understanding of how it worked, but we still lack its hydraulic parameters (depth, slope and profile of the canal).

To the north of the city, in the largest area explored (31 ha), a third bridge with massive fired brick piers was discovered (B93) in the centre of the Grand Canal C3, as well as the dense network of canals that branched off from it to the west (and the course of the canal C7 rectified). The area, which was cultivated, concentrated the city's water reserves in several large basins. The largest, the great reservoir P2 (26,660 m²), shows traces of successive enlargements and reductions, in connection with the remodelling of the network, notably the creation of canal C9, which was probably due to King Sin-iddinam since it starts from the Grand Canal C3. This major canal, 650 metres long, was flanked on its southern side, along the palatial and governmental area, by warehouses (B75-80, B90), certainly under the control of the Palace (50 m away), which show that river traffic penetrated the heart of the city. The broad outlines of the governmental sector are also beginning to take shape. It spread out in a rectangular perimeter, oriented north-west/south-east, measuring just under 400 m by 250 m, or 10 ha, bounded on the north-west by basin P2 (and its appendage C15), on the north-east by canal C9, and on the south-west and south-east by a 6 m wide mudbrick enclosure wall. Far from being empty, it contained numerous buildings, organised to the north of the royal palace around a water supply basin (P3). It goes without saying that future work will focus on completing, refining and correcting this initial overview.

To the south of the city, the structure of the port of Larsa, discovered in 2021, is also beginning to reveal itself. Its internal canals were laid out in a zigzag pattern in order to maximise the number of docks available in a small area. The context of the inscribed bricks and the nature of the buildings discovered in the 1980s are now established and show that the port was part of King Sin-iddinam's major hydraulic works. He enlarged its outer basin (P7) to 36,800 m² and equipped the inner harbour (2.9 ha) with a new warehouse (B57, 4590 m²) and a new enclosure isolating it from the rest of the city. Tower B58, in the centre, controlled all port traffic (the equivalent of a harbour master's office).

To the west of the city, work has focused on the ramparts and the large canals nearby. The western city gate (Z43) has been confirmed. The surprise comes from the 15-metre-wide rampart, which has regular 4-metre steps every 20 metres along long sections on both sides, creating a sawtooth pattern. First observed on the western curtain wall, this configuration was then observed to the east and south of the city. This explains the reduced number of bastions needed to cover such a vast

enclosure (5,376 m), replaced by simple recesses. Inside the city, the imagery reveals the southern boundary, which we were missing, of the agricultural area that extends to the north-west of the site. It coincides with the course of an ancient wadi, starting from the Ebabbar, beyond which dense habitation is visible. The agricultural zone covers a total of 30 hectares, or 15% of the intra-mural city. Outside the city, our attention focused on the water supply during the Gungunum period (phase 1 of the Amorite network), whose connection with the city remained to be clarified. The two main supply canals for this phase, C88 from the Iturungal and C37 from the Euphrates, converged to form a complex system equipped with a drainage basin (P29). The technology of large fired brick water-gates, illustrated by B65 to the east of the site and B17 to the south, was not used at this time, with water entering the city through two small canals (2 m), reducing the stress on the base of the rampart.

Fig. 5 *– The route of the canal C149 from C4 to the north, at its bend to the northeast.*
(photo L. Cez, 2022)

Geo-archaeological work (L. Cez, R. Vallet, R. Khazal-Ahmad) has also been carried out in the city and the plain. To the south-east of the city, a second irrigated agricultural area was discovered to the north of canal C4. More modest in size, covering less than 3 ha, one tenth of the north-western cultivated area, it is fed by C4 and is intertwined with a residential neighbourhood. One of its canals (C149) was sounded and sampled (Fig. 5). The vicinity of the C4 canal contains several cistern-type storage structures (5 to 6 m in diameter), supplied by a secondary network originating from C4. These may have been supplementary resources compensating for the absence of a large reservoir in the area.

Outside the city, mapping of the Larsa plain continued to expand and become more accurate. All newly discovered structures fit into the phasing observed by the large canals near the city and corroborated by historical data (Vallet, Cez, Darras 2022: 69-72). We have not encountered any structures that would require us to revise the chronology of the system[1] . The city was surrounded by a series of basins, seen in imagery in 2021-2022 by the mission and Archaios (Giraud et al. 2022; Vallet, Cez, Darras 2022), but which had not been visited and assessed in the field, something that was done in November 2022-2023. Most of these structures were built in former paleo-channels, which were re-excavated for this purpose, with the extracted earth forming large peripheral dykes (Fig. 6), on several of which are the remains of small square buildings, made of fired or unfired bricks (B72, B104, B105),

[1] For the record, it should be noted that the Larsa hydraulic system at the time of Amorite rule was organised into four phases (phase 2 having two sub-phases), from Gungunum to Sin-iddinam, plus a few later elements, probably due to Rim-Sin.

certainly the posts of those responsible of the structures. The basins are located at strategic points in the network and were used to regulate its operation in order to ensure a sustainable supply. In the south (P31-35) and west (P36-38), they were mainly of local interest due to their small size (a few hundred or thousand square metres). In the north of the city, on the other hand, there were huge reservoirs (P27-28), exceeding 100,000 m², which served as strategic reserves for the city and its surroundings. Connected to the urban network at the latest under King Abi-sare, it is likely that their development was initiated by Gungunum, as part of his programme to develop the (remains of) the marshes, in the middle of which he made Larsa 'emerge' (Georges 2011: 96).

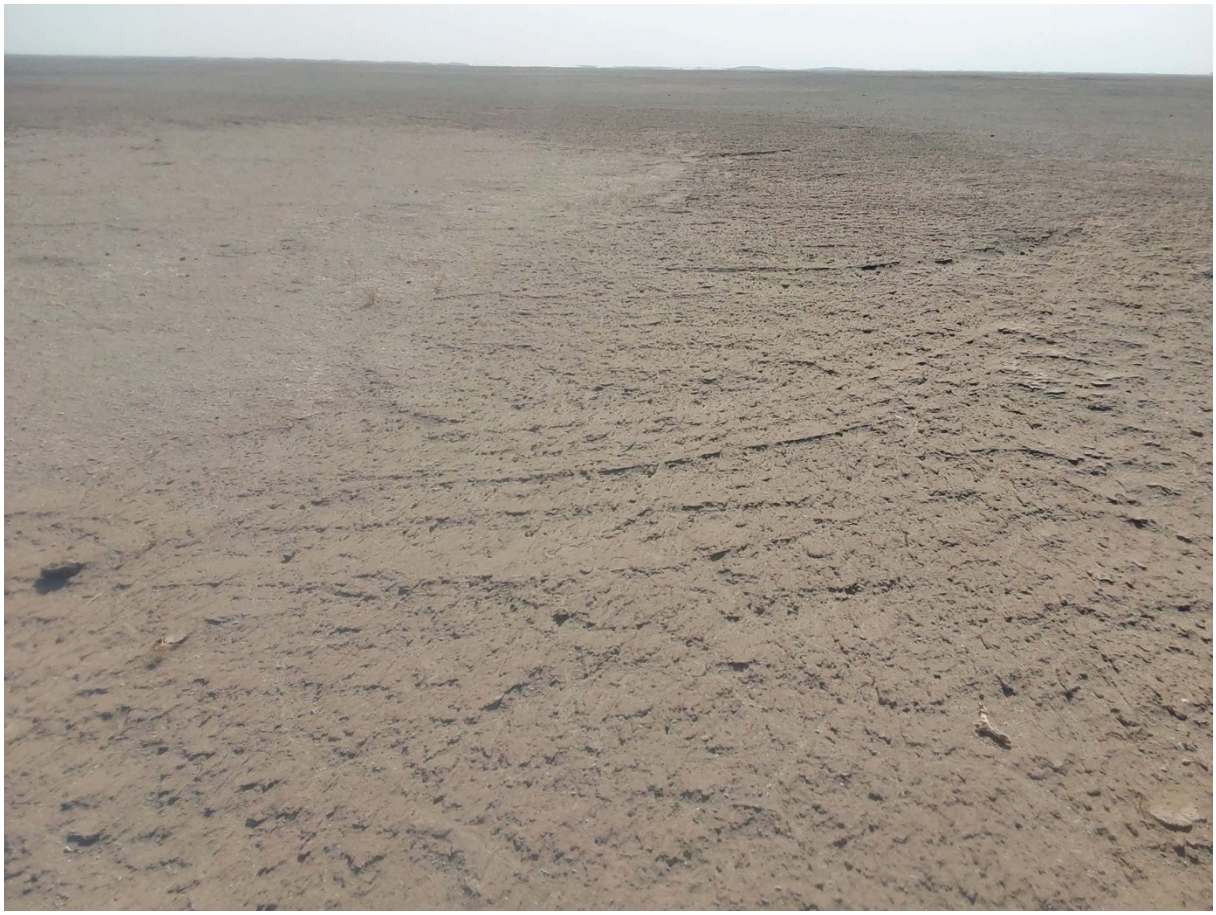

Fig. 6 *– Earth deposits forming the outer wall of the reservoir P27, eroded by wind deflation (streaks). (photo L. Cez, 2022)*

Two excavation trenches are currently underway on the Grand Canal C3. In 2023, we opened a trench (H1, Fig. 4) for stratigraphic purposes to the north of the canal (L. Cez). A ceramic collector sewer pipe (C132) was discovered there, emptying into the canal through an opening in the fired brick facing of the canal quay (Fig. 7), reinforced with buttresses and surmounted by the dwelling built on the edge of the canal (building B83). The pipe comes from the area excavated in the 1980s (houses B59 and B27), 130 m to the east. As in the PZ site further south (below), the canal has a stepped profile, with wide landings descending towards the centre of the canal. Only the upper landing has been cleared, at an altitude of 6.73 m, which is a slight elevation compared to the surrounding plain (which fluctuates between 4 m and 6 m in altitude). It is therefore possible that the deep centre of the canal was at the same altitude as the plain, which further work should verify.

***Fig.** 7 – Trench H1: Pipe C132 discharging into the Grand Canal C3 through the fired brick quay, from the west (photo R. Vallet, 2023).*

At the southern end of Canal C3, in the centre of the city, we have been excavating since 2021 one of the three bridges with fired brick piles that crossed the canal, Bridge B69 (Fig. 8), discovered in 2019 (in trench 'PZ', for 'Pont de la Ziggourat', nearby, Fig. 4) (C. Coppini, R. al-Debs, H. Salem, Z. Cuma). The structure, whose excavation is not yet complete, has two levels of construction. Level 4B, attributed to Sin-iddinam (inscribed bricks), and level 4A, dating from the 18th century according to the material collected, covered by the remains of a Kassite potter's workshop (levels 1-3). The eastern pile of the bridge (4511) has been cleared across its entire width (4 m) and over a length of 8 m (it continues northwards). Its south face has been cleared down to the foundations, over a height of 3 m (30 courses). Its foundations were specially designed. The pile was equipped with foundation pillars near its corners, sinking deep into the ground. The south-east pillar, preserved over 20 courses, has been completely uncovered. Its bricks were jointed with bitumen. A set of secondary piles was associated with the main pile, extending to the quay, founded at different heights according to the landing where installed. At the latest during the reconstruction of the bridge (level 4A), perhaps following the events of 1763 (destruction layer), the large pile 4511 was connected to the quay by filling in the land between the two, and the canal was narrowed to 8 m. This shows that the structure was designed to withstand the pressure of the water in canal C3, but also to facilitate the management of the structure, the largest in the intramural network. It is a dam-bridge, capable of closing the canal to regulate its flow and allow it to be dredged.

***Fig. 8** – King Sin iddinam's bridge B69 over Larsa's Grand Canal, under excavation, seen from the northwest (photo R. Vallet, 2023).*

The other excavation sites are located to the west of the site (Fig. 4), dedicated respectively to large religious architecture (B50), sumptuous dwellings (B48-49) and the Sumerian city (F11).

In B50 (M. Vobauré, R. Vallet), since 2019 we have been excavating a large royal construction, adjacent to the Ebabbar, which, based on the inscriptions found (10 inscribed bricks from Sin-iddinam), was probably the Gipar of Larsa, the temple-residence of the priestesses of the god Shamash (Charpin 2022; Ait-Said, Vobauré, Vallet 2022; Vallet 2023). The complex occupies a rectangle measuring 127 x 61 m (7,250 m²) and consists of two buildings, the larger of which is to the north (2,745 m²), separated by a courtyard measuring 43 m on each side. In 2019-2021, 772 m² were cleared, including the west façade of the complex, with its stepped fired brick facing, and several rooms to the south of the main building, preserved there at a height of 4.5 m, up to the first floor.

In 2023, we stripped the core of the north building, its central strip of rooms and part of the western half of the building. However, despite extensive clearing, totalling 1,300 m² (almost half of the building), we have not yet found a single passageway in the building (only two possible thresholds). This means that a significant part of the ground floor, such as the blind room 3019 excavated in 2021, was used for storage and was only accessible from the upper floor. But what is striking about the cleared floor plan is its duplication, its symmetry, which is perhaps perfect. We initially thought that one of the two buildings in the complex, the one to the south of the courtyard, might have been the priestess's residence and the other the temple. But considering what is now emerging, it seems more likely that what we have called the temple, the northern building, combined these two

components, the house of the deity and that of the priestess, hence the doubling of the plan. The southern building of the complex, which remains to be excavated, could be that of the temple staff, who are known to have been numerous. Future campaigns will focus on uncovering this.

Further north, we are exploring the settlement through the excavation of two sumptuous residences from the late 20th century, B48 and B49. The excavation of B49 began in 2021. The building, which is almost square (37 x 40 m), covers 1480 m². Three rooms had been excavated, including archive room 1598, which yielded fragments of around 90 tablets that enabled the building to be identified as the residence of Etellum, prime minister to kings Gungunum and Abi-sare. The violent destruction of the building revealed that their successor, Sumu-El, had certainly seized power by force.

***Fig. 9** – B49: Antoine Jacquet and Carolyne Douché excavating the kitchen 1632, view from the south (photo R. Vallet, 2023).*

Excavation continued in 2023 (A. Jacquet, M. Mnather) with two objectives: to complete the excavation of the north wing of the residence and to continue its extensive excavation towards the south. To the south, the reception hall (1607), with a 2.5-metre-wide entrance onto the main courtyard (1634), is 18 metres long and 4.7 metres wide (85 m²). Further south are several vestibules regulating traffic between the various functional areas of the building. A sounding in the courtyard showed that the building is preserved on seven courses of masonry, three of which form the foundation, and that the courtyard (14 x 15 m, 210 m²) had side pavements (three bricks wide).

However, most of the work took place to the north of the building, where a kitchen (1632) was discovered, built on two landings. On the lower landing to the west, the cooking facilities have been preserved (Fig. 9), buried under thick layers of ash that have not yet been fully excavated: a

circular oven and a set of three tannurs, one of which yielded a fragment of a seal of great interest (Charpin, Jacquet). It is the seal of En-ana-tuma, priestess-entum of the god Nanna in Ur, elevated to this position by her father Ishme-Dagan, king of Isin, and who remained in office after the capture of Ur by Gungunum of Larsa in 1925. We can imagine that having retained her status while Ur was controlled by Larsa, the priestess, daughter and sister of the last kings of Isin, sent a gift to the Grand Vizier of Larsa as a sign of gratitude or allegiance.

***Fig. 10** – Trench F11: Building B74 and the buttressed Wall 5515, from the east (photo R. Vallet, 2023).*

Finally, we reopened Tell F11 to the north-west of Larsa, opening a trench on its northern flank (M. Zingarello, C. Padovani, C. Abric). Two periods of occupation were identified: a potter's workshop from the early 2nd millennium and a large monumental complex from the early 3rd millennium, associated with peripheral constructions. The kilns of the pottery workshop (level 1), with double chambers and vertical draught, are organised in batteries set up on refurbished landings of the ruins of the 3rd millennium building. The floor of the upper battery yielded a well-preserved tablet, possibly from the reign of Rim-Sin according to palaeography (A. Jacquet). The large complex from the Early Dynastic I period below (B107) is evidenced by its circular or oval-shaped mud-brick enclosure, up to 5 m wide, enclosing terraced steps that make up Tell F11. Pilasters adorned its façade. At the foot of the complex is an adjoining building to the east (B74) and a tiled square to the west (Fig. 10). Two successive levels of construction are attested (levels 2a-2b). The excavation of B74, with its badly degraded bricks, melted by erosion, is currently superficial, except for a narrow test sounding near the circular complex. The building, cleared over an area of around 100 m², extends to the north and east. It was destroyed by fire, as evidenced in particular by a large room (5516) which yielded a great deal of material in situ. Its study is ongoing, but we can already say that the building was used both for storage (jars) and for the collective consumption of beverages (hundreds of solid footed goblets). These discoveries demonstrate that Ebabbar, which already existed in the 3rd millennium, was not the only very large temple in the Sumerian city.

***Fig. 11** – Tell el-'Oueili, composite orthophoto (2019–2023) of the trench to the north-west of the main mound (R. Bernard, R. Vallet, 2024).*

At Tell el-'Oueili (J. S. Baldi, G. Russo, E. Baudouin, M. Karim), we are conducting an extensive stratigraphic excavation, combined with a technological study of the ceramic material, using the *chaînes opératoires* method, thus reconstructing it in space and time. The main objectives are to determine the structure of the 7th millennium village and the evolution of the site's occupation sequence over the long term, from the 7th to the 4th millennium. In 2019-2021, we resumed excavation of the area northwest of the main mound (Fig. 11), where the 7th millennium levels had appeared very close to the surface (Vallet 1996). Nine levels were distinguished, from Ubaid 5 (level 1) to the 7th millennium, with levels 5a-b-c corresponding to levels IA-IB and III of the former excavations, immediately below the remains of a large Ubaid 1 ceramic workshop (level 4) (Vallet, Baldi et al. 2020; Baldi, Baudouin, Mnather 2022). 600 m² of the 7th millennium village have been excavated, beginning to give an idea of its structure.

The buildings are very densely packed, with narrow alleys separating groups of structures. To the north are dwellings (houses 37-41) and further south, perhaps towards the centre of the village, large granaries, built on mud-brick crawl spaces, which were also used for grain processing (platforms, ovens). Among them, building B110 stands out, with more extensive food processing

functions (millstones, basins, ovens) and its own storage areas, as well as a first floor supported by walls reinforced with wooden posts on mudbrick bases, as found in dwellings to support the roofs of the main rooms. Despite the densification of buildings over time (at level 5a, which has three sub-phases), the plot layout and alley network remain stable, reflecting an organisation that is neither centralised, as the granaries are clearly distinct, nor domestic, as food storage and processing take place in communal areas. The village brings together groups, certainly based on kinship, that are economically autonomous. It goes without saying that future work will seek to clarify this initial picture, but it should be noted that this is a transitional stage in the evolution of local communities. Indeed, the excavation of the underlying Level III produced a huge granary, made up of different units but perfectly agglutinated, reflecting a more centralised management system, while the subsequent Ubaid 1 levels yielded more modest granaries associated with specific houses, and therefore a more domestic system (Forest, Vallet, Breniquet 1996). However, this trend is part of a more fundamental evolution to which it is probably linked.

The technological study of ceramic material (J. S. Baldi) shows that what we named "Ubaid 0" in 1983 is only marginally at the origin of the Ubaid culture (Baldi 2022; Baldi, Baudouin, Vallet in press). There is no need to go into the details of ongoing research here, but level 5b sees the emergence of a new technical tradition that is clearly at the origin of Ubaid 1, which amplifies at level 5a and then becomes dominant, and whose differences from previous traditions are such that it cannot have been carried by the same groups. At the same time, the earlier traditions became acculturated through contact with the new one and then disappeared, leaving only a few forms and decorations in the Ubaid 1 repertoire, which followed on without interruption. Contrary to what was thought on the basis of overly limited excavations, there was in fact no abandonment between the "Ubaid 0" and 1 phases (the pottery workshop of level 4 is completely intertwined with the recycled remains of level 5a). Levels 5b and 5a are truly transitional, and the transition was long and gradual enough for acculturation to occur in both directions: the form of the habitat, in particular, persists from one phase to the next.

In any case, these discoveries shed completely new light on the formation of the Ubaid culture at the turn of the 7th–6th millennia, as well as the earlier pre-Ubaid culture, for which we are abandoning the name "Ubaid 0" in favour of "Oueili" culture, which remains for the time being the only site where it can be studied.

In 2023, torrential rains flooded the site early in the season, rendering it impracticable. There was just enough time to confirm the alleyway (2110) to the west of building B110 and to discover a third sub-phase (5a1) of level 5a, to the south-east of building 41. All efforts were focused towards the summit of Tell, which had been spared by the flooding, where the connection was made with the excavations of the 1970s. Between 1976 and 1983, an Ubaid 4 community building with a bipartite plan[1] (Huot 1980; Huot et al. 1981; Huot ed. 1983, 1987), was uncovered at the summit of Tell on three successive levels (4a-4b-5, from top to bottom), associated with granaries and seemingly surrounded by a large wall (recognised on two sections, to the west and south), the interpretation of which remained open (enclosure? retaining wall? neighbouring constructions?).

[1] It was not tripartite, as suggested by J.-D. Forest (1983a), who combined elements whose contemporaneity has never been established and which have different orientations.

Level 2 of our own sequence (three successive levels, 2a-2b-2c, from top to bottom) corresponds to the large Ubaid 4 complex, which does indeed have a wall with steps and buttresses (wall 2147), the extension of which we have uncovered. The discovery of a "censer" (incense burner) confirms, if confirmation were needed, the exceptional nature of the construction.

Finally, C. Douché continued the archaeobotanical study programme at both sites, implementing a systematic collection and sampling strategy that is beginning to bear fruit. At ʻOueili, the supposed predominance of barley in the late Ubaid period (Neef 1991) was merely a sampling bias; wheat dominates the entire sequence, with long-term developments (from emmer to einkorn) perhaps reflecting strategies for adapting to climatic and environmental fluctuations (aridity, salinisation). In Larsa, the discovery of an exceptionally rich and well-dated assemblage in the kitchen (1632) of the Etellum house (B49), most of whose floors remain to be excavated, should provide a wealth of new data. Preliminary analyses show that barley is by far the most common cereal, alongside numerous wild species, some of which are typical of wet environments (near canals). This is not surprising, but the barley collected shows great morphological variety. Future analyses (morphometric, isotopic, gypsum content, in particular) should provide information on growing conditions and soil quality. Here again, the investigation is only just beginning.

***Fig. 12** – Shamash rises above Larsa (photo R. Vallet, November 2022).*

I – THE URBAN STRUCTURE AND HYDRAULIC SYSTEM OF LARSA, 2022-2023 WORK

Regis Vallet, Lionel Darras, Lucie Cez

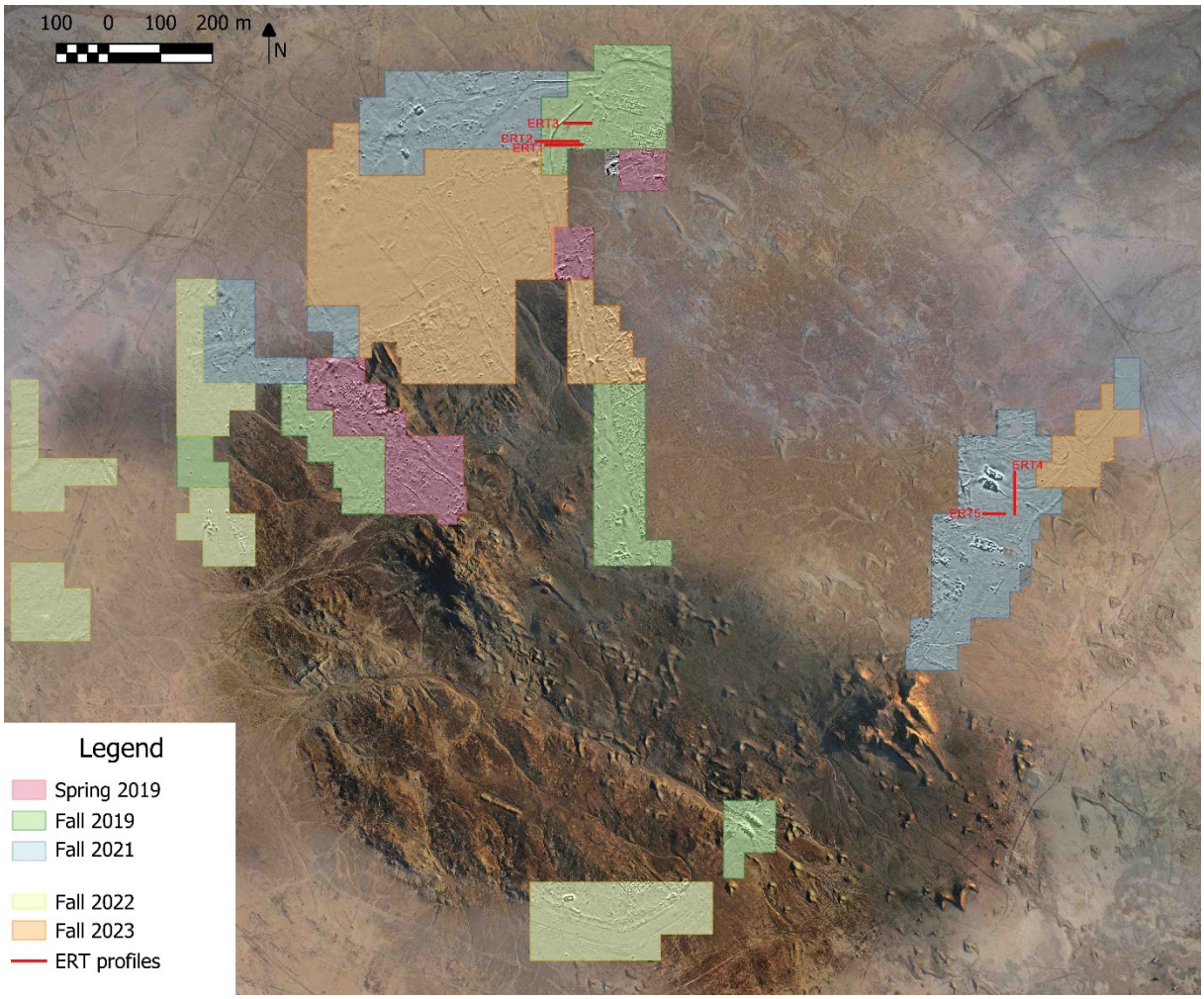

***Fig. 1** - General plan of the geomagnetic prospecting by campaigns, with ERT profiles (L. Darras).*

In 2022-23, the study of the structure of the site, of its urbanism, continued in the field, then in the laboratory, by crossing the geophysical (LD), archaeological (RV) and geo-archaeological (LC) approaches. The work continued to be focused on the urban envelope (rampart) and the canal network, two fundamental elements of the urban space that maintain complex relationships affecting the organization of the city. Thus, the definition of their structure and interrelationships constitutes an essential initial step in the spatial study of the site.

The geophysical method used is magnetic prospecting, which is a fast and effective method for a first approach on an archaeological site. The principle of the magnetic method is to measure local variations in the Earth's magnetic field due to the presence of iron oxides in soil and archaeological structures (Aspinall, Gaffney, Schmidt 2008). Magnetic prospection was conducted with a G858 cesium vapor gradiometer (Geometrics Inc) on a 37 ha area, in addition to the 36 ha of 2019-21 (Fig. 1), distributed in areas of 50 m by 50 m and a survey following magnetic profiles spaced 1m apart and measurements every 10 cm along the profiles. The measurements were interpolated to 50 cm.

Four sectors were selected. To the north, the sector opened in 2019 was extended to the south to the palace and temple area and its connection to other geophysical sectors. To the east, the Parrot

Gate area, where the city's main water supply from the reign of Sin-iddinam (1849-1843 BC) was identified, has been completed. To the south, a new sector on either side of the city wall, near the south-east city gate (B36) and water-gate B17, was opened. Its objective was to clarify the structure of the city's harbor (P7), discovered through drone imaging, and the inner harbor. Finally, to the west, the prospecting begun around buildings B50 and B48-49 was extended to the northwest along the city wall, as far as the west city gate (Z43), as well as outside the city, to test the method on the network of large peri-urban canals. In addition to the survey, five tomographic profiles, up to 80 m long, were carried out across the Grand Canal, the C1 water supply canal and the rampart.

The new aerial data provided in the frame of the 2022 and 2023 campaigns consists of ortho-photos taken from Mavic Air 2 pro drones processed by M. Atton in November 2022, by R. Bernard and S. Dohr in November 2023, covering the site and the surrounding plain at high resolution over a total area of more than 2,000 ha. R. Vallet and L. Cez, with the participation of L. Darras, carried out the carto-photo-interpretation work of the all the available imagery, to which is added the proofreading of the aerial photographs from G. Gerster dated from 1973 and systematic observations in the field. The interpreted maps presented here are a synthesis of all available information. This information is still being analyzed, but the broad outlines of the cartography presented here are solidly established and should only be refined in the future. Two clarifications. This is not an exhaustive mapping, only the outlines of the most important structures are shown. It does not contain any restitutions - the dashed lines correspond to shapes that have been observed but whose existence or nature has yet to be confirmed. It is understood that these reservations do not protect against errors which are entirely of our own making.

This chapter concerns only the areas covered by the geophysical survey. The other sectors of interest in the program on the structure of the site and its surroundings are presented separately (Cez, Vallet, Khazal-Ahmad, in this volume). We briefly expose below the main results obtained in the different sectors of the city.

1 – The northern sector

Begun in 2019, geomagnetic prospecting in the northern sector was extended southwards by two additional areas, the largest to the west (17 ha) and the other on a missing section of the Grand Canal (2 ha), bringing the total area prospected to 31 ha (Fig. 2). Numerous discoveries have been made, and we now have a good picture of the Grand Canal and the agricultural area to the west, where the city's water reserves were concentrated (Fig. 3).

The compartmentalised structure of the Grand Canal (C3) is well established, with four sections in the area of interest here (six in total), separated by a partial dyke used by street R3 to the north, a more significant narrowing at the water intakes of the western network (canals C130 and C8) and reservoir P22 (4800 m^2) – already seen by Archaïos (Giraud 2020: fig. 10, p. 40) – and finally to the south by the B93 bridge discovered this year. The high magnetic value of structure B93 (between 25 and 75 nT), typical of fired brick, at a shallow depth (estimated at 1 m to 1.5 m), produces a particularly clear image. This is a bridge crossing the Grand Canal, well connected to the road network and undoubtedly in better condition than the B69 bridge currently being excavated (Coppini et al. in this volume). The structure's function as a crossing is beyond doubt,

but its specific layout and the massiveness of its anchoring in the C3 canal's cavalier[1] walls show that it also had hydraulic functions. In other words, it is a dam-bridge, facilitating the closure of the canal to regulate its flow and allow dredging. The location of basin P22 upstream of this section of the main canal makes it a collector of overflow water during maintenance operations on the downstream section. Similarly, canals C8-C130 redirected the overflow to the west, where it could be stored in basin P20 and used for agriculture in the north-west. At the same time, basin P22 could store water from the upper section of the main canal when it was drained, thanks to a diversion built at the narrowest point near building B88.

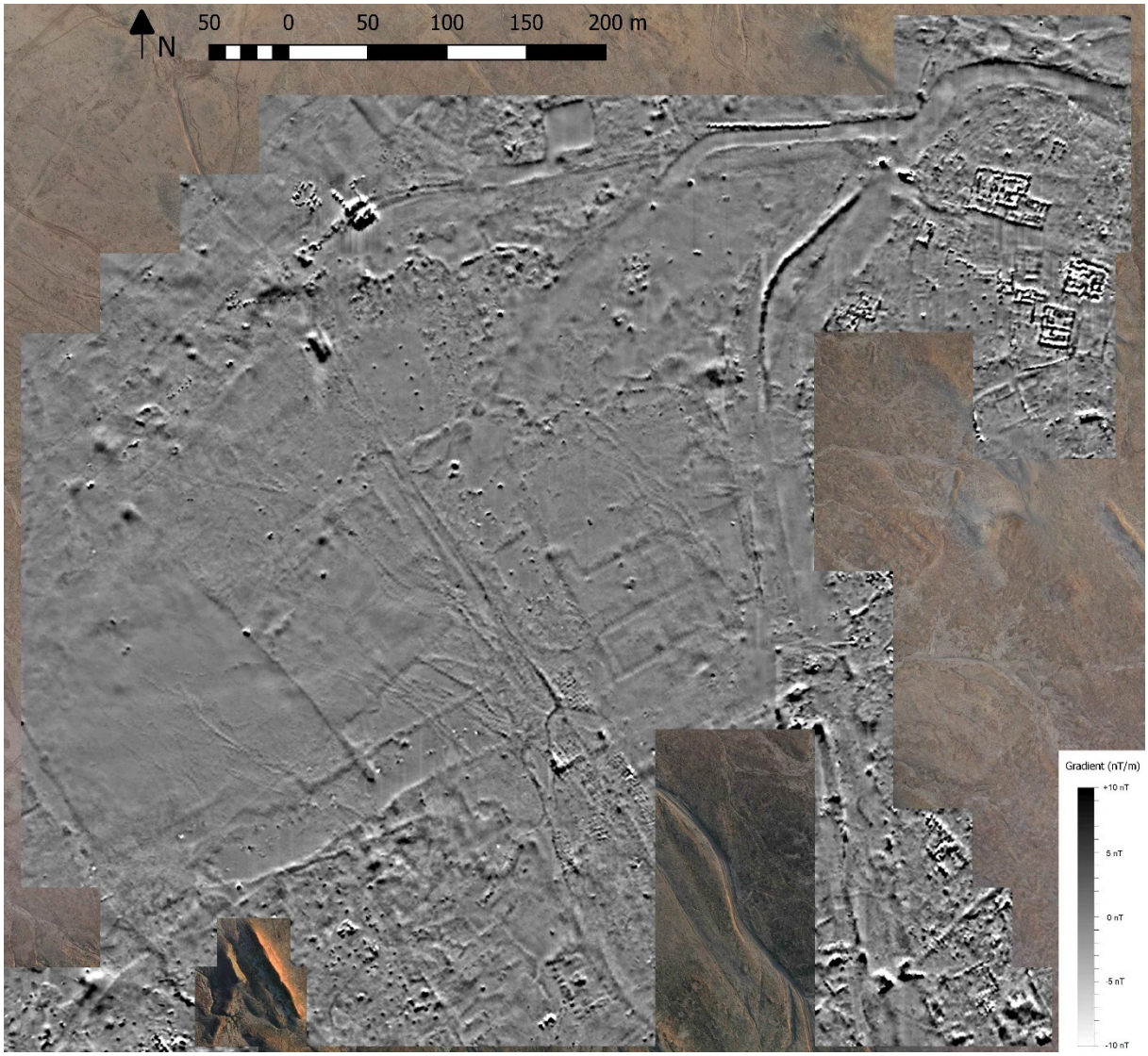

***Fig. 2** – Geomagnetic map of the northern sector (L. Darras).*

The other crossing points also had to be able to close the canal in the same way. To the west of the canal, the large D3 dyke is visible halfway along its length but certainly continues further south (all the canals and basins were lined with earth embankments, but only the structures visible in images or on the ground are mapped). The R1 road on the D3 dyke is particularly clear along its entire length, to the point that one might wonder whether it rested on a layer of compacted earth and was covered with a surface (mudbrick tiles?). To the east of the canal, there is a high density of

[1] Lateral embankments consisting of sediments excavated during the digging of the canal. The "levées" are embankments of natural origin.

buildings, to the north of which the C132 sewer discovered this year in the H1 site (Cez et al. in this volume) runs for more than 130 m, from the street west of house B59 excavated in the 1980s (Calvet 2003b) to the Grand Canal. This is therefore a sewer serving a district of the town. In the same area of canal C3, three tomographic profiles (Figs. 4-5) show the layout of the structures observed, namely the canal in its width, the embankment bordering it to the west and its dyke, and the urban terrain built to the east, although the depths remain approximate with this method of investigation and will need to be clarified by excavation.

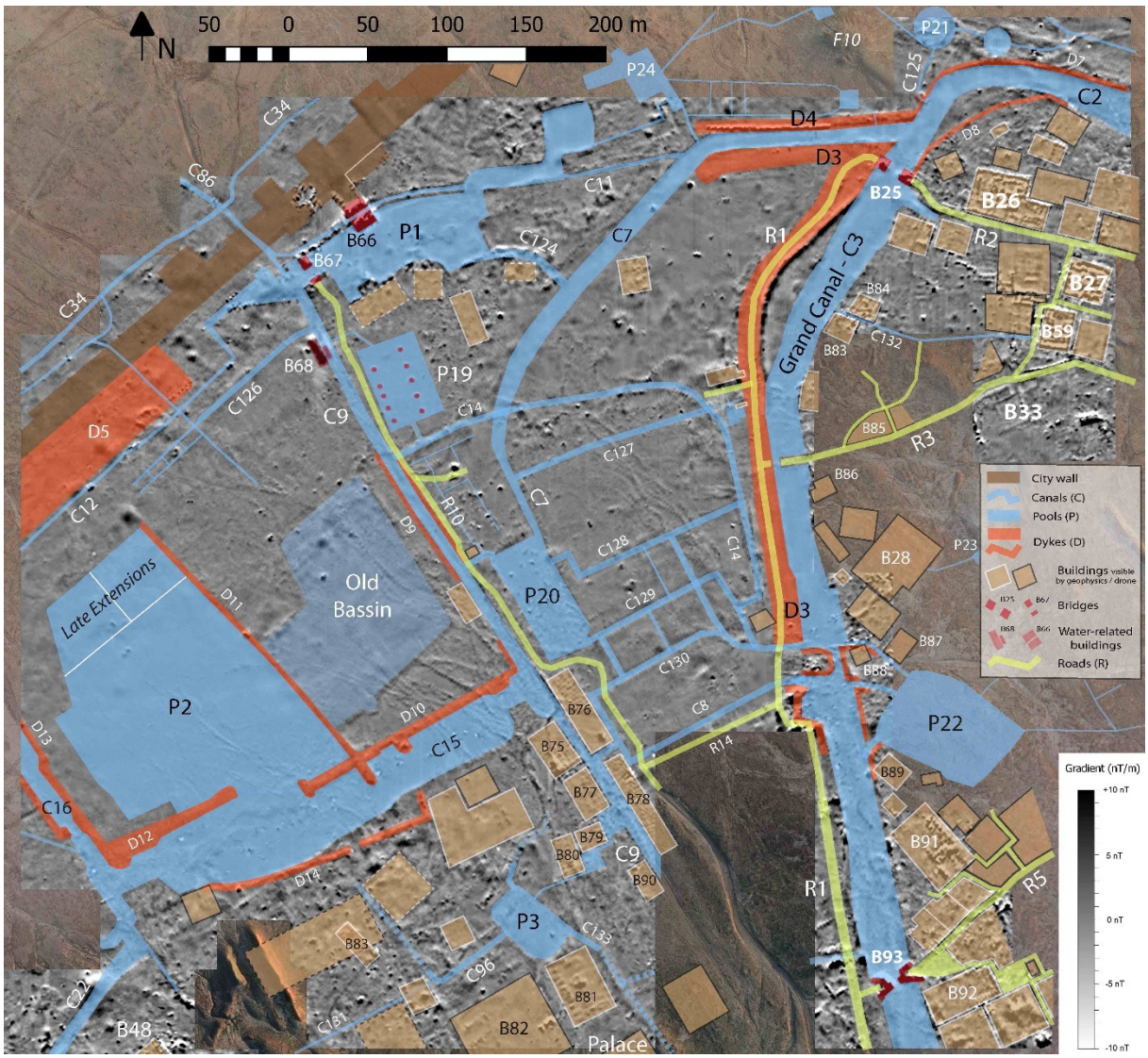

Fig. 3 – Interpreted map of the northern sector (R. Vallet, L. Cez, L. Darras).

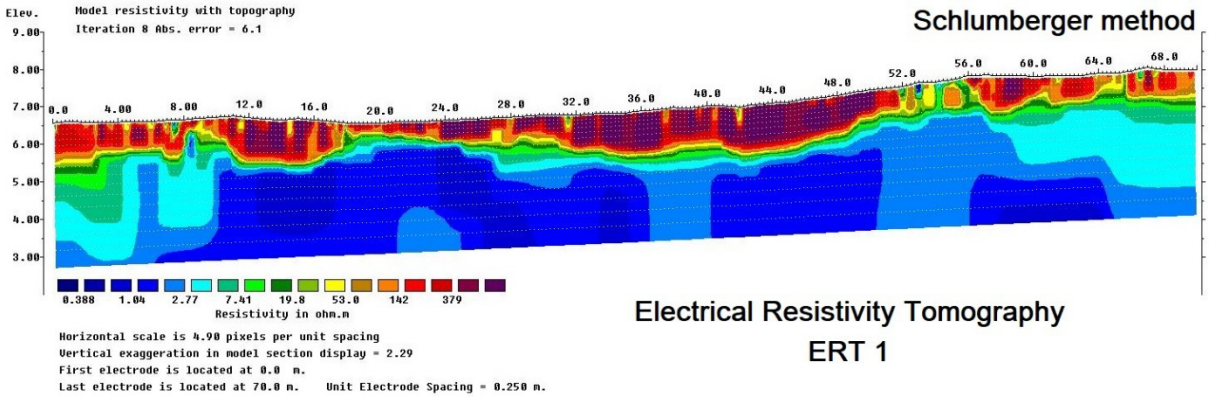

Fig. 4 – ERT profile 1 (L. Darras).

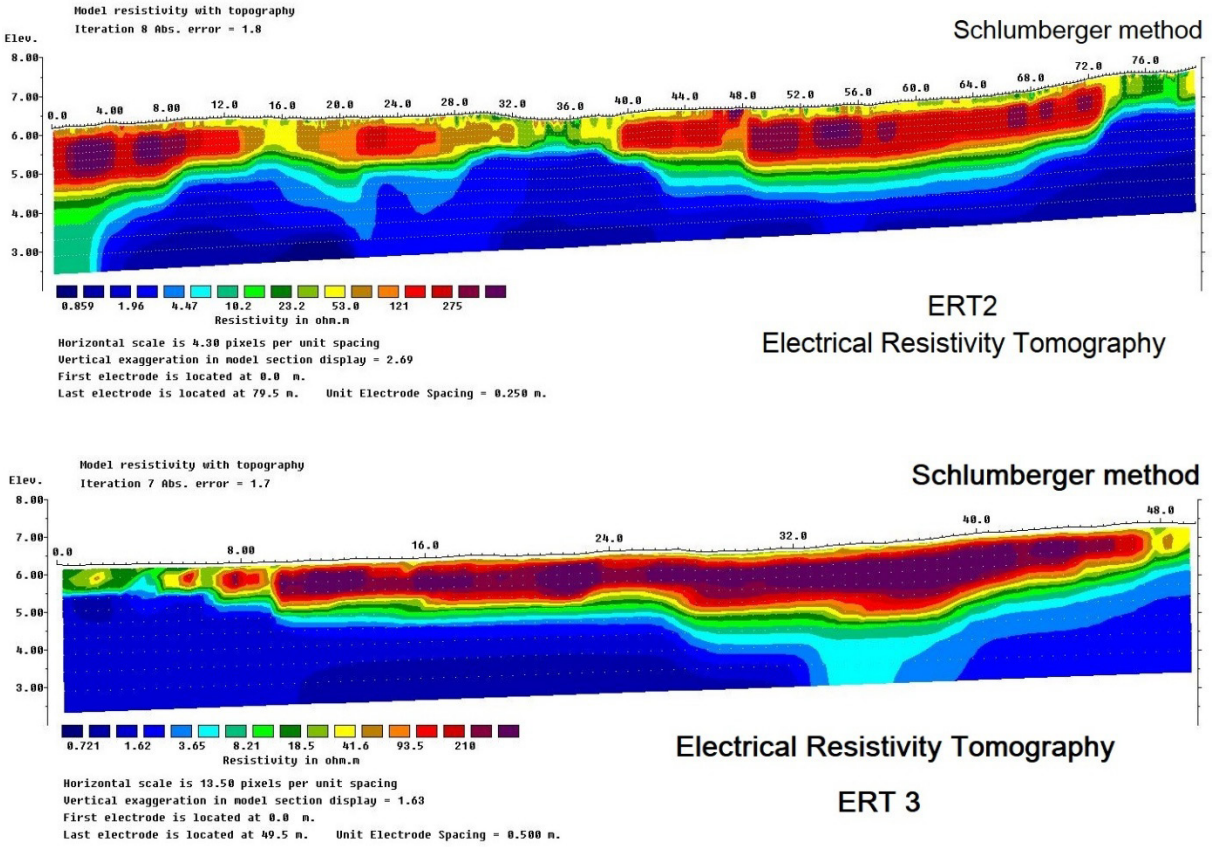

***Fig. 5** – ERT profile 2 and 3 (L. Darras).*

To the west of the Grand Canal, the cultivated area was crossed by a series of medium-sized canals, around 3 m wide at their widest points (C8 and C14 already known, C127-128-129-130), feeding the basins further west and the local irrigation network from the Grand Canal. Canal C7, a major branch of canal C2 to the north of the city, did not join the water intake of C130 as we had believed, but one of the basins, P20 (2330 m²), built along canal C9. A second basin, P19 (2180 m²), a little further north, has a remarkable structure: two parallel rows of small piles (less than 2 m) probably built of fired bricks according to their magnetic value. Given that the layout of this structure and its integration into its surroundings are consistent, it is likely that this is a special type of basin. The fairly widely spaced rows of piles suggest the vertical supports of a very light removable cover (canvas?), but they could have had other functions. For example, they could have been used to stretch nets dividing a fishpond into compartments. This is a plausible speculation given the economic importance of the region's fish resources, which have been exploited since ancient times (Greco, Pöllath 2024). A few nearby structures could be linked to the activities that took place there.

However, the most unexpected structures associated with canal C9 are found to the south, near the palatial and governmental area bounded by the canal to the east. South of its junction with canal C15, canal C9 is lined on both sides by a series of similar structures, which seem to continue southwards beyond the surveyed area: rectangular buildings of varying lengths, from 10 m (B78) to 20 m (B75) deep, made exclusively of parallel walls delimiting narrow rooms, each approximately 2 m wide. Two of them (B79-80) are set back from the canal, encroaching on the palace area and accessible by a waterway connecting canal C9 to the central basin (P3) of the palace area. The layout of these buildings is consistent with warehouses located along C9 and linked to river traffic.

Integrated into the palace sector and close to the palace itself, these buildings would then have been under its control. It goes without saying that excavations are necessary to verify our hypotheses and, in so doing, confirm the reality of river traffic within the city (at least to the palace), and not only concentrated in the port to the south of the city (see below). It should be noted, however, that this only applies from the reign of King Sin-iddinam (1849-1843 BC), since the network of large canals crossing the city, of which C9 is a part, is the work of this ruler.

Further west, the large P2 basin, which certainly dates back to Gungunum (1932-1906 BC) as it is linked to the earliest phase of the Amorite network (Vallet, Cez, Darras 2022; and see below for the western sector), clearly has a long history. Imagery acquired in 2023 revealed an ancient L-shaped basin (10·000 m²), which extended eastward from the main basin before being removed and completely filled in (its filling shows the same traces of irrigation and cultivation as the surrounding land). It is possible that Sin-iddinam's major works were behind this change, as the eastern basin may have been considered too close to the route of canal C9, and that the extensions observed to the north of P2 were intended to compensate for its removal. In any case, the geophysical survey reveals most of the network of dykes surrounding the large hydraulic structures in the area, revealing their contours. Basin P2 extended over at least 20,000 m² (the western angle remains uncertain), 26,660 m² with the western part of canal C15, forming a sort of front basin separated by a mole (D12). The eastern section of C15, which joins C9, also resembles a basin rather than a simple canal, as it was exceptionally wide, around 30 m. To the south of C15, the palatial and governmental area was protected by a dyke (D14, which must have continued eastwards, where it disappeared), partially built at an angle, perhaps to make way for a platform (landing stage) to the east, in its recess, similar to dyke D3, which deviates to the north of the Grand Canal.

Finally, to the south of C15 lies the city's palatial and governmental area. To the north of the palace (known as the "Nur-Adad palace" but probably predating this ruler and covering an older palace, points which will be the subject of further study), it can be seen that the site was not empty, as was thought at the end of the previous surveys (Huot, Rougeulle, Suire 1989: 46). Although some of the structures identified remain to be confirmed, bearing in mind that they were not necessarily all contemporary (there are some overlaps), there are around ten of them (not including the possible warehouses already mentioned), of various sizes, shapes and no doubt, functions. B81 (1270 m²) could belong to the category of economic or storage buildings, with stores arranged around a courtyard rather than aligned, but B82 next door is a truly monumental building (3160 m²), with mudbrick walls over four metres wide and large rooms arranged in several rows. All these buildings were organised around a central basin P3 (1360 m²), whose connections to the network have only been partially identified so far (C96 probably connected to C15 and C133 to C9, among others), but which is known to have supplied fresh water to the entire area, as far as B49 more than 200 m to the west, whose connection, a large ceramic pipe (C131), is still visible in places on the surface. Since B49 is precisely dated (Charpin, Jacquet, this volume), the P3 basin, and therefore some of the neighbouring structures it supplied, also date from the 20th century, i.e. from the network set up by Gungunum.

2 – The eastern sector

Prospected in 2021, the eastern sector revealed the connection of the large canal C1, attributed by historical sources to King Sin-iddinam (Sigrist 1990: 24, Frayne 1990: 158 ff., Steinkeller 2001: 22-84), to Larsa, its entry into the city through the monumental water-gate B65, as well as the true extent and function of the nearby city gate B1 (known as the "Parrot Gate" since its excavation in 1933), protecting the city's water supply (Vallet, Cez, Darras 2022: 37 ff.). However, we were missing a small 2-hectare area between the course of the C1 canal in the plain and the approaches to the B65 water-gate, where its width is already reduced to 5 metres, compared to 20 metres upstream. This particularly important area was surveyed in 2023 (Fig. 6). Although it has clearly undergone significant disturbance, which is undoubtedly not coincidental given that it marks the subdivision of the large C1 canal into several waterways, this area shows magnetic alignments of moderate value but with clear boundaries, which make it possible to distinguish the structures (Fig. 7).

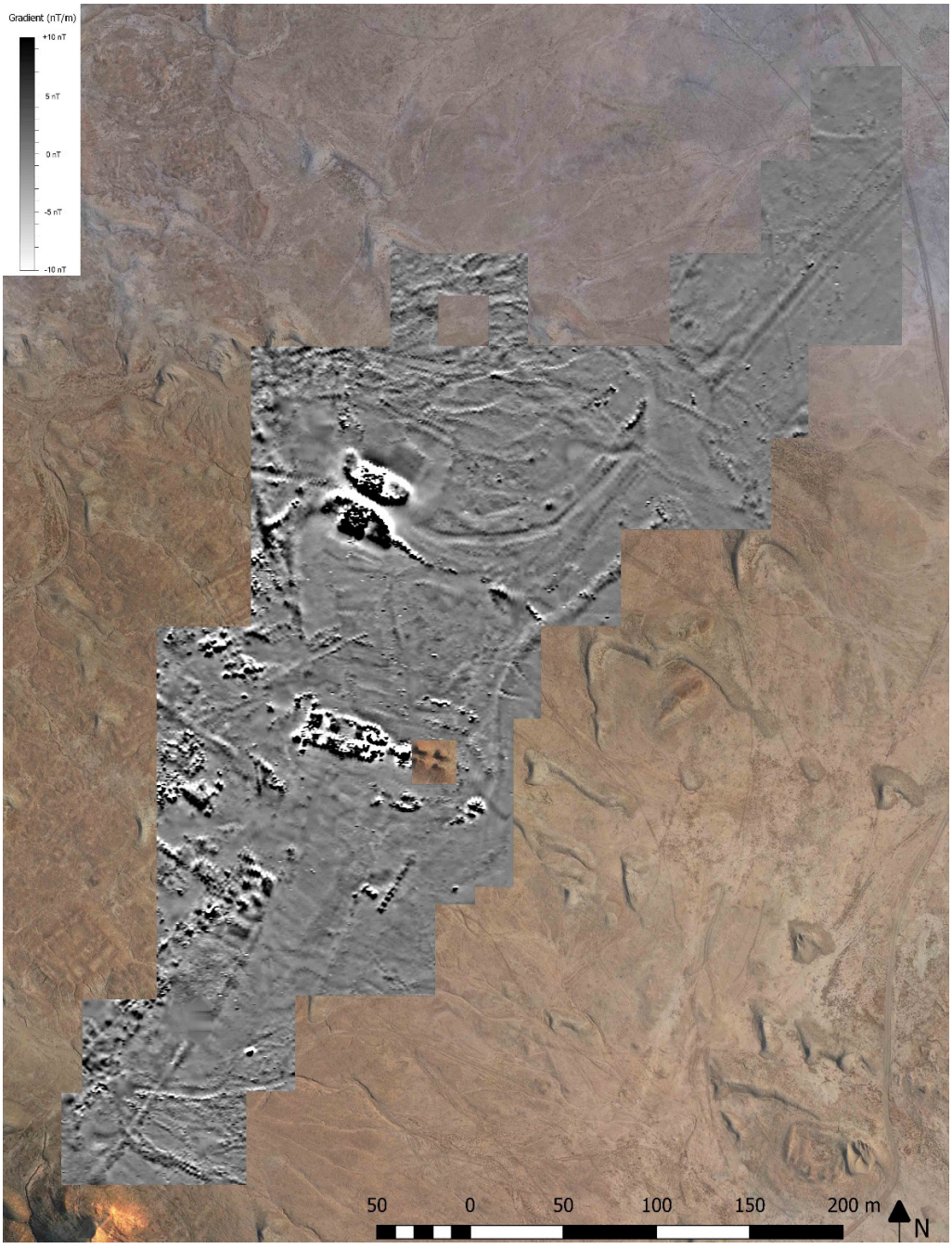

Fig. 6 *– Geomagnetic map of the eastern sector (L. Darras).*

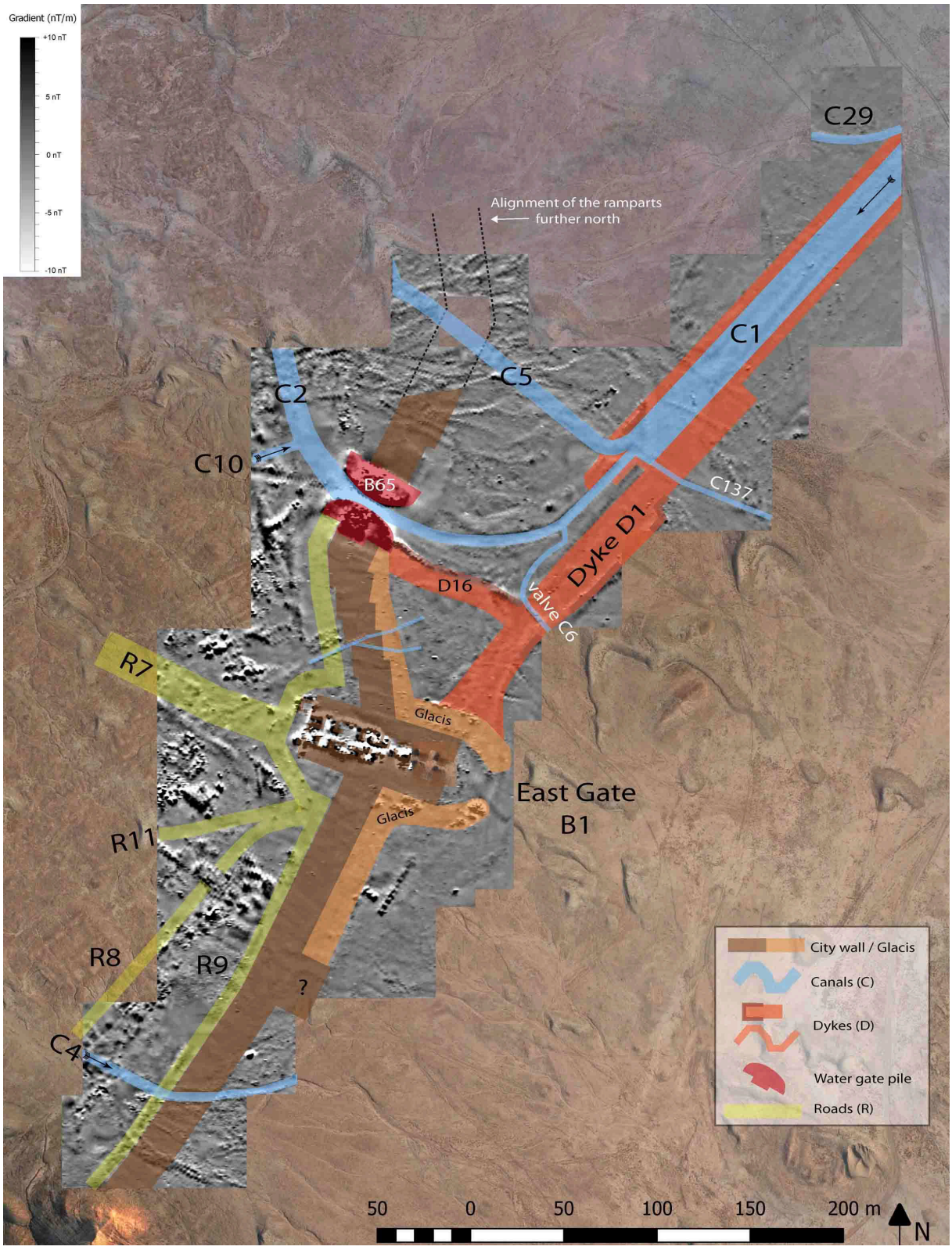

***Fig.** 7 – Interpreted map of the eastern sector (R. Vallet, L. Cez, L. Darras).*

It is exactly 150 m upstream from water-gate B65 that canal C1 splits. The central part of the canal continues as the 5 m wide canal already described in our previous reports, up to water-gate B65. About 60 metres downstream from the fork, at the beginning of the curve that the canal makes to direct the flow between the two piers of water-gate B65, valve C6 used to discharge C1 excess water. Starting from the fork, the C5 canal to the north, which was perhaps slightly wider (its trace varies around 8 m), turned (almost) 90° to pass under the rampart approximately 95 m north of C1. A dune largely masks the intersection of C5 and the rampart, but we know that nothing remains of the rampart at this location, as it has been completely eroded by modern wadis (Vallet, Cez, Darras

2022: 62, Vallet in press: 227). Only the bottom of channel C5 is visible on either side. That being said, if a monumental river gate made of fired bricks, such as B65, had existed at this location, traces of it would remain, which is not the case. We can speculate that C5 crossed the rampart through a vaulted tunnel made of mudbricks, perhaps quite narrow, as was likely the case for the canals supplying the city to the west (see below). In any case, C5 continued into the city where it joined canal C2, 150 m from the rampart, feeding water from C1 back into it to maintain the flow. The third branch leading off from C1, canal C137, at least 3 m long, ran in the opposite direction, towards the south-east, through dyke D1, 19 m wide at this point (28 m further south), to join the peri-urban canal C60, 185 m further east. A section of this structure at its junction with C60 had already been mapped but not numbered (Vallet, Cez, Darras 2022: fig. 9, p. 45). Like channel C5 to the west, but narrower, it is a relief channel for C1.

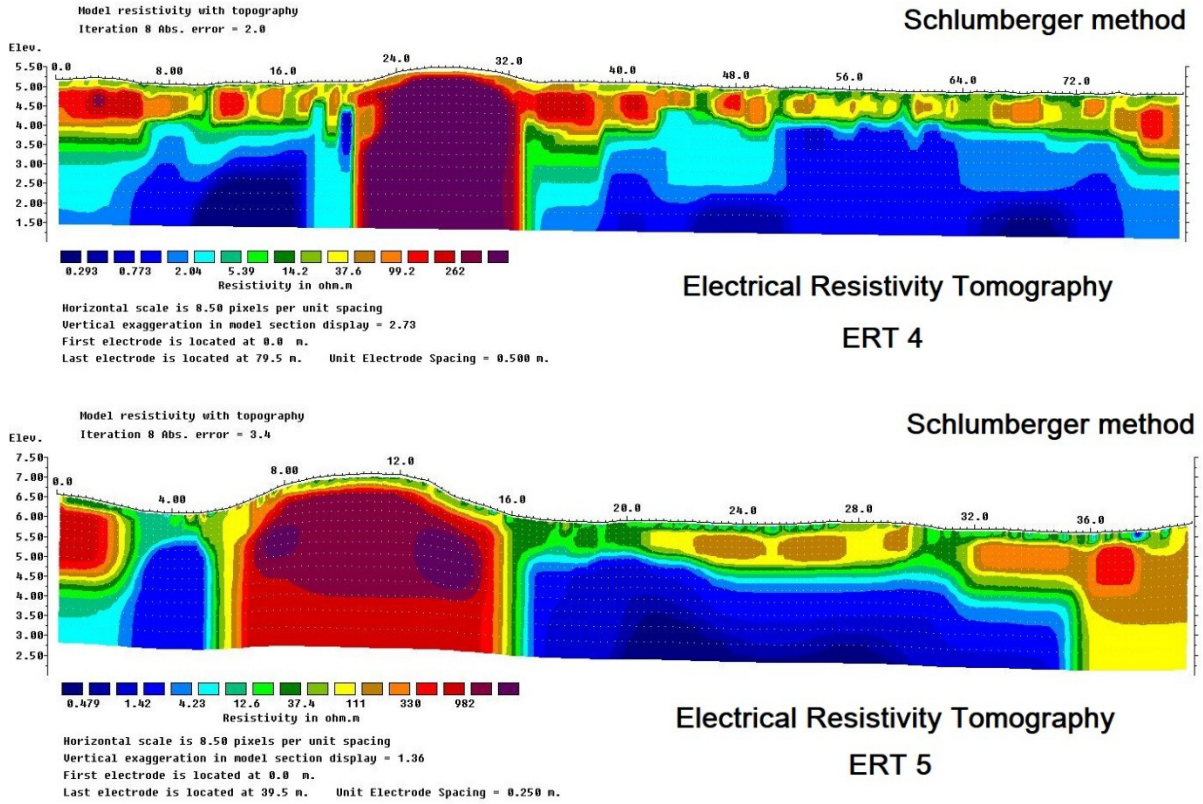

***Fig. 8** – ERT profile 4 and 5 (L. Darras).*

Two tomographic profiles were made in the area, one 80 m long, oriented north-south, across C1 in front of water-gate B65 (Fig. 8, top), the other 40 m long, oriented east-west, across the rampart south of B65 (Fig. 8, bottom). The electrical signatures of the structures are more subtle than in the case of the Grand canal, probably due to the relative complexity of the terrain and its thicker sandy cover, but they are clearly present. The profile of the canal reveals that the fired brick wall connecting B65 to D1 (at valve C6) is the facing (or support) of a 15 m wide earthen dyke (D16). The profile of the rampart seems to show only part of its footprint (over 12 m), but the measurement was hampered by a sand dune, and, above all, the exact configuration of the rampart and the details of its successive arrangements are largely unknown. In this regard, the imagery reveals that the curtain wall north of the Parrot Gate had regular recesses, approximately 4 m every 15 m (five in total between B1 and B65, and at least three, smaller in size, on the inner face), facing the river gate B65, confirming, if proof were needed, that it was the focus of local defence. As a

result, at several points along this section of the curtain wall, as shown by the tomographic profile, its footprint was reduced to only about 15 metres. It is likely that similar recesses also existed to the south of the Parrot Gate, but the current imaging does not allow their outline to be clearly reconstructed as it is to the north of the gate. Near the gate, we can just make out a few oblique recesses (the axis of the wall being straight) on both sides of the wall (approximately 18 metres wide), which will need to be verified by new aerial photographs and, if possible, on the ground.
In any case, the main features of the complex hydraulic system used to bring water from the C1 canal into the city are now known. To go further, and in particular to determine the depth of the canals, which is essential for understanding how the system worked, excavation (supplemented by core sampling) is essential.

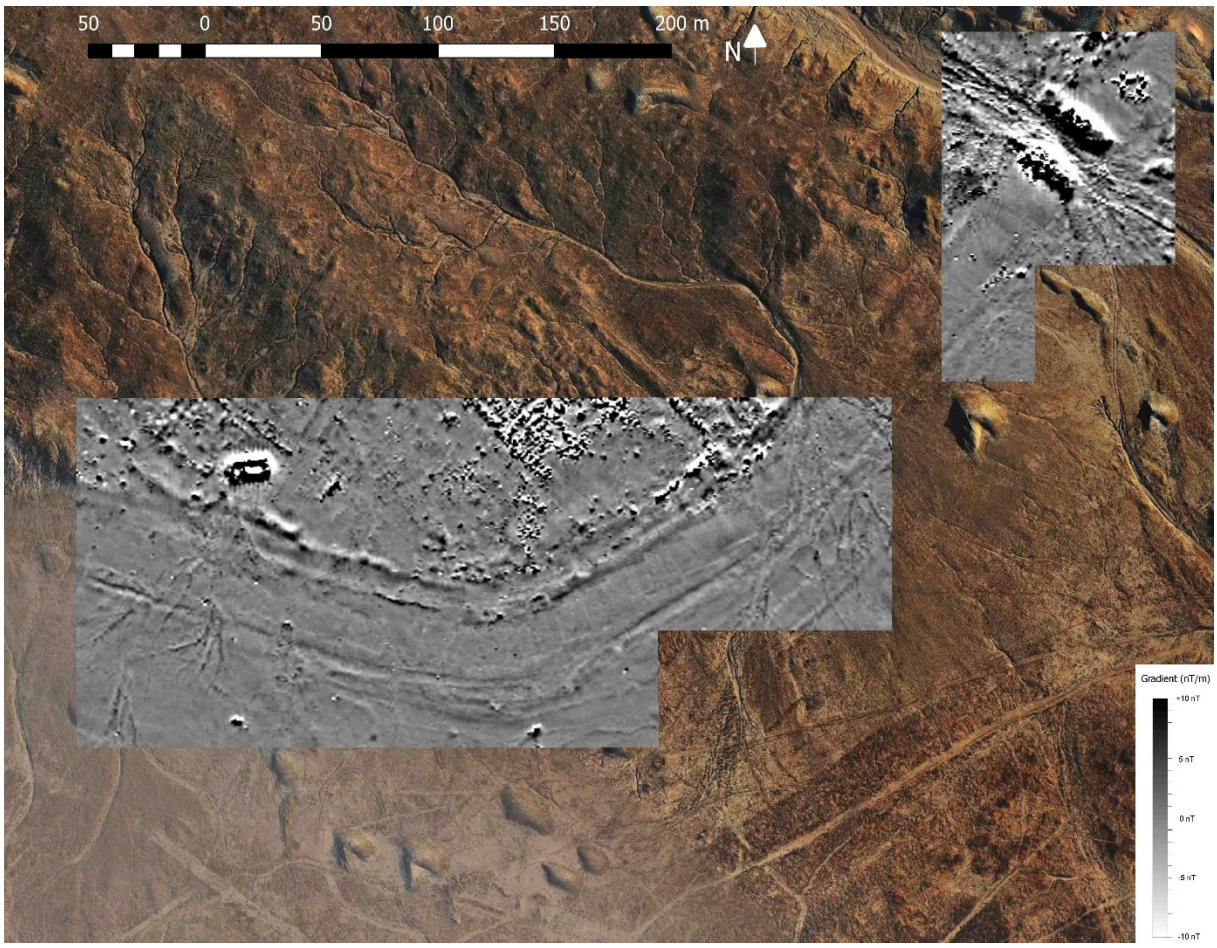

Fig. 9 – Geomagnetic map of the southern sector (L. Darras).

3 – The southern sector

The map of the hydraulic network and other major structures south of the city is still incomplete. This is a topographically higher area with more rugged terrain, sandy soil and heavily eroded by wadis. In 2019, limited geophysical prospecting (1.25 ha) confirmed the layout of city gate B36, which had been prospected in the 1980s (Huot, Rougeulle, Suire 1989: 42), and showed that the nearby structure B17 was a water-gate of the same type, although more modest, than B65 to the east of the city (Fig. 9). In 2021, ground and photogrammetric surveys revealed the city's port, P7, extending both outside for the most part and inside the city. The two parts of the port were connected by two canals (tunnels) through the rampart, whose visible layout is particularly wide at this point, reaching up to 30 m. It is clear that this is not the curtain wall, but simply the strip of

land on which it stands, between other structures (notably the C135 drainage ditch to the south and the C136 canal to the north). A preliminary map of the area had been drawn up (Vallet, Cez, Darras 2022: fig. 17, p. 58). In 2022-23, the aim was therefore to confirm and clarify the structure of port P7. An additional 5 ha were surveyed using geomagnetic methods and new drone coverage was carried out. The new images, which are currently being processed, will enable us to complete and correct the mapping in several areas (Fig. 10), but we are awaiting the results of further geophysical prospecting, which should unify the sector, before proceeding with a more complete update of the plan, particularly of the rampart. However, it is already clear that the curtain wall occupied only part of the strip of land reserved for fortifications and that, as in the east (above) and west (below) of the town, it follows a zigzag pattern over long sections (but not everywhere), with recesses of around 3 m every 20 m on both sides of the wall (approximately 14 m to 17 m wide). Some of these are particularly clear to the south of the large building B57.

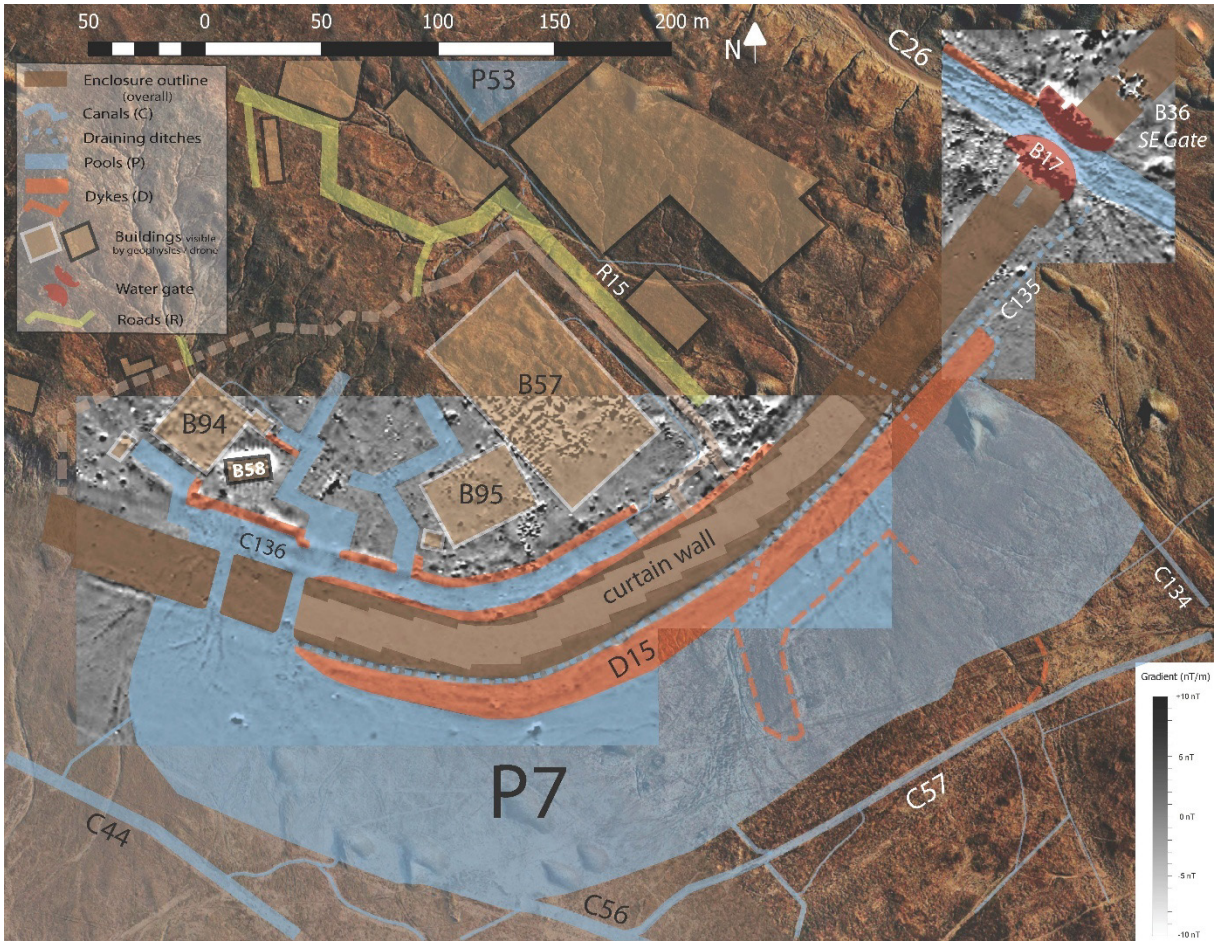

***Fig. 10** – Interpreted map of the southern sector (R. Vallet, L. Cez, L. Darras).*

South of the fortifications, the outer harbour basin is slightly larger than we thought based on the initial images, extending further eastwards. With a width (north-south) of around 75 m, it extends over more than 450 m from east to west (36,800 m²), following the curve of the ramparts. Such a vast basin could not have been built in a single phase. As in the case of the large P2 basin to the north-west of the city (see above), the images show traces of successive enlargements to the east, at least one, possibly two, divided by ancient boundaries. This is all the more certain now that we know (below) that Sin-iddinam carried out work on the port as part of his major hydraulic engineering programme.

Geophysical surveys have confirmed and provided additional details about the entrance/exit system with the inner harbour. Separated by 28 m, the two passages, 3 m wide, cross the entire fortified area, the curtain wall and its lateral earth strips, the latter acting here as dykes, mainly on the outside (D15), crossed by a ditch (C135) draining runoff water towards basin P7. Water erosion, traces of which are still visible, has entered through these openings, creating a pile of fired bricks, probably torn from the facing of the passageway at the end of one of them. To the east of basin P7, based on aerial imagery, we proposed in 2021 a large bastion near a possible postern gate (Vallet, Cez, Darras 2022: 73), but this is in fact the complicated network of port dykes, which only excavation would allow to be disentangled. However, the existence of a postern gate, providing pedestrian access to the inner harbour, remains possible.

Inside the city, the central basin of the inner harbour is much smaller than the washed-out surface suggested, which is not surprising. Geophysics provides a fairly accurate, albeit still partial, picture of the inner harbour. The docks mainly consisted of three canals. A 7-8 m wide canal (C136), extended to the west by a bayonet-shaped appendage, ran along the inner embankment of the enclosure for a little over 200 m. From there, two slightly narrower canals, approximately 4 m wide, ran northwards (up to 70-80 m from C136) in a broken line, so as to multiply the length of the docks in the smallest possible area. The length of the docks available in the plan that emerged exceeded 850 m.

On either side of the docks, four important buildings are currently known (plus a few very modest structures), two of which were discovered during surveys in the 1980s, B57 and B58 (Huot, Rougeulle, Suire 1989: 50). B58 is a rectangular tower (at least 13 x 7.5 m) with a base made of fired bricks with particularly high magnetic value (up to 200 nT) with at least one room measuring 7 x 3.3 m visible on the surface, and possibly another smaller one to the west, surrounded by 2.1 m wide walls. It is therefore a very tall structure, facing the entrance/exit of the port, in what was probably an original central position (below), from where it would have been easy to monitor all port activity. Perhaps the equivalent of a harbour master's office. The two newly discovered buildings, B94 (1025 m²) and B95 (1140 m²), have not yet yielded any clues, nor has their layout, which would shed light on their functions.

Further east, B57 had already been explored in the 1980s, then again in 2019, when it appeared to us that the tight partitioning of this vast rectangular building (90 x 51 m, 4590 m²), heavily eroded in the south, indicated that it was probably a building used for storage (Vallet, Suire 2020: 58). Our current knowledge of its context suggests that it was the main warehouse of the port. The building yielded a brick inscribed with the name of King Sin-iddinam (Huot, Rougeulle Suire 1989: 50), near its northern corner, and another from the same ruler from a structure a few metres to the east (J. Suire, personal communication), which we now know to be the port enclosure (the bricks bore the inscriptions No. 3 and/or 4 of Sin-iddinam). Six metres east of B57 runs a powerful wall, apparently reaching a width of 4 m in places, with a fired brick base, which we were able to trace for 180 m, from the rampart to the south-east to the north of building B57, which it encloses. Further west, a succession of sections of large mud-brick walls is visible in photogrammetry, which curves about thirty metres west of building B94 towards the rampart. Our surveys will focus on verifying whether this is indeed the extension of the port enclosure, which does not appear to have extended beyond this limit, where urban habitat is visible. Thus circumscribed, the inner port

would cover an area of 2.9 ha, or 6.58 ha in total with the outer basin. Access from the city has not been established with certainty, but there may have been three points of entry. To the east, near the rampart, a rectangular space forms a sort of passageway between the port and the adjacent street, which may have served as an access point, while to the north and west, two streets point towards the enclosure, which is interrupted at their level.

In any case, it is clear that Sin-iddinam played a major role in the city's port. Certainly created by Gungunum when he rebuilt the city, the port was enlarged and renovated, equipped with a new warehouse and a (new?) boundary wall, and its basin was enlarged as part of the gigantic hydraulic works that connected the city to the Tigris and radically altered its topography. In fact, the port's rehabilitation and upgrading were essential, as the new network from the Tigris, added to the existing ones, must have stimulated river traffic. Evidence of this can be found in B57, which tripled the port's storage capacity, assuming that buildings B94 and B95 were former warehouses.

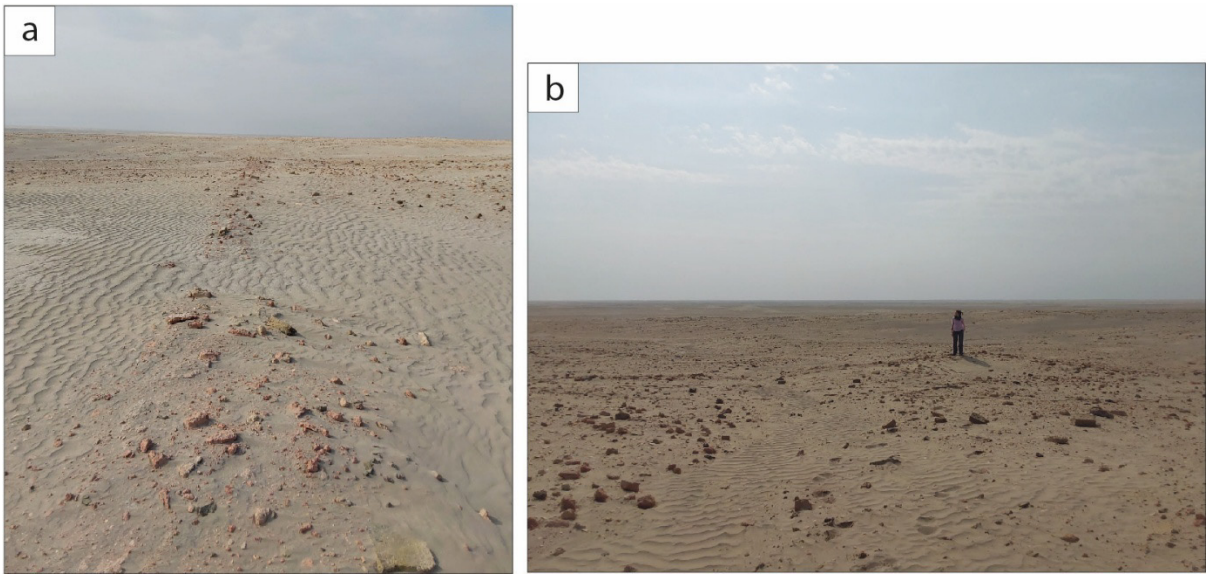

***Fig. 11** – The P53 basin south of the city. (a) Alignment of fired bricks from the south wall of the basin. (b) South-west corner of the basin. © L. Cez, R. Khazal-Ahmad, November 2022.*

Around the port complex, the neighbourhood was densely built (perhaps a little less so to the west), with regular blocks, particularly to the east, probably resulting from the redevelopment of the port, and other more anarchic ones. A main street ran through it, R15, running along the rampart and the eastern façade of the port, then, after skirting a block, turning north-west, where its width varies between 6.50 m and 10.30 m. Finally, to the north of the sector, our field surveys uncovered a large square basin measuring around 50 metres on each side (2,500 m²), identified in the 1980s as a building, B53 (Huot, Rougeulle Suire 1989: fig. 9a and 10, p. 35), between canal C26 and the port (Fig. 11). This basin, which we have renamed P53, was surrounded by a thick fired brick wall and was fed from the north by a water intake on canal C26. It was also connected to the east, where the canal is 65 metres away. The western wall of the basin had an opening through which a drain connected to the sewer that flowed into the adjacent street and joined drain C135 beyond the rampart. Supplying the neighbourhood, basin P53 therefore also helped regulate the water level in the port. It is likely that pipes connected it more directly to the latter (the start of two pipes leading to the port is visible in photogrammetry).

4 – The western sector

Our prospecting began in the western part of the city in 2019, in order to survey the site prior to the planned excavations. We discovered the true extent of building B50 and the irrigated agricultural land that extends further west. The position of the western rampart was also determined (Darras 2020). Largely empty of buildings as it was used for agriculture, the area did not occupy us further, but we returned in 2022 with two objectives: to resume exploration of the enclosure wall (on 4 ha), in particular the western gate of the city (Z43), and to carry out tests (on 4.25 ha) in the plain further west where the large ancient canals overlap, and to compare the geophysical and photogrammetric observations (Fig. 12). The two correspond perfectly, so that although the geophysical survey of the area remains fragmentary, the available imagery and field observations allow us to propose an initial overall interpretation (Fig. 13). It should be noted that outside the city, only the main elements of the oldest visible hydraulic network (that of phase 1; for the network and its phasing, see Vallet, Cez, Darras 2022: 69-72), which was of specific interest to us, are represented.

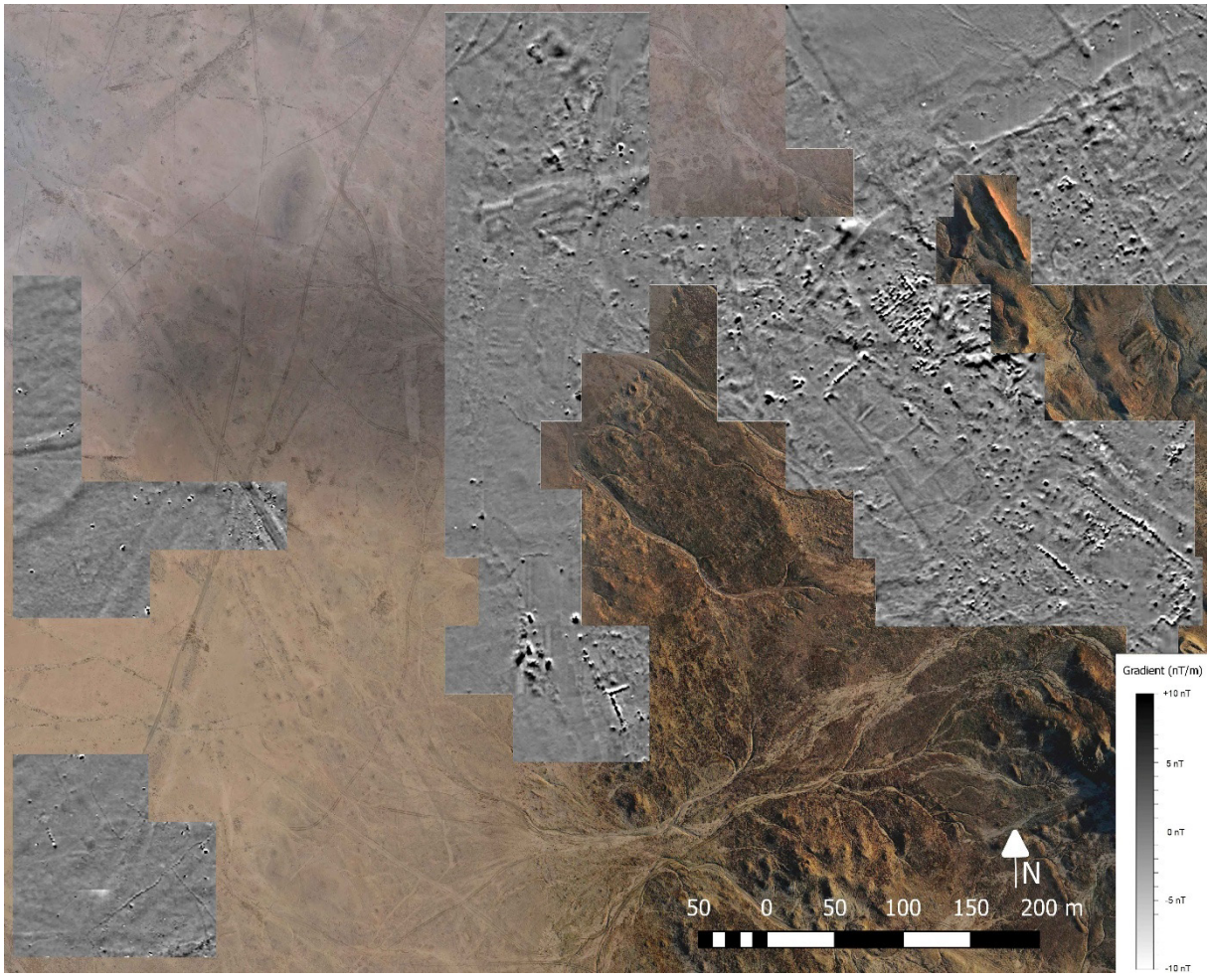

***Fig. 12** – Geomagnetic map of the western sector (L. Darras).*

To the west of the city, we therefore continued the geophysical survey of the rampart for a further 150 m to the south, so as to cover the probable western gate and beyond. The western rampart is now visible in geophysical surveys over a length of 565 m, which is extended and completed by photogrammetric images. The low mound (maximum elevation 2 m) Z43 had already been identified as the probable site of the western gate of the town during surveys in the 1980s (Suire 2003: 13), which our observations confirm. The gate appears to be built into a single outer bastion

37 m wide (north-south) and projecting 25 m in front of the curtain wall, which is 15 m wide, giving a total structure of 1480 m². The passage is visible, approximately 3 m wide, slightly offset to the south and with a median break. At the recess, two corridors lead off, one to the south and the other to the north (where a room measuring approximately 6 x 5 m is visible), probably serving staircases built into the masonry (and therefore invisible) leading to the upper levels. On either side of the gate, rows of bricks probably correspond to the remains of lateral glacis, the northern one crossed, along with the adjoining rampart, by a pipe with an angle layout starting from the large building B63 and connected to the local water system.

The four city gates about which we have information are therefore all different, ranging from a simple passageway to a single transverse hall (south-east gate B36) to a powerful fort straddling the wall (east gate B1). The western gate, due to its size and elaborate internal structure, seems to have been one of the best defended, less fortified than B1 but more so than the north-western gate B56.

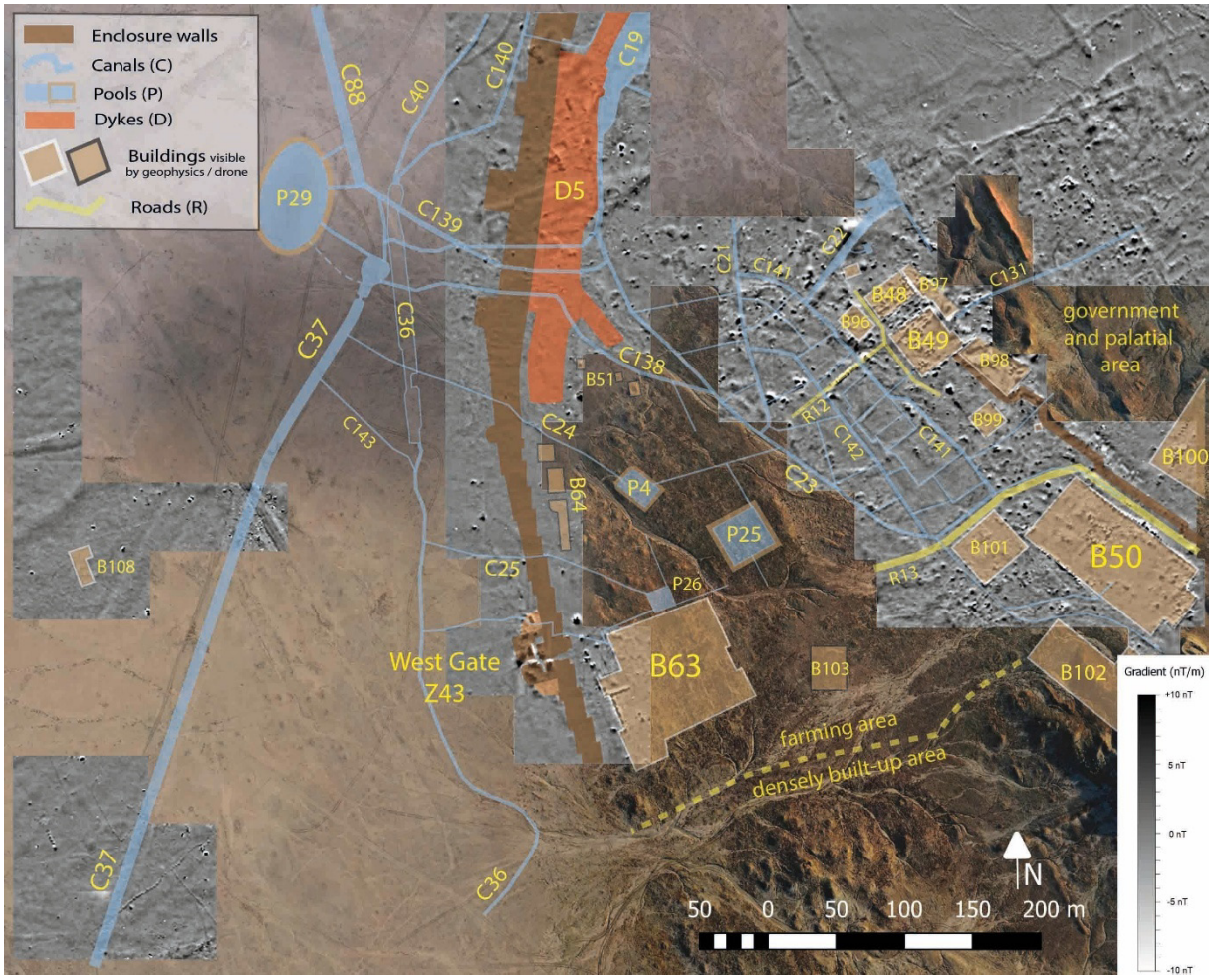

***Fig. 13** – Interpreted map of the western sector (R. Vallet, L. Cez, L. Darras).*

The curtain wall held a surprise for us, as it was in this area that geophysical surveys revealed the sawtooth pattern of the rampart faces, which was subsequently observed in the eastern and southern sectors (above). This unexpected configuration was previously invisible in photogrammetry (which, depending on the composition of the terrain, shows details that are not visible in geophysical surveys). The recesses are most clearly visible to the south, on the inner face of the wall, which seems to have suffered less erosion than the outer face. They are visible on both sides for 230 m and certainly continue to the south. The curtain wall has a footprint of 15 m. The breaks, 4 m

long, occur every 20 m, but their regularity does not seem perfect. To the north of the gate, the outer face shows only four, three of which are widely spaced and smaller in amplitude, but this may be an imaging bias.

In 2019-2021, when the layout of the ramparts was revealed (Vallet, Cez, Darras 2022: 60-64), we were struck by the small number of bastions found for an enclosure of this size (5,376 m). We now have the explanation. At least over most of the southern half of the perimeter of the enclosure, the systematic use of recesses was preferred to the construction of bastions. We can only speculate on the reasons for this choice. It is certain that a succession of recesses increases the stability of a structure, but we do not believe that the motive was technical. A quick and approximate calculation based on the available metric data shows that giving cover to the enclosure, which is the main military objective, with bastions rather than recesses would have required the construction of around 85 bastions 15 m wide (like those of the north-west gate), or around 100 bastions 10 m wide, spaced 40 m apart (2 x 20). We also know that the enclosure was very high, exceeding 15 m in places (Vallet, Cez, Darras 2022: 63, Vallet in press: 231-232). It therefore seems obvious that the use of recesses, rather than the usual bastions, represented a very substantial saving in materials, time and therefore construction costs, which could be estimated, but we will not do so here. In our opinion, this is the reason for the highly original choice made at Larsa.

In any case, the breaks disappear north of the small B64 buildings, where the rampart changes direction. The visible outline of the enclosure widens to 20-22 m, and large projections (up to 20 x 12-15 m for the two main ones) could correspond to large bastions. This is where the original water supply for the Amorite city was located (see below), which was undoubtedly heavily defended, as was later the case with the supply added by Sin-iddinam on the other side of the town (see above). However, no details can be distinguished in this intensely eroded terrain, and it is possible that the discernible contours correspond to the embankment of the fortifications, as in the port area (supra), rather than to the curtain wall and its bastions. This uncertainty could perhaps only be resolved by excavation, but it does not call into question the layout of the enclosure.

At the other end of the area studied, to the east, the sector borders the government zone around the royal palace, where the imagery shows what appears to be another enclosure wall, 6 m wide along street R13, which separates it from B50, perhaps a little less further north. It can be followed for 300 m, to about 20 metres from the Ebabbar, where it branches off to the north-east. It has two recesses and a possible entrance, set back, through which a pipe passes. To the north-west, it is not documented in the B49 site but may branch off to the east before this point. Given the functional importance of this structure, perhaps the enclosure of the palatial sector, we plan to excavate a section, for example in conjunction with the excavation of the nearby temple B50. The next geophysical survey, which will cover the palatial sector, should provide additional data.

Immediately to the south is the religious heart of the city, bringing together the main temples around the Ebabbar, the ziggurat to the northeast and the Gipar (B50) to the northwest. Two other large buildings were certainly part of it: B101 (1550 m²), touched upon by the excavation (Vallet, Vobauré in this volume) and B102, 80 m long, attached to the Ebabbar of which it may have been an annex.

Between the institutional sectors and the enclosure lay the city's largest intramural agricultural area, part of whose irrigated plots have been known to us since 2019 (Darras 2020). The area that interests us most here was fed from the large canal C16 by canals C21 (via C20) and C22, from which canals C141 and C142 irrigated the land for 245 m, up to road R13 running alongside B101, collecting various drains from nearby buildings, including the Ebabbar and B50. The C23 canal provided drainage, returning the water to the rampart, through which it could be discharged via the C138 canal or reinjected into the C19-C16 loop.

South of the C23 canal, the land was irrigated by interconnected basins, fed directly from the peri-urban network. P4 (435 m²) was already known, to which P25 (1,000 m², with walls over 3.5 m high) and P26 (255 m²) were added. Various constructions dotted the outskirts of the area. These included small single-celled buildings or two- or three-room buildings in rows (B51, B64), a probable granary, B103 (880 m²), with a characteristic grid plan, and the enormous complex B63 (8,270 m²). With a modular layout and irregular outline, probably extended over time, this gigantic complex is located at the interface between the urban agricultural zone, the city and the surrounding area, which was also intensively cultivated on the outskirts of the city (an agricultural building, B108, is visible 300 m from the western gate). It can be conjectured that it played an important role in the agricultural economy of the city and its outskirts, and even beyond. In any case, the boundary of the intramural agricultural area was about 50 metres south of B103 and B63, where dense housing appears along a wadi of certainly ancient origin, perhaps partially canalised, leaving the city to the south of a small dyke perpendicular to the rampart (D6) protecting B63. The cultivated area thus covered 30 hectares, or 15% of the city's surface area[1] .

Finally, to the west of the city, our work aimed to clarify the configuration of the water supply system in the oldest phase of the Amorite network. We recall that the intersections of the large canals west of the city had enabled us to reconstruct the evolution of the system in four major phases, from Gungunum to Sin-iddinam, corroborating historical data (Vallet, Cez, Darras 2022: 69-72, Cez, Vallet, Darras in press1). However, the connection between the oldest major canals, C37 and C88, and the intramural storage system C19-C16-P2 remained unclear. Geophysical tests confirm our interpretation of C37 (and the canals that intersect it), while photogrammetry clarifies the connection pattern to the intra-urban network.

Canal C37, coming from the Euphrates via canal C49, and canal C88, coming from the Iturungal, converged about 50 metres from each other and about 75 metres from the city walls. They were connected to each other by secondary canals and were equipped with drains carrying water to the centre of an 85-metre-long oval structure to the west, which probably corresponds to an ancient flooded area, a lake of dead arm, transformed into an artificial basin (P29). This layout is similar to the storage basins already identified in other areas of the surrounding plain, to the north-west and south of the city (Cez et al. in this volume). Wide earthen embankments created by re-excavating the natural depression surrounded the lake.

The city was supplied by the C139 canal, approximately 4 m wide, which divided into two branches, each 2 m wide, to cross the rampart, about 15 m apart, between the possible large bastions

[1] The other boundaries of the north-western agricultural area of the city, which included others (Cez et al. in this volume), follow the following route, from south to north: B102-B101-R13, C141-C22, C16-C15-C9-C8, D3 and then, on the other side of the C7 canal, Tell F10 (the "Eagles' Hill"), from which the land to the east is occupied by pottery workshops.

already mentioned. There is no trace of a monumental water-gate, such as B65 to the east of the city or B17 to the south, which would certainly have been the case if there had been one here too. Clearly, this technology was not used at the time, and the division of the flow into two seems to have compensated for this in order to reduce the strain on the base of the rampart. Once they had crossed the enclosure and the D5 dyke, they turned north, joined by the C23 canal, and flowed into the C19 reservoir canal. As we can see, Gungunum was simply describing an objective reality when he proclaimed that he had "made the Euphrates flow straight into [his] city" (Georges 2011: 96).

II – THE LARSA HYDRAULIC NETWORK IN THE SECOND MILLENNIUM BC: NEW RESULTS OF THE GEO-ARCHAEOLOGICAL STUDY

Lucie Cez, Régis Vallet, Rym Khazal-Ahmad

The water supply of Larsa (Tell es Senkereh), capital of Lower Mesopotamia in the 2nd millennium BC, was to represent a crucial issue and a logistical and technical challenge for this 200 hectares city located in the lower alluvial plain of the Euphrates River (southern Iraq, near Nasiriyah, Dhi Qar governorate). The restitution of its hydraulic system is a new research focus since the reopening of the site in 2019, after thirty years of suspension of field work. Since the beginning of its exploration by André Parrot in 1933, the Larsa hydraulic network has only been known from historical sources which mention canals, including in urban areas (Charpin 2002) and archaeological and geomorphological prospections which have revealed large structures on the plain (Adams and Nissen 1972; Adams 1981; Geyer and Sanlaville 1996), without their connection to the city being established. Similarly, the existence of an internal network of canals in Larsa has been the subject of a debate centred on the layouts revealed to the north of the city by Georg Gerster's aerial photographs dated 1973, available to the mission in 1984 and interpreted as major traffic routes or canals (Huot, Rougeulle, Suire 1989: 20-22, 34-35; Margueron 2013: 129). Since 2019, six study campaigns, three of them including excavations, have made it possible to settle this debate and map the city's hydraulic network (Vallet, Cez, Darras 2022; Cez, Vallet, Darras in press2) (Fig. 1).

This first map, dated from 2021-2022, is based on photogrammetric, geophysical and archaeological data, and from 2021, on geo-archaeological investigations and targeted excavations of hydraulic structures. The identification and photointerpretation of the hydraulic structures is based on the photogrammetric drone coverage of the site and the surrounding plain over an area of more than 2000 hectares in 2023. Indeed, the layouts of fossil canals and basins are visible in this desertic surface despite the wind deflation that strips the old surface of the plain and the silting that partially covers them over varying periods of time. In addition, the geomagnetic prospecting covering 73 hectares to date enables to reveal the spatial footprint of structures dug up to 2 m deep (Aspinall, Gaffney, Schmidt 2008) (see Vallet, Darras, Cez, this volume). This approach revealed a complex network which, in its final state in the 18th century BCE, founded on more than a hundred interconnected main canals and several large basins, including a 26,660 m^2 intramural reserve (P2) to the northwest of the city and a 37,000 m^2 port basin (P7) to the south (Vallet, Cez,

Darras 2022). The analysis of the structures and their comparison with historical data has made it possible to establish connections with the great lowland canals and to periodize the evolution of the Larsa's hydraulic network that has become considerably denser during the 2nd millennium.

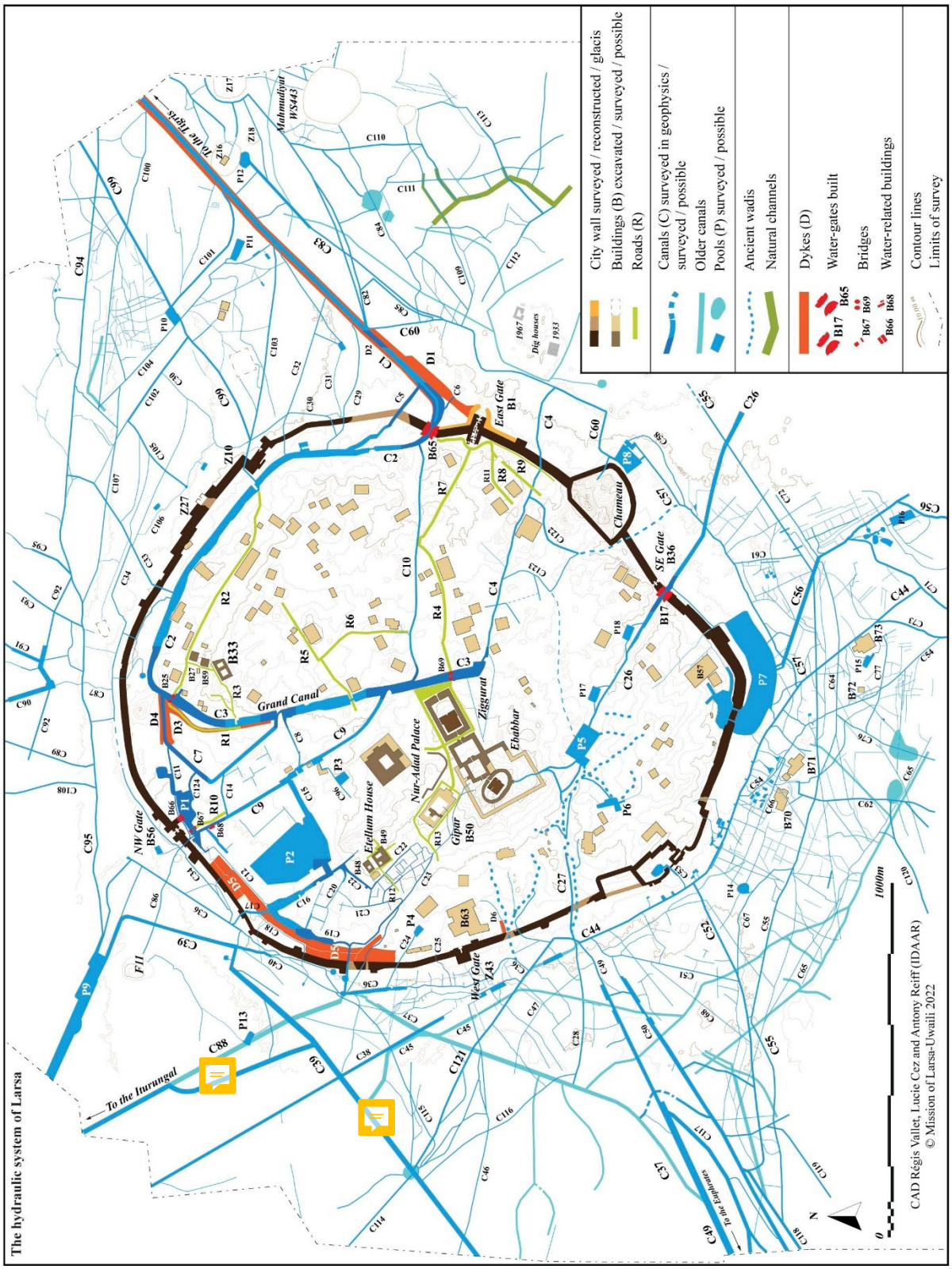

***Fig. 1** – Map of the hydraulic system of Larsa and the nearby surrounding plain (R. Vallet, L. Cez, A. Reiff 2021-2022).*

The network of the Amorite period developed at the beginning of the 2nd millennium, in four main phases from the reign of King Gungunum (1932-1906 BC), when the city was fed from the west by the Euphrates and the Iturungal, by two large canals 15 m wide (C38 and C88), to the great works of King Sin-iddinam (1849-1843 BC), which had brought the waters of the Tigris River by a 62 km long canal, C1 (Vallet, Cez, Darras 2022: 64-72), dated to the 19th century by historical sources (Sigrist 1990: 24 ; Frayne 1990: 158-160 ; Steinkeller 2001). The water was diverted at the site of Zabalam, passed through Umma and Bad-Tibira northeast of Larsa, and then carried into the city through four canals forming a large loop (C1 to C4) inside the city. The management of the flows within the city was based on different structures and technics. Near the city, the C1 canal was equipped with two offloading canals, C5 to the north heading towards the city, and C137 to the south joining the peri-urban network. It then passed through a monumental watergate (B65) built into the rampart about 100 m north of the Parrot gate (P1), the eastern gate of the city. The watergate B65 was reinforced with fired brick retaining walls and had a control valve (C6) which also had a defensive function. Within the city, the water flowed through structures reinforced with dykes and bordered in some sectors by flood areas. It was connected to the road network by three bridges built on the large C3 canal (from north to south B25, B93 and B69), the main artery of the intramural network, 20 to 25 m wide, carrying water to the center of the city. Other crossing points existed, also connected to the roads (R1 to R14). All of these adapted devices that facilitate water management in an urban context reveal a hitherto unsuspected level of master's degree in hydraulic engineering reached by the cities of Mesopotamia at the beginning of the 2nd millennium. Beyond the ramparts, the peri-urban network was based on an impressive density of canals and basins, also integrating sections of palaeochannels. At each phase of its development, several major structures carried water to the gates of the city, while diversion canals allowed the agricultural development of the plain. The entire system, which has become particularly dense during the 19th century BC, involved the management of water resources on the scale of the plain. This was the function of the two very large reservoirs identified to the north of the city, with an estimated surface area of 105,000 m^2 for the western reservoir P27, 50,000 m^2 for the eastern reservoir P28 (infra).

This interdisciplinary approach made it possible to reconstruct the general urban structure of Larsa and to apprehend, sector by sector, the specificities of the hydraulic network. Based on these results, geo-archaeological investigations continued in the field in 2022 and 2023, particularly in the northeastern and southern sectors where silting up and gullies of modern wadis hinder the identification of structures from spatial imagery. On the peri-urban network, surveys have targeted the large reservoirs to the north of the city in order to place them in the history of the general functioning of the system and its evolution.

New data on the intra-urban network east of the city

The north-eastern sector of the city is bounded by the loop formed by the C1 to C4 canals, built by King Sin-Iddinam in the 19th century BC, who made it the main source of water supply of the city (Vallet, Cez, Darras 2022: 44-45). The sand accumulation prevents understanding the organization of large parts of the network within the city, especially in the east. The sands carried by the prevailing winds, oriented N-W/S-E, are trapped and accumulate in the plundering holes widened by erosion. This makes it necessary to systematically observe the small variations in relief

in the field left by hydraulic devices and not or only slightly visible on space imagery. Fossil hydraulic structures dug into the ground have a spatio-temporal inertia that makes them detectable on the surface. When they are not covered by the barchans crossing the site, the old canals form fairly marked depressions of several metres wide, relatively straight and filled by silts and sands. For the deepest ones, a sparse xerophytic vegetation has sometimes developed thanks to the silty layers at the bottom of the fill which retains moisture, as in the Grand Canal C3 (Vallet, Cez, Darras 2022: fig. 19). They can be distinguished from the more or less deep talwegs formed by the many wadis on the site, which have a more irregular and sinuous layout.

The termination of the C3 "Grand Canal" and the C4 canal

The geophysical image shows the southern termination of the large C3 canal. It forms a crow's foot with several branches. The C3 branch to the southeast forms a zone of narrowing for about 30 m in distance, gradually reduced in width until it forms a 5 m wide passage which becomes the C4 canal with a maximum gauge of 3,5 to 4,5 m (Fig. 2). It diverted the water from C3 in a south-easterly direction to the city rampart, which it crossed between the Parrot gate (P1) and the set of tells known as "the Camel", which dominates the site at an average altitude of 27 m (Fig. 1). Beyond the rampart, it joined the C60 canal, which was itself connected to C1, 300 m further north. Between its connection to the C3 canal, in the center of the city, and its junction with the peri-urban network, the canal C4 extends over 820 m. Its passage through the rampart formed an angled opening 6 m wide, reinforced with fired bricks to the south, located 180 m south of the Porte Parrot and 90 m north of the Chameau.

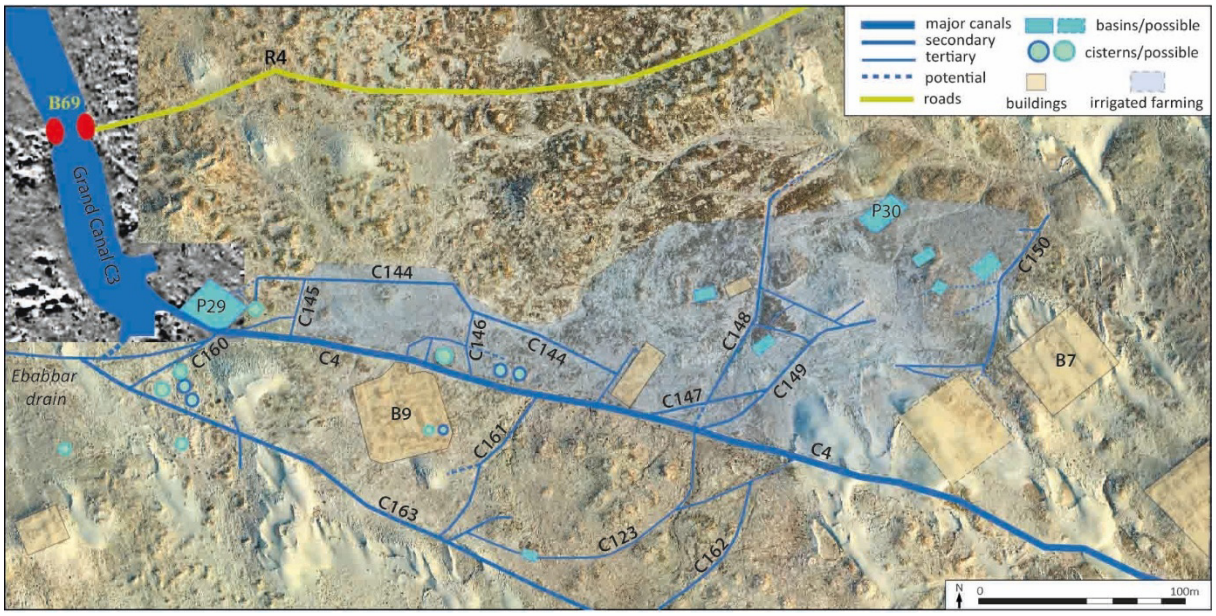

***Fig. 2** – Plan of the agricultural area north of the C4 canal.*
© Drone image J. Lisein/Larsa-'Uwaili mission, 2019. DAO: Lucie Cez.

The C3 junction to the southwest is located at the edge of the geophysical image, which complicates interpretation. It seems that the drain of the Ebabbar, the temple of Shamash, the sun-God, deity of the city, built in the center of the city, was connected to this branch of C3. In the continuity of the drain from the west, a canal made the junction with the C4 canal, which it joined about 50 m further to the west.

The agricultural area east of the city

Along the C4 canal, several canals going north and south had been identified during surveys of the previous campaign and partially visible on old aerial photographs from 1973, for example the C123 canal. This indicated that a secondary network was developing on either side of the C4 canal (Vallet, Cez, Darras 2022: 44). The analysis of drone orthophotos and field work (surveys and soundings) north of the C4 canal revealed a series of canals and basins that fed an agricultural area where crops were irrigated (Fig. 2). As an extension of the termination of the Grand Canal C3 to the south-east, downstream of the narrowing zone between C3 and C4, a quadrangular storage basin, P29, with an approximate surface area of 470 m^2, was built on the left bank of C4. It was connected at its northeast corner to a cistern-type storage structure connected to canal C144. The agricultural area to the west was structured by the C144 canal, which fed into the P29 basin to the west and diverted the water to the east and then to the southeast from a bend in the middle of its course. Several canals, N/S oriented, reinjected water from C4 into C144, immediately east of basin P29 (C145), further east at the bend of C144 (C146), the third being a small drain at its eastern end that extended along the west wall of a rectangular building.

The agricultural area extended to the east and north, where it was structured by the C148 canal, starting from C4 in a generally N/S direction and then marking an inflection towards the north-east where it probably extended. Canal C148 probably had a direct outlet on the canal C4 and was also fed by the canal C147, which started from C4 to the northeast just after the above-mentioned rectangular building. It intersected the canal C148 and then the canal C149. Canal C148 had a smaller size than shown in the drone and ICONEM images because the recent gullies of wadis have widened it. Several canals ran from C148 to the east, where the irrigated plots were to be concentrated. This area where only a few scattered buildings were present is a vast low-gradient depression. The whitish appearance of the surface in the old aerial photographs from 1973 and the more recent drone images, as well as on the ground, can be explained by the coverage of clay silts deposited during recurring water spread. It was bounded to the north and north-east by three basins of varying sizes, the largest of which was the P30 basin with an estimated surface area of 165 m^2. It is not clear if they were connected to each other. The southernmost basin, square in shape, was probably connected to the C150 canal which marks the eastern limit of the agricultural area. Part of its N/S layout has been restored. It had several branches to the agricultural area to the west and redistributed water at its southern end, an area occupied by large buildings (e.g. B7).

The basins located on the edge of the agricultural area were surrounded by small geometric structures, to the south of the P30 basin and to the southwest of the two smaller basins that follow it to the south. Drone imagery of the area shows the dark brick alignments of the plot boundaries, the one adjacent to the basin forms a square (4 x 4 m) of 20 m^2. The two small plots adjoining to the south have areas of about 10 m^2 and 13 m^2. The area was irrigated by the C149 canal starting from C4 in the south and heading northeast, in the heart of the cultivated area, then marking an inflection towards the east. Small, interconnected irrigation canals were to run from the C149 canal and carry water to the plots in all directions. This tertiary network has been partially restored between C148 and C149. On the field, the C149 canal is materialized by two parallel alignments of fired bricks and stones (Fig. 3a) which define a width of 1,50 to 2,10 m at most.

***Fig. 3** – Alignments of baked bricks materializing the C149 canal (A) and stratified fills of the canal showing water control for irrigation (B). The white squares show the block samples for micromorphological thin-section analysis. © Photo Lucie Cez, November 2022.*

A sounding was carried out in the sedimentary deposits of its filling, which were unearthed at a depth of 1,40 m without the bottom of the structure having been reached. The stratigraphic sequence is characterized by alternating sub-horizontal layers of fine to sandy silts (dominant fine sands) and centimetric clay beds (Fig. 3b). The successive phases of hydrosedimentary functioning result from generally low energy water inputs and calm sedimentation conditions. Thicker clay beds indicate that flows are stopped, favouring the settling of the finest particles. At the top of these settling joints, fine clay crusts indicate regular episodes of rapid drying. The particle size of the drained sediments and the stratified organization of the filling deposits into numerous sub-horizontal beds, result from semi-continuous water inputs. This indicates a control of the energy of the flows entering the canal, characteristic of an irrigation use (Cez 2023). In order to study more precisely the nature of the sedimentary deposits and the mode of operation of the canal, a micromorphological study will be carried out on the thin sections made from three blocks taken from the filling of the structure.

The agricultural area was bordered by buildings, including buildings with a storage function that were generally elongated in shape and with a compartmentalized plan composed of rows of small cells, of the granary type. Among the archaeological material on the surface, mainly west of the C148 canal at the level of a rectangular building associated with a basin, fragments of millstones and an entire millstone (30 cm x 23 cm) confirm the agricultural function of this area of the city north of C4 (Fig. 4).

With a minimum surface area of 25,000 m^2, it did not have the same extension as the large agricultural area to the north-west of the city, of nearly 30 hectares, fed by a network of canals derived from C3 and the large P2 reserve (Vallet, Darras, Cez in this volume). However, drone images and old aerial images indicate that the area south of C4, also empty of large buildings, was regularly flooded, making it an area probably dedicated to irrigated crops as an extension of the one

to the north and structured by a network of canals also fed by C4. The plots bordering the basins north of C4 were much smaller in size than those identified northwest of the city (Vallet 2020: 26; Vallet, Darras 2021).

***Fig. 4** – Grindstone of the farming zone north of C4. © Photo Lucie Cez, November 2022.*

The hydraulic network south of C4 has still only been partially restored (Fig. 2). Canal C163 was highlighted from the ICONEM image and recent orthophotos showing different sections of this structure up to 2,5 m wide. It connected to the termination of the Grand Canal C3, at its branch facing southwest. In this area, it was also fed by a canal connected to canal C4 to the north. The C163 canal has been reconstructed over a distance of about 400 m in a south-easterly direction. It was to connect to the C122 canal about 70 m before the Chameau boundary wall in the rampart (Fig. 1). In the first map of the city's hydraulic network established in 2021, the canal connecting the southern ends of canals C122 and C123 corresponds to the downstream portion of this structure. This canal was fed by the C4 canal by several diversion canals: the C160 in its upstream part to the north-west, then by the C161 to the east of the B9 building and further east by the C162. Between these last two ones, the C123 canal formed a sort of fork to the north on the C4 canal to the north but did not connect directly to the C163 canal. It forms a large curve towards a probable storage basin, in the center of a flat area that may have been cultivated.

Cisterns of Larsa

On either side of the C4 canal, circular structures 5 to 6 m in diameter were identified in satellite and drone imagery and corresponded to large-format fired bricks arranged in a circle on the surface (Fig. 5). Their shape and location along C4 or along secondary canals starting from C4 indicate that they are probably cisterns. These structures have so far only been observed in the southern part

of the city. In the agricultural area north of C4, a large cistern and two smaller ones located side by side are distributed along the C146 canal. A probable cistern existed near the P29 basin, upstream of the farming area and connected to the C144 canal. To the southern end of the large C3 canal, several cisterns are grouped together in the angle formed by the C160 and C163 canals. Finally, this type of structure has also been identified inside building B9, at the south-east corner, where they could have been fed by a branch from C161 canal. The easternmost cistern of the two is about 2,5 m in diameter (measurement between the internal walls). Elsewhere in the city, similar circular structures have been observed south of the P5 basin and near the inner basin of the P7 port area. A systematic survey will be carried out during the next field campaign in November 2024 in order to map and understand their distribution and their role in the general hydraulic system.

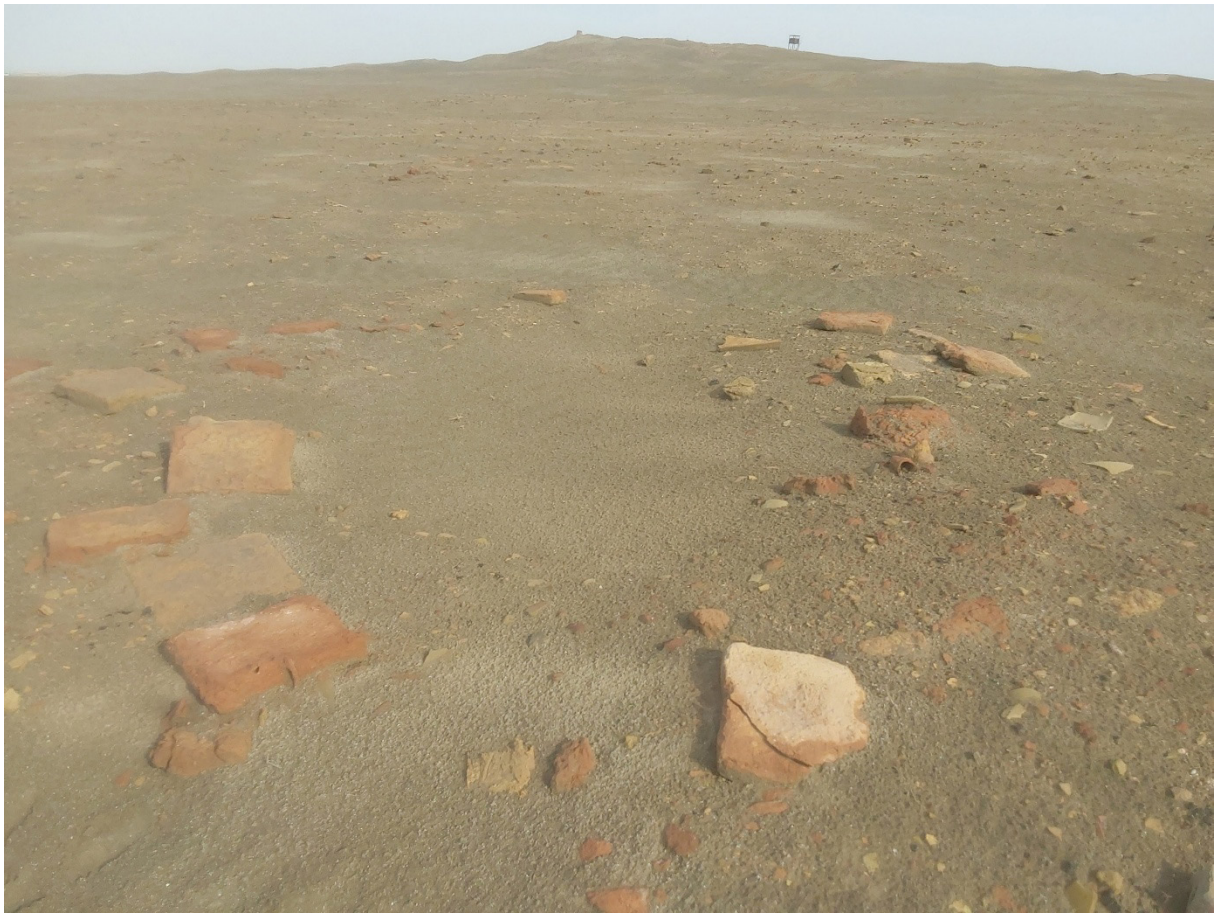

***Fig. 5** – Fired bricks materializing the top of a circular structure of a cistern south of the C4 canal, fed by the C170 canal. © Photo Lucie Cez, November 2022.*

In the current state of the data, it can be said that these cisterns were connected to the canals and that they stored part of the flow of water flowing to the surface. For this, an opening was made in the wall. However, none of these structures have yet been excavated at depth and it is not known whether they were (or some of them) connected to the water table, which would then make them wells. Generally speaking, cisterns are make-up water tanks. In view of their much lower storage volume than that of the known basins in Larsa (apart from the P2 intramural reserve and the large peri-urban reservoirs north of the city P27 and P28), they made it possible to smooth out short-term variations in the water supply. In the agricultural zone, the use of cisterns was to refer to a level of management of water distribution to the plots, which was easier to manage from these small structures, which were themselves fed by canals in the secondary network (starting from C4). They were to be used for a group of plots, in the same way as the small basins for adjoining plots.

The group of cisterns located south of the C3 canal, at the end of the main artery of the internal network, may have corresponded to more significant water needs, during maintenance work (cleaning of the bottom of the canals C3 and C4, repairs and consolidation of canals), which requires the flows to be temporary suspended, or in the event of difficulties, or even the disruption of the water supply. These situations can result from a drop in flows linked to the instability of the natural channels on which the water intakes are built in drier or wetter years and leading to avulsions. They may also be a consequence of the rivalries between cities that led the rulers of Larsa to increase the volumes of water brought to the city and to build up strategic reserves in the event of a siege. As far as we know, the eastern part of the city was indeed devoid of a large water reserve like the P2 reserve in the northwest.

The H1 sounding on the Grand canal C3

***Fig. 6** – Orthostatic view of sounding H1. (R. Bernard, S. Dohr, 2023).*

The great works carried out by King Sin-Iddinam in the 19th century BC have made the Grand Canal (C3) a major structure of the Larsa intramural network in the centre of the city. Its average size, between 20 and 25 m, could occasionally reach more than 30 m wide. It brought water from the C2 canal, north of the city, to the level of the ziggurat, where it formed a wide bend to the southeast on which the C4 canal branched. During the November 2022 campaign, several electrical tomography profiles (ERT 1 to 3) were established perpendicular to the canal, on its northern section downstream of the B25 bridge, in order to determine its depth (see Vallet, Darras, Cez in this volume). The depth estimated from the profiles could be of the order of 2 m (ERT 1). This seems very shallow in view of the width of the canal, because only the depth makes it possible to control possible overflows which would be very damaging in the heart of the city. The depth of the canal is a decisive parameter for the circulation of water in an artificial structure where the upper part of the water column is characterized by a high degree of mobility. However, several elements should lead to caution in considering the depth data of the structures of the ERT resistivity profiles.

The desert environment in which Larsa is located and the sandy materials in which the measurements are made can hinder the propagation of electrical waves at depth. In addition, there are inherent limitations to the method itself, related in particular to the choice of electrode spacing, and to the data inversion algorithm insofar as the resolution decreases with depth.

***Fig.** 7 – Front view of the baked brick base of the building and the sewer pipe in the eastern part of the H1 sounding. © Photo Lucie Cez, November 2023.*

The H1 transect opened in November 2023 in the Grand Canal aimed to determine its depth and study its operation from the deposits of its filling. The trench was opened on the eastern edge of the canal, perpendicular to the direction of flow, over a length of 4,20 m from east to west and a maximum width of 2 m from north to south. The eastern part of the borehole shows 3,20 m of built structures bordering the canal, while the western part corresponds to flood deposits associated with the C3 canal over a 1 m extension (Fig. 6). In the eastern part of the sounding, the base of a building (6500) was excavated over a length of 2,45 m (from north to south) and 1.10 m wide (from east to west) (Fig. 7). It consists of 8 rectangular fired brick courses (25 x 15 x 10 cm) in total, the base of which is located at an altitude of +6,43 m. The 3 lower levels of foundation were inserted into the deposits forming the embankment (the upper limit of which is shown in Figure 8 by the dotted line). These three foundation courses are arranged in a slight projection towards the west (about 10 cm), forming a footing intended to reinforce the stability of the structure, which is also equipped with buttresses (0,75 m long by 0,27 m projection). The eastern wall of the transect

did not reveal any mud brick walls in place (collapsed and melted mud brick), but it may have been built set back from the face of the basement. The unearthed baked brick structure probably corresponds to the canal quay, which incorporated the excavated pipeline, while to the south it was surmounted by building B83, known thanks to geophysics (Vallet, Darras, Cez in this volume). A 1 m wide portion of a quay has already been unearthed on the eastern edge of the Grand Canal C3 further south, at the level of the B69 bridge currently being excavated (Zingarello, Bachelot, Hsony 2022: 81; Coppini et al. in this volume), made of rectangular baked bricks of similar size (27 x 17 x 10 cm). The masonry base is equipped with a recess, 0,9 m wide by 0,43 m high (four courses), in which a large ceramic pipe, 0,2 m in diameter, was embedded, wedged and sealed by a heterogeneous embankment whose top is located at an altitude of +7,36 m covered by an irregular slab (stone) 0,2 m thick (Fig. 7).

***Fig. 8** – Boundaries of the lateral median of the Grand Canal C3 (white dotted line) and the collapse deposits in the continuity of the layers of debris visible in stratigraphy on the south face of transect H1. The blue dotted line represent the limit of the upper canal fill. © Photo/DAO: Lucie Cez, November 2023.*

Aerial imagery makes it possible to follow the trench of the pipe (C132) over a length of 130 m, from the street along the B59 house excavated in the 80s (Vallet, Darras, Cez in this volume). It is therefore an important sewer collector, draining water from a large district to the Grand Canal C3. Several bunk beds, about 0,25 m long, suggest interventions over time, raising the pipe. Several baked bricks found across the pipe, which protruded 0,9m from the base wall, indicate that it had collapsed and damaged it. Two field bricks extended it to its termination, directing the flows further into the great canal. All the ceramic material identified in trench H1 (including an almost complete "Larsa" goblet), including on the surface, can be attributed to the Isin-Larsa period (Coppini et al. in this volume). The upper part of the embankment in which the basement was founded consists

of several layers of clay-silt deposits, rich in charcoal and ceramic fragments, as well as pockets of sandy material. The rather coalescing nature of these deposits indicates that they were deposited in a muddy to slightly wet state, which allows them to be interpreted as deposits resulting from the cleaning of the canal, accumulated on its edge and compacted in order to consolidate it. The nature and structure of the materials making up the embankment indicate that it is the eastern *cavalier* of the Grand Canal, i.e. the lateral embankment containing the waters of C3 to the east and whose flattened top could be built. According to this H1 data, the surface of the sloped embankment was at least 2 m (from west to east), but probably extended eastwards for some distance, under the neighbouring buildings (B83, B84). Its boundary is very clearly marked in plan at the bottom of the borehole and in stratigraphy on its south face where it forms a small step (Fig. 8). It has a series of angular irregularities typical reworking work with tool.

To the west, beyond the embankment of the canal rider, more or less aggregated heterogeneous materials are visible at the bottom of the sounding. They are located in the continuity of collapse layers visible in stratigraphy on the south face of the transect and composed of fragments of ceramics, coals and pieces of baked bricks. This debris being at the outcrop at the same altitude as that of the canal bank, it can be deduced that it accumulated along the wall of the *cavalier* covering the *revanche* of the canal, i.e. the upper part of the lateral slope that is out of water and which prevents overflows. Their accumulation may have been from the bottom of the canal or from a landing in the slope of the inner wall (stair step profile). At the western end of the sounding trench, finely stratified deposits composed of very fine sands and silts can be observed alternating with massive centimetre clay settling joints. Their stratigraphic relationship to the layers of debris visible on the south face of the transect H1 indicates that these are flows contemporaneous with and subsequent to the collapses in the channel. The flow sequences visible at the top of the stratigraphy are indeed located at an altitude higher than that of the top of the eastern cavalier of the canal, the accumulation of debris having raised the base level of the flow in the structure.

The study of the deposits covering the canal slope and the building foundation located on the eastern edge of the canal reveals part of the functional history of the structure that has not been recorded or preserved in the rest of the filling of the structure due to the cleaning and the circulation of water which destroyed part of these sedimentary archives. The excavation of the C3 canal (H1) reveals two types of deposits on the edge of the canal: dredging deposits and collapse deposits. However, it is necessary to extend the sounding to the west and at depth to reach the bottom of the canal in order to know the water circulation altitude and the profile type and dimensions, and also to document the functioning of this major hydraulic work through which large volumes of water passed. It is also a question of understanding the origin of the layers of debris and the impact of lateral collapses on its functioning. It is indeed a question of knowing whether these are events located at this level of the canal, destruction linked to the siege of the city of 1763 BC or collapses following its abandonment in 1738 BC impacting the entire network. Further downstream on the Grand Canal, the excavation of the eastern pier of the B69 bridge would show two phases of functioning (Coppini et al. in this volume). How they fit into the history of the general operation of this canal? The challenge is to characterize the hydrosedimentary dynamics of its usual functioning in order to better identify the phases of malfunction and abandonment.

New data on the peri-urban network and water management in the Larsa plain

The peri-urban basins south of Larsa

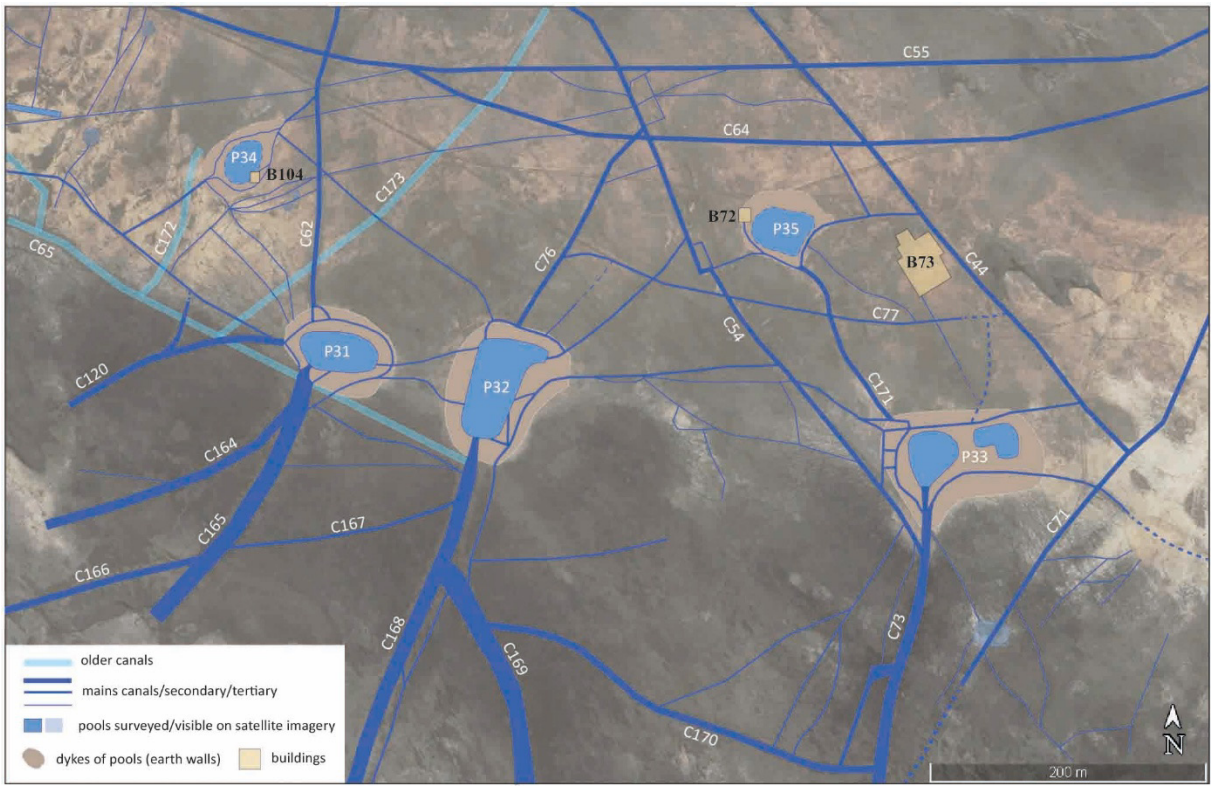

***Fig. 9** – The system of basins and spillway canals south of Larsa. GoogleEarth Pro 06-06-2023 (DAO: L. Cez).*

South of Larsa, two large structures have been previously interpreted as potential sites for extracting earth for building, connected to old canals and exploited after they have ceased to be functional (Giraud 2022: 110-111, fig. 65). In 2022, our surveys showed that these were former water storage basins, P31 and P32, fed by several large canals from the south (Fig. 9). A third basin, P33, has been identified 280 m east of the easternmost of the first two, composed of two small internal water reservoirs. Two other smaller basins were identified on satellite imagery (GoogleEarth image dated June 2023): P34 to the northwest, connected to the westernmost basin by the C62 canal and P35 to the north of the easternmost basin. Their geometry and dimensions can only be approximated. These basins were surrounded by wide earthen dykes up to 20 m for example for the basin P32. The appearance of these walls on space imagery is related to wind deflation which has created a multitude of erosion furrows. These structures did not reach those of the large P27-P28 reservoirs to the north (infra). However, the surface area of basin P32 to the south-west is estimated at 870 m^2 and that of basin P34 with which it was connected to the north-west of at least 750 m^2. The central P32 basin is the largest of the basins on the plain to the south with an estimated surface area of 2400 m^2. To the east, basin P33 consisted of a first water reservoir with an approximate surface area of 600 m^2, connected to a second to the east of barely 400 m^2. It was connected to the north by the P35 basin, with an area of at least 700 m^2. On the dyke of this basin, a small mud-brick building (B72) was most likely dedicated to monitoring the basin. This type of small earth construction probably existed on the southeast dyke of basin P34 (B104) where the satellite image shows a quadrangular mass of earth compatible with the walls of an old building. This is the same type of building as observed north of the city on the dyke of the large P27 mega-basin (infra).

The three largest southernmost basins (P31, P32, P33) were fed by large canals from the south, of which only the final sections can be seen in the imagery, most of their layouts being covered by the barchan fields. The main supply to the P31 basin was provided by the large C120 canal from the south-west and the C164 and C165 canals which joined in a fork just upstream of the basin. The P32 basin was fed by the C168 canal from the south, joined by the very large C169 canal about 100 m upstream of the basin. The P33 basin was fed from the south by the smaller C73 canal. These large structures were connected by transverse canals: the C167 ensured the junction between the P31 and P32 supply canals, while the C170 connected between the P32 and P33 supply canals.

Some of the water carried through these canals was stored in the basins, while some was diverted through a network of small canals dug into the thickness of the dykes. The function of these spillway canals was to collect overflow water from the basins that they reinjected into the peri-urban network: through the C62 canal from the P31 basin, to which the P34 basin was connected to the west, through the C76 canal from the central P32 basin and through the C44 canal in the case of the eastern P33 basin. From the latter, the C171 canal ran northwards, parallel to the C54 canal to the west and ended in the P35 basin. In addition to their function of recovering water, these canals made it possible to connect the different basins, thus making them united within this ingenious system facilitating the storage and redistribution of water. The three western basins (P31, P32 and P34) could be old developments that have been reused and perfected insofar as they are located along old canals to the south and west, such as C65, C172 and C173. In this area, the satellite image shows probable remains of other basins, abandoned and covered by more recent canals. Some of them were therefore probably enlarged to store larger volumes of water in order to meet the city's growing water needs and develop agriculture in the plain.

Our reconstruction shows that these canals had their source at the level of the Euphrates River, located about 6,5 km southwest of Larsa. These are new power supplies built on the river that have been combined with the existing power supplies for the city. They have made it possible to further increase the volumes of water withdrawn and to store part of it on the outskirts of the city. At the same time, there has been a significant increase in the size of these canals that feed these basins. The canals linking these large structures made it possible to irrigate the plain to the south of the city, thanks to the numerous small canals of the tertiary irrigation network (Vallet, Cez, Darras 2022: 72). This system of basins also allows for better water management and wider redistribution on the plain.

The peri-urban network to the west of Larsa

Two other basins of the same type have been identified on the satellite image to the west of the C38 canal, a major artery of the peri-urban network under Nur-Adad (1865-1850 BC), fed by the Iturungal northwest of Larsa (Fig. 10). The westernmost P36 basin is located 800 m west of the C38 junction with the C39 canal, a hydraulic work inherited from the previous phase of network development (Vallet, Cez, Darras 2022: 70-71). This oval basin had an estimated surface area of at least 1000 m^2. Our reconstruction shows that it was connected to canal C121 by canal C114, of which it was an extension to the west, as well as to canal C188, to which C114 connected to the north. Canal C195 joined C39 and C38 downstream at the junction of C37 and C45 canals associated to the previous phase of the hydraulic network. Running from basin P36 to the north,

canals C189 and C190 joined canal C191 further north. This latter was connected to the main artery of C192, which joined the C38 canal just before its intersection with C39. The C38 canal is a construction attributed to Nur-Adad (phase 3), with an average size of 10 m, aiming to double the C88 canal. Analysis of the satellite image shows that it was itself supported by a canal feeding directly into the Euphrates. The P36 basin was connected to another smaller P38 basin located 270 m to the southeast, fed by the C174 canal from the southwest, redistributing the water to the city through the C175 canal, from which several canals (C176, C177 and C178) joined C39 started. Between these two basins, the highly eroded remains of a third structure (P37) are visible. It was at the heart of a dense network of secondary canals (C182, C183, C185) and tertiary canals that started from it. As with the basins to the south of the city, the basins to the west were connected to each other: basins P36 and P37 by the C189 canal, basins P37 and P38 by canals whose route is poorly preserved on the surface, but also between the two basins distant from P36 and P38, by a series of branches C181 and C180. They formed an identical system of interconnected basins allowing for better water management.

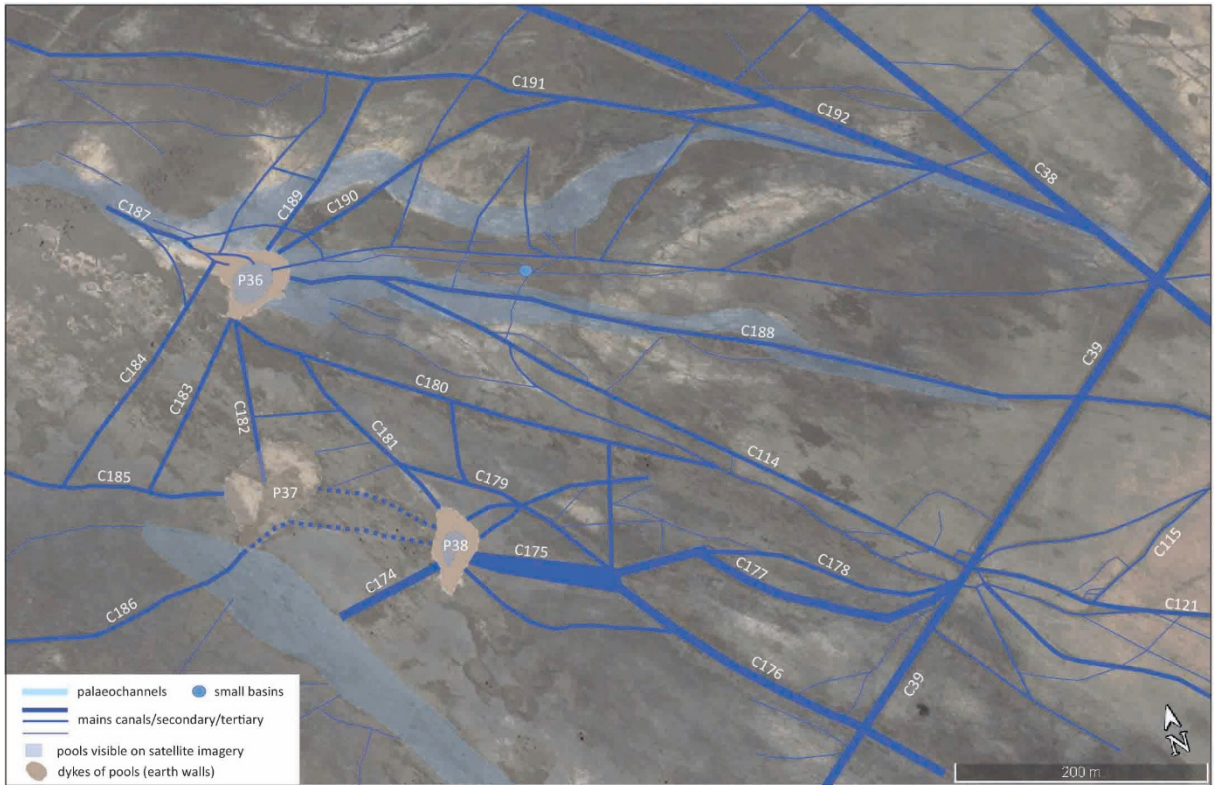

Fig. 10 *– The extension of the hydraulic network to the west of Larsa and the system of redistribution basins. GoogleEarth Pro (image from 06/06/2023). DAO : Lucie Cez.*

This western part of the hydraulic system is developed in a sector of the plain of Larsa which is crossed by large palaeochannels of the Euphrates River. These large water depressions have been drained, such as the C187 canal to the west of the P36 basin and the C188 canal to the east of the basin, the latter crossing the paleochannel on its entire longitudinal slope before joining the C39 canal. A network of secondary and tertiary canals associated with these large strips of alluvial land shows that they were exploited for crops, which benefited from greater humidity. This system of peripheral basins was probably implemented during the reign of Nur-Adad (1865-1850 BC), who developed the peri-urban network to the west, southwest and south, during phase 3 according to our periodization of the network (Vallet, Cez, Darras 2022: 69-72). Their location at the end of

the peri-urban network, from north-west to south, indicates that they were the pivots of its extension into the plain. The purpose of this extension was to increase the supply of water for the city, but also to secure its supply in the context of the rivalry between the cities of Isin and Larsa, by multiplying the diversions from the Euphrates and the Iturungal. This strategy also led to the construction of the C50 canal, which aims to double the C49 canal, during the reign of Nur-Adad. This type of basin has not been observed to the east of the city, this sector having been developed later, from the C1 canal diverting the waters of the Tigris, becoming under the reign of Sin-Iddinam the main supply of the city. On the other hand, these basins have been observed on the periphery of the large reservoirs north of the city.

The mega-reservoirs north of Larsa

On the peri-urban hydraulic network, our prospections focused on the two large structures located about 1,5 km north of the city walls, interpreted as possible natural or artificial reservoirs (Giraud 2022: 111). Our observations in the field established that these were two large artificial basins (P27 and P28) built from ancient sections of paleochannels. Their location on the periphery of two active hydrological sectors in the north-west, where numerous palaeochannels of the Euphrates are visible, and in the north-east where they form a succession of meanders (north of the modern expressway) indicate that they are ancient oxbow lakes, i.e. ancient active channels disconnected from the river floodplain. They were occasionally flooded during the high water of the nearby river (Vallet, Cez, Darras 2022: fig. 25). Other oxbow lakes of sinuous morphology were spotted on the satellite image to the north and northwest of the reservoirs. These residual fluvial palaeoforms bear witness to the past dynamics of watercourses of the divaging (braiding) type. Subsequently, these flooded depressions were transformed into reservoirs. The numerous canals that over time have connected to these reservoirs indicate that the Euphrates palaeochannels in these two sectors of the northwest and northeast of the city were active in the 2nd millennium.

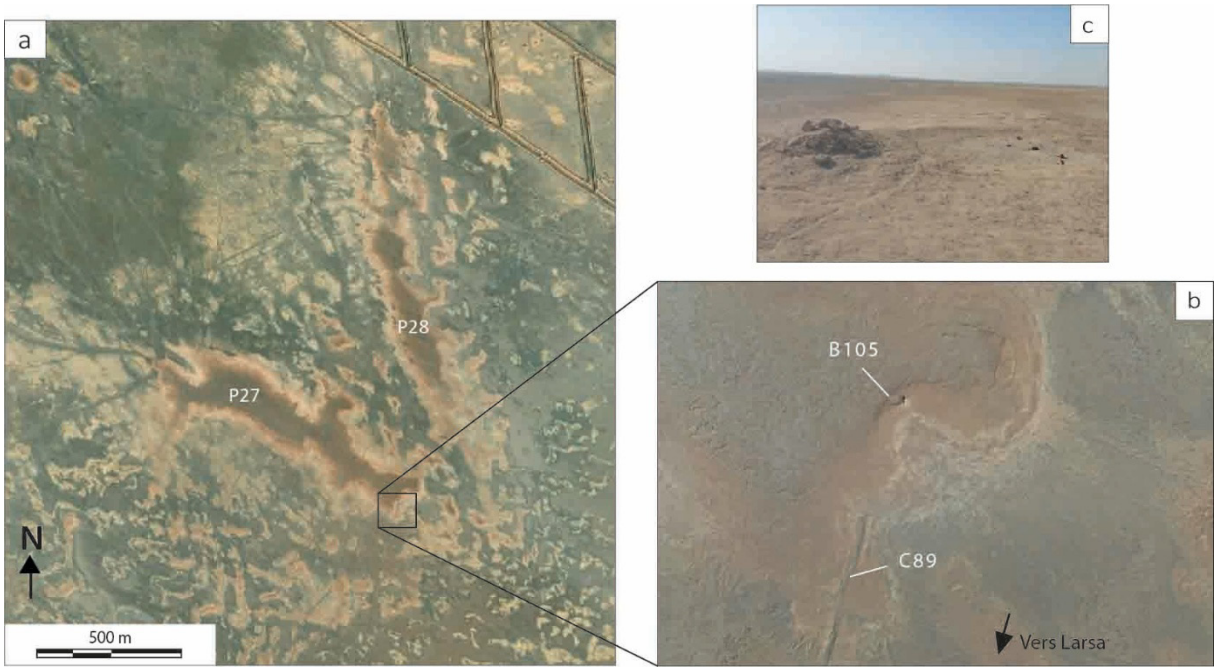

***Fig. 11** – The mega-reservoirs P27 and P28 north of Larsa (A) and the connection with the C89 canal (B). © R. Bernard, S. Dohr, Larsa-'Uwaili Mission, 2023. Detail of a control building located on the wall of the western basin (C). Photo © L. Cez, 2022.*

These water areas have been closed by walls of earth from their digging and whose hold on the surface of the plain is identifiable despite their stripping by the prevailing winds. Deflation has created the same erosion furrows there as on the walls of the peripheral reservoirs to the south and west of the city (supra). The width of the wall on the surface is average 10 m wide, which makes them powerful dykes adapted to the large volumes of water stored. The filling of the basins consists of sandy silts covered with a high density of carbonate concretions, which attests to the presence of a body of water. These reservoirs have a modular plan with extensions at strategic points of water redistribution. Some of these correspond to sub-rounded to quadrangular basins of the same design as those previously described to the south and west of the city, with thick walls and built along the reservoir dyke. By digging an opening in the thickness of the dyke of the main reservoir and the associated basin, the storage capacity was increased. These extensions also facilitated the redistribution of water to the plain via the various canals starting from the ends.

A small quadrangular building with a base of baked bricks (B105) built on the southern edge of the western reservoir P27, indicates that they were placed under the control of agents appointed like other redistribution basins in the plain (Fig. 11). In their final state, these mega-reservoirs with an area of 105,000 m^2 for P27 and 50,000 m^2 for P28 have enabled the agricultural development of the entire plain north of Larsa. They are located at the heart of a very dense network of small canals, linking numerous redistribution basins for irrigation, which is currently being mapped. The ceramic material on the surface around the reservoirs, which is scarce, dates from the 2nd and 1st millennium BC, as well as from the later Sassanid and Islamic periods (M. Zingarello and C. Coppini). There is no doubt, however, that the large hydraulic structures were integrated into the hydraulic network of the 2nd millennium. The western basin P27 was in fact connected to the city's network by various water supply structures, including the C89 canal which started from the southern end of the reservoir at the level of the B105 surveillance building. This C89 canal joined the C95 canal, with a west-east orientation, starting from the P9 basin and itself connected to the C94 canal. It therefore seems to be proven, according to the already established phasing of the network (Vallet, Cez, Darras 2022), that the connection of the mega-reservoirs to the peri-urban network by the C89 canal existed during the reign of Abi-Saré (1905-1895 BC), i.e. the period of the construction of the C95 canal. Along the C89 canal, upstream of its branch to the C94-C95 system, several canals diverted water from the reservoirs to the southeast and joined canals C90 and C91, which are former canalized natural channels whose terminations have been widened to form reservoirs (Fig. 1).

However, the connection of the P27 basin to the canals of the peri-urban network to the north of the city (C94-C95), via the C89 canal, is not what allowed the drainage of the oxbow lakes of the plain and their transformation into freshwater reserves. The configuration of the Euphrates fluvial system north of Larsa makes it possible to divert flows from the west to the water areas and to evacuate them to the east where a wide palaeochannel is visible less than 1 km from the P28 basin. The two large tanks P27 and P28 were also connected to each other by several canals. Such work was an essential prerequisite for the exploitation of the plain for agriculture. They were probably carried out largely during the reign of Gungunum (1932-1906 BC) who was at the origin of the first major hydraulic works to the west of the city where he built the great canal C88 which was fed by the Iturungal or directly by the Euphrates (Vallet, Cez, Darras 2022: 66, 70). The history of

mega-reservoirs (origin, functioning, successive extensions, integration into the peri-urban network) is therefore closely linked to that of the city's water supply system as a whole and to the different phases of its development. More broadly, it reflects the palaeohydrographic and palaeoenvironmental context of the lower alluvial plain of the Euphrates in the Larsa sector in the 3rd millennium BC, prior to the hydraulic programmes of successive rulers in the 2nd millennium that led to an artificialisation of its hydrological functioning and a profound transformation of its water landscape.

III – Trench 'PZ' across the Grand canal of Larsa

Costanza Coppini, Rateb al Debs, Haneen Salem, Zaman Cuma, Régis Vallet

***Fig. 1** – Overall view of the remains of bridge B69 in trench PZ, from the eastern quay of the Grand Canal. In the background, the ziggurat (photo R. Vallet, 2023).*

In the 2021 season excavations in and across the Larsa Grand canal brought to light a structure consisting of baked bricks and forming a large pillar (4511). This structure was identified as one of the piles of the canal bridge B69, together with a baked brick wall interpreted as the canal quay (Zingarello, Bachelot, Hrsony 2022). However, the two baked brick structures were not fully brought to light, and to understand their shape, size and therefore their function it was necessary to continue investigations in the area. For the afore mentioned reasons, the main aims of the 2023 excavation campaign were (a) to establish the whole plan of pile 4511 and (b) to investigate the bottom of the pile and, therefore, its relation to the canal filling and to its bottom. Moreover, further geophysical investigations conducted along the canal have highlighted anomalies to the east and north of trench PZ. These anomalies have been interpreted as possible structures and have

therefore provided hints about the actual extent of the entire east pier of the B69 Bridge. Based on these data, the excavation area was extended (Fig. 1). If the 2021 results showed four levels of occupation, from the Kassite period (levels 1-3) down to the Old Babylonian / Isin-Larsa period (level 4), in the month of our work we were able to identify two phases of use of the canal and related structures (pile, pillars, walls, quay), which are now called levels 4A and 4B.

Level 4B (Isin-Larsa period)

The structure of pile 4511 has revealed to be more complex than it seemed during the 2021 campaign. The structure extends over 7.60 m north-south and 4.20 m east-west for the time being, but its clearance is not yet complete (Fig. 2). It consists of 30 layers of baked bricks, measuring 35 x 35 x 9-10 cm, from the very top of the structure (top of late eastern facing 4549, see below) to the very bottom of the foundations (base of foundation pillar 4551, see below). Rectangular half-bricks are also used, particularly for facing, to ensure alternating vertical joints, or even broken bricks, to solve masonry orientation problems. Pile 4511 and its associated structures underwent at least two building phases (4A and B), and we ascertained that its lower half consists of solid baked brick foundations, which were built in Level 4B. In fact, in the very last stage of the 2023 excavations, we were able to reach these foundations at an elevation of +7.94 m. This corresponds to a preserved elevation of 2.90 m for pile 4511, from the base of its deepest foundations to its preserved top cleared in 2021/2023. It was established that the foundations are a complex system composed by the bottom of the main body of pile 4511, flanked by pillar-like structures (4551 and 4552).

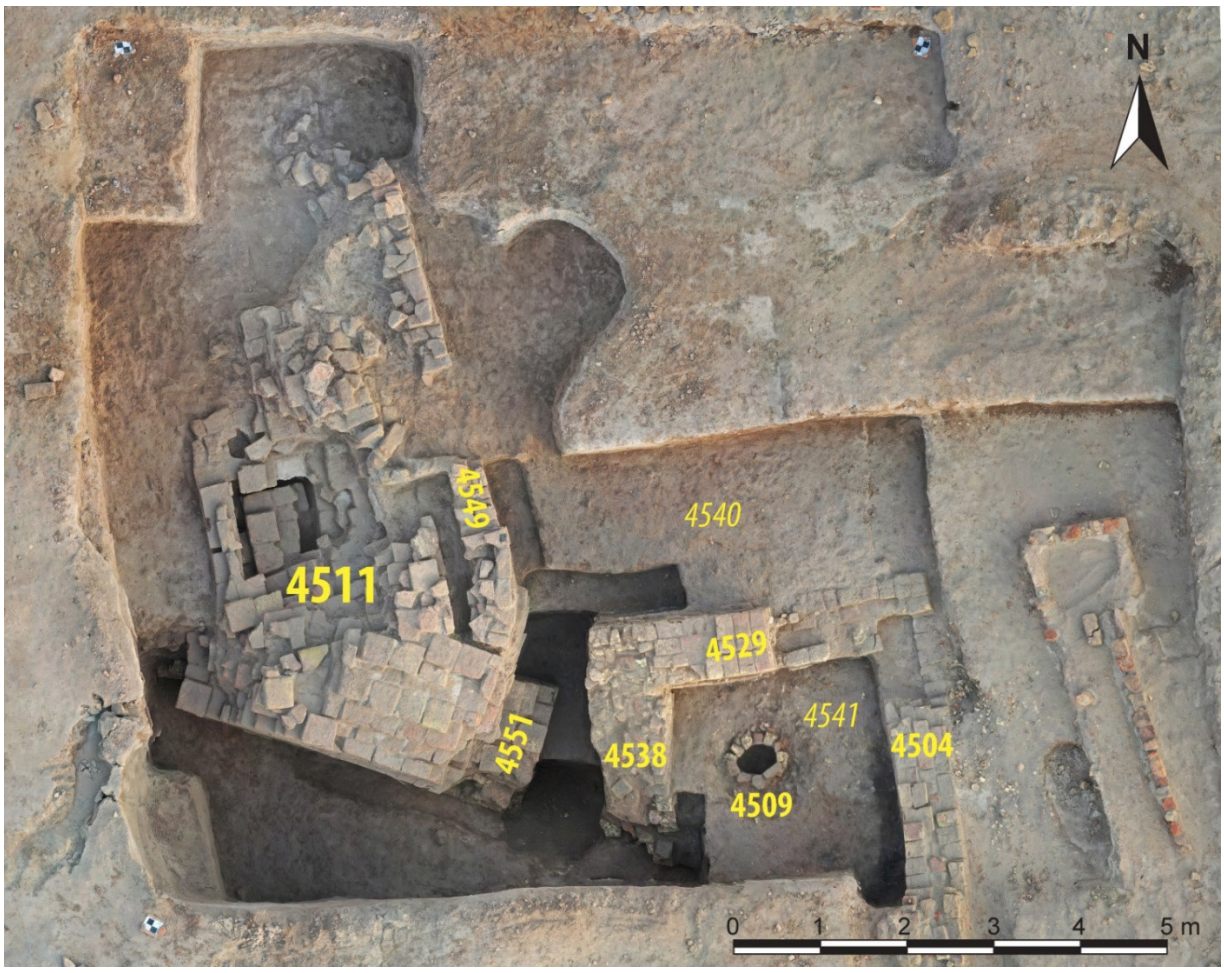

Fig. 2 - Orthostatic view of trench PZ, 2023 (R. Bernard, R. Vallet).

The main body of pile 4511 consists of two binded masonry blocks. A south block, oriented WNW-ESE, measuring 3.60 x 1.70 m, whose south face has been completely exposed (Fig. 3), and a north block (probably central), oriented NNW-SSE, currently 5.35 m long by 2.60 m wide, later increased to 3.40 m in width (in Level 4A, see below). Pile 4511 main body is preserved on 16 layers of baked bricks in total (18 including the late east facing 4549). The massif is fitted with internal canalizations (Fig. 4, left), empty spaces 10-15 centimeters wide, designed to evacuate seepage water, some of which opened onto the south face. The five lower courses form the foundations of the main body of pile 4511 (Fig. 4, right), with a V-shape base (the courses are progressively narrower towards the bottom) to anchor the pile in the bottom of this part of the canal. A few adjustment bricks are visible beneath the base itself, at around +8.70 m. This configuration was not deemed sufficient to anchor the bridge pile in the canal bed, as the pile was fitted with powerful lateral foundation pillars, near its corners, binded with the pile main body to play their role and sinking deep into the ground. At the current state of excavation, the south-eastern pillar (4551) was fully brought to light (Fig. 5, left), while its south-western counterpart (4552) was identified but not excavated (Fig. 5, top right). The south-eastern pillar 4551 measures 1.5 m (NS) by 1 m (at least). It is preserved on 20 brick courses (perhaps its original elevation), 9 courses binded to the main body of pile 4511 and 11 courses sinking into the ground below the base of the main body of 4511, hooking it into the canal's ground to resist to water. Pillar 4551 revealed that the baked bricks in its lower layers were jointed and protected by bitumen (Fig. 5, bottom right).

Fig. 3 *- Pile 4511 and PZ trench, from the south-west.*

On the north-western side of the pile 4511, at +10.26 m a baked brick with an inscription of King Sin iddinam was found (Fig. 6, left). Two other inscribed fragments were found in the collapsed

structure. All bear the same inscription as the brick discovered in 2021 (Charpin, Jacquet, in this volume). The pile 4511 was in sandy soil, mixed with potsherds. Given the composition and texture of the soil, and observing the southern profile of the area, it can be argued that the sandy soil filled the canal. Therefore, the structures were in the canal itself. The contact of pile 4551 with water is also proved using bitumen on the eastern side of the pillar 4551.

***Fig. 4 – Left**: detail of the internal canalizations of pile 4511. **Right**: foundations of pile 4511, from the south.*

***Fig. 5 – Left**: foundations of pillar 4551, from the S-E. **Top right**: Top of pillar 4552, set back from the south face of pile 4511, from the south. **Bottom right**: Detail of the bitumen joints on pillar 4551, from the S-E.*

Together with its alter ego on the other side of the canal, the large pile 4511 was undoubtedly the main structure of the B69 Bridge. But it was not the only one. This year's work revealed associated secondary piles and even walls, with occupied surfaces, at different altitudes. As the work on the H1 trench also showed (Cez, Vallet, Khazal Ahmad, in this volume), the Grand canal was not a simple structure, with two vertical side faces and a uniformly flat bottom. It was a complex structure, due to its size and importance in the network. Its massive earthen side cavaliers, held up by walls of mud or fired bricks, were laid out in wide tiers, descending towards the center of the

canal. The accumulation of fill over time created an irregular slope. On the other hand, constructions such as B69 were certainly crossing structures, i. e. bridges, but they could also fulfil hydraulic functions, as the plan of the new B93 bridge discovered this year further upstream of the Grand canal clearly shows (Vallet, Darras, Cez, in this volume). They divided the Grand Canal into several sections, regulating flow and enabling maintenance. In other words, they acted as a water-gates that could be closed. Hence the presence of structures linking the main pile to the canal quay. In its final state at least (4A, below), the large pile 4511, perhaps originally in the canal bed, was fully attached to the side embankment when the intermediate space was filled in.

***Fig. 6 – Left**: inscribed brick T-4117-1 (Sin-iddinam no. 3), in situ, from the east. **Right**: Northern part of wall 4538, founded in tiers, from the south-west.*

In the same level 4B, immediately to the east of pile 4511, two further structures were erected, namely piles (or walls) 4538 and 4529. Wall 4538 is oriented north-south and measures 2.63 m (NS) x 1 m (EW). In its lower and oldest phase (4B), it is composed of 10 brick courses (24 x 20 x 9-10 cm baked bricks) to the north (Fig. 6, right), 15 to the south (Fig. 7). Its stepped foundations lie at an altitude of +9.20 m to the north, (top at 10.20 m), +8.70 m to the south. This shows that as early as phase 4B, there was a slope between the space (landing) to the north (east of 4511) and to the south, lower landing in the bed of the canal. Wall 4538 is therefore a kind of pillar, quite comparable to the SE pillar (4551) of the large pile 4511, albeit founded on a higher level. In fact, 4538 seals an earlier mud-brick wall, currently attested over five courses but which certainly continues lower down, well associated stratigraphically with pillar 4551 and the oldest state of the large pile 4511. It is therefore possible that phase 4B should be subdivided into two sub-phases. Further work will focus on determining the exact configuration and nature of this lower masonry (which could be that of the edge of a canal landing rather than a wall like 4538).

The neighboring secondary pile 4529 (which will become a wall in level 4A) is currently only attested with certainty in phase 4A. Below the southern face of its 4A state, there are only earth and collapse layers, and on the other side, to the north, the excavation has not gone down far enough. An elbow-shape extension of 4538 suggests, however, that 4529 already existed in 4B, but with smaller dimensions, which remain to be determined.

Further east, 2.5 m from wall 4538, was located mudbrick wall 4504 (topped in 4A by fired bricks), which had the function of delimiting the eastern side of the quay area of the canal. The space between walls 4504 and 4538 was filled by a collapse layer (4543), consisting of fired bricks, mudbrick debris, ashy soil and a few diagnostic pottery sherds. This collapse layer, abutting wall

4504 and covering the early phase of wall 4538, sloped down westwards until it abuts against pile 4511. Observing the southern section of the trench and the stratigraphy within the trench, the collapse layer lies underneath all the 4A vestiges (see below) and is superimposed by a sandy layer with lime inclusions, characterizing an episode of abandonment of the canal.

***Fig.** 7 - Southern section of wall 4538, from the west. In the background, quay 4504.*

The collapse layer 4543 and the subsequent abandonment phase could coincide with the siege of Larsa, carried out by Hammurabi in 1763 BC. In terms of historical sources, it is well known that the Babylonian king cut water supply to the city of Larsa during the siege, and the end of Level 4B could be identified with this episode in the history of the city.

Level 4A (Old Babylonian period)

The phase following the Isin-Larsa use of the canal sees the rebuilding of all structures accompanied by major changes. Pile 4511 was connected to the quay by the filling in of the land between the two, bounded by walls. The newly created spaces along the quay were used and the material on their floors allows us to attribute the last state of bridge B69 to the 18th century.

It is in this phase that the canal is narrowed by the reattachment of pile 4511 to the bank. The narrowing of the canal is visible since the space between pile 4511 and wall 4538 to the west and quay 4504 to the east is filled with packed earth. Moreover, the pile 4511 changes shape in this phase. An upper layer of bricks is added along its eastern face (4549), which provides a slightly curving shape to the side (Fig. 2). This late façade has a stepped base, descending to the south and highlighting both the high level to the east of 4511 and the steep slope between 4538 and 4511 (Fig. 8).

***Fig. 8 – Left**: recent facing 4549 of pile 4511 (right) and north face of walls 4529 and 4538 (left), from the north-east. **Right**: stepped foundations of the recent facing 4549 of pile 4511. In the foreground, top of pillar 4551, from the south-east.*

The walls of phase 4A rest on those of the previous phase, or in places on destruction layer 4543, at an altitude between +10.20 m and +10.40 m. They are built in rectangular baked bricks measuring 25-26 x 17-18 x 9-10 cm, but many "half-bricks" are also available, broken down to the required dimensions (12.5 x 12.5 cm but also 18 x 16 cm and other sizes). To the west, pillar 4538 has been rebuilt identically, but its 4A elevation, preserved on seven courses to the north, has almost completely collapsed, mainly to the west, i.e. into the canal, since to the east is now an occupied space. The wall binds with wall 4529 at right angles to the east.

***Fig. 9 – Left**: south face of wall 4539, from the south. **Right**: North face of wall 4539, from the north.*

Wall 4529 was the first to appear, at around +11.05 m (Fig. 9). It extends to a length of 3.20 m, up to quay 4504, with which it is binded, and is 0.75 m wide. Its western section has been preserved on nine courses (with a tenth in foundation at the western end), up to a passageway with a threshold (0.8 m wide NS), 1.15 m from wall 4504. The width of the passageway is unknown, as the large modern pit 4503 washed away walls 4529 and 4504 right down to their footings at this point. The first two courses of both walls are slightly protruding, forming a footing at the level of which (and higher up) the associated floors were found. To the east, quay 4504 has been known since 2021. We were able to follow it for almost 5m in length (for a width of 0.65-0,75 m), right up to its junction with 4529, beyond which it does not continue north in level 4A but forms an angle with

4529 (Fig. 2). It is mainly preserved on five courses, except to the north where pit 4503 has left only one or two, and to the south where it rises almost to the surface (surface alt.: +11.34 m), on nine courses, which have fallen sharply to the west.

On either side of wall 4529, floors were associated with the remains of level 4A, from pile 4511 in the west to quay 4504 in the east. To the north of wall 4529, a dark brown, very compact layer (4526), with lime inclusions, appeared from +10.75 m. It was associated with a kind of tiling (4527), made of pieces of brick embedded in mortar, running along the north face of wall 4529 over a width of 0.55m (Fig. 10, left). Further down, after a 15 cm layer of fill, a second trodden floor was found at +10.45, also a dark brown surface, 5 cm thick, with calcite and charcoal inclusions (4540). Trodden floor 4540 abutted the northern face of walls 4529/4538 and ran to the north and to the south of the pile 4511, abutting its eastern side 4549 at the level of its fifth brick course (from the top, at around +10.85 m), which corresponds to the base of the recent facing.

***Fig. 10 – Left**: tiling 4527, abutting wall 4529, from the north. **Right**: Old-Babylonian jar set in floor 4541, south of wall 4529, from the east.*

South of wall 4529, trodden floors 4541, from +10,51 m to +10,35 m, which have similar characteristics to 4540, extends on a surface of 2,85 x 1,35 m, abutting wall 4504 to the east, the southern face of 4529 and the eastern face of 4538. The small, tiled area 4505 excavated in 2021, adjacent to the third course of wall 4504, just above its footing, is part of these floors. A pit in which a jar with ovoid body and vertical neck was located cuts the floors near wall 4529 (Fig. 10, right). The two floors, 4540 and 4541, were strictly contemporaneous and extended a little to the west, on a steep slope: 4540 in the narrow space between wall 4538 and pile 4511, and 4541 around wall 4538 to the south, meeting in the lower bed of the canal at the south-west corner of wall 4538. According to the material from this level, this is dated to the Old-Babylonian period (Coppini, in this volume).

At the end of phase 4A, the canal bed is filled with sand. In the eastern part of the canal bed, the sand mixes with the destruction layer of level 4A: brick fragments from wall 4538 and pottery shards. To the east of the trench, this collapse layer covers all the remains of level 4A.

Levels 3 to 1 (Kassite workshop)

After the space formerly occupied by the canal was abandoned and filled in, the levels dating from the Kassite period were studied in greater depth. We were able to observe that the workshop basin to the east, which continues up to level 1, and pottery kiln 4500 and its associated structures (pipe 4513 and mud-brick platform 4514) to the north-west, were connected by floors. On level 3,

vertical drain 4509 was associated with floors both to the east and north of the area. The drain has a buried drainage chamber, consisting of the upper half of a large jar, pierced with holes and covered with soil mixed with pottery shards (Fig. 11, left). The drain continues lower down (oval shape, maximum diameter 0.47m), bounded by a circle of rectangular baked bricks that also supported the jar (Fig.11, right).

***Fig. 11 – Left**: drainage chamber of drain 4509, in the Kassite pottery workshop.*
***Right**: the continuation of drain 4509, from the east.*

IV – The Excavation of Building B50 at Larsa

Régis Vallet, Matisse Vobauré

Visited by André Parrot, who set up a topographical point at its summit (Parrot 1933: 178), then inventoried in the 1980s, at least for its highest part (Huot, Rougeulle, Suire 1989), the great monumental edifice constituting Larsa's Tell B50 was only revealed in all its true extent in 2019, through pedestrian and geophysical surveys, followed by excavations. The complex, close to the Ebabbar (35 m north-west of the latter), extends in a rectangle oriented NW-SE, i.e. by the angles according to custom, of 127 x 61 m or 7250 m^2. It comprises two buildings, the larger (45 x 61 m, 2745 m^2) to the north, separated by a huge courtyard measuring 43 m on each side. The ruins of the northern building alone form Tell B50, towering 3.50 m above the surrounding terrain on average. In 2019, 540 m^2 were excavated at its summit, revealing colossal mud-brick walls, 2.10 to 5.60 m wide, beneath the very fragmentary remains of a small Hellenistic temple (Obreja, Al-Debs, Vallet, Ibrahim 2020). The material collected attributes the construction to the 19 -18^{ee} c. BC (Oselini, Herr 2020, Coppini 2022). A narrow sounding, right down to the foundations, showed that the building had been preserved, at the top of the Tell, over an elevation of 4.50 m, i.e. up to the first floor, marked by a slight recess (0.2 m) in the masonry to accommodate the floors of the upper storey.

In 2021, a trench on the western slope of the Tell, bringing the total area excavated to 772 m^2, uncovered the western façade of the complex, featuring a multi-recessed baked-brick facing, visible in places on the surface, but whose attribution - to the Hellenistic building (in baked bricks recovered from the ancient site) or to the Amorite building - remained unresolved (Ait-Said, Vobauré, Vallet 2022). Observations made near the façade showed that the building, set in a pit,

had wiped out all previous constructions. Above all, at the top of the Tell, excavation of the room already probed (3019) yielded no fewer than ten bricks inscribed with King Sin iddinam (1849-1843), from the collapsed upper parts of the building and commemorating this king's work in the nearby Ebabbar (Charpin, Jacquet 2022). These discoveries do not constitute an identification of the building in the strict sense of the term, but they do enable us to propose one on an objective basis. It appears that this large royal building was probably the Gipar of Larsa, the temple-residence of the priestesses of the god Shamash, hence the inscriptions found. We know that King Gungunum (1932-1906) had a Gipar built in Larsa on the model of the one in Ur, even before he took control of the city in 1925 (Charpin 2022). The one we are looking at is Sin iddinam's reconstruction, where the two main buildings are not juxtaposed as at Ur, but separated by a courtyard. Finally, room 3019, whose ground floor has been completely preserved, turned out to be a blind, if not concealed room, with no access except from the upper floor, which led us to see it as a possible temple treasure. In fact, it was the function of the first floor of the entire building that was in question.

By 2023, our goal was clear-cut. We now had to strip the heart of the temple to determine its layout. The part of the building already known invited us to do so, formed by two perpendicular bands of rooms, one to the south, forming the façade on the large courtyard, the other in the center, a sort of backbone of the construction dividing it into two equal parts, each organized around an inner courtyard. It was enough to follow this strip of rooms northwards, if possible up to the north facade, to get a good idea of the general economy of the plan. In order to have a chance of doing this in the time available, given the scale of the construction, both in plan and in volume, there was no question of excavating any rooms that appeared. Their filling was removed only to the extent necessary to clear the wall alignments, generally about 15 cm. Similarly, the brickwork was not thoroughly cleaned, as we had done at the top of the Tell, although we did examine it. As we had already seen at the summit, the masonry is mostly made of 35 cm square mud bricks (with a thickness of around 10 cm), with a few rare courses of rectangular bricks (two sizes, 20 x 15 cm and 30 x 18 cm), which are used extensively for the facings, laid in stretchers or headers, to ensure the essential offset of the vertical joints. With the help of six workers, a further 537 m^2 were recognized, bringing the total surface area cleared to 1309 m^2 (Fig. 1).

We therefore resumed clearance of the building where we had left it in 2019 at the top of the Tell, i.e. at the start of rooms 3027 and 3029, at an altitude of 15.34 m (Fig. 2, right). The terrain had a steep downward slope to the north, about 10%, with a 4 m drop between the summit (the Parrot point above wall 3017, at 16.79 m above mean sea level) and the foot of the Tell, 40 m to the north (at around 12.50 m) (Fig. 2, left). Above all, the central part of the Tell's northern flank, where the strip of room we're interested in is located, was cut along its entire length by a wide erosive channel, some fifteen meters wide, which had drained run-off water from the summit. It was therefore so far below the sides of the building that it was feared that erosion had completely washed away the central section of the temple's north façade (and adjoining parts) at the foot of the Tell. As the strip of rooms to be cleared was over ten meters wide, and given the extent of the surface deposits to be removed (a shapeless heap of debris from the two superimposed buildings, rolled from the top), two parallel trenches, each around 4.5 m wide, were dug, one along wall 3022 to the west, the other along wall 3031 to the east, later joined at the level of the transverse walls.

***Fig. 1** – B50, overall orthostatic view 2019-2023 (R. Bernard).*

***Fig. 2** – B50. **Left**: part of the northern slope of the Tell, from the north.*
***Right**: rooms 3027 and 3029, from the north-east.*

The northern boundary of rooms 3027 and 3029 (Fig. 2, right), the cross-wall 3551, quickly appeared, between 14.80 m elevation to the east and 14.64 m to the west, 2.20 m wide like the adjacent walls (Fig. 3). The two rooms measure 4 m long by 2.10 m wide (8.4 m^2). These dimensions, although taken from the ground, must be treated with caution, as they come from the top of a building that has been preserved over several meters of elevation, and whose masonry, as we were able to see where the excavation went deep, had sometimes slipped sideways. Measurements taken at the base of the walls, from one rendered facing to the next, would undoubtedly give a different result, of more than ten centimeters in some cases. The long walls 3022, 3031 and, in the middle, 3056, continued to the north, creating two new rooms, 3552 to the west and 3575 to the east, whose filling revealed an intact "Larsa" beaker, near the room's south-east corner, at 14.70 m (Fig. 4). The two rooms are the same width as the previous ones and extend 6 m in length (12.6 m^2), up to a perpendicular wall 3554, which crosses the entire site and delimits the two side courtyards 3039 (west) and 3040 (east), 17.40 m long from north to south.

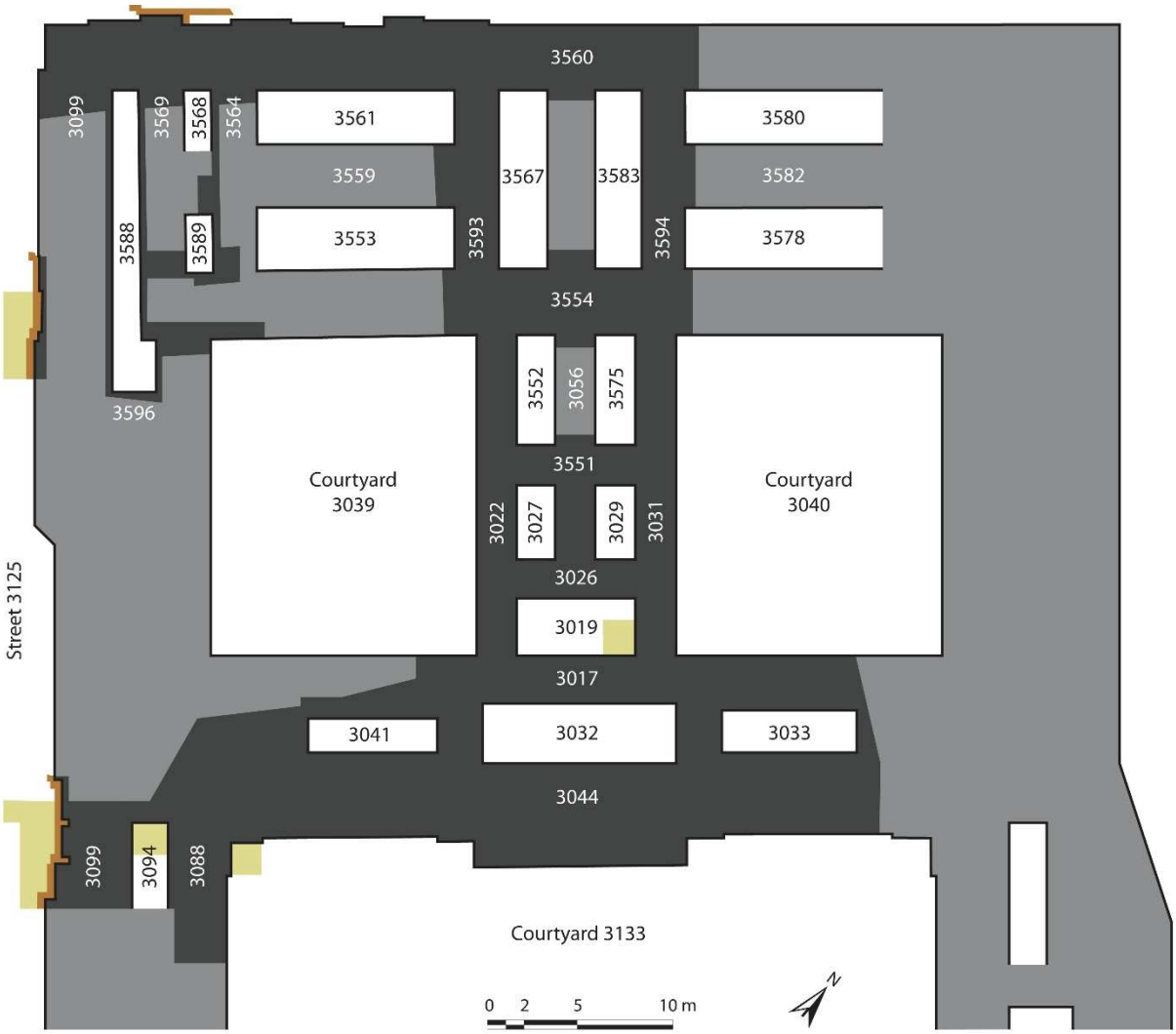

***Fig. 3** – B50, general plan of the north building of the complex (2023). Dark gray: excavated, light gray: prospected, light brown: baked facing excavated, yellow: floors excavated (R. Vallet, M. Vobauré).*

***Fig.4** – B50, intact "Larsa" beaker emerging from the fill in the southeast corner of room 3575, from the north.*

Bordering the northern flank of the Tell at almost mid-slope, wall 3554 reached an altitude of 13.93 m to the east and 13.71 m to the west. The wall, which lacks a buttress on long sections of its southern face at courtyard level, has been given an increased footprint (3.50 m), as have all the walls in the northern parts of the building. Of the three axes we initially followed, only 3056, in the center, continued beyond 3554 with the same alignment and a 2.30 m width. The continuation of the axes represented by 3022 and 3031 was offset by 0.7 m (i.e. two brick rows) in order to enlarge the rooms on either side of the central wall 3056. Although certainly binded to 3554 and through it to the walls further south, these are technically other walls, 3593 to the west and 3594 to the east. The two rooms 3567 and 3583, 2.80 m wide, extend over a length of 9.80 m (27.4 m^2), bounded on the north by the temple façade (3560), of which we were relieved to see the south facing 13.02 m to the east, 12.82 m to the west. On either side of the rooms, walls 3593 and 3594, 2.40 m wide, were binded to powerful perpendicular walls, 3559 to the west (average alt. 13.24 m), 3582 to the east (avg. alt. 13.44 m), 3.60 m wide and each dividing two long, 3 m-wide east-west rooms, 3578 and 3580 to the east, already known to us from geophysics, 3553 (slightly wider, 3.15 m) and 3561 to the west. To the north, facade 3560 continued down the slope for 3.70 m, reaching an altitude of 12.63 m. A sounding just below the north face revealed that only a single course remained, founded at 12.49 m in the brownish earth fill of its foundation pit (recognized in 2021 to the west of the building, Ait-Said, Vobauré, Vallet 2022: 98-99), the edge of which appeared 0.8 m from the wall, in which the excavation stopped at 12.20 m.

It was then decided to follow the façade westwards, where part of its baked brick facing was already known (Ait-Said, Vobauré, Vallet 2022: 97-98), and to clear the more easily accessible western half of the building. A 5-6 m-wide trench was therefore opened, straddling façade 3560 and extending

22 m to the west corner of the temple (Fig. 5). Facade wall 3560 appeared immediately below the surface, gradually rising in elevation from 12.63 m in the center to 13.44 m, 15 m further west, at the level of the preserved segment of its baked facing that acted as an erosion-resistant mole, then falling back to 12.86 m at the corner of the building. To the south of the wall, room 3531 extended over a length of 10.60 m (i.e. 31.8 m^2) up to a 2.50 m wide wall 3564, beyond which were two narrow, 1.50 m wide rooms, 3568 and 3588, separated by a 2.40 m wall (3568), and then the building's west façade (3099), here 3.80 m wide and stripped of its baked facing since it was a foundation, at least in relation to the floors outside the building.

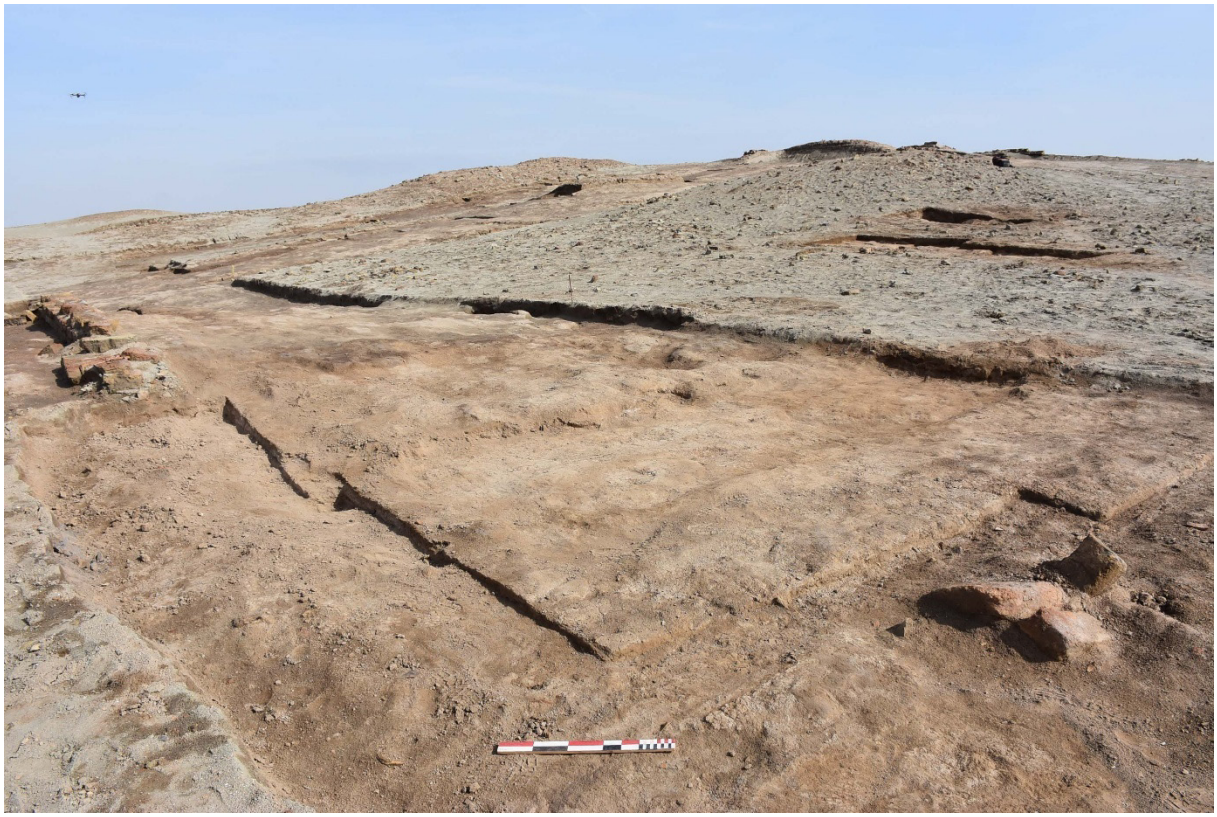

***Fig. 5** – B50, west corner of the north building, from the west.*

On the north side of façade 3560, the remains of its fired brick facing, superficially uncovered in 2021 (Ait-Said, Vobauré, Vallet 2022: 99), were preserved over a length of 5.60 m, 5 m of which belonged to a single niche. The rhythm of the niches and recesses on the north façade is therefore different from that on the west façade, where the niches are 3.70 m long. It was preserved in three courses, emerging slightly above the adjoining mudbrick, at around 13.53 m, set in the backfill of the building's foundation pit at 13.22 m. Only the third and highest course of the facing (preserved over a length of 2.4 m) adjoined the mud-brick masonry of the façade. Behind the two lower courses of the facing was a heterogeneous earth fill (emptied down to 12.91 m altitude) containing shards, 0.55 m wide, right up to the mud-brick face of the façade (Fig. 6). With the exception of its short, highest section (at the level of the third layer of the fired-brick facing), the 3560 mud-brick facade was clearly set back (by up to 0.75 m) from the remains of its fired-brick facing over its entire recognized length of 35 m, and formed a series of irregular offsets (0.2 m) that were incoherent with the layout of the backed facing (Fig. 4). The key to this little enigma had already been provided by the facing of the west facade, studied in 2021 (Ait-Said, Vobauré, Vallet 2022: 97-99), which had shown that the fired-brick facing was anchored in the unbaked masonry by perpendicular "lugs", one to two bricks long, binded to the mudbricks of the wall. The north facade revealed that

the masons had built the facades in two stages, first with the bulk of the mudbrick work (in groups of 6 or 7 courses, separated by leveling layers of reed and mortar, Ait-Said, Vobauré, Vallet 2022: 93) but not completely, leaving a waiting face, irregular, to allow in a second time (perhaps by another team) the anchoring of the baked facing in the unbaked masonry, completed with the laying of the baked facing. Simply, in the foundation, at the level of the first two courses of the facing, where there is no binding to the unbaked masonry, the masons simply filled the space between the waiting face and the base of the facing with all-round material.

***Fig. 6** – B50, infill between the mud-brick foundations of facade 3560 and its fired facing, from the east.*

The north façade of B50 provides further important contextual data. Although culminating above 13.50 m, while the surrounding terrain around the western corner of B50 fluctuated between 12.50 m and 12.75 m, i.e. much lower, no floor was associated with the baked facing of the temple's northern façade. This is only to be expected, since we know that the first three courses of the structure form the foundation, with the floors above them (Ait-Said, Vobauré, Vallet 2022: 98 and see below). This implies that erosion was very violent to the west of the temple, tearing away the second-millennium floors and digging deeply into the substrate, even before the temple ruins (which must have remained standing for a very long time) finally covered the ground. In fact, the entire surrounding area, although lower than the temple, is occupied by the completely melted and decomposed collapse of the edifice, mixed with sandy deposits and scattered fired bricks from the wall facing. In the north-western corner of the trench, the mud-brick corner (1.50 x 1.50 m) of a neighboring building (probably building B101, Vallet, Darras, Cez in this volume, fig. 9), 0.45 m from the western corner of B50, emerged from this layer at 12.76 m.

With the north façade of B50 cleared, excavation turned south, along the two narrow rooms 3568 and 3588 in the corner of the building. To the east, room 3568 continued for 9.80 m, up to the extension of wall 3554 delimiting courtyard 3039, which appeared here at 13.31 m. The room was

divided in two by a mud-brick massif, whose north face we did not have time to clear, at least 1.70 m wide, more or less in line with wall 3559 to the east. To the north of the brick massif, room 3568 proper was at least 4 m long. Space 3589, to the south of the massif, was 3.5 m long (5.25 m^2). Further west, room 3588 is a corridor 16.10 m long, up to a transverse wall 3596 to the south (of which only the north face was recognized), then turning east and widening (2.80 m), as if to join courtyard 3039 but ending on the latter's west wall (3595), 3 m wide (at best). Courtyard 3039, and presumably its counterpart 3040 to the east of the building, extends 14.30 m from east to west, covering an area of 250 m^2. Corridor 3588 showed, especially in its northern half, clear traces of burning, with rubbed or even charred fill and bedding, which may have been floors or a layer of fire. To the north of the corridor, wall 3569 had a 10 cm gap at the top with façade 3560, which could indicate the presence of a threshold between the corridor and room 3568. At the other end of the corridor, to the south, the cleared section of the west wall of the courtyard (3595) could also correspond to a threshold, as the plan suggests that the corridor starts from the courtyard. Without entering into a functional discussion here, it is possible that corridor 3588 served room 3568 from the courtyard, where the mudbrick massif could be the base of a staircase leading upstairs.

***Fig.** 7 – B50, baked facing on west façade 3099, from west.*

To the west of the southern half of corridor 3588, the baked brick facing of the temple's west façade (3099) was visible on the surface. From its northern end, cut by erosion a dozen meters from the west corner of the temple, 7.20 m of it was exposed, including a full niche measuring 3.70 m (Fig. 7). It was preserved on three courses to the north, from 13.09 m to 13.41 m, and rose in elevation to seven courses to the south, culminating at 13.85 m. The floors of adjoining street 3125 had disappeared to the north, but remained to the south, at the level of a double recess, in the form of a series of greyish beddings rising, between 13.30 m and 13.50 m, against the top of the base and the foot of the facing elevation (i.e. the third and fourth courses, Fig. 8). In 2021, floors from the same street had been discovered 22 m further south, associated with the same fired-brick facing, between 12.90 m and 13.09 m (Ait-Said, Vobauré, Vallet 2022: 98), while to the north, as we have seen, against the facing of the north facade, no floor is found at the 13.53 m altitude. It has therefore

been established that the second-millennium floors, and hence the ground to the west of the temple, rose from south to north by more than 0.6 m, which is also reflected, to a lesser extent, in the building's foundations (12.02 m to the south - 12.49 m to the north for the mud-brick work, 12.80 m to the south - 13.22 m to the north for the fired-brick facing). At the level of room 3588, the west façade 3099 is 4.30 m wide, including the fired facing, at niche level, and 4.60 m wide at the level of the double recess.

***Fig. 8** – B50, street floor 3125, associated with west facade 3099, from the north.*

In the last few days, we resumed the excavation of the north-western corner of the large courtyard 3133, south of the temple, which we had stopped in 2021 at 12.93 m in the building's destruction layer, with the aim of uncovering the courtyard floors and the foundations of the temple's southern façade (3044). Facade 3044 was founded at 12.08 m in the brown earth of the foundation pit, preserved over fifteen courses (i.e. 1.70 m in elevation - top at 13.77 m), plus a leveling layer of reed beds and mortar almost equivalent to an additional course, between the 6th and 7th courses (Fig. 9). The 6th course had gaps one brick wide, fairly evenly distributed, filled with mortar, shards and animal bones, certainly intended to allow the wall to breathe and evacuate moisture. The courtyard floors, a series of dark-grey clay beds (3587), with flat sherds, abut the wall almost from its base, at 12.10 m, to the fifth course, at around 12.55 m. That's 0.45 m higher than the top of the floors in neighboring room 3094 (from 12.04 m to 12.10 m, again laid almost at the base of the walls, Ait-Said, Vobauré, Vallet 2022: 96). So direct communication between this room and the courtyard necessarily implies the use of a high threshold, or even a flight of steps.

***Fig. 9** – B50, corner of large courtyard 3133 currently being excavated, seen from the south. Bottom, base of the south façade 3044.*

There is no point in embarking on an analysis of a building that is still being cleared. If our identification proposal is correct, that B50 is the Gipar of Larsa, then it must include a sacred worship space, and we can observe that the block of large rooms 3553-3561, at the back of the building, would correspond well to the classic system of the cella preceded by its ante-cella. But what is most striking about the plan we have uncovered is the way it is split into two, and its perhaps perfect symmetry. Initially, we had thought that the complex as a whole had two buildings on either side of the large courtyard 3133 that one, to the south of the courtyard, might correspond to the priestess' residence and the other to the temple. However, considering what is now emerging, it now seems more likely that what we have hitherto referred to as the temple brought together these two components, the house of the divinity and that of the priestess, hence the mirrored plan. This seems all the more likely given that the complex housed a large staff, including a keeper and a doorman (Charpin 2022). The southern building of the complex, which has yet to be excavated, could be that of the resident staff. Further work should focus on uncovering elements that will confirm our proposed identification and clarify the functions of the various parts of the complex.

Another question, directly related to functional analysis, which will also need to be addressed in further work, is that of circulation within B50. Despite an extensive clearance covering more than 1,300 m^2, we have yet to find a single passageway in the building. The fact that we haven't found any in the highest part of the building, which we know to be above the level of the lintels of any passages, or at the foot of the Tell, where the foundations are, and therefore perhaps below the level of the thresholds, comes as no surprise. On the other hand, we should have found them in the mid-slope part of the building, for example in rooms 3552 and 3575. However, this is not the case. This means that room 3019 was not the only room of its kind, i.e., a basement, probably intended for

storage and accessible only from the upper floor, and that a significant part of the ground floor, the extent of which remains to be determined, had the same purpose. In spite of this, a circulation system had to exist on the ground floor, even if it was reduced to a bare minimum, and we have outlined some possible elements of this system. Future campaigns will focus on discovering this.

V –Excavations at Building B49 in Larsa

Antoine Jacquet, Mohaned Mnather

***Fig. 1** – B49, general orthostatic view 2021-2023 (R. Bernard).*

Excavation of B49, the house of the grand vizier Etellum from the Isin-Larsa period, began in 2021 and continued during the 2023 campaign. We had two main objectives with regard to the layout of the building: on the one hand, we wanted to continue the extensive clearing of the building, and in particular to determine the exact dimensions and location of the house's great courtyard 1634; on the other, we wanted to clarify the layout of the rooms located in the north corner of the house and to excavate part of them. Both of these operations required us to confront the large sand dune on the north-east side of the house, which extends well into the building. Along the way, we realised that a more recent building (Fig. 1), probably dating from the Old Babylonian period, rested on

the north-east façade of the Isin-Larsa house. We now need to distinguish between level Ia (Old Babylonian) and level Ib, the house of Etellum (Isin-Larsa).

The House of Etellum (level Ib)

The great courtyard 1634 and the area 1653 to the south-east

Only the western corner of the great courtyard 1634 came to light during the 2021 campaign, the complete layout, suggested by the geophysical survey, remaining hypothetical (Jacquet, Kwin Anid 2022, Fig. 4, p. 116). From this angle, we were able to pursue the excavation in two directions. On the one hand, we sought out the north corner of the courtyard by following its north-west wall (1609). Its end at the western corner of the courtyard was revealed in 2021. Progressing north-eastwards, we uncovered almost 9 metres of wall at the level of the baked brick courses forming its base before finding, under the dune, an elevation of mud bricks whose face rose to a height of 80 cm, or 6 courses of mud bricks, and whose elevation increased rapidly as we progressed north-eastwards (Fig. 2, left). Part of the north-west face of this mud-brick elevation was cut off by the large Old Babylonian pit 1641 (see below). However, its south-east face can be followed as far as the angle it forms with the north-east front wall of the house (1576), where the building of level Ia is located (see below). The dismantling of a floor from the Old Babylonian level revealed the north corner of the great courtyard 1634, which, contrary to all expectations, extended as far as the north-east front wall (1576) of the house. The front wall is exactly the same thickness (1.08 m) at the corner of the courtyard as it is further north, at the corner of the house.

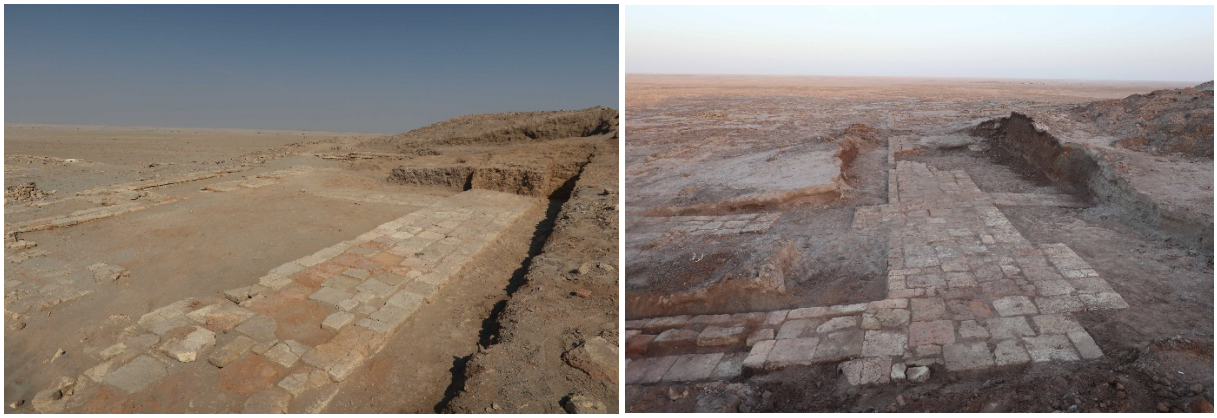

***Fig. 2 – Left**: Wall 1609 and its mud-brick elevation between courtyards 1634 and 1611, from the south.*
***Right**: South-east view of wall 1608 between courtyard 1634 and rooms 1607-1655.*

We also chose to follow the thick south-west wall (1608) of the great courtyard 1634, which ran from the west corner of the courtyard towards the south corner. Part of the wall 1608 was uncovered in 2021, but it came to an abrupt halt after 4.7 metres, interpreted as a likely passageway. This year's excavation confirmed a passage over 2.5 m wide, providing monumental access from the great courtyard 1634 to the reception room 1607 at the centre of the house. From this doorway, the wall 1608 continues for at least 13 metres (Fig. 2, right). At 8 metres from the passage, it forms an angle with wall 1650, this intersection possibly constituting the south corner of courtyard 1634 (given the respective thicknesses of the walls, 0,75 m for 1650 against 1,50 m for 1652, it seems more likely that 1652 is the true south-east wall of the courtyard, 1650 being perhaps only a low wall masking the passages).

***Fig. 3** – Plan of building B49 partially restored (2023).*

Measuring 14 metres wide by more than 15 metres long, the great courtyard 1634 therefore occupied more than the 210 m^2 along the north-east façade of the house. Unfortunately, the east corner of the courtyard, located under the spoil from A. Parrot's excavation and the dune, will be difficult to find. Access to the courtyard would have been via the 1653 space, barely sketched out by the excavations carried out this year, through one or two doors in the S-E wall (1650), which has yet to be excavated. At the present stage of our research, we can only observe the wide doorway in the south-west wall (1608) leading to the vast reception room 1607, as well as the threshold in the west corner of the courtyard, in the north-west wall (1609), leading to the vestibule 1610 and beyond to the north quarter of the house (Fig. 3).

A small sounding in the west corner of courtyard 1634

A small sounding was carried out at the west corner of the great courtyard 1634 and along half the length of the threshold leading to the vestibule 1610. Both of them are badly damaged, probably destroyed by a pit of modern looters. Only the south-western end remains. The modern pit provides access to the building's foundations, revealing 7 courses of baked bricks resting on unbaked clay. At the level of the third course, the courtyard floor was tiled with baked bricks in at least three rows (altitude: 11.25 m). The centre of the courtyard appears to have been left in rammed earth (Fig. 4 left).

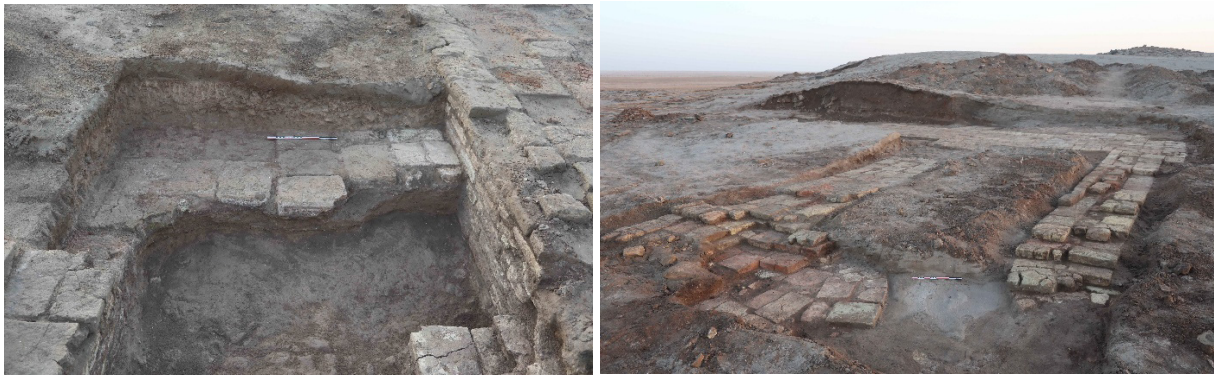

***Fig. 4 – Left**: Sounding through a looting pit in the west corner of courtyard 1634, from the north-west.*
***Right**: The 1655 vestibule to the south-east of room 1607, from the south.*

Reception room 1607 and the vestibule 1655

The reception room 1607, whose north and west corners and three sides, north-west (wall 1590), north-east (wall 1608) and south-west (wall 1605), were excavated in 2021, found its definitive dimensions with the excavation, in 2023, of its south-east side (wall 1651) and south and east corners: it is a rectangle measuring 18 metres by 4.7 metres, i.e. a surface area of almost 85 m^2 . This vast space, which has been the object of visits by looters, has not yet been excavated. In addition to the monumental access from the courtyard, there are three doorways, the first to the north-west leading to the bathrooms 1595 and 1617 through courtyard 1589 and room 1592, a second to the south, in the wall 1605, leading to the long corridor 1604 through the vestibule 1635, the large rooms 1626-1636, and courtyard 1601. The third is near the east corner, leading to room 1630 through vestibule 1655.

The excavation of the vestibule 1655 has modified the image suggested by the geophysical survey and drawn on the 2022 plan. This year, it was discovered that a passageway had been built into the south corner of the room, at the intersection of walls 1605 and 1654, leading to room 1630 and the southern part of the house. The curvature of the walls at the level of the doorway is quite original and of the most beautiful effect (Fig. 4 right). It remains to be seen whether this surprising layout is original or the result of a remodelling of the building's circulation network. A special effort will be made to uncover the floor plan of this part of the building during the next campaign.

The kitchen 1632 and the north side of the house

The excavation of wall 1609, to the north-west of the great courtyard 1634, provided an opportunity to clarify the layout of the northern part of the house, giving room 1632, barely hinted at on the 2022 plan, its definitive outline (Fig. 5). First of all, we had confirmation of the existence

of wall 1633, which had already been revealed by the geophysical survey: 6.5 metres from the passage leading from courtyard 1634 to vestibule 1610, wall 1633 runs at right angles to wall 1609 to the north-west, delimiting on one side the square courtyard 1611 (4.5 x 4.7 m) and on the other the room 1632, which extends as far as the north-east front wall of the house (1576). A doorway was built between these two spaces close to wall 1580. To the north-west of this wall, space 1579 is now interpreted with certainty as a stairwell leading to the upper floor or to the terraces (Fig. 6, left). Access to the bottom of the staircase was from courtyard 1611. Access to the underside of the staircase, where a storeroom would have been located, was via the threshold leading from 1578 to 1579. Wall 1577 simply ended, to the south-east, with a thick pilaster to support the weight of the staircase. It must therefore be assumed that room 1578 and room 1632 formed a single unit, 1578 being the short corridor leading to the storage space under the staircase 1579.

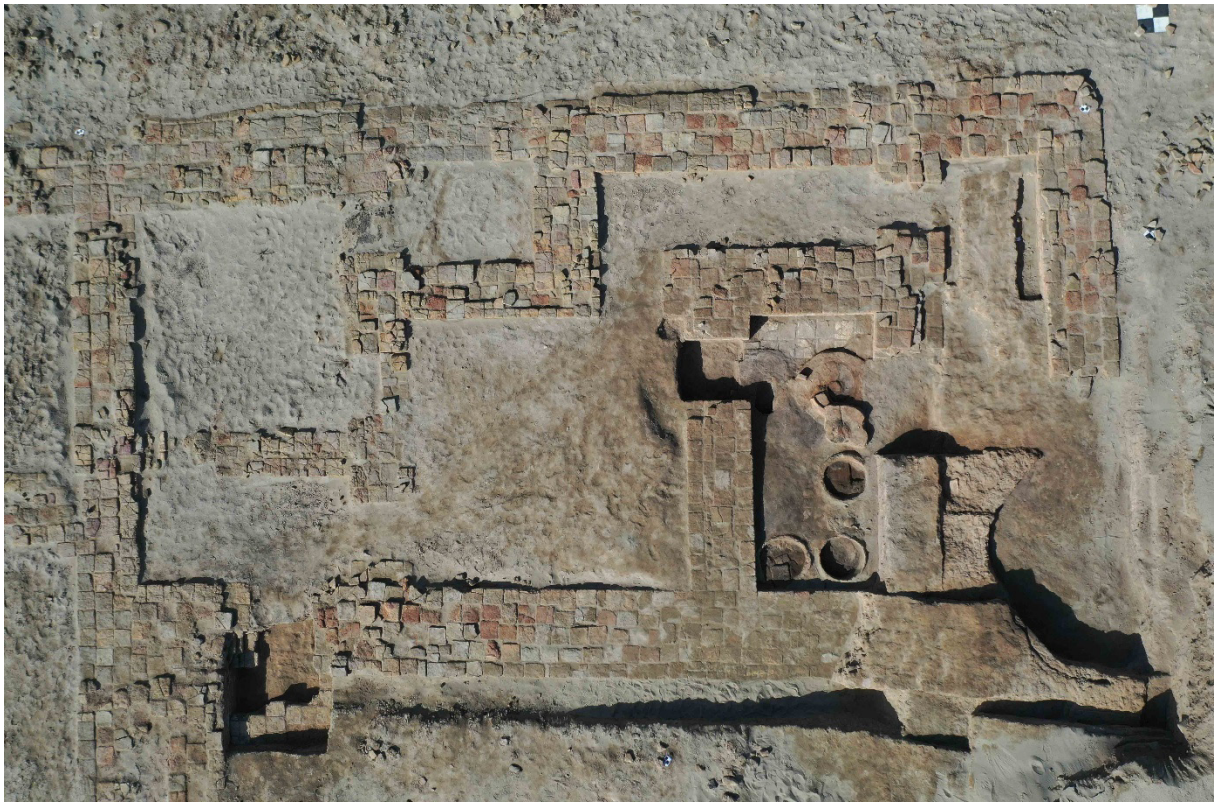

***Fig. 5** – Aerial view of the north quarter of House B49.*

***Fig. 6** – **Left**: Stairwell 1579, from the east. **Right**: The 1632 kitchen being excavated, from the south-east.*

The lower part, to the south-west of room 1632, was the subject of a meticulous excavation, which should be continued during the next campaign, given the important discoveries made there. Everything points to a vast kitchen. Above all, we found the lower parts of three *tannur* and the remains of a large circular oven used for cooking (Fig. 6, right). The occupation levels were only partially excavated, with the floor tiled with baked bricks only visible, for the time being, in the west corner, along the wall 1580 and in front of the passageway to courtyard 1611. Numerous ceramics and animal bones littered the occupation levels, a series of dark grey beddings up to 10 cm thick in places that must be the result of regular emptying of the furnaces.

Tannur 1642 is located in the south corner of the room. Measuring 90 cm in diameter, it appears to be bottomless, resting directly on the kitchen's baked-brick floor. It does, however, contain a few fragments of baked bricks blackened by the fire. The two small sealing fragments T-1109-1 and 2 (see A. Jacquet, this volume) were found in its filling. *Tannur* 1643 is located immediately next to 1642, along wall 1609. It has a diameter of 80 cm. No significant finds were made during the excavation of its backfill. The third *tannur* (1644) was installed in the middle of the room, between 1643 and the large oven 1649. A space was left to pass through on either side, from the entrance towards the centre of the room. It measures 86 cm in diameter. It too was empty of any objects. However, excavation of the backfill revealed its mouth, facing N-E, towards the centre of the room. The contents of the three *tannurs* were taken for archaeobotanical study (Douché, in this volume).

***Fig.** 7 – The 1649 oven, from the south-west.*

The large oven 1649 is facing the entrance of the room (Fig. 7). Its ceramic dome, which had collapsed to the ground, stood some thirty centimetres above the occupation layers of the room. Its base is circular, with brickwork around the perimeter and uniformly smoothed clay in the centre, where the combustion chamber was located. This clay is red on the surface and ashy (black)

underneath (separate samples were taken for archaeobotanical study). Fragments of a thick circular ceramic hearth were found *in situ*. A brick still standing on edge indicates the location of the oven's mouth, opposite the room's access. Between the mouth and the room's entrance, the ashy occupation layers are sinking below the level of the tiling, probably indicating that a pit was built there to evacuate the ashes, that we didn't have time to clear.

To the northeast of this area, two vast pits dating from the Old Babylonian period disturbed the floors and the fill of room 1632. The first (1621) had already been spotted in 2021. It was dug right in the middle of the room, against the 1577 wall. The second (1641) was partially cleared this year but not completely demarcated as it spans the 1576 front wall and extends outside building B49. It cuts into the wall 1609 on its north-west side, occupying the entire east corner of room 1632. The area between the two pits remains to be excavated. There appear to have been at least two floor levels, with lower floors, at tile level, associated with the ovens excavated in the western part of the room (altitude: 11.22 m), and a high landing, at the entrance to corridor 1578 and perhaps all along wall 1576 (altitude: 11.98 m). This configuration is undoubtedly due to the fact that the site was not levelled prior to construction, leaving the very large wall of level II under 1576 in place (Jacquet, Kwin Anid 2022: 119). This remains to be confirmed during the next campaign.

A small sounding in the passageway between kitchen 1632 and the courtyard 1611

In the passage leading from the courtyard 1611 to the kitchen 1632, we did not find any trace of a built-up floor but a modern pit: the presence of ceramic shards and pieces of baked bricks in the disturbed earth surely indicate the recent passage of looters. The baked brick tiling in the kitchen stopped abruptly at the threshold. We took advantage of this opportunity to carry out another small sounding here and were thus able to go down to the foundations of the walls, revealing a careful baked brick construction (Fig. 8): on a layer of unbaked clay at the base of the wall were laid 7 courses of baked bricks, 3 of which were below the floor (visible on the kitchen side) and 4 above it, in a process identical to that already observed in the west corner of courtyard 1634.

***Fig. 8** – The sounding in the sill between the kitchen 1632 and the courtyard 1611, from the south-west.*

***Fig. 9** – Aerial view of the northern corner of B49 during excavation. Bottom left shows the corner of the Old Babylonian building covering the northeast façade of B49 and the associated large garbage pit 1641 (level Ia).*

An Old Babylonian house on the north-east façade of the building (level Ia)

However, the most unexpected discovery was made during the excavation of the mud-brick elevation of wall 1609, to the north-west of the great courtyard 1634. It appears that the corner of a late building rests on the north-east façade 1576, on wall 1609 and on the collapsed levels of the great courtyard of the house of Etellum (Fig. 9), which was probably burnt down and abandoned in 1895 BC, as shown by the archives discovered during the 2021 campaign (Charpin, Jacquet 2022). Only two mudbrick walls forming an outward angle (1646 and 1647) were uncovered during this campaign. Two floors are associated with them (1645 and 1648). Floor 1645 (altitude: 12.90. m) rests on the top of the 1576 front wall of Etellum's house and and was certainly associated with pit 1641 (Fig. 13-14), which served as a dump for the Old-Babylonian house. Floor 1648 (altitude: 12.70 m) extends over the collapsed layer of the great courtyard 1634 of Etellum's house.

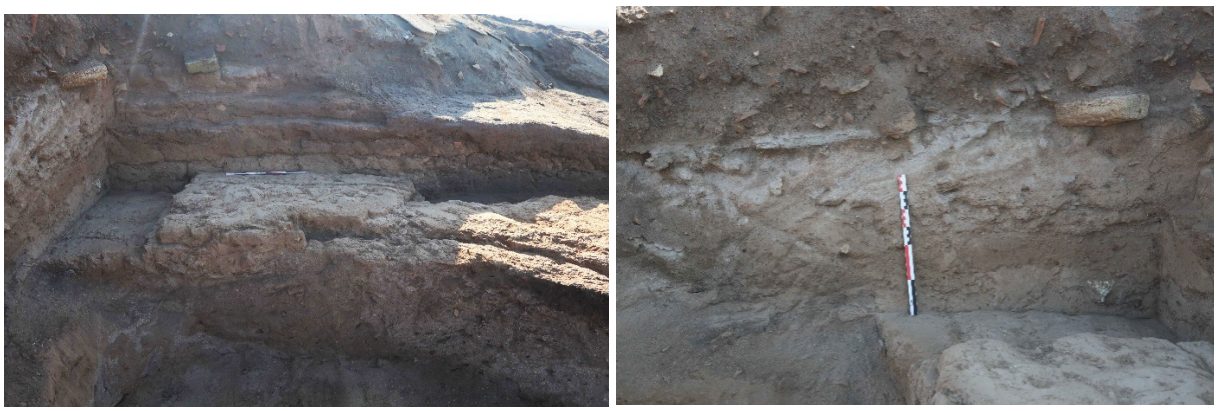

***Fig. 10** – **Left**: Level Ia above the mud-brick elevation of walls 1576 and 1609, from the north-west. **Right**: Detail view of Level Ia floors in the east section of the trench.*

These discoveries mean that the images given previously by the geophysical survey for this part of the building covered by the dune should be treated with caution. Certain elements that had been associated with the Isin-Larsa period house may turn out on excavation to belong to hitherto unsuspected Old Babylonian levels.

VI – REPORT ON THE 2ND MILLENNIUM POTTERY OF LARSA (ALL TRENCHES)

Costanza Coppini

***Fig. 1** – Fabrics of the pottery.*

During the 2023 excavation campaign the work on 2nd millennium pottery aimed at recording the ceramics from the ongoing excavation. Works were carried out in trenches B49, B50[1], PZ, H1 and F11. The workflow for the ceramic material was the following: 2a) drawing of a selection of the ceramic material; 2b) photography of all contexts; 2c) registration of all contexts; 2d) partial processing of contexts. The primary aim was to delineate the chronology of the phases brought to light in each trench.

The ceramic assemblages from the 2023 excavation have been analysed concerning the sherds colour, fabric and shape. Fabrics (Fig. 1, Tab. 1) belong to three main categories, classified on the base of the main component of the fabric: 1) mineral, 2) sand, 3) vegetal. Each main category is subdivided into sub-categories, according to the inclusions associated to the main component of the fabric:

[1] Only 5 pottery sherds were retrieved from B50.

Main category	Sub-category
Mineral	Mineral, sand (Fig. 1a)
	Mineral, vegetal (Fig. 1b)
Sand	Sand, few mineral
	Sand, mica, calcite, few vegetal
	Sand, few vegetal
	Sand, mineral (Fig. 1c)
	Sand, vegetal (Fig. 1d)
Vegetal	Vegetal, few mineral
	Vegetal, few sand
	Vegetal, mineral (Fig. 1e)
	Vegetal, sand (Fig. 1f)

***Table 1** – Fabrics of the ceramic assemblages.*

A total of ca. 1350 pottery specimens – both sherds and complete or half-preserved vessels – have been retrieved from deposits, fillings of rooms and structures, and from room floors. The chronological spectrum embraces the whole 2nd millennium, from the Isin-Larsa to the Kassite period. In the following part the pottery will be described according to the excavation trench and will be followed by a preliminary chronological determination.

The assemblages from B49

Ceramics from B49, the house of the Isin-Larsa period Grand Vizier Etellum, have been recovered in the deposits in the building's kitchen and adjoining rooms (Jacquet, Mnather in this volume, fig. 3). The material is very homogeneous, in terms of fabrics as well as shapes. Open shapes are bowls with conical wall and simple (Fig. 2.1) or inward rim (Fig. 2.2) and string-cut base. Besides them, deep bowls occur with ledge squared rim (Fig. 2.3). Among goblets, the shape with cylindrical body and disc base occurs, though in a small quantity (Fig. 2.4). The most attested type is the so-called 'Larsa' goblets (Fig. 2.5-6), few specimens with a small stamp containing an inscription. Jars are present in a low quantity and occur with vertical neck and everted, outside thickened ribbon rim (Fig. 2.7), associated with jars with short neck and sharp shoulder. They have a pointed base (Fig. 2.8).

Conical bowls with simple or inward rim and jars with ribbon rim and ovoid body are attested between the 20th and the 18th cent. BC. Goblets with short neck and cylindrical body are attested in the 20-18th cent. BC, and find comparisons with Tell ed-Der (Gasche 1984, pl. 15.5, 19.6), Telloh (De Genouillac 1936, pls. XXX.2242, XXXI.1359) and from Larsa Sounding J VIII, niveau 2 and 3 (Calvet et al. 2003, fig. 17.b-l).

Ceramic assemblages from PZ: between the Larsa dynasties and the Kassite rule

The pottery found in PZ comes from the levels of the Kassite workshop and from the deposits beneath it, which are the deposits of the Old Babylonian levels and the filling of the Larsa Grand Canal (Coppini et al. in this volume, fig. 2).

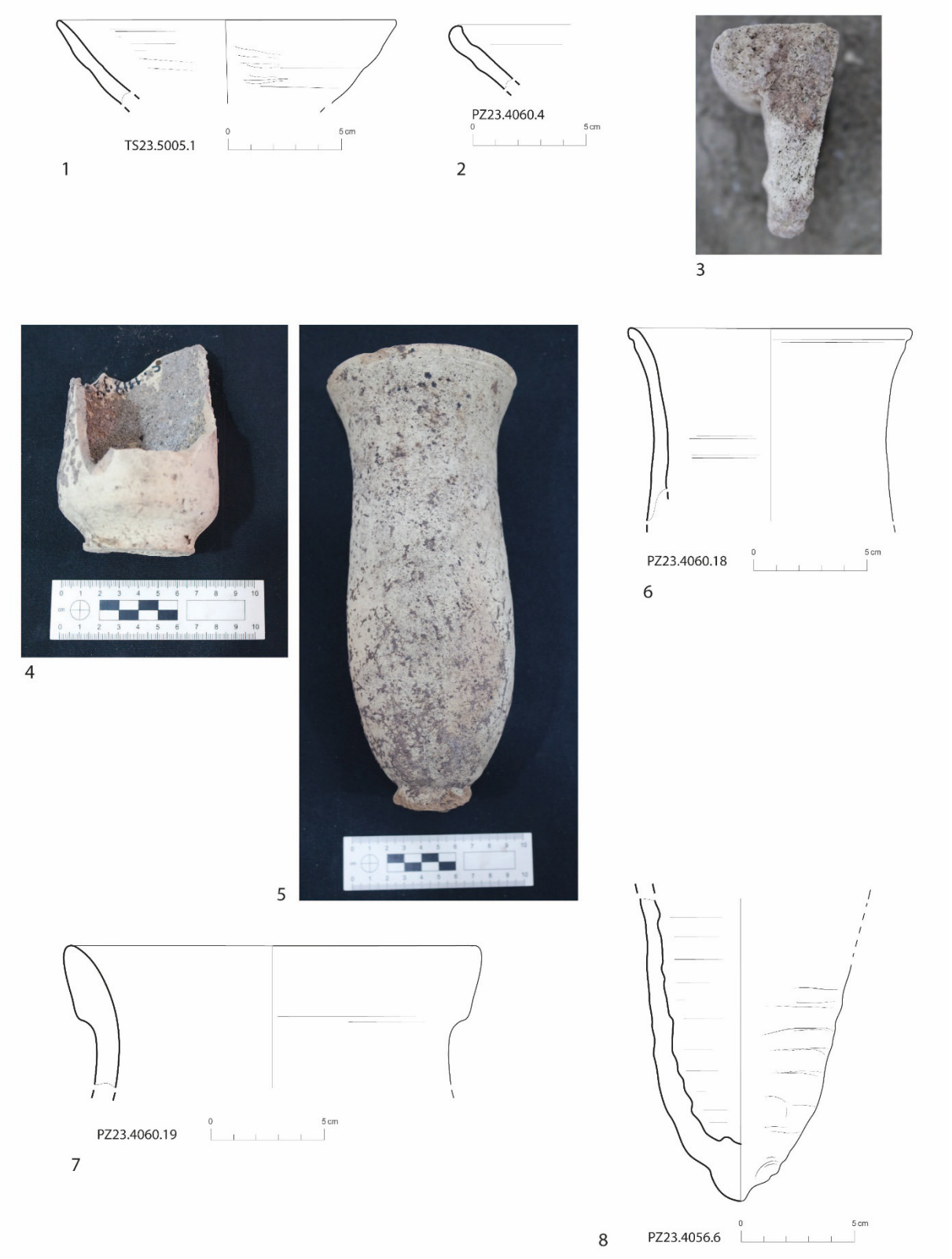

***Fig. 2** – Pottery assemblage from B49, B50 and PZ (drawings A. Cocoual, P. Vertuani).*

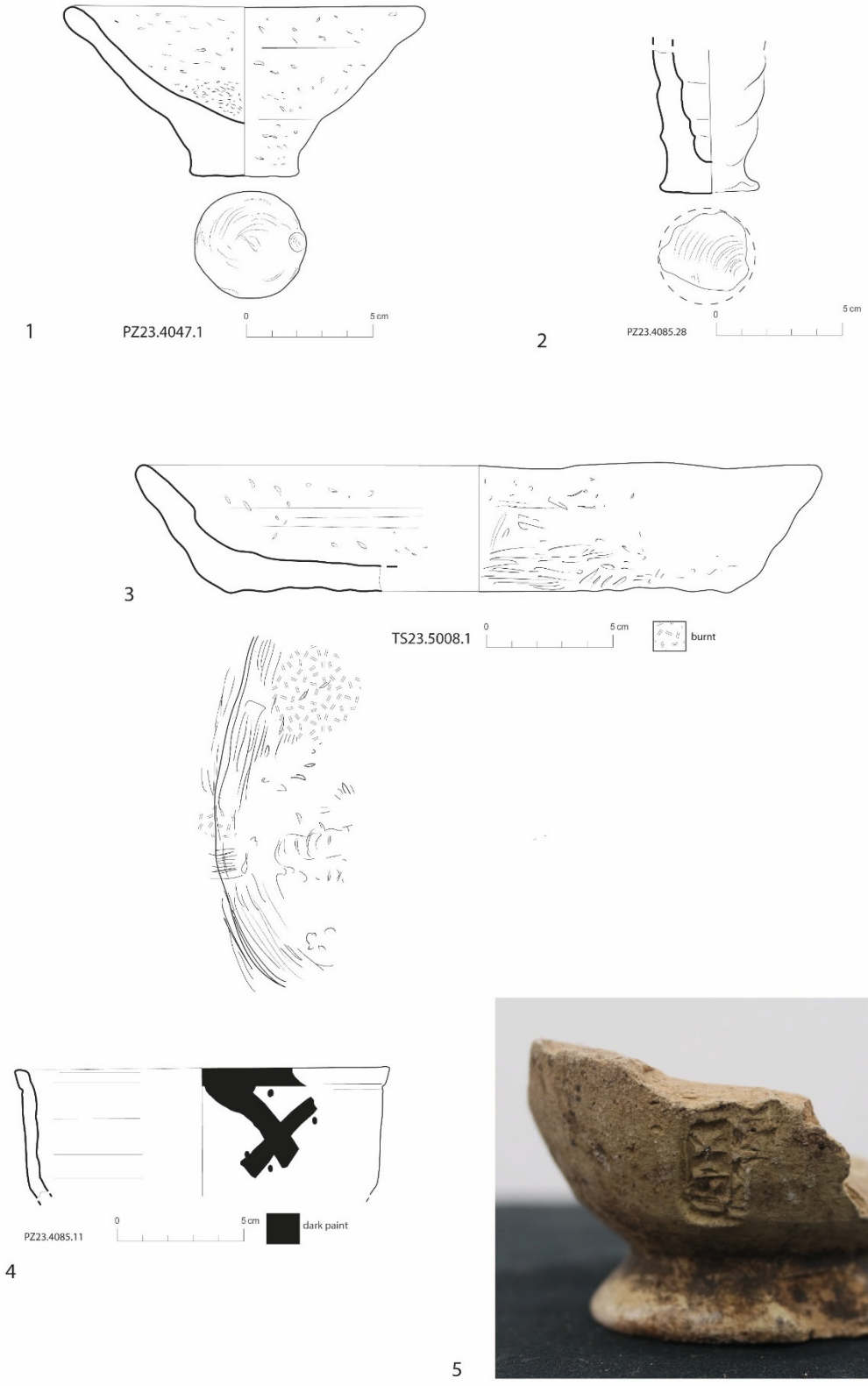

***Fig. 3** – Pottery assemblage from PZ (drawings A. Cocoual, P. Vertuani).*

The assemblages from the Kassite workshop (levels 1 to 3) were retrieved from the floor around pottery kiln 4500 and drain 4513. The ceramics mainly consist of wide bowls with thick base (Fig. 3.1) and drinking vessels can present a thick foot base (Kassite goblet, Fig. 3.2), both characterized by a chaff fabric, with few calcite inclusions. Closed shapes are jars with squared rim, not enough preserved to establish the neck and body shapes.

Pottery from the Old Babylonian level (level 4A) has been found in the deposits covering the walls and trodden floors of this level, and from the trodden floors. Open shapes consist of platters with internally-bevelled rim or with outside thickened rim and convex wall (Fig. 3.3), and bowls with convex profile or with carinated vertical wall and painted decoration on wall (Fig. 3.4). Closed shapes are jars with ribbon-rim and ovoid body (Fig. 2.7). The chronological attribution of wide platters, as stated concerning B50, falls in the 18th-17th cent. BC: their occurrence in association with the painted goblets and jars with thin ribbon-rim in the levels below the Kassite artisanal area, i.e. before this was set in use, speaks in favour of a filling of the canal in the Old-Babylonian period.

The Isin-Larsa ceramics were retrieved from the filling of the Larsa Grand Canal and from the collapse layer (Coppini et al. in this volume). The assemblage recalls that from B49, thus confirming the chronology of the PZ Level 4B ceramics. Open shapes are characterized by the presence of conical wall and simple or inward rim and string-cut base (Fig. 2.1-2), and by bowls with profiled rim. Closed shapes are represented by two jar types: 1) with long and vertical neck, and ribbon rim, sharp, and to the type with short neck and sharp shoulder. Goblets with cylindrical body and disc base are also attested, as well as the very recurrent 'Larsa' goblet (Fig. 2.5-6).

F11 and H1

The second millennium ceramics from trench F11 have been recovered in the ceramic craft area, attributed to the first centuries of the second millennium BCE. The presence of platters with internally-bevelled rim (Fig. 3.3) or with outside thickened rim and convex wall and jars with thin ribbon-rim and ovoid body (Fig. 2.7) suggest a date to the 18th century BCE.

On the contrary, the few sherds recovered from trench H1 (Cez et al. in this volume) indicate an occupation of this area and of the structure coeval to the use of the canal in the Isin-Larsa period. This assumption is supported by the occurrence in the assemblage of 'Larsa' goblets (Fig. 2.5-6) and jars with thin ribbon-rim (Fig. 2.7), associated with the absence of platters, typical of Old Babylonian period ceramic assemblages.

VII – Epigraphic discoveries from the 2021-2023 campaigns

Dominique Charpin, Antoine Jacquet

***Fig. 1** – Lot of 119 fragments of tablets and envelopes L-TAB-1081.*

A return to the epigraphic discoveries from the 2021 campaign (D. Charpin, A. Jacquet)

The purpose of the November 2022 mission was to revisit the epigraphic discoveries made in building B49 during the 2021 campaign (Jacquet, Kwin Anid 2022; Charpin, Jacquet 2022). These had occurred in the very last days of the excavation, so that not everything could be processed at that time. From November 10 to 21, 2022, we resumed our study of the tablet fragments remaining at Nassiriye. We cleaned and deciphered them, transcribed them, partly copied them and systematically photographed them.

An initial observation has been made, confirming the impression already noted in 2021: the tablets that were kept in archive room 1598 were found in the form of a multitude of small fragments (Fig. 1). This indicates that they had been deliberately thrown to the ground before the house fire, and literally exploded when they hit the paved floor of the room. We were able to make a few joins and tried to estimate the number of tablets we were dealing with. Forty-two tablets or fragments bore a year name, but some fragments showed that the tablet to which they belonged had no date. If we assume that around half the tablets had a date, this gives an initial corpus of around 84 tablets. Another approach has been attempted, by weighing the fragments; the total comes to 6300 gr. If we assume that the average weight of a tablet was 70 gr (an estimate obtained by weighing the best-preserved tablets), the total number of tablets would have been 90. The concordance of the two approaches is significant: it shows that the number of tablets preserved in room 1598 at the time of the sacking of the residence was just under a hundred.

***Fig. 2 – Left**: Fragment of inscribed and sealed clay tablet L-TAB-1081-E02.*
***Right**: Fragment of sealed envelope L-TAB-1084-E02.*

Examination of the fragments from the 2021 campaign confirms that room 1598 housed part of the internal archives of the residence of the grand vizier (sukkal-mah) Etellum (Fig. 2, left). These were the household's accounting archives. No legal documents were found. Most of the texts relate to the management of grain reserves, which were obviously used to feed men and livestock (sheep and cattle) and pay salaries. There are also a few tablets relating to sums of money. There are some omissions: nothing about oil, wool or textiles. One fragment refers to messengers on their way to Girsu: one might think that this is an "official" text, but the passage actually corresponds to a well-known formulation in accounting texts, which specifies the occasion of the expenditure (*inûma …* "When ..."). The Grand Vizier's "official" archives must have been located elsewhere, probably in the royal palace. His title deeds and the contracts he had drawn up were undoubtedly kept in his residence, but elsewhere - unless they had been evacuated as a priority before the building was ransacked.

Although these are internal accounts, most of the tablets were sealed; some were even originally covered with a sealed clay envelope (Fig. 2, right). The impressions of the cylinder seals, both on the tablets and on the envelopes, were the subject of a particularly detailed study, made particularly difficult by the small size of the fragments. In the end, the corpus includes thirty-two different seals, providing important results for prosopography, as already mentioned in 2021. We have completed the reading of certain legends and discovered those of additional seals, notably those of two more sons of Etellum, one of whom bore the title of scribe; this brings to four the number of sons of the grand vizier attested in his archives.

The study of certain fragments revealed additional attestations of year names. The conclusion formulated in 2021 has been confirmed: in the current state of the corpus found in building B49, no text is later than the last year of Abi-sare (year 11). The hypothesis of a revolt that put an end to Abi-sare's reign in 1895 BC and enabled Sumu-El to ascend the throne is therefore increasingly likely.

Epigraphic discoveries from the 2023 campaign (A. Jacquet)

Like every year, the Larsa 2023 campaign has delivered its harvest of epigraphic documents. The quantity may seem meagre this year, but it is as always rich in first-rate historical information. In all, there is an Old-Babylonian letter, two fragmentary sealings, a royal inscription on brick and an inscribed beaker.

***Fig. 3** – **Left**: Old-Babylonian letter T-5002-1. **Right**: Fragment of sealing T-1109-1.*

The Old-Babylonian letter T-5002-1 was discovered on Trench F11 at the very start of the campaign (Fig. 3, left). The tablet is damaged on the reverse, but the text, which is inscribed in full on the face of the document, is apparently complete. The handwriting is neat and indicates an Isin-Larsa dating (perhaps from the reign of Rim-Sin). It is a letter from a man called Ipqu-Addu to his father (*ana abiya*), dealing with personnel management in what we guess was a family business. The tablet was found in the context of a potters' workshop (Zingarello et al. in this volume). After the address and blessing by Šamaš expected in a letter from Larsa, the text is brief and straightforward, running to 8 lines: Ipqu-Addu informs his father that he has transferred a worker named Ahi-asat to the service of Sin-magir and Nidin-Ištar to replace Inbuša. The father must therefore ensure that Inbuša is returned to him.

Two small fragments of sealings were then uncovered on Trench B49. They were originally intended to seal a container closed with a thin cord, as indicated by the traces left on their reverse (Otto 2010). They were found in the collapse layer covering one of the tannurs in kitchen 1632 excavated this year (Jacquet, Mnather, in this volume), in a level of destruction dated to the Isin-Larsa period. Although they are contemporary with the tannur, they are not necessarily contextually linked to it. Fragment T-1109-2 is too fragmentary to read its legend. T-1109-1, on the other hand, is better preserved and has been deciphered in collaboration with D. Charpin (Fig. 3, right). It is of the greatest interest. The seal on it is of the IN.NA.BA type, common in the king's entourage at the time of Ur III and more rarely at the time of Isin-Larsa, even though we have another example from

B49 with the seal of Etellum found on the fragments of room 1598 discovered in 2021. It reads: "Royal Name + title and/or epithet, (to) Personal Name + title and/or epithet, gave (this seal)". Unlike the more common two-column format (cf. Etellum's seal), this is a single-column seal with 7 lines. This is the seal of En-ana-tuma, *entum*-priestess of the god Nanna in Ur. She is known to have been elevated to this position by her father Išme-Dagan, king of Isin (1955-1937); she held it throughout the reign of her brother Lipit-Ištar (1936-1926), son of the previous king, and remained in office after the capture of Ur by Gungunum of Larsa (1932-1906) in 1925 (Charpin 2020: 207 and n. 120). The date of her death is not known. The question is: what is this sealing doing in the house of Grand Vizier Etellum in Larsa? Surely we must imagine that, having retained her status as *entum*-priestess during the period when Ur was controlled by Larsa, the priestess of Nanna, daughter and sister of the last kings of Isin to date, sent some gift to the Great Vizier of the Larsa kingdom as a sign of gratitude or even allegiance.

***Fig. 4 – Left**: Inscribed brick T-4117-1 (Sin-iddinam no. 3). **Right**: Fragmentary inscribed beaker C-4095-1.*

Trench PZ delivered a fully preserved inscribed brick, T-4117-1 (Fig. 4, left). It comes from the outer part of the bridge pier (Coppini et al. in this volume). Two fragments, T-4117-2 and 3, were discovered shortly afterwards in the same context. All three bear the same inscription, which had already been discovered in 2021. Although the format of the cartouche is different, indicating that several stamps were used for the same inscription, the text is the same. It is inscription no. 3 of Sin-iddinam (1849-1843), commemorating the work carried out by this king of Larsa in the Ebabbar complex (Frayne 1990: 160-161). These new discoveries therefore only confirm the dating of the construction of this major edifice.

Finally, the inscribed beaker C-4095-1 was discovered on Trench PZ in a re-employment context (ceramic layer used as filler within the construction). It is fragmentary and the seal unrolled on it is only partially legible (Fig. 4, right): two lines are visible (*a-wi-i*[*l*-...] / ˹DUMU *ša*˺-[...]).

VIII – CHECK SURVEY OF THE AREA IMMEDIATELY NORTH OF LARSA

Johnny Samuele Baldi, Melania Zingarello, Haider Shanior Kazim

***Fig. 1** – Baked bricks building on one of the two mains Tells of the "Mahmoudiyyat" area (*photo *M. Zingarello, 2022).*

During the week between 3 and 9 November 2022, a test survey of the occupation of some areas around Larsa was carried out. The inspection operations did not constitute a formal survey and did not involve collecting and sampling surface materials but were accurate enough to identified areas with the highest concentration of ceramics and record their GPS location. The autoptic investigation focused on an area north of the northern walled enclosure of Larsa, running east-west over a band approximately 200 metres wide.

The group of small Tells known as "Mahmoudiyyat" marks the easternmost boundary of this surface analysis. The two main Mahmoudiyyat reliefs were inspected and, albeit badly buried under the dunes, both show the same construction and stratigraphic configuration. Both main mounds were built as large, solid buildings in square baked bricks, with thick walls, plans characterised by an apparently symmetrical layout divided by a central wall axis, large entrance courtyards and modular quadrangular rooms around two intermediate symmetrical courtyards. Both of these buildings are remarkably well preserved, with wall surfaces still reaching 2.5-3 m in certain sectors (Fig. 1). Although not many ceramic materials were visible (they are probably on floors buried under the present-day dunes), all fragments clearly suggest a date to the early 2nd millennium BCE. Both the location and the robust structure of these two buildings indicate an administrative and control function of an important communication axis that bordered the city in this area at the beginning of the 2nd millennium. This is the grand canal C1 (Cez et al. in this volume), possibly with associated quays for loading and unloading certain goods in this area, outside but very close to the city. The presence of important waterways and quays is, in any case, attested by large bands of small white shells crossing the desert in this area. However, neither of these buildings had a very long life and experienced a similar evolution. In fact, brick factories were established on both of the main mounds, perhaps by exploiting the ruins of these two large buildings, or by readapting them. What is certain, however, is that large kilns and many brick slags occupy the tops of both hills. These production areas, being devoted to bricks, did not yielded many ceramic sherds, but the visible material still suggests a date to the early part of the 2nd millennium. In any case, no ceramic sherds later than the Isin-Larsa period have been identified in the entire Mahmoudiyyat area.

In addition, brick production extended far to the east of the two main Mahmoudiyyat Tells. Given the configuration of this production area, it seems highly unlikely that these were clusters of firing installations that were established in different locations at different times. In fact, even to the east of the two main tells, kilns were concentrated in specific clusters full of slags, interspersed with areas densely covered with ash, without firing refractories and probably used to dry or pre-fire bricks. The firing areas were quickly raised due to accumulated brick waste and slags, which were not evacuated from the zones around the kilns. In contrast, the intermediate areas, of consistent width, are almost completely free of processing waste and show only a few remains of well-fired ceramics and bricks. In itself, it is not surprising that brick kilns were concentrated on hillsides or in raised areas as it helped to disperse smoke more effectively. The fact that slags were not removed from around the firing spots, progressively raising the firing precincts, suggest that there was still water between the Mahmoudiyyat and the city, with some circulation routes facilitating the transport of large quantities of bricks into the city (see the many mapped channels in this sector, Cez et al. in this volume, fig. 1). Consequently, it seems likely that there were no easily accessible areas for dumping waste.

In any case, this layout of brick factories in the first half of the 2nd millennium (no brick-firing area has yielded any Kassite or later fragments) shows a consistent pattern in the area west of the Mahmoudiyyat, where all the hillocks were systematically reoccupied by large brick firing installations with many significant deposits of slags concentrated around the furnaces. This is what happens, for example, on the so-called "Butte aux aigles" (Tell F10) in the northern part of the city.

***Fig. 2 – Left**: Fragments of typical Early Dynastic I pottery. **Right**: The shoulder of a jar with a radial reserved slip decoration and four-rim tabs jar (photos M. Zingarello, 2022).*

In this northern sector to the west of the Mahmoudiyyat, however, the most interesting feature is the presence of a large settlement area dating back to the beginning of the 3rd millennium. This settlement straddles the walls from the 2nd millennium and extends significantly beyond them, although its boundaries have not yet been clearly defined. Pottery from the 2nd millennium (Isin-Larsa with very rare Kassite forms) becomes extremely scarce despite the fact that the ground is everywhere covered with ceramic sherds. Both the pastes (sandy and often reddish or dark beige), and the shapes primarily belong to the typical Early Dynastic I repertoire (Fig. 2). The typology, moreover, seems very wide-ranging: plain and decorated ceramics, small and large jars, beakers, bowls of varying sizes, trays and cooking pottery, with a low rate of fragmentation, many shapes

easily recomposable and still in situ. The presence of all functional categories indicates that this area was a settlement and not a cemetery from the 4th and 3rd millennium. Furthermore, no Uruk or Jemdet Nasr ceramic shapes were identified, nor were any bones or pits that would suggest a large necropolis. The presence of a residential district in this sector north of the city walls had never been reported before. However, it is largely confirmed by the visible remains of large buildings (i.e. east of the so-called "Butte aux aigles"), with long walls drawing courtyards with quadrangular room systems organised around them (Fig. 3). A few pottery kilns from the late 3rd millennium (late Akkad or Ur III in date) have been found irregularly installed within the ruins of the Early Dynastic I buildings (Fig. 4), but they do not obscure or disrupt the understanding of this ancient residential area.

***Fig. 3** – Mudbrick structures visible on the surface east of the "Butte aux aigles" (photo M. Zingarello, 2022).*

***Fig. 4** – Overfired and warped fragments of late 3rd Millennium BC pottery showing the presence of ceramic kilns in the area of Early Dynastic I residential area (photo M. Zingarello).*

***Fig. 5** – Mudbrick wall clearly visible at the base of mound F11 (photo M. Zingarello, 2022).*

***Fig. 6** – Some of the stone vessels fragments found in the area south-west of F11 and in the residential area dating to the Early Dynastic I (photo M. Zingarello, 2022).*

Further west, the mound known as "F11" (site 442 in the Uruk survey, Adams, Nissen 1972) stands out as another area of extreme interest. Similarly to the entire northern part of the city, with kilns rising above ancient hills, the top of this mound features pottery kilns dating back to the 2nd millennium. The mound itself consists of a large mudbrick structure with an apparently ovoid plan and at least two solid external buttresses. (Fig. 5). This construction not only dates back to Early Dynastic I, as indicated by the ceramic evidence, but it was also likely contemporary with the settlement area to the north of the city. Indeed, although later hydraulic works remodelled the sector north and east of F11, a certain amount of early 3rd millennium pottery shows that F11 was constructed as a "margin" building in close contact with the northern settlement area. In addition, the early 3rd millennium F11 area extended south-westwards along a small canal with dwellings or

Early Dynastic I workshops. What is particularly surprising in this area, at the foot and south-west of F11, is the large quantity of stone vessels and bowls. A few specimens can also be spotted among the buildings of the Early Dynastic I settlement to the north of the city, and around the "Butte aux aigles" (Tell F10). But at the base of F11, there are also large blocks of hewn or rough-hewn stone, suggesting that, for a certain period, some of these vessels were produced here. They are small- and medium-sized vessels crafted from white, grey-black, reddish and pink stone, all of which were carefully polished (Fig. 6). On the other hand, the wide canal that runs from the west over F11, possibly embracing its base, probably dates back to the 2nd millennium, when the potteries produced on top of F11 had to be transported to the city (the axis P9-C39; canal C86 also connected F11 directly to the city, Cez et al. in this volume, fig. 1). Nonetheless, given the unexpected scale and complexity of the Early Dynastic I residential and working areas north of Larsa, one cannot exclude that important facilities have existed since the beginning of the 3rd millennium BCE.

IX – Research on Larsa in the 3rd millennium: Excavations at Tell F11

Melania Zingarello, Claire Padovani, Camille Abric

In 1967, a small mound located about 300 metres northwest of Larsa was visited during the survey of the Uruk region conducted by R. Mc. Adams and H.J. Nissen. The site was assessed as likely dating from the Jemdet Nasr and Early Dynastic I periods (Adams and Nissen 1972: 237, site WS442). In 1985 and 1987, the French archaeological mission to Larsa and 'Uwaili conducted a programme of survey and analysis of aerial photographs focusing on the urban structure of Larsa (Huot et al. 1989, Suire 2003). This study revealed various structures and features visible on the surface of the site and in its immediate surroundings. In the published reports, the small northwestern mound is mentioned in sections related to pottery and mudbrick kilns, due to the abundant presence of slags and overfired pottery covering the hill. As a result, the site was designated F11, where "F" stands for "kilns" in French (Huot et al. 1989: 34-36 and Figs. 9a, 17). During the twelfth campaign in 1987, three test pits each measuring 5 x 5 m were excavated on the southern slope of the Tell (Fig. 1). This limited operation confirmed the presence of Early Dynastic I material. However, it did not yield any results in terms of architectural remains (Calvet 2003a: 24 and Fig. 1, square "A I").

The discovery of a large mudbrick buttressed wall and Early Dynastic I pottery sherds during an informal survey in November 2022 (Baldi, Zingarello, Kazim, in this volume) led to the launch of a new programme aimed at exploring the earliest levels of Larsa. The abundant ceramic waste on the surface of F11 (Fig. 2) makes this small mound an ideal location for investigating potential pottery workshops[1]. Excavations revealed a small portion of a large, monumental complex dating back to the early 3rd millennium BC, enclosed by a thick ovoid or circular wall (Fig. 1). Research has shown that the ruins of this complex were reused at the beginning of the 2nd millennium BC to accommodate a pottery workshop featuring a complex layout. It is worth stressing that the results

[1] Work carried out as part of the ANR FACT.WORK (ANR-22-CE27-0003, led by J.S. Baldi, CNRS), which is funding the operation.

of this initial campaign on Tell F11 are preliminary. After a month of fieldwork conducted by three archaeologists and five workers, many stratigraphic and architectural details remain to be verified. Future campaigns may require revisions to the information presented here.

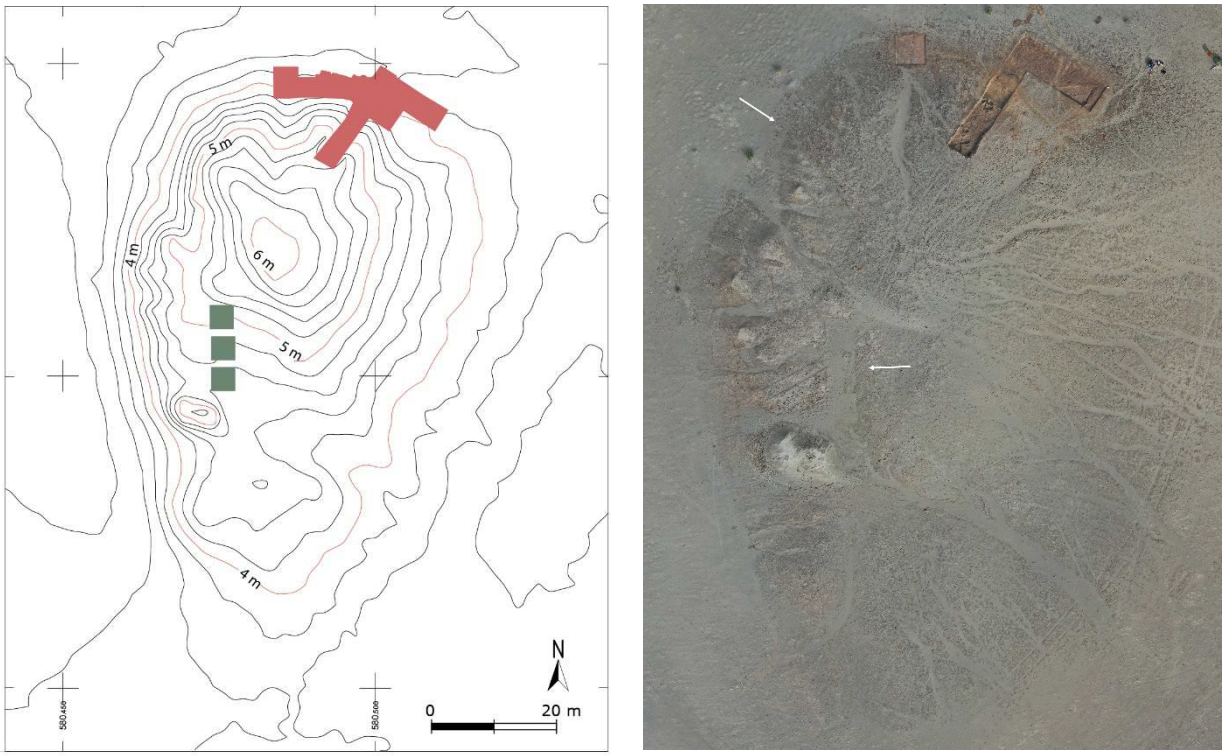

Fig. 1 – Left: *Topographic map of Tell F11. In green, the soundings of 1987. In red, the trench of 2023.* ***Right:*** *Ortho-image of F11 (November 2023). The white arrows indicate the visible circular layout of the enclosure in the northern sector of the mound, along with the soundings conducted in the 1980s.*

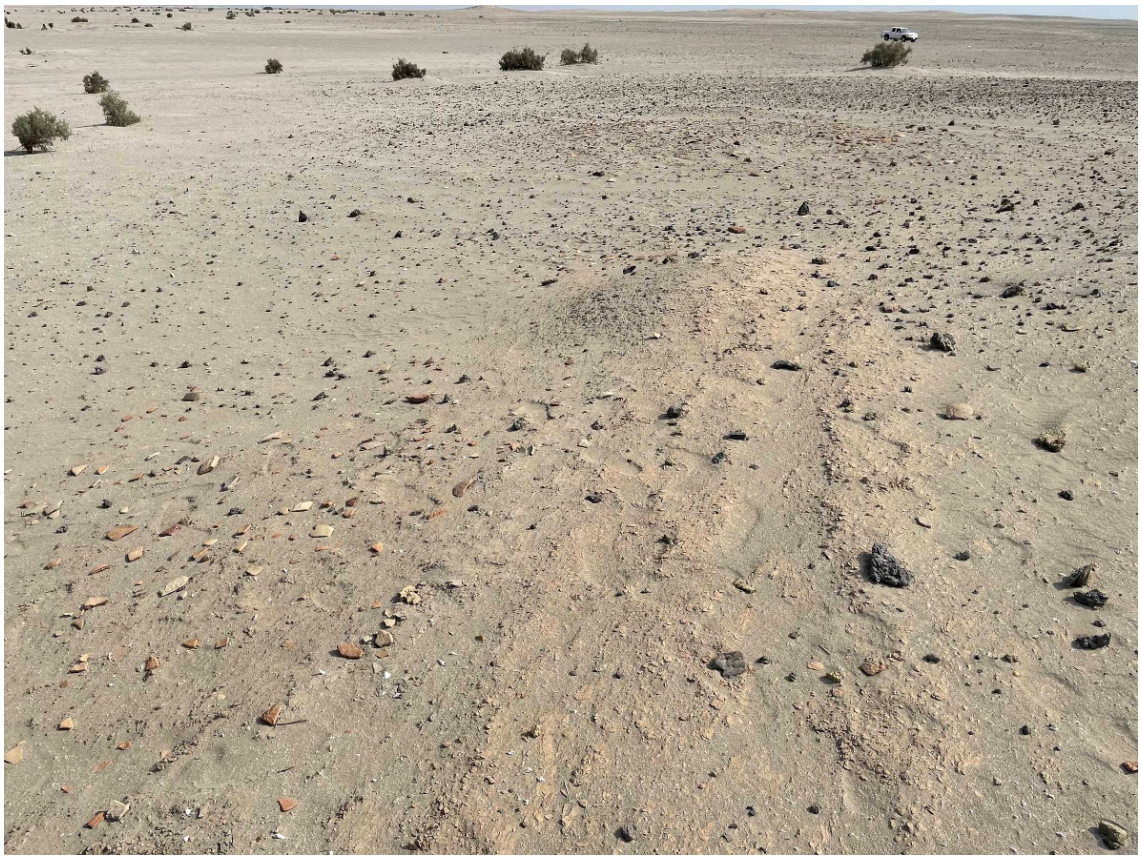

Fig. 2 *– View of the mudbrick enclosure 5515, visible on the surface in 2022. The high concentration of ceramic material in the background corresponds to Room 5516, partially excavated in 2023.*

The F11 site features an anthropic hillock measuring approximately 110 x 70 m and reaching a maximum height of around 6 m above the surrounding plain. To gain insights into the various occupations of the Tell, an initial NE-SW trench was opened up on the northern slope of the hill. The two identified phases of occupation (Fig. 3) align with the information provided by the surface material and can be dated to the early 3rd and early 2nd millennium BC, respectively.

The large Early Dynastic I complex and its surroundings

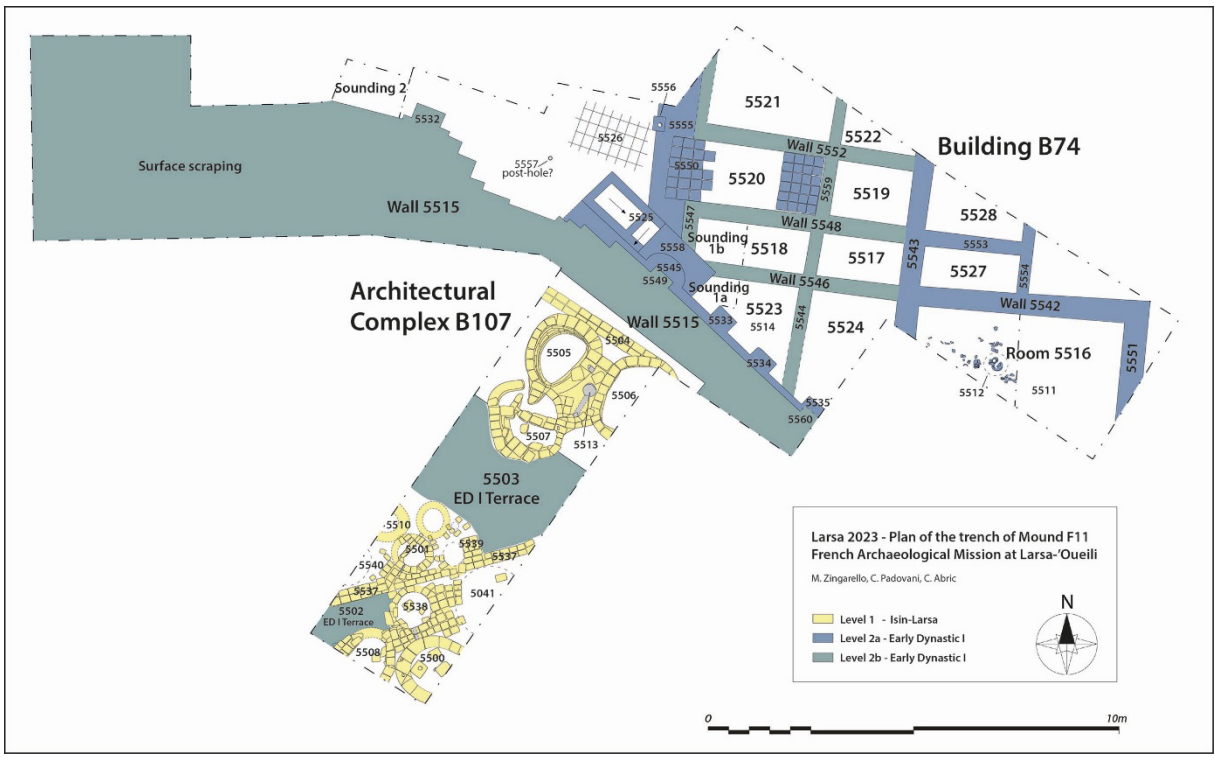

***Fig. 3** – Plan of trench at Tell F11 (November 2023).*

The distinctive feature of the early 3rd millennium complex is, from the outset (Level 2b), a long, imposing wall made of red mudbricks (Wall 5515 – Fig. 3) identified in the northern part of the original trench. To verify the shape and orientation of this structure, the initial trench measuring 3 x 18 m was expanded in its northern section both eastward and westward. This allowed a full reveal of the curvilinear layout of Wall 5515. It soon became clear that this wall bordered a series of mudbrick terraces which, despite being heavily affected by atmospheric conditions, still contribute to F11's appearance as a small mound. Additionally, it was apparent that architectural structures with quadrangular cells were emerging north of Wall 5515. Thus, Wall 5515, which appears to encircle the base of hill F11 (Fig. 1), at least on the northern side, has, since its construction in Level 2b, clearly served as an enclosure for a large architectural complex that will be referred to as B107. This wall does not isolate the complex from the surrounding structures, especially from the building to the northeast, named B74. To better understand the construction logic and its relationship to the surrounding area, the trench was subsequently extended to the north and northeast, where piles of sherds in situ and visible on the surface, dated from the early 3rd millennium BC, indicated that structure B74 continued in those directions.

Complex B107, built during the Early Dynastic I period, was therefore delimited by an ovoid enclosure, with quadrangular structures adjoining it on the outside (Building B74). Excavations revealed two successive construction levels, labelled 2b and 2a, from bottom to top. The most recent

involved an enlargement of the oval enclosure and significant modifications to Building B74. However, the specific layout of the B107 complex and the features of the large mass of mudbricks within its enclosure wall (5515) have not yet been clearly defined. For now, it seems preferable to refer to the entire inner area of B107 as a mudbrick "terrace", although it is likely that it originally consisted of a series of superimposed terraces, probably decreasing in size. Over time, Wall 5515 has undergone modifications, covering the remains of earlier structures, particularly concerning its access system to the internal terraces (infra). Although a detailed assessment is not yet possible, the variations in the width of Wall 5515 – ranging from 2 m to the east to nearly 5 m to the north – clearly suggest a complex structural and construction history (Fig. 3).

Level 2b: the initial state of the complex

Since its initial construction, the B107 complex consisted of a large oval area featuring a central terrace surrounded by a monumental wall (5515) made of rectangular red mudbricks (measuring 38 x 20 x 12 cm). Adjacent to the external north-eastern section of enclosure 5515, the excavated area of the complex included a series of quadrangular rooms oriented north-south, referred to as Building B74. These peripheral structures were clearly present from the foundation stage, with several of their walls identified beneath the more recent level 2a (as discussed below). As early as the first construction phase 2b, two architectural focal points – a vast terrace enclosed by a massive elliptical wall (B107) and at least one building consisting of rectangular rooms adjoining it (B74) – were integrated at both a structural and likely, functional level.

The connection between B107 and B74 is the large wall 5515, which constituted *de facto* the southern façade of at least part of B74. Its oval outline, easily recognisable in aerial photographs, has been characterised by uneven thickness since its construction, varying from 2 m in its northeastern section to more than 5 m in the northern section. Although archaeological investigations have not yet clarified the structural details of Wall 5515, these significant variations in thickness suggest that, from Level 2b onwards, the oval wall likely incorporated various features, such as entrances, ramps and reinforced segments, possibly in correspondence with pillars 5532, 5549 and 5560. The most thoroughly explored section of Wall 5515 is near the small rectangular pilaster 5549, built from red mudbricks measuring 38 x 20 x 12 cm, consistent with the rest of the wall. This area may have served as an access point. However, its existence could not be verified due to later modifications that covered this part of Wall 5515 at Level 2a (see below). Inside the oval enclosure, there was a large mudbrick terrace or possibly a series of terraces. What remains of this terrace lies beneath more recent structures (infra), making it difficult to define its precise configuration at this time.

To the east of the trench, on the other hand, several features of Building B74, which adjoined B107, could be identified. A large, likely quadrangular room (5516), partially excavated, was bounded to the north by Wall 5542. This wall, rebuilt on Level 2a, ran in an east-west direction and consisted of two rows of bricks. The dimensions of the mudbricks, identical to those used for the oval enclosure, provide further evidence that B107 and B74 were part of the same architectural project. To the west, the extension of Wall 5542 was represented by Wall 5546 (Level 2b only), which defined a trapezoidal room (5524), located north of enclosure 5515. Rooms 5524 and 5516, measuring 2 m and 5 m wide respectively, were separated by the north-south wall 5543, which

appears to have been constructed in two courses of mudbricks. These two perpendicular axes (5546-5542 and 5543) seem to form the backbone of the section of the B74 plan uncovered so far, which underwent extensive modifications at a later stage. North of Wall 5546, intersecting with the single-course mudbrick Wall 5544, are the two-course east-west Walls 5548 and 5552. The walls were well connected and enclosed two rows of four rooms each (from 5517 to 5524) to the west of B74. To the east of the building, around Room 5516, only a small section of Walls 5543 and 5542 was occasionally observed on Level 2b, beneath the Level 2a reconstructions. None of the eastern rooms (5516, 5527, and 5528) has been excavated to Level 2b.

To the west of the building, the excavation went a little deeper. Two small test soundings (1a and 1b, Fig. 3) were dug on either side of Wall 5546. Due to the later widening of enclosure 5515, which partially covered Level 2b of Building B74, it was not possible to observe the contact between the building and enclosure 5515 in Level 2b without dismantling it. However, the existence of Wall 5547 has been ascertained: closing off Room 5518, it would have extended northwards – beneath the recent tiled floor 5550 – to form the western façade of B74 in Level 2b. The sounding located to the west of Room 5518 reveals that its walls (5546-5548), preserved to a height of approximately 36-40cm (equivalent to about three to four layers of bricks), were founded on a solid rammed earth footing, a platform extending possibly beneath the entire building. It is possible that the original floors of this level were situated just above the footing. However, the transformations made during the later Level 2a do not appear to have left evidence of these original floors in this area. Furthermore, the proximity of a pilaster (5549) of the oval wall 5515 in Level 2b is probably not coincidental. Likely, this pilaster was not isolated, but framed an access point to B107, similar to what can be observed in the following level at the same location, on the façade of Building B74.

Level 2a and its significant structural modifications

Later, the overall configuration of the area remained unchanged, but many elements underwent significant modifications. Level 2a shows two consecutive stages, 2a2 followed by 2a1 (from bottom to top), with no break in between. 2a1 involved the addition of new floors (tiling) and built features.

In Level 2a2, the oval enclosure (5515) of B107 was provided with a new facing of grey rectangular mudbricks, which are slightly larger (40 x 20 x 15 cm) than those of the original construction and can be easily distinguished from the older red brickwork. A set of closely spaced pilasters (5533-5535) was added, along with a large semi-circular pilaster (or buttress) (5545), that was visible on the surface even before excavations began (Fig. 2). This new feature was built around one of the pilasters from the previous level (5549), likely at the location of an access to B107 (infra) (Fig. 3).

Building B74 was reconstructed, but its entire western section, comprising the two rows of rooms 5517 to 5524, was removed and replaced with a courtyard. This courtyard is bordered to the west by a new, one-metre-wide façade (5555). Test soundings 1a and 1b revealed that the former Rooms 5518 and 5523 were thoroughly emptied (the only pottery fragments found in this area were at the foot of the new buttressed wall) and subsequently filled in. Following this, all the walls in the area were levelled, and the ground was covered by two layers of square mudbricks, each averaging 29 cm in size. The entire western part of B74 was thus transformed into a large, tiled courtyard. The arrangement of the pilasters on the new facing of B107 confirms that the adjoining space was now open rather than covered.

To the east of Building B74, the excavation did not reach Level 2a2. This level was identified solely through the widening of Wall 5542, which extends from one to two courses of bricks. However, it should be noted that the tiled floors in the new west courtyard of the building, as well as the floors in the adjoining square to the west, are at least 0,4m higher than the floors of the eastern rooms, which were not reached (infra). Additionally, the levelling of the western rooms and the limited area cleared to the east do not yet provide any information about the circulation system within the building. Nonetheless, the insertion of tiled floor 5550 into façade 5555 could suggest the presence of an entrance to the building, possibly since Level 2b (Room 5520).

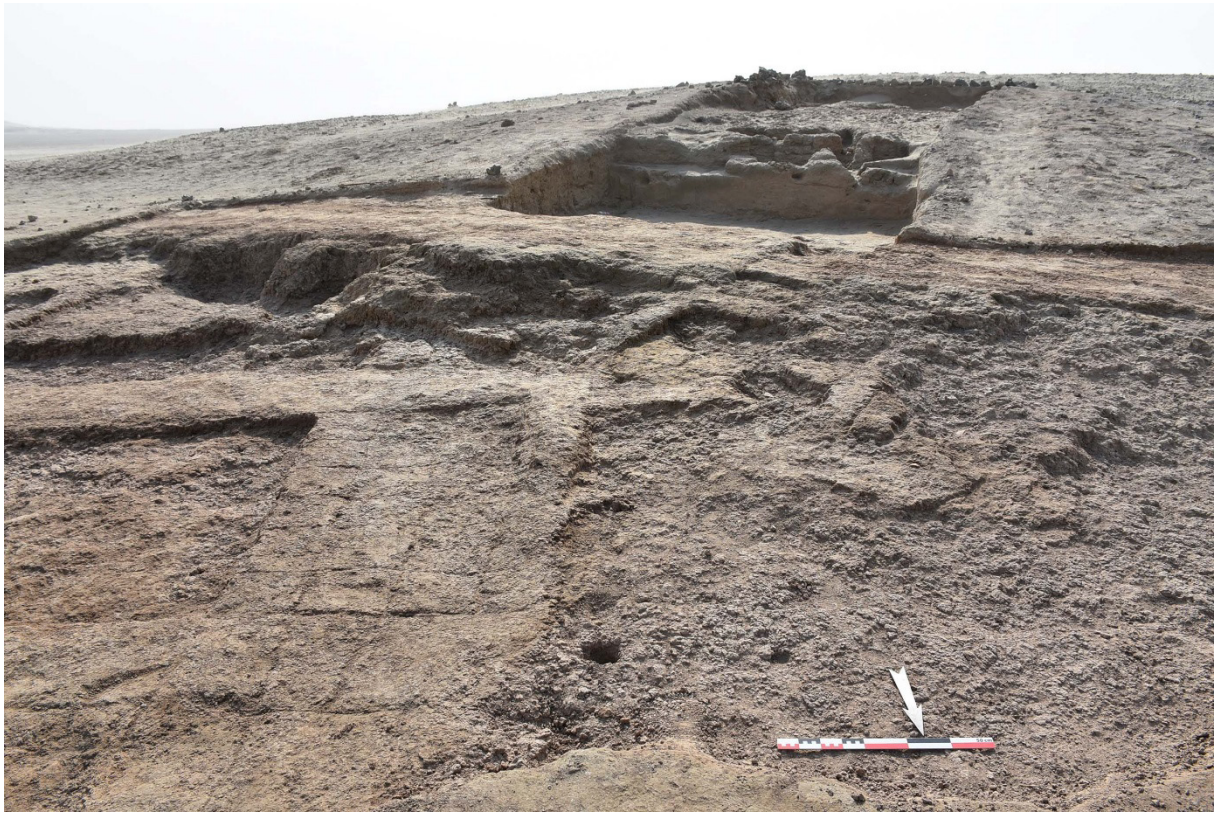

***Fig. 4** – View from the north of the remains of Staircase 5525 and Wall 5515, including its pilasters. In the foreground is the tiled floor 5550 set into the walls of Level 2b, along with the tiled floor 5526 with post holes.*

During the following phase 2a1, the functional significance of the area where the façade of B74 meets the oval enclosure of B107, at the level of pilasters 5549 and then 5545, becomes apparent. The large semi-circular buttress 5545 is now enclosed (at least at its base) within a rectangular mudbrick structure (5558) projecting approximately 1 m from the oval façade 5515. This substantial structure served as the support for the landing of a mudbrick staircase (5525) that ran along the oval façade, providing access to the enclosure of B107 immediately to the west of pilaster 5545. Staircase 5525 is clearly visible on the ground, although its brickwork has suffered significant erosion, leaving only a few alignments of its internal masonry discernible (Figs. 3, 5). As previously mentioned, it is likely that staircase 5525 sealed the earlier accesses (2b and 2a2) to complex B107. In the same phase 2a1, the esplanade 5561 at the foot of staircase 5525 was covered with a tiling (5526) of square bricks (averaging 26 cm). The orientation of the tiled floor appears to be a compromise between those of B107 and B74. Furthermore, the floor seems associated with post holes that may have supported a light cover shading the area (Fig. 4).

***Fig. 5** – Aerial view of Tell F11 during excavation. The two phases of Wall 5515, in red and grey mudbricks, as well as the pilasters and associated structures, are clearly visible.*

***Fig. 6** – Ceramic material in Room 5516, embedded within the ash deposits of a thick destruction layer.*

***Fig.** 7 – A group of Early Dynastic I vessels found in situ in Room 5516.*

To the east of the site, during this final phase of the Early Dynastic I occupation, evidence of the last use of Building B74 was visible at ground level. A very thick layer of destruction (5511), resulting from the collapse of Room 5516, yielded a sheer quantity of Early Dynastic I pottery, with most of it visible on the surface. The destruction of the room, and possibly the entire building, was caused by fire. Thick layers of ash, containing fragments of rubbed and burnt bricks, filled Room 5516 (Fig. 6) and extended into the courtyard to the west of Wall 5543, along the enclosure of B107. Most of the closed shapes found in Room 5516 were arranged horizontally or upside down, following a line running from the northeast corner to the southwest. This pattern may suggest that the vessels were stored on shelves along walls 5542 and 5543. A batch of containers, including various types of jars, was found in situ within a large basket (5512, probably wicker or reed[1]). Its burnt remnants left a whitish trace within the room's fill (Fig. 7). Although the western half of the room and its perimeter walls were excavated to a depth of 0,5m (four courses of mudbricks), the floors of the room were not reached. In some places, the accumulation of fragmented pottery formed the entire filling of the room from the surface. It is possible that some of this material originated from a collapsed upper floor, as much of the pottery in the room was found in piles, suggesting that it may have fallen from above. The relatively low rate of vessel fragmentation aligns with this possibility. The vessels may have been broken due to mechanical impact and then left in place since the abandonment of the area.

These conditions are ideal for a functional analysis of the collected assemblage. Although Room 5516 has been only partially excavated, it is possible to confidently state that it served as a space devoted to the consumption of liquids and the storage of containers used during communal events. Plates and trays are virtually absent, and small bowls are rare. The numerous medium-sized jars

[1] The analysis of the sampled phytoliths is underway.

typically feature spouts and lugs (PI. 1: 9, 12). They also exhibit various surface treatments, such as reserved slip (Pl. 1: 8, 10, 12) and elaborate decorations, including geometric fenestrations and incisions (Pl. 1: 11, 13, 14), as well as rare painted and appliqué motifs (Pl. 1: 7, 15).

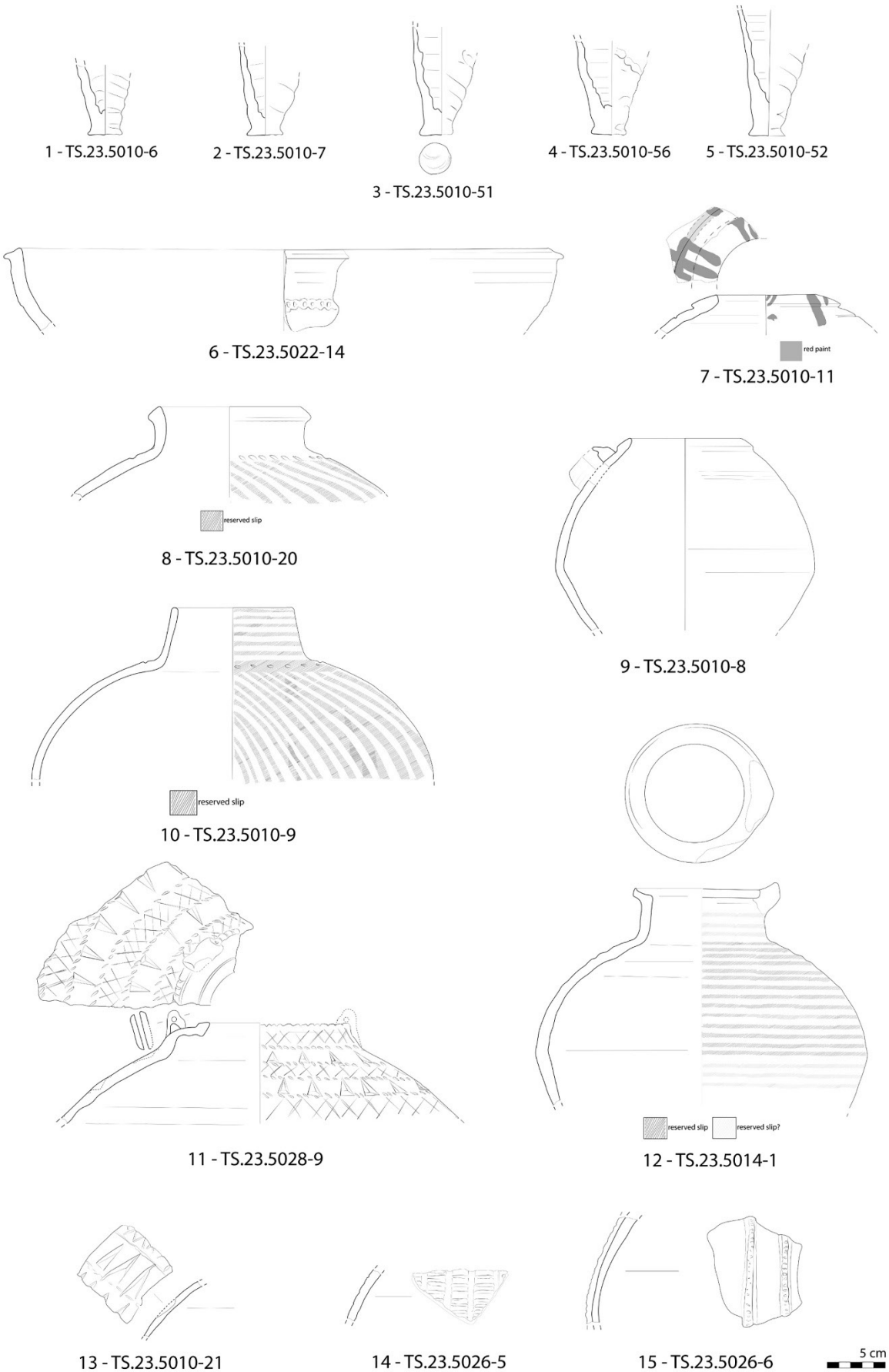

***Plate 1** – Ceramic material from the Early Dynastic I period (Level 2) at Tell F11 (drawings P. Vertuani).*

***Fig. 8** – Part of the "narrow-based cups" and "tall cups" recovered from the destruction layer in Room 5516.*

***Fig. 9** – A complete cup found inside a jar in Room 5516 (installation 5512).*

However, what strongly suggests frequent libations is the large quantity of narrow-based cups and tall cups[1]. Over a hundred of these cups have been collected and are relatively well preserved, despite encrustations and corrosion caused by the salinity of the soil (see PI. 1: 1-5, Figs. 8 and 9). The actual number of beakers must have been undoubtedly greater, as evidenced by dozens of base fragments found scattered across the surface from layers of destruction. Many of these fragments are so fragile that they crumble upon touch. In terms of typology, the repertoire of shapes and decorations suggests a date to the early Early Dynastic I period[2].

The early 2nd millennium ceramic workshop

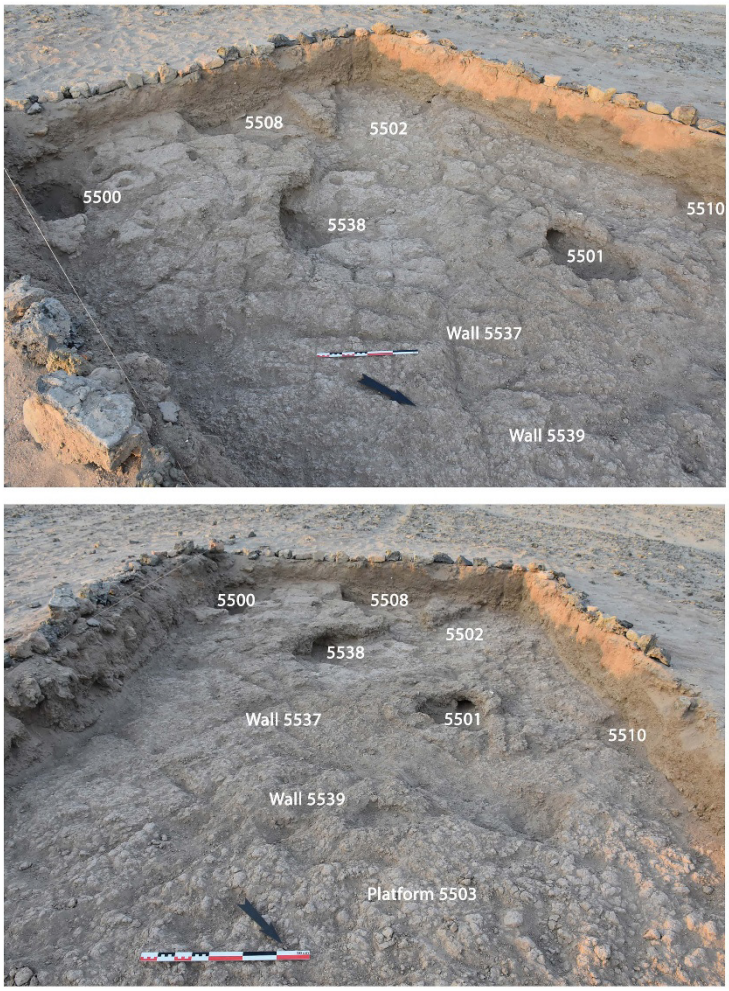

***Fig. 10** – Views of the upper unit of the pottery workshop of Level 1.*

At the top of the trench, to the south, a craft area dedicated to ceramic production forms level 1, dating to the Isin-Larsa period in the 19th-18th centuries BC based on the ceramic material (Coppini, in this volume).

The workshop includes at least two groups of kilns built with yellowish mudbricks (30 x 16 x 8 cm), featuring a double chamber with vertical draught and arranged on different stages (Fig. 3). The kilns were constructed on the earlier system of stepped terraces of the B107 complex, with the remains of these terraces used to accommodate various firing units. Remnants of the Early Dynastic terrace are visible in some places, such as at passage 5502 and between two stages (platform 5503). Platform 5503 yielded a few pottery fragments dating from Early Dynastic I, including a diagnostic jar sherd with incised criss-cross decoration (PI. 1: 14). This arrangement of the kilns into two zones – one located near the top of the Tell (2.5 m above its base) and the other 1.30 m below – likely took advantage of the slope of the 3rd millennium terrace remains to enhance the circulation of hot gases and improve heat transfer.

[1] These typological distinctions were established by R. Matthews (1997) based on cups found in the rubbish dump of Mound B at Jemdet Nasr. He established a chronological difference between the "narrow-based cups" and the "tall cups", suggesting that the former serves as the precursor to the well-known Early Dynastic I "solid-footed goblets". Room 5516 of Building B74 appears to contain examples of both types identified by Matthews.

[2] J.S. Baldi and C. Abric are conducting a study on manufacturing techniques. A program for organic residue analysis is planned to obtain an overview of substances potentially used and consumed in Room 5516 and Building B74 (M. Zingarello).

On the upper stage, the excavated area revealed four kilns (5500, 5501, 5508 and 5538) distributed across different units and associated with work platforms (5503, 5540), low walls (5537, 5539) and circulation areas such as passage 5502 (Fig. 10). A well-preserved cuneiform tablet (T-5002-1) was found in passage 5502, near Kiln 5538. It is a letter concerning personnel management in what appears to have been a family business. Based on palaeographical analysis, it may date from the reign of Rim-Sin (Jacquet, in this volume). Two additional kilns, situated along the western section of the trench (Kiln 5510) and near the eastern section (Kiln 5041), were identified but not excavated. Other circular structures likely exist to the north and east of Kiln 5501, but their nature remains to be determined.

***Fig. 11** – Group of connected kilns 5505, 5506 and 5507 from the lower unit of the Level 1 workshop, viewed from the northeast.*

A second group of three large furnaces (5505, 5506 and 5507) was brought to light on a lower stage, approximately in the centre of the trench (Fig. 11). Two of the kilns, 5505 and 5506, shared the same chimney (5513). The largest of the three (5507) showed fragments of its perforated platform, which was supported by internal pillars and two intersecting low walls. Its combustion chamber was filled with ash. It is worth noting that virtually no ceramic material was found associated with these lower kilns.

X – Report on the 2023 fieldwork campaign in Tell al ʻUwaili

Johnny Samuele Baldi, Giulia Russo, Emmanuel Baudouin, Mohaned Karim

***Fig. 1** – Plan of Level 5 (pre-Ubaid phase) with its different sub-phases.*

The fieldwork operations conducted during the 2023 campaign at ʻUwaili spanned from the 4th to the 27th of November. The excavation team included the authors of this paper, Carolyne Douché, and, on various days, 6 to 8 workers from the area. The archaeological efforts were primarily focused on three distinct areas. Specifically, two sectors of Level 5, originating from the phase previously

known as “Ubaid 0” (the late 7th millennium BCE), were explored to delineate essential aspects of the settlement architecture within the extensive area of the village that has been excavated since 2019. Additionally, a significant portion of the work concentrated on the summit of the Tell and the more recent phases of occupation dating back to the Ubaid 4. This new trench on the hilltop made it possible to connect the features identified in 2019 with those unearthed in the 1970-80s.

Some new activities in the oldest known village in southern Mesopotamia

Since 2019, Level 5 (Fig. 1) has been the primary focus of the excavations, representing the earliest settlement in southern Mesopotamia and dating from the pre-Ubaid phase, labeled “Ubaid 0” by the excavators of pillar buildings 37 and 41 in the 1980s (Vallet 1990, 1996). The latest campaigns have allowed for the extensive investigation of over 600 sq. m. of the area, revealing a substantial part of the settlement layout. Level 5 consisted of different stages: first, the 5c stage identified under the foundation of the main constructions, then a 5b sub-level, and finally a 5a layer, with major additions that expanded on the previous architectures while respecting their organizational logic. Some of the main buildings were barns (G1, G2, B111, with extensions G3, G4, B112 and B113) that featured internal platforms and raised compartments, lying on basements constituted by a dense series of walls defining little cells or roughly parallel rows. South of the small alley 2112, the architectural blocks G1, G2, and G3 were likely used as huge granaries with integrated functional units for grain processing, such as large ovens and facilities. In some buildings, such as B110 (Fig. 2), or the eastern portion of G2, where ovens were flanked by large plastered basins and canisters, cereal handling and processing was particularly intensive.

***Fig. 2** – Level 5 Building B110, view from the North (picture taken from street 2111).*

Furthermore, although sharing many of the characteristics of the neighbouring edifices, the B110 building had a partially different nature and function. B110 also yielded ovoid or circular ovens

(see structures 74 and 2096), similar to fire installations such as 62 and 73, located in the barns to the north of alleyway 2111. Similarly, the entire southern portion of B110 was composed of rectangular cells which, just as in granaries G1 and G2 further north, probably constituted a ventilated basement system beneath the floors of rooms used for storing foodstuffs. However, in contrast to G1 and G2, the northern portion of B110 was not equipped with work platforms paved with mudbricks, but it was rather articulated in two communicating rooms, characterised by the presence of solid quadrangular pillars and half-pillars protruding from the load-bearing walls (Fig. 1-2), as well as (in the case of the southern room), by two postholes (2059, 2060). These features, along with the presence of a staircase (close to the main entrance on alley 93 and running alongside the wall that bordered alley 2111 above basins 2065, 2066 and 2067), suggest the presence of an upper floor. In addition, the type of ash that filled the ovens of B110 (very dark and markedly different from the greyish firing residues from the ovens of the other granaries), and the presence of carefully plastered basins indicate that some spaces of B110 were dedicated to specific practices compared to the surrounding granaries.

The overall layout of the Level 5 settlement is clearly defined by the presence of barns and buildings dedicated to food-related activities, forming a dense yet distinct environment. The interconnected grain storage and processing units were notably large, situated in close proximity to each other, creating a closely packed environment. Despite the significant architectural expansions in subphase 5a (with the construction of G3, G4, B112, and B113), the arrangement of lanes and alleys remained consistent. Essentially, the blocks did not cater to nuclear families-related activities, nor did they exhibit one centralized storage or processing system. Instead, the alleys served as a fundamental framework, organizing the spatial layout of a socially diverse village organised into similar and fully compatible workspaces, but most likely organised according to a spatial and logistical pattern pertaining to large supra-family or lineage groups. In fact, apart from building B110, which shows some notable operational specificities, the other architectural blocks such as G1 and G2 appear to be fully analogous, but also functionally independent. Ceramic and spatial analyses about the organisation of Level 5's village community are in progress and will be the focus of future studies.

In November 2023, at the far western end of the trench (Fig. 1), the section being studied near Building B110 was expanded to determine the width of the road that surrounds the edifice. This revealed that it is actually an alley, of comparable dimensions to the other small roads, particularly in its late period of existence of Level 5 (5a – the only one who has been clearly identified so far on this edge of the excavation). At this time, two additions to Building B110 (G3 and G4), including a grain storage area with a basement level featuring small chambers divided by mudbrick partitions, extended to both the east and west of the primary building. The intense rain in November 2023 caused significant damage to building B110 and the high clay content of its bricks led to severe melting of the structure. Despite this setback, the architectural and spatial analysis of this area has been successfully completed. Although unplanned, this situation presents an opportunity to investigate the deeper levels during the upcoming campaign. We know, in fact, that the currently exposed layers of Level 5 are the last of the period that was called ‘Ubaid 0’ in the 1980s, the oldest phases of which have never been extensively excavated and could therefore start being brought to light in this sector.

Concentrated in the northern sector of the investigated area, the other intervention impacting Level 5 occurred between buildings B113 and B41, spanning street 2112. In fact, the series of reconstructions of the lockers used as granary bases revealed themselves to be more complex than previously observed (Fig. 3). Despite no notable extension of the surveyed surface, a detailed examination of the stratigraphy of diverse construction phases was conducted. This analysis led to the identification of additional sub-levels, distinct from the previously identified stages, in the evolution of Level 5 structures. More specifically, the south-east corner of the pillar building B41, which had not been touched until now, was excavated in November 2023, revealing an additional sub-phase (5a1) of a level 5 that was exceptionally rich in architectural activity (Fig. 1).

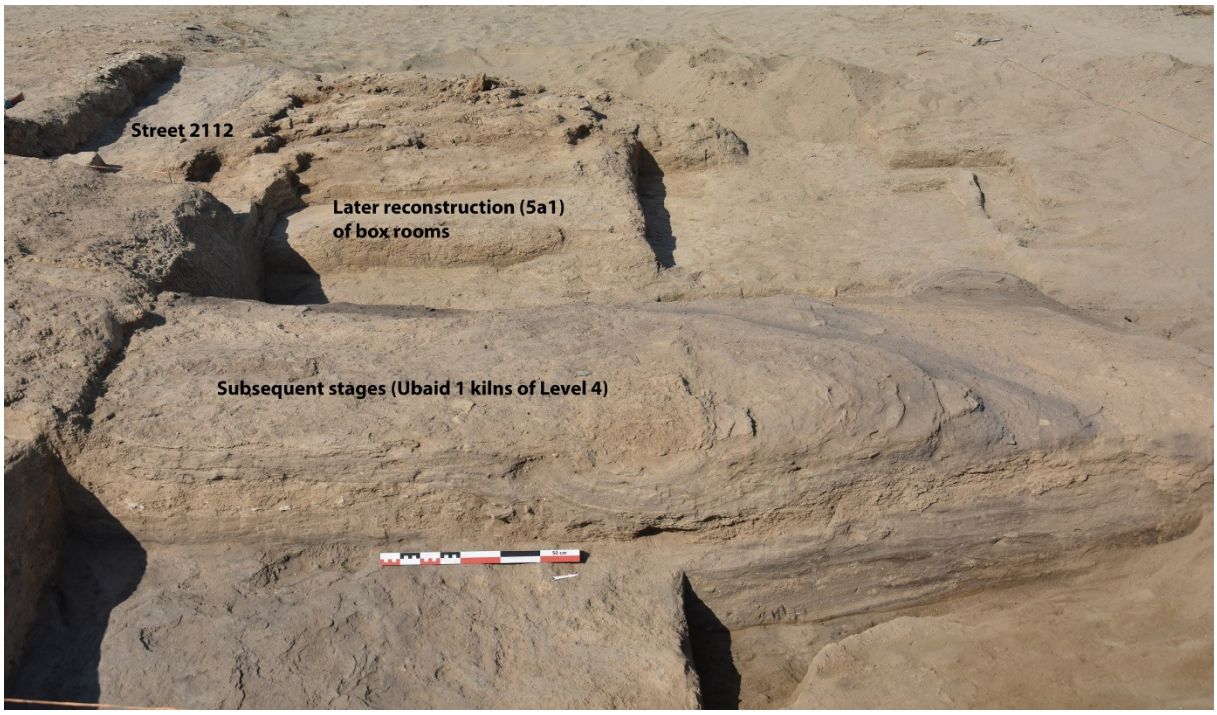

***Fig. 3** – Reconstructed portion of street 2112 in sub-level 5a and subsequent stages.*

Indeed, an early sub-phase 5c, the deepest reached so far, has been identified thanks to the discovery of a few small walls under the foundations of building B37. Then, during sub-phase 5b, the pillared building B37, the granaries G1, G2 and B111, as well as the building B110 with its ovens and plastered basins were built. After this stage, the pillared building B41 represented the very first expression of a moment of great architectural expansion. In fact, while the previous 5b edifices were still in place, along with B41, the complexes B113 and B112 (additions to G1 and G2 respectively), as well as G3 and G4 (extensions of B110 to the south and east) belong to a same sub-phase 5a3. During a slightly more recent sub-phase (5a2), building B41 underwent an internal remodelling, notably with the complete partitioning of the basement of room 1 to the south (Vallet 1996, see in particular fig. 2), sub-phase 5a2 of which we found the extension to the south-east of the building (wall 2108). The last modification to building B41 (sub-phase 5a1) was the construction of a few small lockers (2123), which were built along the south wall of the building bordering alley 2112 (Fig. 3), without however modifying the layout of the latter. At this stage (5a1), building B41, or at least its south-eastern part, was a structure made of small compartments, probably used for storing grain. This final reconstruction 5a1 is only attested in the south-eastern corner of B41, having been completely eroded in the rest of the building.

On the south side of the small road 2112, the earlier phase of granary G1 was associated with B37 during sub-phase 5b. Then, in sub-level 5a3, while north of the 2112 alley the first version of B41 was built, granary G1 saw an enlargement with the inclusion of narrow corridors designed like basements referred to as B113. Despite alterations caused by building reconstructions, alley 2112 and the whole street layout remained pivotal elements in the architectural design of this area throughout all the sub-phases of Level 5. Then, with the end of the buildings and rearrangements of Level 5a (immediately after sub-phase 5a1), this sector was affected by the general reuse of this entire area of the site as a large pottery manufacture zone. In the 2023 campaign, Level 4 and its Ubaid 1 pottery kilns, which mark the very beginning of the Ubaid sequence (Fig. 3-4), were not specifically excavated. But their stratigraphic relationship with Level 5, already observed in 2021, was confirmed, so that everything suggests that, although the functional change was radical, the transition from Level 5 to Level 4 occurred without any significant abandonment.

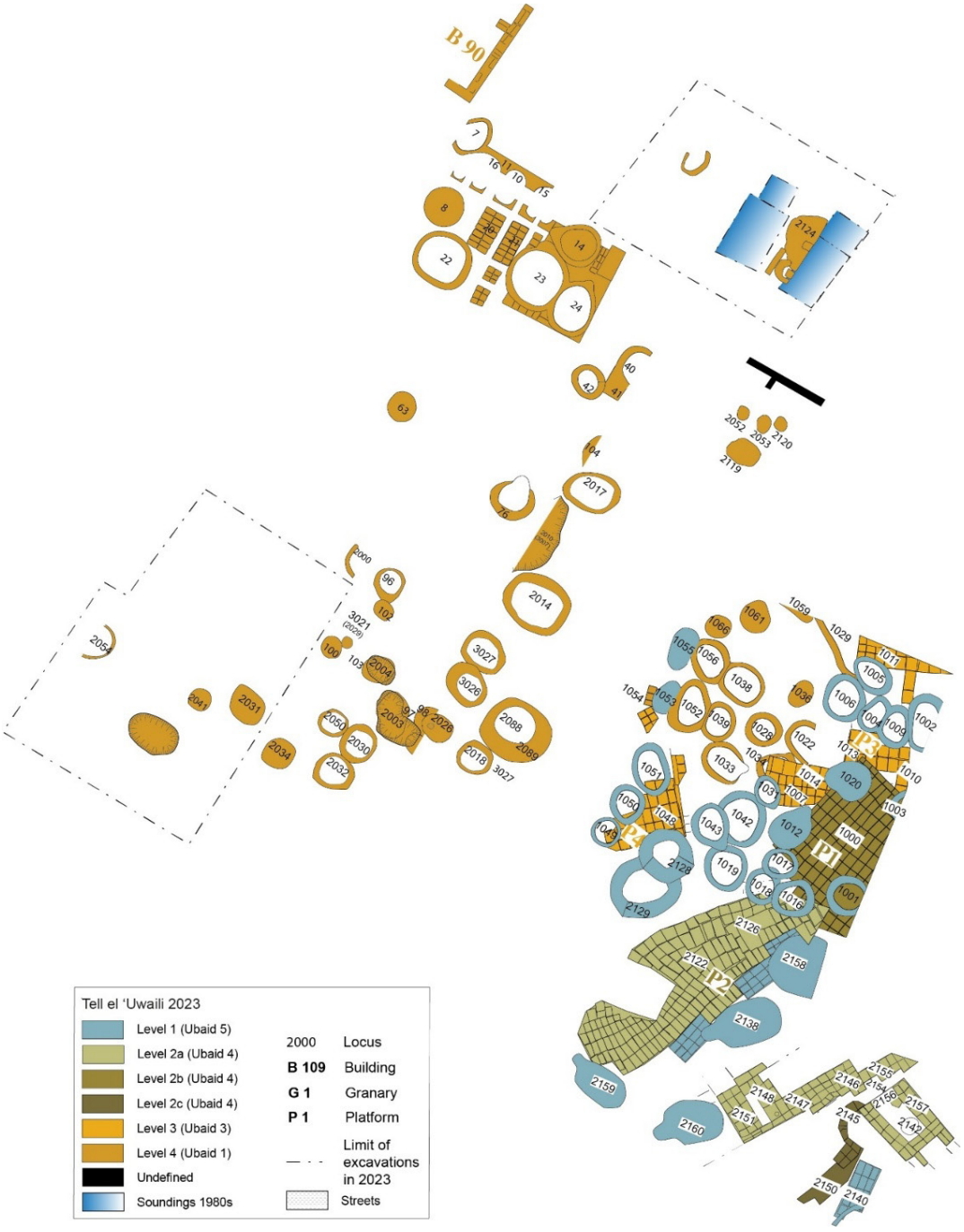

***Fig. 4** – Plan of Levels 4-1 (Ubaid 1 to Ubaid 5).*

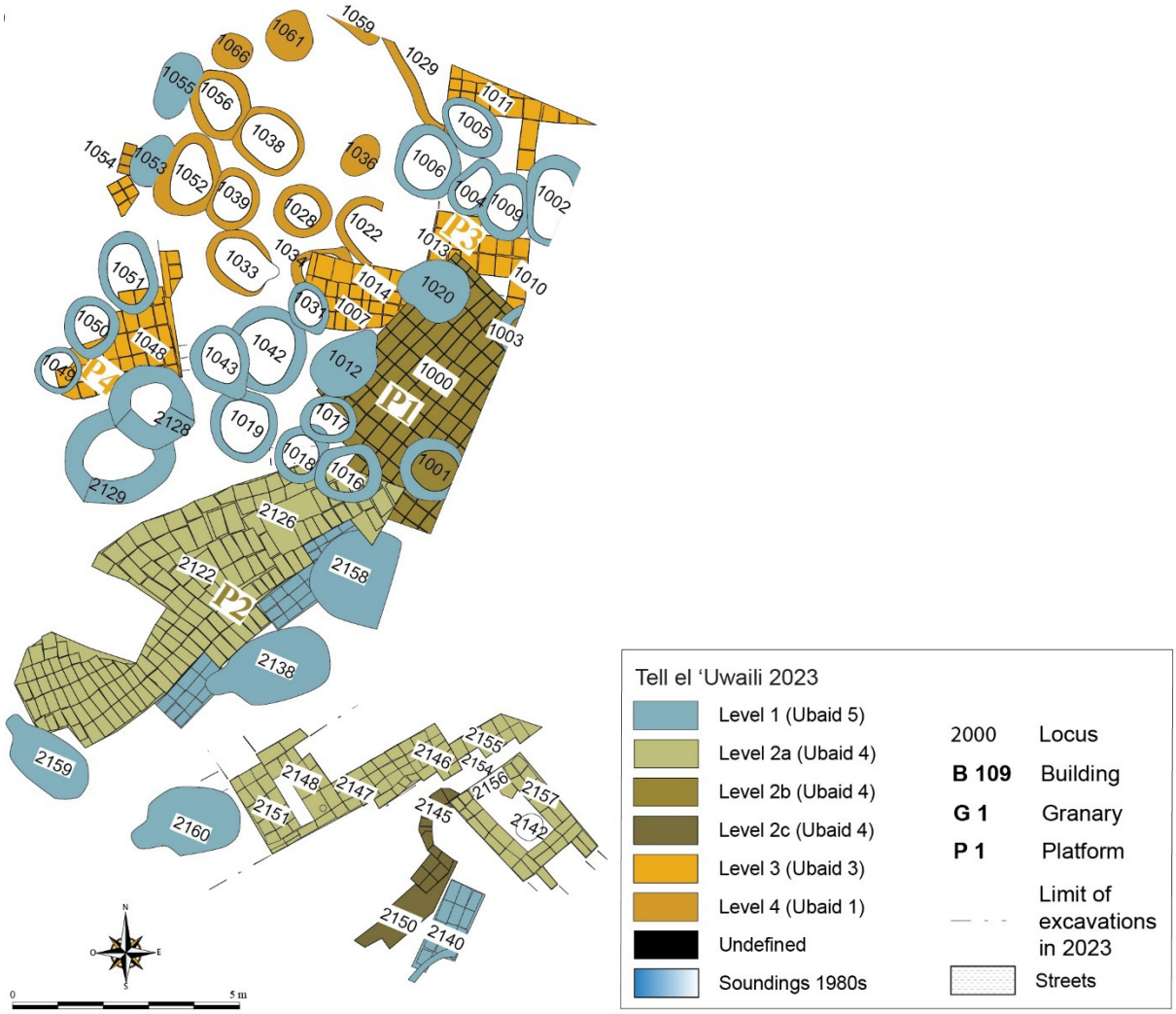

***Fig. 5** – Plan of Levels 4-1. Detail of the structures on top of the Tell, in particular Level 2 (Ubaid 4), on which work in this area will be concentrated in 2025.*

The largest excavation area during the 2023 campaign was opened in the upper sector of the Tell, uncovering several sub-stages of Level 2 that were dated to the Ubaid 4 based on the pottery finds (Fig. 4-5). Structures recognized at the bottom of a sounding opened in the 1980s in square X28 and in the immediate vicinity indicated the steep gradient sloping upwards east-southeast of this part of the Tell. The Level 2 structures were built with thicker foundations of unequal width to level the slope. During the campaigns conducted between 2019 and 2021, Level 2 revealed a mudbrick platform (P1), specifically a terrace, which covered a significant part of the hilltop and was surrounded by a row of smaller mudbricks. As evidenced by previous excavations, this period was characterised by significant architectural changes, in respect of which the construction of a terrace is entirely consistent.

The structures identified in this level in November 2023 came to light after extending the excavation area to the south and south-east (Fig. 5). The aim was to connect the features excavated in recent years with those unearthed in the 1970s and 1980s all around the large building that was hypothetically rendered according to a vast, typically Ubaid tripartite plan (Forest 1983a – but the general plan might also be bipartite). The uneven, sloping topography of this area and the limited documentation available from the old excavations made this work of reconnection particularly

complex, requiring a non-stop back and forth between new excavation data and archive research during and after the campaign. Forest (1983b: 20) already emphasised the importance of the stratigraphic and architectural understanding of this area, especially considering the presence of the steep slope: « Displaying such a slope furnishes a key for understanding the whole site. As for the most probably tripartite building, it explains the presence of deep compartments: we are dealing with an architectural technique intended to provide an inhabitable, horizontal surface. As in the same time we could recognize the presence of a transverse slope running from west to east, primarily possible to infer that in the centre of the site was extending a large hill, the most of which has been eroded away. ». And again Forest (1987: 17): « Instead of being horizontal, the Ubaid 4 levels that we discovered in 1976, 1978 and 1981 [...] we then realised [...] that we were digging on the side of a hill, most of which had been swept away by the prevailing north-westerly winds. » (translated from the French by J.S. Baldi).

Our impression is that the slope is so severe that it should not be attributed, or at least not only, to wind erosion, but probably also to the action of an ancient wadi in this area (see the eastern and southern sections of the old sounding in square X28, first opened in the 1980s and re-excavated in 2023, in Fig. 6). Although the new trench opened in this area in November 2023 only covers an area of approx. 11.5 x 6.5 m, new sub-phases could be identified within Level 2, so that a more detailed stratigraphy could be defined.

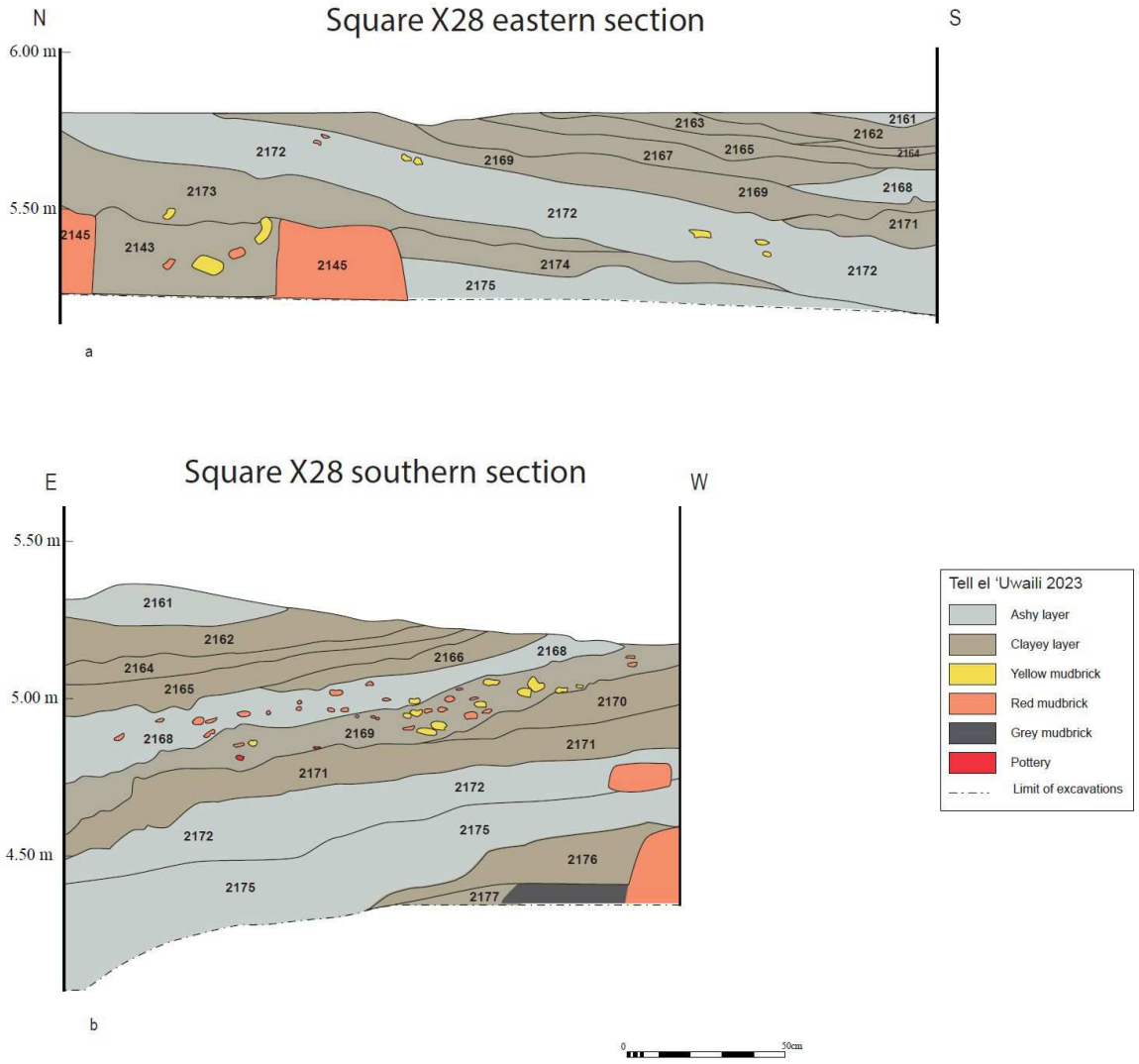

***Fig. 6** – Eastern (a) and southern (b) sections of the sounding in square X28.*

***Fig.** 7 – Level 2c: wall 2150 (to the left) and potter's kiln 2145 with its heat-vitrified plasterwork (view from the Southwest). Notice the walls of room 2157 resting upon the bricks of the kiln combustion chamber.*

A thick N-S wall (2150) and an up-draught kiln (2145) were discovered in the earliest sub-phase (2c) (Fig. 5) near the eastern edge of the excavation area that was initially opened in the 1970s and further excavated in 2023 across squares X28 and Y28 (Fig. 7). The lower part of the kiln was exceptionally well-preserved, with the thick plaster still intact on the walls and vitrified by the intense heat. Remnants of the kiln's intermediate perforated brick-floor were still visible in the eastern section of the trench. The mudbrick platform (P1; Fig. 4-5) discovered during the 2019 campaign and further exposed in November 2023 is part of a later sub-phase (2b). As mentioned above, this entire sector of the hilltop was characterised by a strong downward slope to the southeast. Considering the significant difference in elevation (approximately half a metre) between platform P1 and wall 2150 or kiln 2145, for the time being it is more cautious to ascribe these structures to different stages of Level 2, namely 2c for 2145 and 2150 and 2b for P1, respectively, despite the homogeneity of the ceramic finds all attributable to the Ubaid 4. At a subsequent stage (sub-phase 2a), located slightly further to the west, a wall with niches and buttresses on its southern side (2147) was constructed, oriented almost parallel to the previous wall 2150 (Fig. 4-5).

This wall likely served as a boundary for the extensive Ubaid 4 complex unearthed at the summit of the Tell during the 1970s. It is separated from the remnants of the communal building previously identified by a narrow passageway, which was nonetheless accessible through a doorway (2154) facing another entrance of the same size that led to a small rectangular room (2157) with thick grey brick walls. This room, approximately north-west – south-east oriented, featured a small circular pit (2142) that contained pottery and fish bones, suggesting its use for storing or discarding food. It is likely that room 2157 was probably used as a staircase, leading into the easternmost Y28 square and connecting to structures that were identified in the 1970s. The walls at the western end of the room were built on the bricks of kiln 2145's combustion chamber, which were located deep

underground. Similarly, the eastern end of room 2157 was supported by another wall (2161, not yet brought to light and partially visible in depth) going deep into the ground and characterised by a curved surface, possibly indicating the presence of another earlier sub-phase pottery kiln, analogous to 2145.

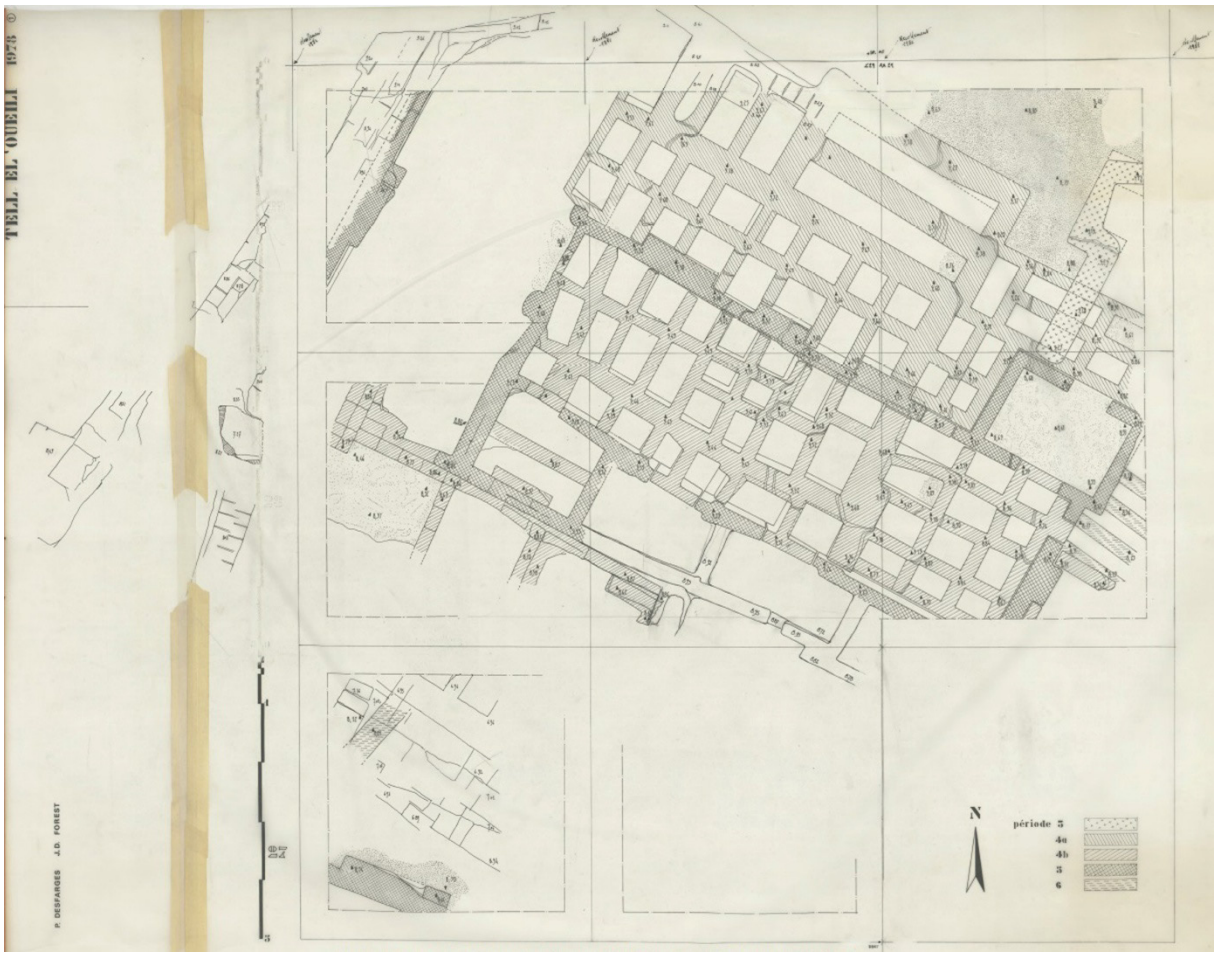

***Fig. 8** – Plan of the features excavated during the 1978 campaign on the summit of Tell al 'Uwaili. The structures indicated in squares X-Y28-29 are room 2157 and wall 2147 of Level 2a.*
© Mission de Larsa-'Oueili, R. Vallet.

Room 2157 (NE corner of squares X-Y 28-29), kiln 2145 and wall 2147 (W corner of square X28) were partly excavated in the 1978-1981 campaigns. In the 1978s plates (Fig. 8), wall 2147 is hatched (level 5), while the narrow walls 2148 and 2151 tied to its NW side are not drawn. Room 2157 (east wall) is also hatched (level 4b), while kiln 2145 is not assigned to a specific phase. According to Forest (1983a: 72) : « The 1981 campaign yielded some results of lesser importance: to the west, in squares X 28 and 29, a NE-SW wall of as yet uncertain layout appeared, which was probably contemporary with the tripartite construction. This wall is an extension of one of the elements of a double wall previously uncovered in square Y 29, which, due to the presence of buttresses, was initially thought to be the boundary of a second building. Insofar as this wall does not have any recess, it is more likely to be a terrace wall that blocked off the E-W slope of the ancient hill to make it easier to build the tripartite structure » (translated from the French by J.S. Baldi).

The rediscovery of these structures, already uncovered many years ago, as well as their connection with new vestiges that expand the planimetric knowledge of this area, is a notable outcome of the 2023 season, setting the stage for additional research in this direction during the next campaign.

XI – Report on the ceramic materials from Tell el ʻUwaili 2023

Johnny Samuele Baldi, Giulia Russo

Throughout the 2023 fieldwork season, a total of 702 fragments from various parts of the vessels were carefully examined and counted according to the procedure already followed during previous campaigns. The meticulous sorting process, which involved multiple stages of selection, started during the excavation and extended to the stages of photography, marking, description, and sampling of selected sherds. Each phase of classification and selection was guided by the principle of ensuring analytical representativeness of diverse ceramic groups in terms of chronology, technology, morphology, and style. This representativeness was evaluated both quantitatively, in statistical terms, and with respect to the specific excavation contexts where the sherds were discovered (see also Baldi 2022, 161). The limited amount of pottery collected is due to the fact that the 2023 campaign did not involve deep excavation or removal of significant mudbrick vestiges. Mainly because of the heavy rains that slowed the excavation, the latter was oriented towards extensive digging rather than the removal of deep and large quantities of stratified sediments, which resulted in the collection of relatively limited amounts of pottery.

Approximately two-thirds (430 fragments) of the collected assemblage comes from the lower part of the excavation area, namely from Level 5, dating from the second half of the 7th millennium BCE. Within this older assemblage, a large majority (298 sherds) came from the eastward extension of the trench (alley 2110 and foundation cells from the last phase of life of building B110, namely sub-phase 5a). The sherds from the oldest sub-phases (5b and 5c) of Level 5 (132 specimens) all come from the excavation of the sector around the street 2112, under the buildings B113 and B41 (which both belong the sub-phase 5a). Although older, these fragments come from less altered contexts, as evidenced by their distinctly low fragmentation rate resulting in a rather large average size. Further east, towards the top of the Tell, work in squares X28, X-Y 28-29 focused on phases Ubaid 4 and 5. These trenches yielded 272 pottery sherds, which were subsequently selected for coding, photography, drawing and macroscopic fabric analysis according to the standard procedure applied at the site (Baldi 2022, 161).

Some preliminary clarifications are necessary. The pottery kilns of the Ubaid 5 (Level 1 in the periodization of the site) were built over a mudbrick platform dated to the Ubaid 4 (Level 2). The scanty remains of these kilns lay immediately below the present surface of the mound and were covered only by a thin, loose aeolian deposit of fine sand, which also covered the mudbrick platform below. As a result, sherds were very rarely found – hence collected – from these loci. These are, in essence, the same conditions observed for these levels since the 2019 campaign that have already been described extensively to justify the very small number of *in-situ* diagnostic fragments collected from both the Ubaid 5 kilns and the P1 platform and associated Ubaid 4 features (Baldi 2022). Furthermore, part of the work in square X28 consisted of emptying the trench excavated by the previous mission in the late 1970s to early 1980s (Forest 1983b, 1983a; see also the section dedicated to stratigraphy and architecture in this report). This aeolian deposit, which has filled the trench over the last forty years, yielded rare sherds, obviously not *in situ*. Thus, of the 272 sherds mentioned above, only 96 diagnostic ones came from well-stratified contexts, namely the small room 2157 and the destruction layer covering the remains of the mudbrick wall to the west of the room. Thus, the analysis of the Ubaid 4 pottery presented below is essentially based on these

fragments. Both for the fragments from the various sub-phases of Level 5 and those from Level 2, the altered preservation conditions due to post-depositional gypsum and sea salt have already been discussed in detail elsewhere (Courtois and Velde 1983; Baldi 2022). It suffices here to say that this poses serious challenges to the examination of the sherds' painted decorations and traces of manufacture to reconstruct their *chaînes opératoires*.

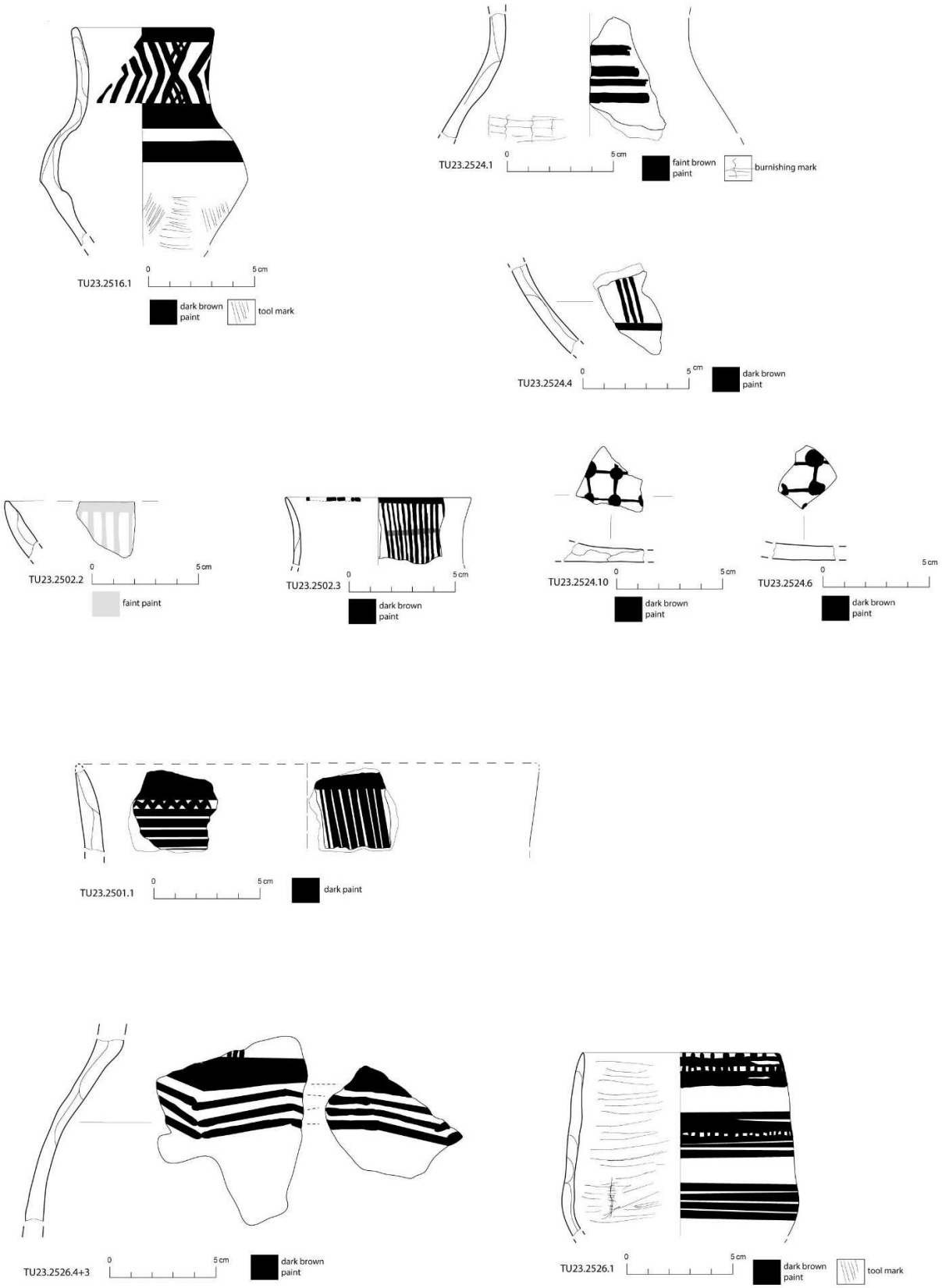

***Plate 1** – Selected pre-Ubaid pottery samples from Level 5 (drawings P. Vertuani).*

Pre-Ubaid ceramics from Level 5 (J. S. Baldi)

The pottery from this level has long and erroneously been referred to as "Ubaid 0" (Lebeau 1987), even though it represents an earlier production rather than the beginning of the actual Ubaid sequence (Baldi *et al.* in press). Level 5 ceramics exhibit a moderately fine texture and are reasonably well-fired, albeit with some irregularities. Vegetal inclusions are not unusual. In terms of non-plastic mineral inclusions, there are smaller proportions of heavy minerals and altered mica flakes. In some instances, the relatively abundant black opaque grains are likely concretions of paedogenic origin (Vallet et al. 2020). The occurrence of sparsely distributed altered grains of microlithic volcanic rocks, as well as biological elements with elongated, sinuous, black opaque characteristics, should be acknowledged. All these components are believed to be remnants of phytoliths, containing organic matter enclosed within organic silica layers that have undergone pyrolysis *in situ* without calcination. Consequently, these elements are preserved as "pyrobitumens" within the ceramic paste (Baldi 2022). Variations in firing conditions can result in the baulk displaying colours that range from beige to green to red-reddish-rose, with around three quarters of the assemblage exhibiting this colour spectrum. Firing accidents, including fire stains and deformations, are commonly observed. Additionally, there is a wide range of paint types that are used for the decoration.

When considering all the sub-phases of Level 5, four different groups of fabrics can be defined:

A. Orange mineral tempered fabrics (with probable magnetite, biotite and muscovite inclusions).
B. Orange mixed tempered fabrics (with probable phyllite, pyrolusite and small plant inclusions).
B^{I}. (A variant of the previous one) orange mineral tempered fabrics (with probable phyllite, pyrolusite and quartz).
C. Beige or greenish mineral tempered fabrics (with calcium, shale).

On the other hand, if manufacturing techniques are taken into consideration, three shaping methods are documented in Level 5.

I. Hollowing out a lump and pinching and stretching the walls + in brown or red painted decorations.
II. Hollowing out a lump and pinching and stretching the walls + application of white slip + black painted decorations.
III. Overlapping ring rounded 2-2.5 cm thick coils with inwards oriented joints + application of white slip + black painted decorations.

Throughout the various sub-phases of Level 5, some key evolutionary changes occur in terms of technical processes and quantitative aspects. The transition observed in the manufacturing methods reflects a shift from traditional practices involving red pastes and shaping by hollowing-out a lump (already documented in sub-phase 5c), to a new tradition utilizing beige-greenish pastes and small coils (increasingly common from sub-phase 5b onwards).

The morpho-functional classification encompasses a range of vessel types, including bowls with relatively large size, oblique walls, and a slightly flared rim, as well as bowls with less everted walls. Additionally, large deep bowls, sometimes carinated at the lower part of the body, feature a thinned rim. Other types include bottles, carinated jars with an in-turned neck profile, short-necked jars, jars with sinuous walls and slightly flared rim, and carinated pots with convex shoulders (Lebeau 1987, Pl. I-VIII). With the exception of a few very general types, the producers who made pots by

hollowing out a lump and using red fabrics created bowls with flat bases, husking trays, and carinated pots with convex shoulders. Conversely, the craftspeople who adhered to the small coil tradition with greenish fabrics manufactured rounded or ring-based pots and globular jars without any carination. In fact, in the case of specimens made by little coils, even pots with composite profiles have not real carination, but rather a curving contour, with gentler profile transitions (Pl. 1 TU23.2526.1).

The painted designs consistently exhibit geometric characteristics, featuring patterns that vary from simple lines to intricate textures. As phase 5a progresses, these decorations start to encompass larger areas of the vessels, including internal surfaces, foreshadowing the stylistic transition towards the later Ubaid 1 phase (Pl. 1 TU23.2524.1, TU23.2502.1, TU23.2524.4, TU23.2524.1, TU23.2501.1) according to a tendency already observed in the X36 deep sounding during the 1980s (Calvet 1987). However, wavy lines or bands are virtually absent, while vaguely triangular horizontal zig-zag decorations (that tend to disappear in later phases – see Pl. 1 TU23.2526.4; Lebeau 1987, Pl. V.7, but also in Tepe Tulai, see Hole 1974, Fig. 14.C) are still widely documented. The painted motif composed of dots connected by lines to create a sort of paperclip weave is also entirely typical of the late Neolithic phase in the whole Mesopotamia and is not attested within the later Ubaid repertoires (Pl. 1 TU23.2524.6, TU23.2524.10, see also Lebeau 1987, Pl. VIII.6). Finally, although this stylistic aspect has already been emphasised several times (Baldi 2022; Lebeau 1987), it is worth noting that some specific samples (which in the pre-Ubaid levels are only related to the production by small coils but later become typical of the Ubaid tradition) have parallels in terms of both morphology and decoration with the painted Hassuna and Samarra sphere (see the bell-shaped beakers as Pl. 1 TU23.2526.1, that become common from the Ubaid 1 phase in Eridu XIX – Safar, Mustafa, and Lloyd 1981, Fig. 100.5, but were previously already documented in Baghouz by du Mesnil du Buisson 1948, Pl. XXII.11).

Ubaid 4 ceramics from Level 2 (G. Russo)

Observations of the fabrics were carried out according to the methods and terminology applied in the macroscopic analysis of ceramics of the Northern Ubaid and Late Chalcolithic of the Balikh Valley, Syria (Russo 2022). A Dino Lite USB microscope was used throughout the process.

Ubaid 4 ceramics mostly have fine to medium-textured fabrics with predominantly mineral inclusions (Lebeau 1983: 81). Most frequent are white inclusions of calcareous origin, with rare secondary inclusions such as gray to dark gray crystals, fine multicolored sand, fine organic (≤ 5 mm) and red to black, earthy or shiny grains, possibly iron or rare clay pellets. The inclusions are mostly well sorted by size and shape, suggesting careful preparation of the paste. Sherds with mineral fabric are usually well-fired and fully oxidized, with surfaces and cores ranging in color from very pale brown to pale yellow. Another fabric, however rarely found in the 2023 trench, is characterized by a very coarse texture with abundant coarse organic inclusions (>6 mm), with brown surfaces and cores.

As far as the manufacturing techniques are concerned, the macroscopic observations presented here refer mostly to the upper body and the rims, as no complete profiles or vessels were found. Vessels were made by hand by pinching and spreading coils, obliquely joined (TU.23.2529.1). The outer surface was then scraped, turning into smoothing as the clay dried (Fig. 1, top – TU.23.2529.1_h).

During these operations, the potter held the interior of the preform, where the striations left by the potter's hand are visible (Fig. 1, bottom – TU.23.2529.1_c).

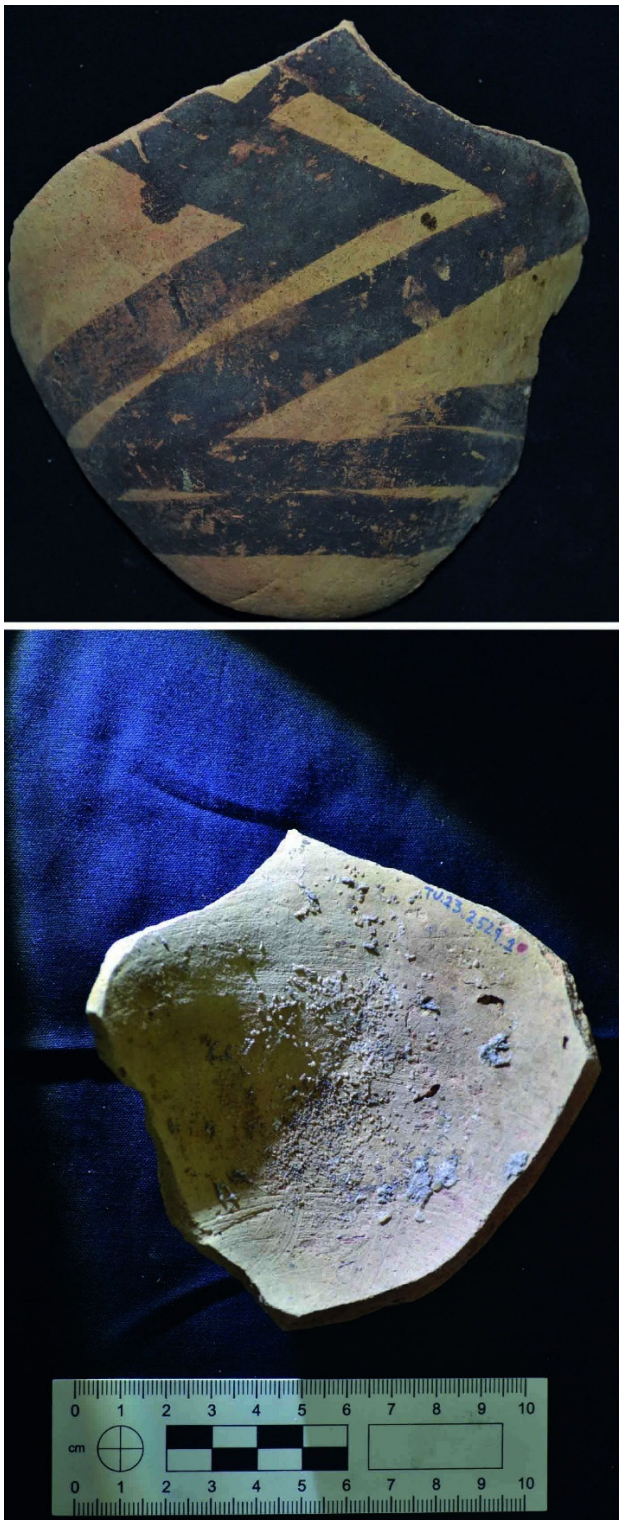

***Fig. 1** – Macro-traces of the shaping method observable on sherd TU.23.2529.1.*

Surfaces were quite often painted. The paint is matt, dark brown to black in color, quite dense and thick. The decorations are predominantly geometric. It appears that specific motifs were chosen to decorate specific parts of the vessels; for example, the inside of the elongated rim of bowls and plates, the so-called "*assiettes à marli*", is usually decorated with short vertical strokes or triangles (Pl. 2 TU.23.2530.3) between a thin line, or with a continuous band. Other decorations include the arrow motif (TU.23.2529.6), and a cypress-like motif (TU.23.2510.1), found in southern Mesopotamia at Haji Muhammad, Tell Ubaid, Ras el Amiya and Ur and in the North also at Tell Abada, Level 1 (see Jasim 2021: 68 with further references).

Coming to morphology, most of the forms identified in the 2023 campaign are already known at Tell al-'Uwaili (Lebeau 1983) as well as at other southern Mesopotamian sites such as Eridu, Ur, Tell Ubaid, Tell Uqair, Uruk, Tello and Ras el Amiya.[1] Among the open shapes, common are painted and unpainted "*assiettes à marli*" (Pl. 2 TU.23.2530.3; TU.23.2530.5), i.e. shallow bowls and plates with everted rims, either horizontal or slightly sloping towards the interior of the vessel, and with a thinned or slightly thickened lip (Lebeau 1983, Pl. III–IV; cf. Tell Zurghul, Phase 3, Volpi 2022, Fig. 4: a-d). Also found are shallow bowls and plates with slightly incurving rim, sometimes with comb-incised wavy bands on the inside (Pl. 2 TU.23.2536.1; Lebeau 1983, Pl. XIV) and rare bell-shaped beakers (TU.23.2529.1; Lebeau 1983, Pl. X; cf. Tell Zurghul, Ph. 3, Volpi 2022, Fig. 4: l) with a painted decoration of broad chevrons on the outside, whose execution could reveal a certain lack of care or skill.

[1] Marc Lebeau (1983) already provided comparisons with the above-mentioned southern Mesopotamian sites for the pottery from 'Uwaili. Please refer to his publication for the references.

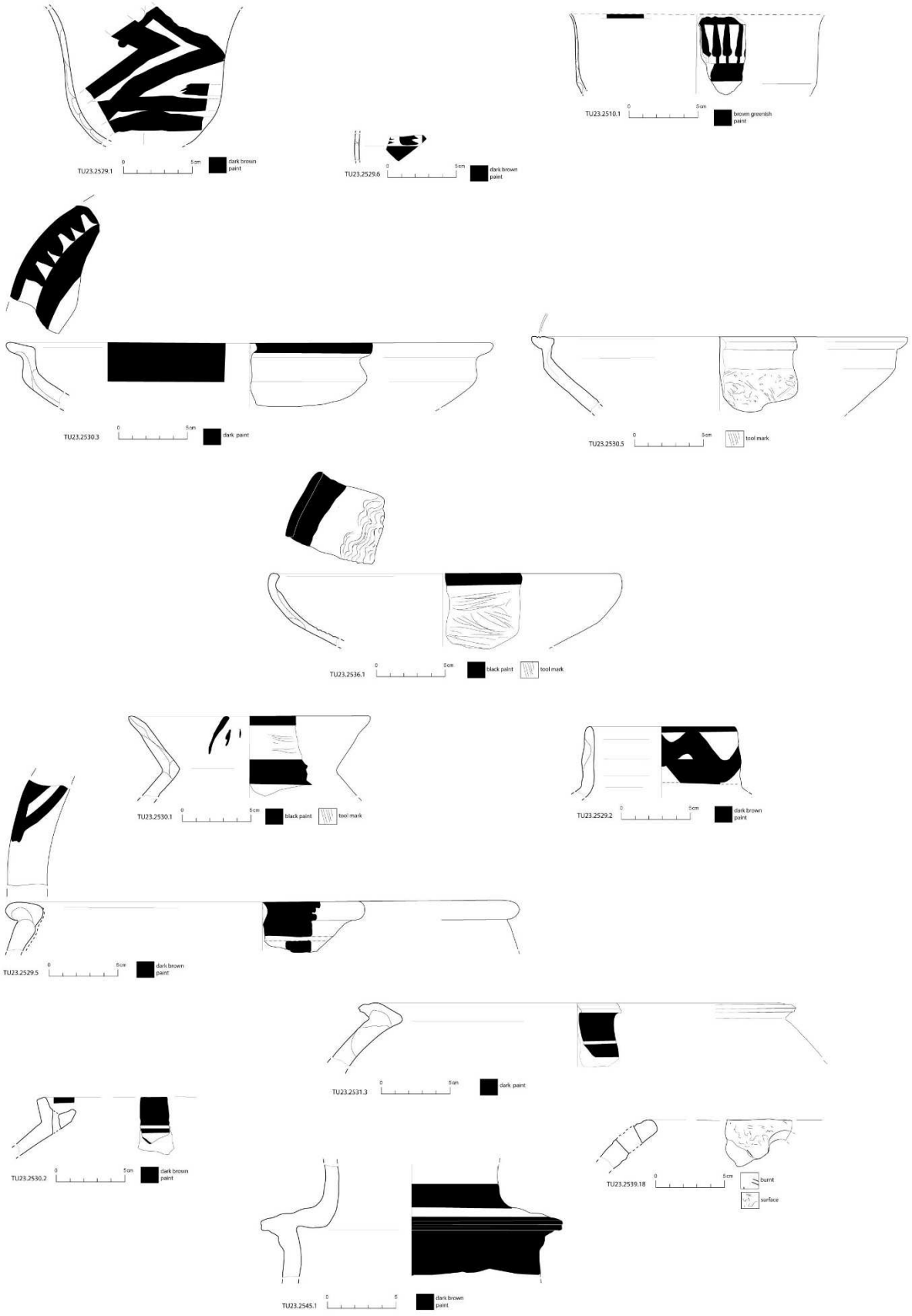

Plate 2 *– Selected Ubaid 4 pottery samples from Level 2 (drawings P. Vertuani).*

***Fig. 2** – Fragments of the rare censer from Level 2 (Ubaid 4).*

As for the closed shapes, these include jars with concave neck, internally angled, and with a flaring rim (Pl. 2 TU.23.2530.1; Lebeau 1983, Pl. XVI: 5; cf. Tell Zurghul, Phases 3-1, Volpi 2022, Fig. 5: r) or with a straight neck and simple rim (Pl. 2 TU.23.2529.2; cf. Tell Zurghul, Phases 3-1, Volpi 2022, Fig. 5: o; Eridu cemetery, Safar, Mustafa, and Lloyd 1981, Fig. 80: 11), with a broad wavy band decorating the outside of the neck. Also present are globular jars with a perforated inner ledge (or double rim; Pl. 2 TU.23.2530.2; Lebeau 1983, Pl. XX), neckless jars with thickened or slightly thickened rim (Pl. 2 TU.23.2531.3, TU.23.2529.5; Lebeau 1983, Pl. XVII: 5-11; Pl. XIX: 3; cf. Tell Zurghul, Volpi 2020, Fig. 7: 6-7), as well as holemouth pots with a simple rim (Pl. 2 TU.23.2539.18).

Finally, it is worth mentioning a censer (Pl. 2 TU.23.2545.1 and Fig. 2) with a solid painted band along the neck and upper body. Comparable shapes occur only at Eridu, Temple sounding, VII-VI (Safar, Mustafa, and Lloyd 1981, Fig. 74: 13, 15) and Tell Zurghul (Vacca 2022, Fig. 7: 4).

Incense burners are found rarely and in the context of buildings usually interpreted as "temples" where non-everyday practices took place. This outstanding find at Tell al-'Uwaili confirms the interpretation of the monumental complex excavated in the 1970s and 1980s on the summit of the Tell as an important communal building.

XII - Report on the plant remains from Larsa and 'Uwaili (2019-2023)

Carolyne Douché

Whereas agriculture is considered as one of the main driver for the development of cities and Mesopotamian societies, most of our knowledge derive from textual evidence. Based on excavation carried out prior to 2010's, plant remains were recovered on 24 archaeological sites located in Lowland Iraq (in the so-called sub-desert area). But, considering sites where a systematic sampling strategy was applied (i.e where at least 10 samples were collected and analysed), this dataset is reduced to 9 sites[1]. Indeed, archaeobotany is a relatively young discipline. When the war with

[1] All periods included, these are : Larsa, 'Uwaili, Abu Salabikh, Mashkan-Shapir, Abu Qubur, Mahmudiya, Tell es-Sawwan, Chogha Mami and Tell ed-Dêr.

Kuweït started, many international teams moved to adjacent countries, such as Turkey and Syria. This period also corresponds to the time when research in environmental archaeology – including archaeobotany – took off. As a result, during the 1990-2000s, plant remains were intensively collected and analysed in these regions, leading to a huge gap between northern and southern Mesopotamia. The systematic sampling strategy allowed to recover large amount of plant remains and new methodologies such as stable isotope or geometric morphometric analysis were applied, allowing to reconstruct farming strategies and to address new research questions. When in 2010s international teams returned to fieldwork in Iraq, the lack of data was immense, compared to neighbouring areas. Fortunately, in southern Mesopotamia, most of the new projects (Ur, Abu Tbeirah, Tell Khaiber, Lagash and Girsu) started to collect samples for bioarchaeological analysis, including archaeobotany. Analysis are in progress.

In this context, when excavation resumed at Larsa -'Uwaili in the Autumn 2019, archaeobotanical studies were immediately reintegrated to the research program. By setting up a more systematic sampling strategy during fieldwork, the main aim was to investigate the plant economy of the Ubaid village and of the early 2nd millennium city, respectively. The sediment was processed by mechanical flotation – using a water recycling system – using sieve meshes of 2 and 0.3 mm. The charred plant remains were studied using a low-power microscope (Leica EZ4W, from x8 to x35), mainly at the dig house and partly at the Institute of Archaeology of Oxford. Identification of the plant remains was carried out with the help of the reference collection - that includes many specimens from SW Asia -, with the almost complete *Flora of Iraq* and various manuals (e.g. Cappers et al. 2012, Nesbitt 2017, Sabato and Peña-Chocarro 2021). New data are compared to those previously obtained by R. Neef (Neef 1989, 1991).

Results

2019-2023	Number of samples processed	Volume processed (L)	Number of remains (identified)
'Uwaili	71 (+2 non-floated samples)	554,75	862
Larsa	87	1001,75	1932

***Table 1** – Synthesis of the samples processed for plant remains during the 2023's excavation season.*

During the 2019-2023 seasons, a total of 71 samples from 'Uwaili were processed by mechanical flotation and 49 flots were analysed (Table 1[1]). Similarly, 87 samples from Larsa were processed by mechanical flotation out of which 44 were analysed. Interestingly, during the flotation process it has been noticed that despite their richness in cereals, some samples were difficult to float. Indeed, whereas numerous charred barley grains were clearly visible in the bottom mesh, they didn't easily come up to the surface of the water and couldn't be collected in the small mesh. Consequently, these remains had to be recovered when sorting the heavy fraction. Most of the plant remains are preserved by charring but a few, such as the Boraginaceae, are mineralised, as it is often the case. The density of remains varies greatly from sample to sample.

[1] Among this dataset, only a very limited number of samples (7 from 'Uwaili and 19 from Larsa), collected in 2019 were exported and further analysed in laboratory. The rest of the material was exported in 2024. We express our gratitude to the SBAH for allowing to export the samples to carry out further analysis.

***Fig. 1** – Examples of plant remains recovered at Tell el-'Uwaili in 2023. a) Barley (Hordeum vulgare subsp. distichum) grain, b) Einkorn (T. monococcum) grain, c) Emmer (T. dicoccum) grain, d) Barley rachis, e) Einkorn (T. monococcum) spikelet base, f) Hard wheat (T. durum) rachis, g) Bolboschoenus sp. nutlet, h) Carex sp. nutlet, i) Eleocharis sp. nutlet, j) Chenopodium sp. seed, k) Brassicaceae seed.*

'Uwaili

Overall, despite the numerous and large volumes of sediment collected for plant remains, the preservation at 'Uwaili is poor. However, samples collected in 2021 in the earliest occupation levels of the site ("Ubaid 0") and those collected in 2023 in the upper levels (Ubaid 4) yielded more plant remains than other samples (Fig. 1). Future explorations will hopefully help us to understand if the poor preservation of the plant remains at 'Uwaili is linked to the archaeological contexts or to the location within the tell. The richness of the assemblage, previously studied by R. Neef (1991), evidenced the importance of barley at the site. However, these results were biased, as the numerous

grains were recovered in a single storage structure (a silo). During the season 2023, a total of 14 flots were analysed. The earliest levels (Ubaid 0-1) were poor in plant remains. A limited number of crop remains were recovered, and mainly include unidentified cereal grains and glume wheat chaff (predominantly emmer, *Triticum dicoccum*). Conversely, later occupation (Ubaid 4) yielded much more crop remains, predominantly chaff. Again, glume wheat appears to be dominant but is mainly represented by einkorn (*Triticum monococcum*). Hulled barley - mainly two-rows (*Hordeum vulgare* subsp. *distichum*) - is also attested. Concerning the wild taxa, the Ubaid 4 level yielded a high diversity, including Asteraceae, *Astragalus* sp., Cyperaceae (*Bolboschoenus* sp., *Eleocharis* sp.), small grasses (cf. *Lolium*, Panicoideae, unidentified Poaceae), *Polygonum corrigioloides*, Chenopodiaceae (*Suaeda* sp., *Chenopodium* sp.). Conversely, in the earliest levels (Ubaid 0-1) only *Lythrum*-type, unidentified wild grasses and possible tuber fragments of *Cyperus rotundus* were recovered.

Larsa

At Larsa, the difficulty to collect the barley grains of some rich samples in the light fraction could be related to gypsum. Further analysis will aim at distinguishing if the gypsum covers the grains (suggesting it appeared after charring) or fill them (indicating it was absorbed by the plant during the grain filling phase). The detailed analysis of the internal structure by using SEM imagery may be helpful to confirm this hypothesis. The results would be meaningful as they could provide information about the condition of the soils supporting cereal fields during the 2nd mill. BCE. The high content in gypsum would have reduced the quality of the grains and be the result of intensive irrigation (Jacobsen 1982). Overall, the density of plant remains varies according to trench and archaeological contexts. In B49 for example, the occupation levels dated to the 2nd mill. BCE emerged rather close to the surface. But surprisingly, the archaeobotanical samples collected in these contexts yielded rich assemblages. Conversely, despite the important depth of the archaeological levels in B50, the samples were poor. A total of 17 flots collected in 2023 in trenches B49 (n=8), F11 (n=6) and PZ (n=3) respectively, were preliminary analysed during fieldwork. Among these, 3 samples from B49, 1 from F11 and 2 from PZ yielded more than 50 identified items (Fig. 2).

Crops are dominated by cereals but in all trenches, many caryopsis were too damaged to be identified further than unidentified cereal (*Cerealia* spp.). Most of the crop remains were recovered in the room 1632 of B49. Hulled barley (*Hordeum vulgare*) is widely dominant, although a few remains of glume wheat (einkorn and emmer) is attested. A fair amount of date stones (*Phoenix dactylifera*) and a few lentil seeds (*Lens culinaris*) were also retrieved in this room. Date stones were found in the tannurs - especially 1642 - and in the great courtyard 1634 (N°1151). Similarly, in the Old-Babylonian occupation (mid-19th-18th cent. BCE) of the Trench PZ, a single date stone was identified above a floor (L.4541– n°4089). In addition, remains of hulled barley (including two and six-rows) and glume wheat (*Triticum monococcum/dicoccum*) were identified in the occupation dated to the Old-Babylonian. Comparatively, the Trench F11 – which explores the 3rd mill. occupation of the site – yielded very few remains of crops, that were very damaged. These include unidentified cereal grains, einkorn (*Triticum* cf. *monococcum*) and free-threshing wheat (*T. aestivum/durum*). All the excavated trenches were quite rich in wild taxa but yielded a distinct composition. B49 exhibits the greatest diversity, with 13 families represented, in particular small grasses (*Hordeum* sp., *Phalaris* sp.), Characeae, Cyperaceae (especially fragment of tubers *Cyperus*

rotundus) and legumes (*Astragalus/Medicago*, *Prosopis* sp. and *Scorpiurus* sp.). In F11, almost only oogones of Characeae and achenes of Cyperaceae (*Bolboschoenus* sp., *Carex* sp., *Cyperus* sp.) were found. In PZ, the wild assemblage of the Old-Babylonian occupation is dominated by Cyperaceae (especially *Bolboschoenus* sp.) but also small grasses (*Cynodon* sp., *Phalaris* sp.) and to a wider extend Polygonaceae (*Persicaria*-type, *Polygonum corrigioloides* and *Rumex* sp.).

***Fig. 2** – Examples of plant remains recovered at Larsa in 2023. a) Barley (Hordeum vulgare subsp. distichum) grain, b) Barley rachis, c) Barley glume, d) Date (Phoenix dactylifera) stone fragment, e) Lentil (Lens culinaris) seed, f) Phalaris sp. grain, g) Panicum-type grain, h) Asteraceae diachene, i) Suaeda sp. seed, j) Dianthus-type seed, k) Possible textile fragments.*

Discussion

'Uwaili

The campaign 2023 offers a unique opportunity to compare the earlier Ubaid occupation to the later one. The predominance of glume wheat in the earliest levels of 'Uwaili is consistent with previous analysis carried out by R. Neef (1991) and with our own results, obtained since 2019. However, the new study indicates that glume wheat remains the major crop during the late Ubaid whereas previous results suggested the increasing importance of barley in the Ubaid 4. This difference is the consequence of the sampling strategy. The large amount of barley grains was recovered in a silo. As a result, this level is represented by a rich and pure stock of barley that biases the assemblage. Comparison with other Chalcolithic sites in Lowland Iraq indicates that the composition of crops varies from site to site but also depends on the material recovered. At Tell es-Sawwan, the Hassuna material reflects the predominance of barley (Helbaek 1965). But only three samples were collected and studied, and only cereal grains were recovered (no chaff). Similarly at Ur, the previous study suggested that barley was dominant during the Middle Chalcolithic (Ubaid 3-4), but the grains were identified in the form of imprints from only two archaeological contexts (Jacobsen 1982). Uruk and Eridu yielded too few remains, but evidence from the Uruk Mound of Abu Salabikh (Middle Uruk, LC3) indicate that glume wheat was, as at 'Uwaili, the major crop.

The very low number of plant remains recovered in the earliest levels of 'Uwaili makes the comparison difficult. The preliminary results from 'Uwaili suggest a switch in the type of glume wheat exploited, passing from emmer in the early levels (Ubaid 0-1) to einkorn in the late occupation (Ubaid 4). If this difference had to be confirmed in a near future, it would be interesting because it could reflect change in farming strategies either as the results of socio-economic decisions and/or as an adaptation to environmental changes. Indeed, emmer wheat can bear higher temperatures but doesn't grow on marls and chalk. Conversely, einkorn wheat can grow on a wide range of soils (including basaltic, marls, clays and limestones) and better thrives on poor soils than other wheats, but it is less tolerant to hot/arid climate (Zohary et al. 2012: 34–35). Considering that 'Uwaili was settled on fertile alluvial soils and that at the beginning of the Ubaid period (7th mill. BCE) the climate was colder and more humid (Riehl et al. 2009, Altaweel et al. 2019, Engel and Brückner 2021), the cultivation of both emmer and einkorn could have been adapted to local conditions. Further work on the identification will be necessary, including for the wild taxa, in order to understand their ecology. As none of the wild progenitors of these glume wheats was growing in Lowland Iraq (Zohary et al. 2012), the crops were likely introduced in the region (Charles 2007). Thus, the reconstruction of the adaptation path associated to the transfer of plants in a new region is crucial to understand how the inhabitants of 'Uwaili succeeded in a farming system that was maintained for millennia.

About the Ubaid 4 occupation, the new results indicate a wide diversity of taxa, with reference to halophytic taxa (arid and salt-tolerant plants) such as *Suaeda* sp., and to hygrophilous taxa like the Cyperaceae. Again, this may indicate environmental changes.

Larsa

The abundance of crops (mainly cereals) in the room 1632 of B49 at Larsa is consistent with the facilities that were discovered - three *tannurs* and a food oven – indicating the use of this space as a kitchen. Both, barley and date have already been identified in B49. In 2021, excavation carried out in the room 1598 yielded large amount of barley grains and date stones (Douché 2022), together with textual evidence. This unique recovery of plant remains and cuneiform texts in a single context confirm the economic importance of these resources for the ancient city of Larsa, the kingdom and the region. As previously mentioned by several scholars (Stol 1982, Breckwoldt 1995, Richardson 2015), various settlements located around the capital-city were producing agricultural surplus on Crown lands, to feed the important urban population. Among the edible resources collected and transported – mainly by boat - to Larsa, texts report the delivery of barley, beer and dates (Breckwoldt 1995). Once in the city, the grain was dispatched to private houses/owners, temples and official institutions. Interestingly, the preliminary analysis of the samples suggests the presence of distinct morphotypes of barley, some grains looking slender/narrower than others. Further analysis (such as geometric morphometric and isotopic analysis) will be needed to understand if these morphotypes represent grains that grew under different conditions, originated from distinct fields or locations, or if they had distinct purposes.

Apart from crops, the predominance of Cyperaceae in the Old-Babylonian occupation of PZ might be the result of the proximity of the canal, allowing for the development of wetland taxa, within a riparian vegetation. Similarly, the high proportion of Characeae (stonewort) in F11 and B49 likely reflect the presence and the exploitation of freshwater, favourable to the growing of green algae. Here we would like to highlight that F11 was surrounded by channels, and B49 was located at a distance of approx. 8-10m from the canal C141 and the fields it irrigated (see Vallet et al. in this volume, esp. fig. 13). Further identification of the wild taxa will be necessary to reconstruct the arrival and the survival of the wild taxa recovered in B49. They may be arable weeds, growing in cultivated fields and discarded during crop processing or represent plants grazed by animals whose the dung was used as fuel for cooking.

Conclusion

To conclude, the season 2023 allowed to collect and process additional archaeobotanical samples at ʻUwaili and Larsa. Preliminary results suggest their immense potential to reconstruct the plant economy of the earliest village in Lowland Iraq and of the capital-city of the kingdom of Larsa. Farming played an important role in the development of these two settlements and likely contribute to their social organisation. The recovery of wild taxa will also provide information about the ecology of the sites (natural and/or anthropized). This will be a crucial work to understand how the Mesopotamian societies emerged, adapted and evolved in this particular environment.

XIII - ARCHAEOZOOLOGICAL STUDIES

Emmanuelle Vila

***Fig. 1** – Animal remains assemblage from Building B49.*

The study of the fauna of the 2019 and 2021 excavation campaigns was carried out during a 10-day stay in November 2022. The animal remains came from the excavation of several areas, including buildings B48, B49 and B50, as well as the PZ site. The faunal remains from the three buildings B48, B49, and B50 relate to the Isin Larsa period and date to the first half of the second millennium BC. The fauna from the PZ site dates to the final filling of the canal (late 18th century BC) and a later Kassite occupation (14th-12th centuries BC). The size of the faunal assemblages is very uneven between the different excavation sectors (Tab. 1). B48 and B49, in particular, yielded few or very few faunal remains.

Number of bones		B50	B49	PZ	Total
Carnivore marks		1		1	2
Fire action		11	8	6	25
Human butchery	Cutting marks	12	5	7	24
	Axe marks	7	2	5	14
Pathology					0
Total		31	15	19	65

***Table 1** – Marks on bones.*

Quantification was carried out by counting each fragment (NISP). The bones were also weighed (in grams). The identification of mammals (particularly small domestic ruminants) was based on comparative anatomy using osteological atlases (Boessneck et al., 1964, Helmer, Rocheteau, 1994, Schmid, 1972, Zeder, Lapham, 2010, Zeder, Pilar 2010). The remains with preserved diagnostic parts were measured following two references (Driesch 1976, Salvagno, Albarella 2017) (cf. measurement tables in Appendix). Ages were estimated for long bones based on the epiphysis stages

of the distal and/or proximal ends (Silver 1969, Habermehl 1975). Taphonomic traces such as corrosion or burnt marks, butchery marks (cut marks) or animal tracks (rodents, carnivores) were noted. In some cases, it was possible to reconstruct associations between certain bones.

Taphonomic observations

The animal remains are poorly preserved and very fragmentary (Fig. 1). In some contexts, the bones were probably already dry when fractured, according to remains with baguette fractures. Still, fracturing is probably mostly related to butchering and culinary preparations.

Observation of the surface of the bones (with the eye and a hand-held magnifying glass) reveals that traces of animal (carnivores) are very rare on the bones in all sectors (Tab. 1): they are observed on two bones in sectors B50 and PZ respectively. This suggests either that the butchery and consumption remains were not easily accessible to the animals, or that there were no roaming dogs. As far as identified remains are concerned, those bearing traces of more or less intense fire (brown to black in colour) are bones from the limbs and extremities of cattle, pigs and caprines. Fragments of ribs and vertebrae also show burn marks.

Traces of butchery can be seen on bones in all sectors. The traces of clear blade impacts indicate the use of a percussion tool of axe type. This tool was used to cut into quarters. The impacts are present on all the bones, whatever their anatomical position. Cutting striations resulting from the use of knives are also visible on the bones.

Species identification

Taxons		Total 2019-22	B48		B49		B50		Chantier P	
		NISP	NISP	Weight (g)	NISP	Weight (g)	NISP	Weight (g)	NISP	Weight (g)
Sheep	*Ovis aries*	33			7	92	22	279	4	35
Goat	*Capra hircus*	7			3	34	2	9	2	2
Sheep or Goat	*Ovis / Capra*	119	2	18	15	111	70	555	32	141
Pig	*Sus domesticus*	84	1	6	9	55	37	386	37	281
Cattle	*Bos taurus*	21			3	39	12	325	6	136
Donkey	*Equus asinus*	1					1	56		
Gazelle	*Gazella sp.*	5					5	33		
Small ungulate (Sh/Goat-Gazella-Pig)		67	1	6	12	38	32	191	22	77
Large ungulate (Cattle-Donkey)		2								
Total identified remains		339	4	30	49	369	182	1836	104	678
Unindentified small mammals		354	6	6	39	64	177	173	132	170
Unindentified large mammals		46			6	36	18	129	22	124
Total unidentified remains		400	6	6	45	100	195	302	154	294
Mollusc (gasteropds and bivalves)		12			4		7		1	
Fish		4					3		1	
Bird		2					2			
Tortoise	Testudinidae	2					2			
Rodent	Muridae	1			1					
Total remains		760	10	36	99	469	391	2138	260	972

***Table 2** – Faunal inventory of Larsa, 2019 and 2021 campaigns.*

The remains are mainly the bones and teeth of domestic mammals (Tab. 2). The most frequent species are sheep (*Ovis aries*), goats (*Capra hircus*), pigs (*Sus scrofa/domesticus*) and cattle (*Bos taurus*). Only one donkey remains (*Equus asinus*) appears in the assemblages (an upper molar). Very few bones of gazelle (*Gazella* sp.) are present (5 remains in all).

***Fig. 1** – From left to right: (a) Glycymeris cf lividus, (b) Conidae, (c) Hexaplex cf. trunculus, (d) Turritellidae.*

A rat-sized tibia of a rodent of the family Muridae (*Nesokia indica* bandicoot rat or *Tatera indica* Indian gerbil) was identified in the B49 archive room assemblage. Some remains of mollusks, birds, fish and a land tortoise were also found in the bone assemblages. Among the shell remains in B50, marine gasteropod marine and fluvial bivalves are present: a *Glycymeris* cf *lividus* shell (B50, locus 3035 L. Coq 2080, Fig. 2a) and a *Unio* sp. *shell* (B50, N°2059). Some marine gastropods: a Conidae sp. (B50, pit 3018, L. Coq. 2031.1, Fig. 2b), a muricidae *Hexaplex* cf. *trunculus* (B50, N°2000, Fig. 2c), a gastropod of the Turritellidae family (B50, N°3127, Fig. 2d). The marine shells were probably all fished in the Golfe.

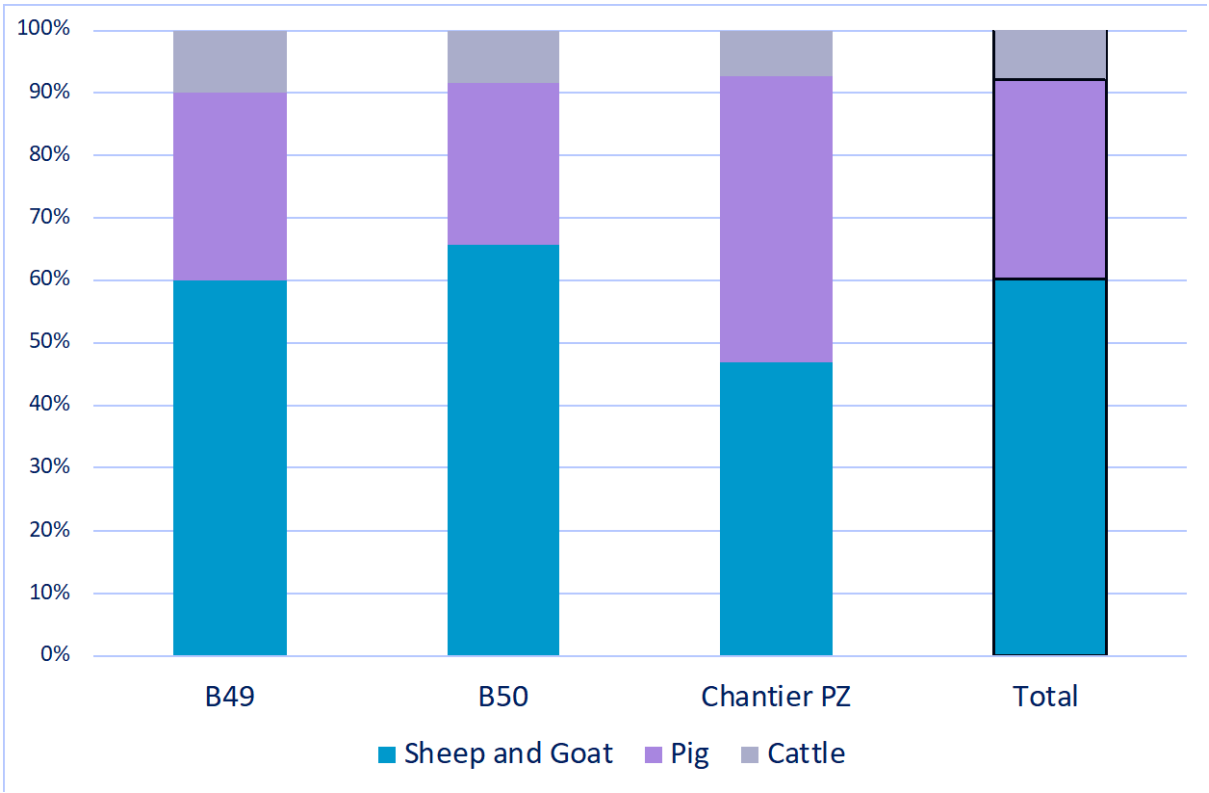

***Fig. 3** – Proportions of the main species according to excavation sectors.*

According to species distribution in the various sectors, the proportion of caprines is more remarkable in buildings B49 and B50 than in PZ sector. In PZ, pig bones predominate (Fig. 3). The difference might be related to a variation in meat consumption of the occupants of the different

areas or a variation in meat consumption between the Isin-Larsa and Kassite periods. Future excavations and faunal material will allow us to investigate these aspects more precisely.

Caprine animals (sheep and goats) and pigs are the most numerous in the assemblages. The size of the pigs is tiny. The remains refer to animals less than one year old, with some exceptions (Fig. 4). They were likely domestic animals. Concerning caprines, the proportion of sheep and goats is mainly in favor of sheep, especially in building B50, where goat remains are rarer than in the other sectors (Fig. 5).

***Fig. 4** – Mandible of a piglet (B50_3097).*

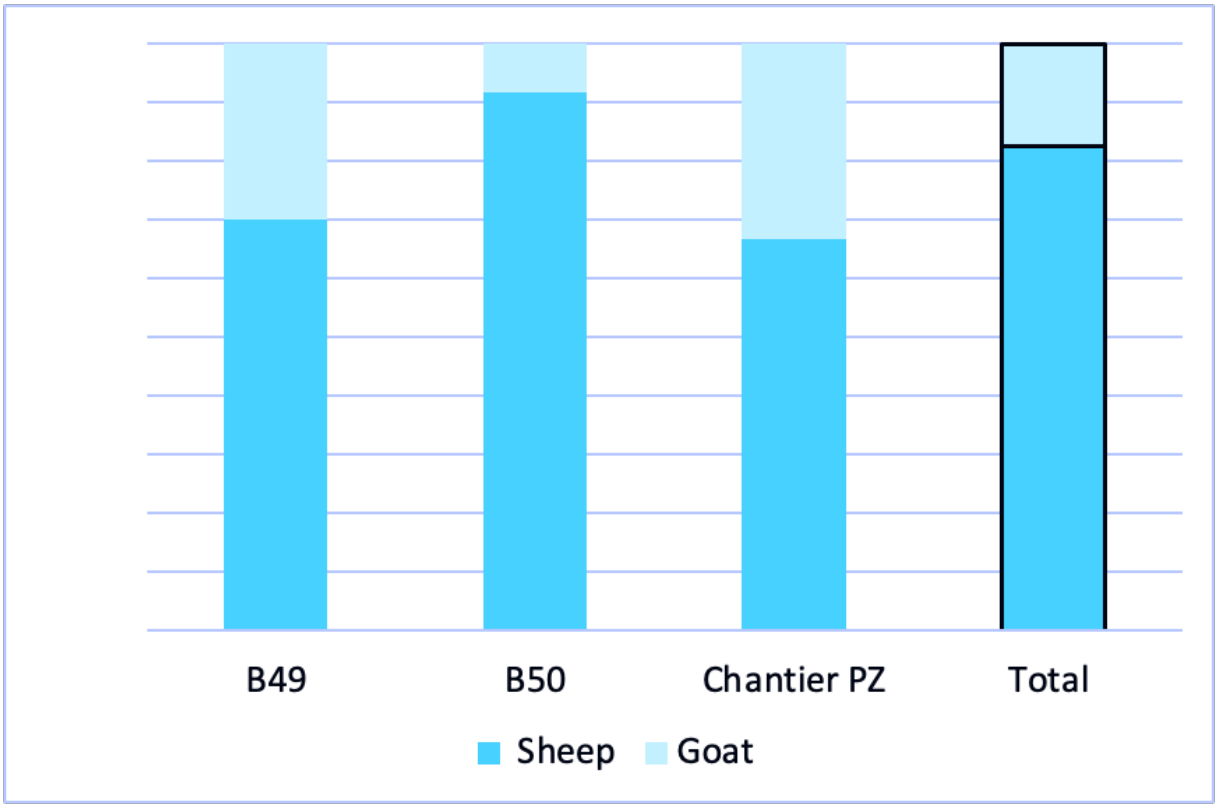

***Fig. 5** – Proportions of sheep and goats according to excavation sectors.*

***Fig. 6** – Faunal assemblages (1084) from the archive room (1598) of Building B49.*

The faunal assemblage collected in the archive room of B49 comprises only burnt bones. These are meat-rich caprine skeletal parts: shoulder parts (long bones of the forelimb: radius, ulna, metacarpus), ham parts (long bones of the hind limb: pelvis, femur, tibia), and sections of the vertebral rachis (associated lumbar vertebrae, thoracic vertebrae) (Fig. 6).

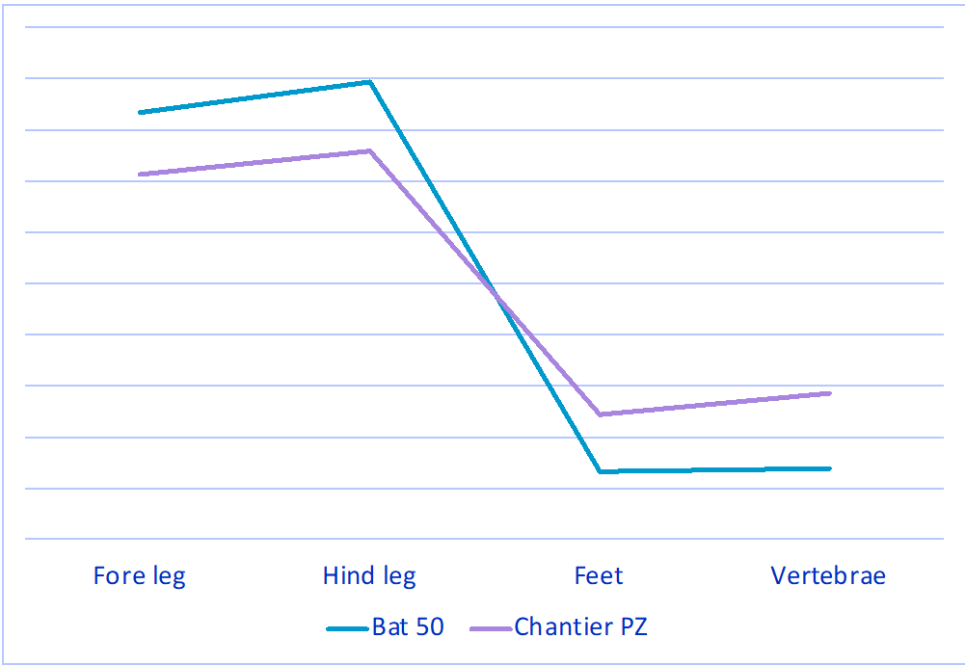

***Fig. 7** – Calculation of the relative proportion of caprine post-cranial skeletal parts for B50 and PZ.*

The faunal remains are mostly elements of the meat quarters. The extremities of the limbs (feet), which are poor in meat and often butchery waste, are proportionally in short supply (Fig. 7).

According to the fusion stages of the caprine bones, the fusion of the epiphyses to the diaphysis was achieved on most of the bones (Tab. 3): thus, adult and sub-adult animals are frequent, with juveniles being rare. Juvenile and sub-adult pig bones are relatively more numerous than adult bones.

Caprines	m=month	B50			B49			B48	PZ		
		Ovis	Capra	OC	Ovis	Capra	OC	OC	Ovis	OC	PR
Unfused	Birth										
	< 3 m			3							
	< 3-12 m										
	< 12-24 m	1		1							
	< 24-36 m	1								1	
	< 36-48 m			18	1		10			4	8
Fused	> 12 m	4	1	4				1		1	1
	> 24 m	2	1	5	2	1			1	1	
	> 36 m	2		1					1		
	> 48 m	2		6			5	1			2

Pig	m=month	B50	B49	B48	PZ
Unfused	Birth	3			
	< 12 m	3			3
	< 12-30 m				1
	< 30-42 m	4	1		1
Fused	> 12 m	3		1	2
	> 12-30 m	1	1		3
	> 30-42 m				

Cattle	m=month	B50	B49	PZ
Unfused				
	< 6-12 m			
	< 18-36 m	1	1	1
	< 36-48 m			
Fused	> 12 m	3		1
	> 36 m	1	1	
	> 48 m			

Table 3 *– Fusion stages of bones.*

In conclusion, the faunal remains from B50, B49, B48 and PZ are mostly consumer waste and represent choice meat quarters from relatively young animals: consumption of tender meat from preferably sheep and pigs.

ANNEXE – Measurements

List of abbreviations for bone measurements
(measurements are taken according to von den Driesch 1976, unless otherwise stated):

Long bones and phalanges
Bp: Breath of the proximal end.
Dp: Depth of the proximal end.
DC: Greatest depth form caput femora (femur).
Bfp: Breadth of the facies articularis proximalis (radius).
SD: Smallest breath of diaphysis.
Bd: Breath of the distal end.
BT: Medio lateral breadth of the trochlea (humerus).
BFd: Breath of the facies articularis distalis (radius, tibia, metapodes).
Dd: Depth of the distal end.
HT: Greatest height of the trochlea (humerus) (Salvagno & Albarella 2017).
HTC: Diameter of the trochlear constriction (humerus) (Salvagno & Albarella 2017).
GL: Greatest length.

(list continues two pages further on)

Scapula											
Site	US	NV	Side	Species	GLP	BG	LG	SLC	ASG		
Larsa	B50	3099	Right	OVIS		25,5	26,2	22,4	25,8		
Larsa	B50	3138	Right	GAZELLA		17,4	26,4	16,4	21,3		
Larsa	B50	2098	Right	OC	34,4	22,7	29,3	21,5	27,6		
Larsa	B48	1007	Right	SUS	25,1	15,1	21,8	16,1			
Larsa	PZ	4028	Right	SUS				16,5			

Humerus											
Site	US	NV	Side	Species	BD	DD	BT	HT	HTC	BE	BEI
Larsa	B50	3084	Left	OVIS	37	31,2	35	22	17,2	15	9,5
Larsa	B50	2011	Right	OVIS?	24,8		31,5	19,1	16,2	9,7	8,2
Larsa	B50	2045	Left	CAPRA	29,6	26,5	28,5	18,3	14,8	8,7	7,5
Larsa	PZ	4044	Right	SUS		30,1		23,2			

Radius											
Site	US	NV	Side	Species	BP	DP	BfP	SD	BD	DD	BFd
Larsa	B50	3097	Right	OVIS	36,2	17,9	33				
Larsa	B50	3091	Left	BOS					73	47	59
Larsa	B49	1060	Right	CAPRA					29,3	17,3	

Femur											
Site	US	NV	Side	Species	BP	DC	SD	BD	DD	GL	GLI
Larsa	B50	3019	Right	OC				38,7			
Larsa	B50	2061	Left	OVIS ?				43	51,7		

Tibia											
Site	US	NV	Side	Species	BP	DP	SD	BD	DD	GL	
Larsa	B50	3090	Left	OC				23,3			
Larsa	B50	3077	Right	OVIS				27,4	21,7		
Larsa	B50	3019	Right	OVIS				27,4	21,6		
Larsa	B50	3019	Left	OC	42	41					
Larsa	B50	3084	Left	GAZELLA				24	18,5		
Larsa	B50	3099	Left	OVIS			16,7	27,1	22,1		
Larsa	B49	1084	Right	OVIS				27,2	20,8		
Larsa	B49	1084	Right	CAPRA				28,6	21,4		
Larsa	B50	3066	Left	OC				26,4	19,3		
Larsa	B50	2052	Right	OC			15,1	28,1	21,6		
Larsa	B49	1083	Left	OVIS				29,5	23,7		
Larsa	PZ	4044	Left	OVIS ?				28,6	20,7		

Calcaneum											
Site	US	NV	Side	Species	GL	GB					
Larsa	B50	3084	Left	OVIS	64,6	21					
Larsa	B50	3092	Left	OVIS	62,7	21,2					
Larsa	B50	3130		OC	56,3	18,7					

Talus											
Site	US	Green number	Side	Species	GLl	GLm	Dl	Dm	BD	BPT	H
Larsa	B50	3077		OC			17,1		19,9		
Larsa	B50	3084	Left	OVIS			18		20,5		
Larsa	PZ	4010	Left	OVIS	31	29,6	18,2		20,1	16,2	24,1
Larsa	B49	1060	Right	SUS	34,8	31,6	17,3	18	20,6		

Metacarpus											
Site	US	NV	Side	Species		BP	DP	SD	BDFuss	DDFuss	GL
Larsa	B49	1084	Right	OVIS		26,9	19,5	15			
Larsa	B50	3138	Left	OVIS		23,4	17,4	13,1			
Larsa	PZ	4041	Left	SUS	MCIII	17,1	14	10,4	13,8	12,5	63,3
Larsa	PZ	4041	Right	SUS	MCIII	16,9	13,3	10,5			
Larsa	PZ	4028	Right	OVIS					26,3		

Metatarsus											
Site	US	NV	Side	Species		BP	DP	SD	BDFuss	DDFuss	GL
Larsa	PZ	4041	Right	SUS	MTV			5			49,6

Phalanx I										
Site	US	NV	Limb	Species	BP	DP	SD	BD	DD	GL
Larsa	B50	3095		OVIS			9,7	11,7	10,8	38
Larsa	B50	3066		CAPRA	11,3	13,7	9,1	10,2	9,3	35,2
Larsa	B50	3066		SUS	13,9	13,3	9,5	12,1	7,9	28
Larsa	PZ	4043		SUS	12,7	12,3	9,9	10,9	7,6	27,4
Larsa	PZ	4009		OC			9,2	9,3	9,6	

Phalanx III											
Site	US	NV		Species	SD	GL					
Larsa	B50	3057		BOS	22,7	72,9					

Scapula
GLP: Greatest length of the glenoid process.
BG: Breadth of the glenoid cavity.
LG: Length of the glenoid cavity.
SLC: Smallest length of the neck of the scapula.
ASG: shortest distance from the base of the spine to the edge of the glenoid cavity (Salvagno & Albarella 2017).

Pelvis
LA: Length of the acetabulum including the lip.

Talus
GLl: Greatest length of the lateral half.
GLm: Greatest length of the medial half.
Dl: Greatest depth of the lateral half.
Dm: Greatest depth of the medial half.
Bd: Breadth of the distal articulation.

Calcaneum
GL: Greatest length.
GB: Greatest breadth.

XIV – ARCHAEOMAGNETISM RESEARCH IN LARSA

Yves Gallet, Régis Vallet

1. Archeomagnetism

The geomagnetic field observed at any point on the Earth's surface is a vector described by an intensity and a direction, two elements that vary continuously in time and space. Its evolution over periods ranging from a few decades to several millennia defines the geomagnetic secular variation whose characteristics depend on the observation site. Direct (instrumental) measurements of the Earth's magnetic field can only describe the secular variation over the last three or four centuries. For older periods, the characteristics of the geomagnetic field can be found from analysis of the magnetic properties of archeological artifacts. This discipline is called archeomagnetism.

Constraints on the ancient geomagnetic field intensity can be obtained from baked-clay artifacts (pottery, bricks, tiles or kiln walls). Due to iron oxides contained in the clay, the firing/cooling process induces a stable thermoremanent magnetization, the direction of which is parallel to the ambient geomagnetic field at the time and place of firing, and its moment is proportional to the field intensity. When the artifacts are well dated, for instance from archeological (historical) or radiocarbon data, it is then possible to recover the temporal evolution of the geomagnetic field for a given area. It should be noted that archeointensity data can be recovered from artifacts displaced from where they were fired (e.g., pottery, bricks), whereas information on geomagnetic directions is lost. Once a regional secular variation curve (intensity and/or direction) is well established, it can be used for dating purposes.

Our project focuses on brick fragments and deals only with geomagnetic field intensity variations.

2. Objectives of the project and archeomagnetic sampling at Larsa in 2023

Recent studies have enabled us to trace variations in geomagnetic field intensity in the Near East over the last three millennia BCE (Fig. 1). These variations describe a series of intensity peaks, in particular around 2500 and 2300 BCE, which are probably due to the presence or re-enforcement of flux concentration zones at the core-mantle boundary, some 2900 km below our feet, in the area beneath the Near East. All the data currently available and the mean geomagnetic field intensity variation curve deduced from them by Bayesian calculation show that the Paleo-Babylonian period, between ~2000 and ~1700 BCE, is characterized by an intensity decreasing trend, from values of ~50 µT to ~40 µT.

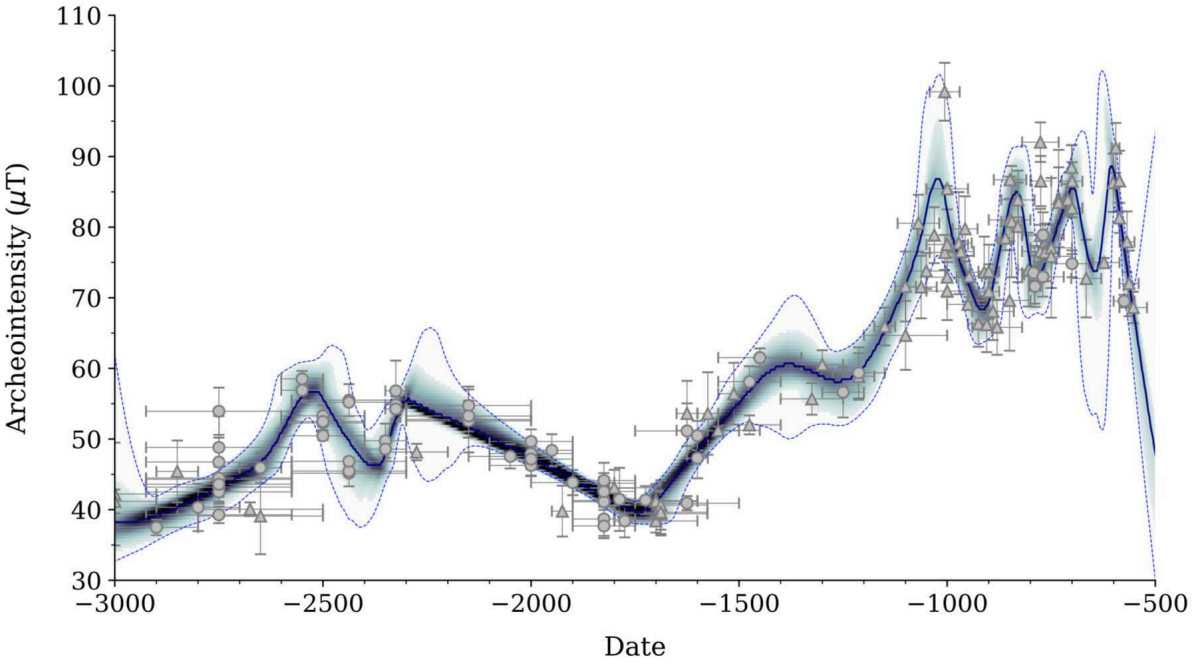

***Fig. 1** – Variations in geomagnetic field intensity in the Near East over the last three millennia BCE. The mean curve and its 95% confidence interval are calculated using a Bayesian technique. The grey dots and triangles show the individual intensity values used to calculate the mean curve.*

However, this trend is currently based on rather scattered data (due mostly to their age uncertainties), obtained in particular at Mari (third urban phase) located in the Middle Euphrates valley, and at Ebla located further west (see color code in Fig. 2). This is why it is important to confirm the trend and better specify the net amplitude of the variations. To do this, it is necessary to obtain new, well-dated archeointensity data for this period. Some of the baked-clay brick structures excavated at Larsa meet this requirement. Once confirmed, the decreasing trend in geomagnetic field intensities during the Isin-Larsa period will make it possible to use them as a dating /or chronological tool for other, less well-dated artifacts.

This year, we have focused our sampling on seven baked-brick structures discovered at Larsa, since the first excavations carried out by André Parrot, those led by Jean-Louis Huot in the 1980s, and finally the most recent ones carried out under the direction of Régis Vallet. Six of these structures concern three kings of Larsa: the two buildings B49 and B48 built at the time of King Gungunum (1932-1906 BCE), a wall of building B50 (the Gipar) and the pier of bridge PZ dated to King Sin Iddinam (1849-1843 BCE), and finally the two buildings B59 and B27 dated to King Rim-Sin (1822-1763 BCE). The last structure sampled is Gate B1, known as the “Parrot Gate”, whose

dating remains uncertain, although it was undoubtedly subject to alterations (extension) during the reign of Sin-iddinam (Vallet et al. in this volume). As shown in Fig. 2, the period covered by our sampling is clearly in line with the above-mentioned decrease in geomagnetic field intensities.

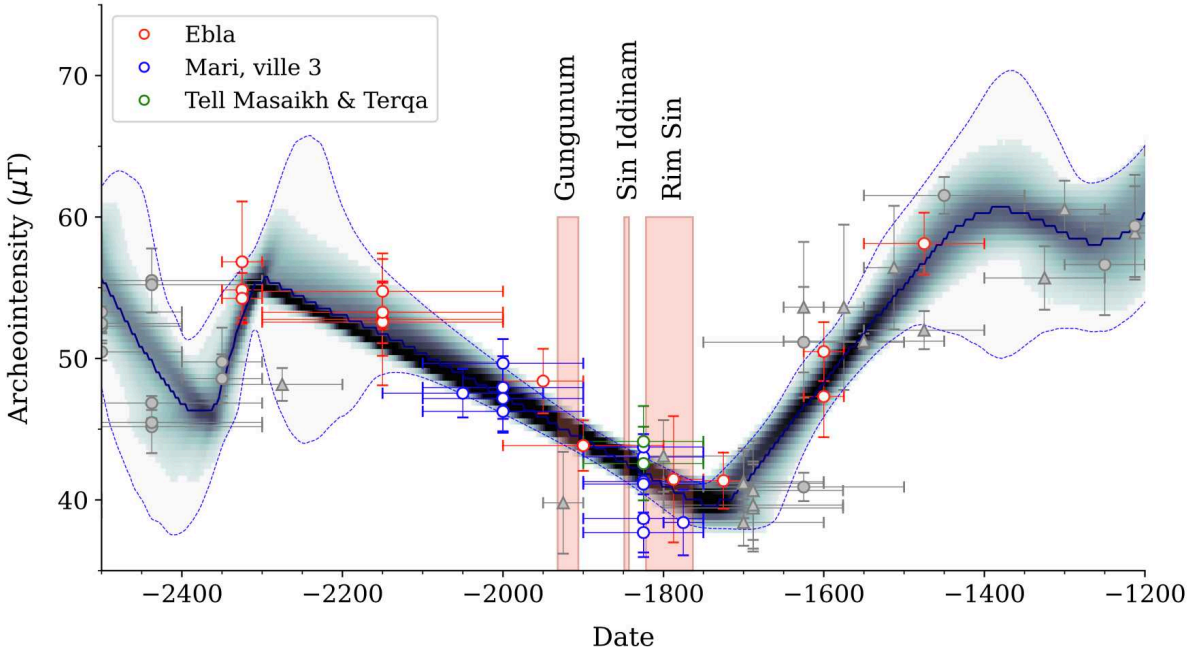

Fig. 2 *– Variations in geomagnetic field intensity in the Near East during the Isin-Larsa period (same description as Fig. 1). The rectangles in light red are placed according to the reign dates of the three kings of Larsa (Gungunum, Sin Iddinam and Rim Sin) concerned by the archeomagnetic sampling carried out in 2023.*

For each sampled structure, we have collected a series (group) of ~10 small brick fragments. From each fragment, 3 to 5 samples of ~1cm^3 will be prepared in the laboratory for archeointensity analysis using an experimental protocol developed at the Institut de Physique du Globe de Paris (Fig. 3).

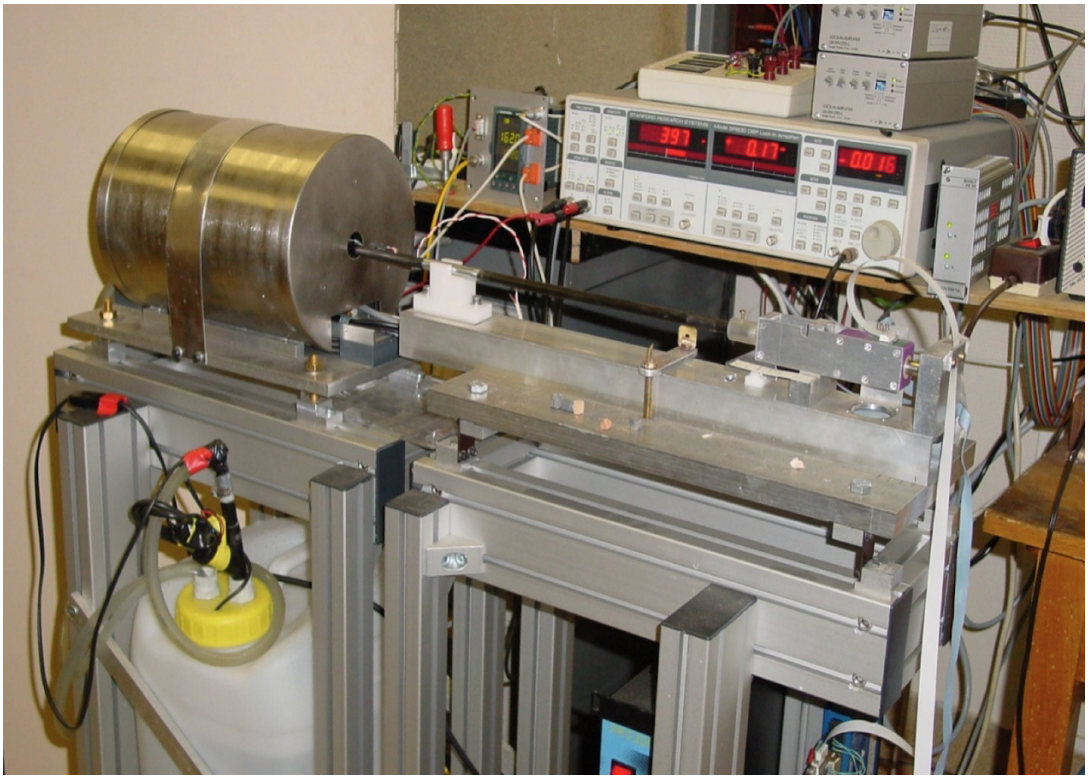

Fig. 3 *– Magnetometer "Triaxe" used for our archeointensity experiments.*

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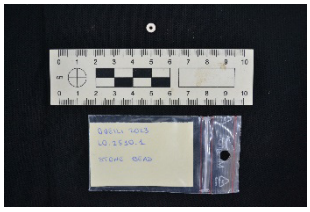
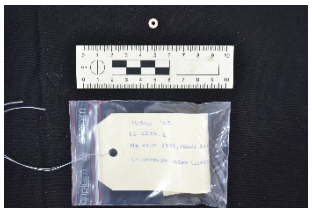
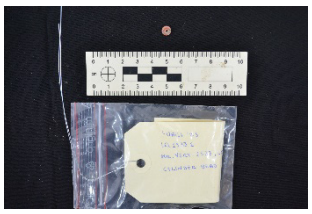
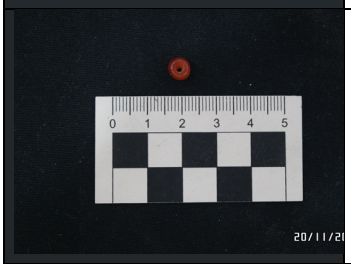
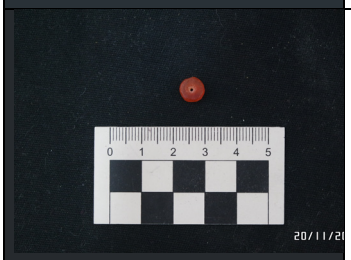
Appendix A – Museum List Fall 2022

PHOTO	Field n°	Dimensions	Material	Description	List n°
	LAR-TAB-1080-Study		Clay tablets	43 fragments of inscribed or sealed clay tablets from the House of Etellum (B49)	317
	LAR-TAB-1081-Study		Clay tablets	119 fragments of inscribed or sealed clay tablets from the House of Etellum (B49)	318
	LAR-TAB-1084-Study		Clay tablets	117 fragments of inscribed or sealed clay tablets from the House of Etellum (B49)	319

Appendix B – Museum List 2023

PHOTO	Field n°	Dimensions	Material	Description	List n°
	LO.2519.1	H. 1,2 cm; D. max. 2,2 cm; D. min. 1,8 cm	Fired clay	Complete object of cylindrical shape with two concave surfaces made of fine clay. The surface is dark Gray and polished with a shiny effect. Fine horizontal, parallel striations are visible along the body. One concave surface has a light grey colour, possibly due to use. A "splash" of Gray clay is preserved along the body. In some tiny areas along one edge, the surface is chipped. Body ornament or counting device?	320
	LO.2500.3	L. 10,6 cm; D. max. 6 cm; D. min. 2 cm	Fired clay	Almost complete pestle of the bent nail type; bent tip broken, rounded head poorly preserved	321
	LO.2510.1	L. 0,2 cm; D. 0.5 cm	Stone	Cylinder bead	322
	LO.2516.1	H. 2,6 cm ; Th. 0,9 cm ; D. max. 3,2 cm; D. min. 1.7 cm; D. hole 1 cm	Fired clay	Truncated semi spherical spindle whorl made of very coarse clay with mixed organic and mineral inclusions (grit). Dark grey colour	323

	LO.2529.1	H. 0,8 cm; D. max. 2,4 cm; D. hole 0,7 cm	Fired clay	Rhomboid spindle whorl made of fine, yellowish-brown clay	324
	LO.2533.1	H. max. 0,3 cm ; H. min. 0,2 cm ; D. 0,6 cm	Stone	Cylindrical stone bead with polished surfaces	325
	LO.2533.2	H. max. 0,3 cm ; H. min. 0,2 cm ; D. 0,6 cm	Stone	Cylindrical stone bead with polished surfaces	326
	LO.2539.3	L. 3,9 cm; Th. Max. 2,7 cm; Th. Min. 0,9 cm	Unbaked clay	Sling missile, broken along the tip	327
	T.5002.1	L. 7,6 cm; Width 4,6cm; Th. 2,2 cm; W. 84 g	Unbaked clay	Unbaked clay tablet with Paleo-Babylonian inscription. Good condition despite deteriorated reverse.	328
	LO.4063.2	D. 0,6 cm	Bronze	Spherical object, complete	329
	LO.4069.2	L. 0,7 cm; Wi. 0,6 cm; Th. 0,2 cm; D. 0,5 cm	Carnelian	Barrel-shaped carnelian bead	330
	LO.4075.1	L. 5,6 cm; Wi. 4,3 cm; Th. 1,2 cm	Terracotta	Larsa, Trench PZ. Kassite level, Old Babylonian dating. Rectangular terracotta moulded plaquette. The orange-colour artefact depicts a female figure in bas-relief, and its upper half is preserved. The woman has cropped hair visible on the neck's sides. The neck is decorated with three torques. The woman's hands support her breasts. The plaquette is slightly abraded, therefore not all characteristics are visible.	331

	LO.4075.2	L. 6 cm; Wi. 5,8 cm; Th. 1,8 cm	Terracotta	Larsa, Trench PZ. Kassite level, Old Babylonian dating. The plaquette is the back element of a chariot model, of which only a fragment is preserved. On it a bas-relief male figure is represented. The figure, which is slightly abraded, wears a horned cap, thus identifying him as a deity. In the right hand he holds a long object (a mace or a weapon?). His dress is barely visible in the upper breast, where a band characterizing the upper part of a vest is detectable.	332
	LO.4083.1	L. 4,6 cm; Wi. 5,5 cm; Th. 1,3 cm	Terracotta	Larsa, Trench PZ. Kassite level, Ur III / Old Babylonian dating. Plaquette of rectangular shape: it depicts a human figure in bas-relief. The plaquette is broken, on the preserved part there is the lower part of a dress and feet placed to the right of the viewer. The dress, although eroded, is arranged in two layers: on the external layer it is possible to recognize a pleated robe. The plaquette is moulded, traces of black paint (bitumen) are preserved on the background and partly on the robe.	333
	LO.4085.1	Th. 0,3 cm; D. 0,8 cm	Carnelian	Larsa, Trench PZ. Old Babylonian level. Rounded bead made of carnelian.	334
	C.4095.1	L. 5,7 cm; Wi. 9,3 cm; Th. 1,2 cm; D. 6,3 cm	Ceramic	Larsa, Trench PZ. Old Babylonian level, Isin-Larsa / Old Babylonian dating. Base fragment of a Larsa goblet. On the vessel's wall, close to the base, a cuneiform inscription is impressed in a rectangular frame.	335
	C.4095.2	L. 16,8 cm; Wi. 9,9 cm; Th. 1,1 cm; D. 8,6 cm	Ceramic	Larsa, Trench PZ. Old Babylonian level and dating. Goblet with vertical wall and simple round rim. Ring base, partially preserved.	336
	T.4117.1	L. 35 cm; Wi. 35 cm; Th. 9 cm	Fired clay	Larsa, Trench PZ, pillar Locus 4511. Squared fired brick, orange colour. The brick belongs to the W face of the building and bears the impressed inscription of king Sin-iddinam.	337

	C.4124.1	L. 18 cm; Wi. 8,8 cm; Th. 0,9 cm; D. 10,4 cm	Ceramic	Larsa, Trench PZ. Old Babylonian level, Isin-Larsa / Old Babylonian dating. Goblet with sinuous profile and ring base (not complete). The rim is everted and simple.	338
	LO.1089.1	L. 3,6 cm; Wi. 3,6 cm; Th. 2,5 cm	Terracotta	Larsa, Trench B49. Surface. Fragment of a plaquette of rounded rectangular shape. The object is broken and eroded. The preserved part depicts a human figure (head and shoulders preserved).	339
	LO.1103.1	D. 6,1 cm; Th. 1,1 cm	Ceramic	Larsa, Trench B49. Collapse layer of the Isin-Larsa level. Circular jar lid in good condition. Salt inlay on reverse.	340
	LO.1109.1	D. 3,2 cm; Th. 0,8 cm	Ceramic	Larsa, Trench B49. Collapse layer of the Isin-Larsa level. Circular jar lid. Eroded.	341
	T.1109.1	L. 2,3 cm; Wi. 1,8 cm; Th. 0,9 cm	Unbaked clay	Larsa, Trench B49. Collapse layer of the Isin-Larsa level. Fragment of sealing with the seal of Enanatuma, *entum*-priestess of Nanna in Ur. Traces of string on reverse.	342
	T.1109.2	L. 2,6 cm; Wi. 1,7 cm; Th. 1,2 cm	Unbaked clay	Larsa, Trench B49. Collapse layer of the Isin-Larsa level. Fragment of sealing. Illegible. Traces of string on reverse.	343
	C-3146-1	L. 7,7 cm; Wi. 7 cm, Th. 3,5 cm	Terracota	Bird figurine (perhaps a hen?), with tail and head missing.	344

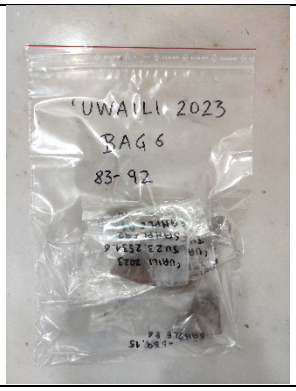
	C-3191-1	L. 22,7 cm; Wi. 11 cm; Th. 0,5 cm	Ceramic	Complete beaker typical of the Isin-Larsa period	345

Appendix C – Sample List 2023

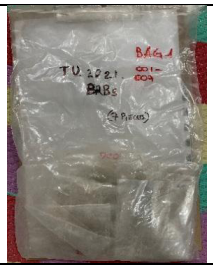
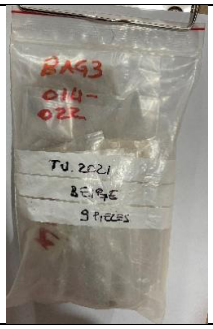
Box 1 – Ceramic samples

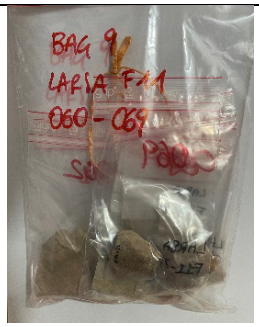
BAG 1				
Sample N.	**Material**	**Site**	**N.**	**Photo**
001, 002, 003, 004, 005, 006, 007, 008, 009, 010, 011, 012, 013, 014, 015, 016	Pottery	Larsa	TS21.1038.003, TS21.1041.002, TS21.1042.002, TS21.1048.002, TS21.1048.003, TS21.1048.004, TS21.1048.007, TS21.1048.008, TS21.1048.015, TS21.1048.018, TS21.1048.021, TS21.1048.032, TS21.1061.005, TS21.1061.008, TS21.1061.009, TS21.1061.011	
BAG 2				
017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, 028, 029, 030, 031, 032	Pottery	Larsa	TS21.1061.013, TS21.1061.014, TS21.1062.006, TS21.3066.001, TS21.3066.002, TS21.3066.007bis, TS21.3066.007ter TS21.3066.008, TS21.3066.008, TS21.3066.010bis, TS21.3066.016, TS21.3066.021, TS21.3084.010, TS21.3084.017, TS21.3084.021, TS21.3084.024	

BAG 3				
033, 034, 035, 036, 037, 038, 039, 040, 041, 042, 043, 044, 045, 046, 047, 048	Pottery	Larsa	TS21.3084.032, TS21.3084.051, TS21.3085.003, TS21.3085.006, TS21.3085.008, TS21.3085.011, TS21.3085.014, TS21.3085.018, TS21.3085.019, TS21.3085.020, TS21.3085.024, TS21.3085.032, TS21.3085.033, TS21.3095.001, TS21.3095.003, TS21.3095.008	   
BAG 4				
049, 050, 051, 052, 053, 054, 055, 056, 057, 058, 059, 060, 061, 062, 063, 064	Pottery	Larsa	TS21.3095.009, TS21.4009.001, TS21.4009.001, TS21.4009.002, TS21.4009.003, TS21.4009.004, TS21.4009.006, TS21.4009.006, TS21.4009.006bis, TS21.4009.013, TS21.4010.010, TS21.4010.015, TS21.4010.016, TS21.4010.017, TS21.4010.018, TS21.4010.020, TS21.4010.036	   
BAG 5				
065, 066, 067, 068, 069, 070, 071, 072, 073, 074, 075, 076, 077, 078, 079, 080, 081, 082	Pottery	Larsa	TS21.4010.036, TS21.4010.038, TS21.4010.044, TS21.4010.046, TS21.4010.054, TS21.4010.065, TS21.4010.067, TS21.4010.069, TS21.4014.014, TS21.4014.018, TS21.4014.019, TS21.4017.001, TS21.4017.002, TS21.4017.005, TS21.4017.020, TS21.4017.030, TS21.4017.035, TS21.3111.001	    

BAG 6				
Sample N.	**Material**	**Site**	**N.**	**Photo**
083, 084, 085, 086, 087, 088, 089, 090, 091, 092	Pottery	Tell ʻUwaili	TU23.2503.1, TU23.2539.9, TU23.2539.14, TU23.2539.15, E.2543.1, TU23.2503.4, TU23.2539.1, TU23.2539.19, E.2510.1, TU23.2531.6	

Box 2 – Ceramic samples

BAG 1				
Sample N.	**Material**	**Site**	**N.**	**Photo**
001, 002, 003, 004, 005, 006, 007	Pottery	Tell ʻUwaili	TU.BRB1, TU.BRB2, TU.BRB3, TU.BRB4, TU.BRB5, TU.BRB6, TU.PROTO.BRB1	
BAG 2				
008, 009, 010, 011, 012, 013	Pottery	Tell ʻUwaili	TU.RED1, TU.RED2, TU.RED3, TU.RED4, TU.RED5, TU.RED6	
BAG 3				
014, 015, 016, 017, 018, 019, 020, 021, 022	Pottery	Tell ʻUwaili	TU.BEIGE.1, TU.BEIGE.2, TU.BEIGE.3, TU.BEIGE.4, TU.BEIGE.5, TU.BEIGE.6, TU.BEIGE.7, TU.BEIGE.8, TU.BEIGE.9	
BAG 4				
023, 024	Pottery	Tell ʻUwaili	TU.COOK.1, TU.COOK.2	

BAG 5				
025, 026, 027	Pottery	Tell ‘Uwaili	TU.RES.1, TU.RES.2, TU.RES.3	
BAG 6				
028, 029, 030, 031, 032, 033, 034, 035, 036, 037	Pottery	Larsa B33	B33-1, B33-2, B33-3, B33-4, B33-5, B33-6, B33-7, B33-8, B33-9, B33-10	
BAG 7				
038, 039, 040, 041, 042, 043, 044, 045, 046, 047, 048	Pottery	Larsa B33	B33-11, B33-12, B33-13, B33-14, B33-15, B33-16, B33-17, B33-18, B33-19, B33-20, B33-21	
BAG 8				
049, 050, 051, 052, 053, 054, 055, 056, 057, 058, 059	Pottery	Larsa F11	F11-1, F11-2, F11-3, F11-4, F11-5, F11-6, F11-7, F11-8, F11-9, F11-10, F11-11	
BAG 9				
060, 061, 062, 063, 064, 065, 066, 067, 068, 069	Pottery	Larsa F11	F11-12, F11-13, F11-14, F11-15, F11-16, F11-17, F11-18, F11-19, F11-20, F11-21	

Box 3 – Archaeobotanical samples

BAG 1 - UWAILI				
Flot	**Trench**	**Locus**	**Green N°**	**Photo**
#FL.10		1027	1024	
#FL.11		1027	1024	
#FL.14		1026	1020	
#FL.19		51	49	
#FL.20		50	48	
#FL.21		1037	1026	
#FL.22		1045	1033	
#FL.23		86	73	
#FL.25		86	72	
#FL.28		2004	3005	
#FL.29		2003	3004	
#FL.30		2018	3018	
#FL.31		2017	3015	
#FL.32			3020	
#FL.33		2019	3021	
#FL.34		2026	3019	
#FL.36			3032	
#FL.37		2027	3022	
#FL.38		2031	3023	
#FL.39		2030	3029	
#FL.40		2032	3033	
#FL.41		2041	3044	
#FL.43		2034	3035	
#FL.44		2035	3036	
#FL.45			3050	
#FL.46			3049	
#FL.48		2111	3046	
#FL.49		2111	3046	
#FL.50		2111	3046	
#FL.51			3051	
#FL.52		2047	3048	
#FL.53		2045	3045	
#FL.55		2060	3060	
#FL.56		74	3055	
#FL.57		2067	3068	
#FL.58		2116	2506	
#FL.59			2507	
#FL.60		2124	2521	
#FL.61		2107	2517	
#FL.62		2112	2522	
#FL.63		2124	2524	
#FL.64		2124	2523	
#FL.65			2539	
#FL.66			2539	
#HP.1-2-3			3023	

BAG 2 - LARSA				
Flot	**Trench**	**Locus**	**Green N°**	**Photo**
#FL.17	B48	1515	1017	
#FL.18	B48	1515	1017	
#FL.19	B48	1515	1017	
#FL.21	B48	1515	1017	
#FL.22	B50	3032	2073	
#FL.23	B48		1007	
#FL.24	B48	1504		
#FL.25	B49	1595	1072	
#FL.26	PZ		4010	
#FL.27	B49	1595	1076	
#FL.28	B49		1058	
#FL.32	B49	1595	1077	
#FL.33	B48	1538	1067	
#FL.34	B49	1598	1079	
#FL.35	B49	1598		
#FL.36	B50	3094	3129	
#FL.37	B50	3019	3144	
#FL.38	B49	1598	1081	
#FL.39	B49		1083	

BAG 3 - LARSA				
Flot	**Trench**	**Locus**	**Green N°**	**Photo**
#FL.40	F11	5502	5002	
#FL.41	F11	5508	5008	
#FL.42	F11	5506	5007	
#FL.43	PZ	4543	4091	
#FL.44	B49	1642	1110	
#FL.45	B49	1643	1109	
#FL.46	B49	1644	1114	
#FL.47	B49	1638	1109	
#FL.48	B49	1641	1113	
#FL.49	PZ	4541	4089	
#FL.50	PZ	4543	4094	
#FL.51	PZ	4542	4093	
#FL.52	PZ	4500	5046	
#FL.53	F11	5512	5014	
#FL.54	F11	5512	5014	
#FL.55	F11	5511	5010	
#FL.56	F11	5512	5014	
#FL.57	F11	5511	5010	
#FL.58	F11	5512	5010	
#FL.59	F11	5511	5010	
#FL.60	F11	5511	5010	
#FL.61	F11	5513	5011	
#FL.62	B49		1098	

#FL.63	B49	1644	1129	
#FL.64	B49	1644	1127	
#FL.65	PZ	4509	4100	
#FL.66	PZ		4103	
#FL.67	B49	1621	1130	
#FL.68	B49	1641	1118	
#FL.69	B49	1598	1084	
#FL.70	B49	1643	1133	
#FL.71	B49	1643	1132	
#FL.72	B49	1638	1131	
#FL.73	B49	1621	1134	
#FL.74	B49	1645	1139	
#FL.75	PZ		4122	
#FL.76	B49	1638	1143	
#FL.77	B49	1642	1140	
#FL.78	B49	1638		

BAG 4 - LARSA

Flot	Trench	Locus	Green N°	Photo
#HP.1	B50		2000	
#HP.2	B49		1086	
#HP.3	B49		1045	
#HP.4	B49		1044	

Box 5 – Baked brick samples

Sample number	Trench	Photo
LA01	B49	
LA03	B50	
LA04	PZ	
LA05	B59	
LA06	B27	
LA07	B1