# BLADEN PAELEOGINDIAN AND ARCHAIC ARCHAEOLOGICAL PROJECT

Edited by Keith M. Prufer, Amy E. Thompson, and Erin E. Ray

Report of the 2022 Field Season
Prepared for the Institute of Archaeology,
National Institute of Culture and History, Belize
Belize Forest Department
Ya'axché Conservation Trust

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# Chapter 1: Introduction to the 2022 Field Season of the Bladen Paleoindian and Archaic Archaeological Project

*Keith M. Prufer, Mark Robinson, and Amy E. Thompson*

## Introduction

This report focuses on the archaeological research conducted at Saki Tzul, Ek Xux, and Muklebal Tzul (Figure 1.1) during the 2022 season of the Bladen and Paleoindian and Archaic Archaeological Project (BPAAP). All research components occurred under the auspices of the BPAAP, under the permit issued to Dr. Keith M. Prufer by and with permissions from the Belizean Institute of Archaeology (IA). Field components at the Classic period surface sites were directed by Dr. Amy E. Thompson. This research was conducted in conjunction with the Ya'axche Conservation Trust.

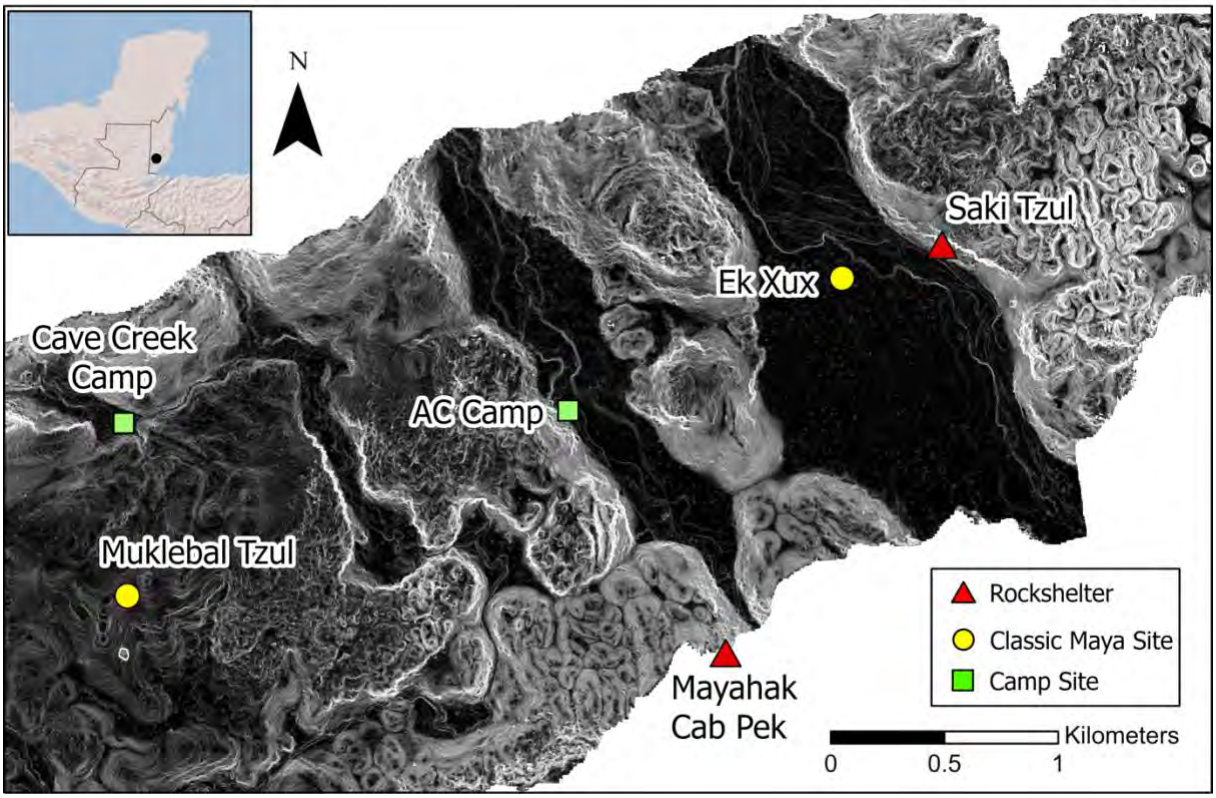


**Figure 1.1.** A. Locations of Saki Tzul Rockshelter and Muklebal Tzul and Ek Xux Classic Maya sites discussed in the text Lidar slope model as the background.

This research was funded by the Society for American Archaeology (SAA) H. and T. King Grant for Precolumbian Archaeology, awarded to Thompson, and further supported by the Department of Geography and the Environment at The University of Texas at Austin (UT). Field based research was conducted between May 13 – June 6, 2022 under permits issued by the Institute of Archaeology, National Institute of Culture and History.

Researchers in the 2022 BPAAP field season included Dr. Keith M. Prufer (PI), Dr. Mark Robinson (co-PI), Dr. Amy E. Thompson (field director), Dr. Willa Trask, UNM PhD graduate

students Erin E. Ray (MA) and Nadia C. Neff (MSc), and UT PhD graduate student Chris Ploetz (MSc). Local field assistants included Olegario Sho, Raymundo Sho, Silvestre Rash, and Wilmer Mes. Ya'axche rangers who participated in field work included Gerry Coc, Dillo Cal, Jack Canti, and Marvin Pop.

Over the years, numerous individuals in Belize provided us support. This year, we thank Jose Mes of Santa Cruz village, Beth Dorgay and Said Gutierrez of the YCT. Other Belizeans have helped make our lives more comfortable while in the field, including Francisca Bardalez and Edward Bardalez of Big Falls Village.

## The Bladen Paleoindian and Archaic Archaeological Project

We conducted continuing excavations in two large rockshelters in the Ek Xux valley of the Maya Mountains, located in the Bladen Nature Reserve, an uninhabited wilderness in the Toledo District. Research was conducted in May and June 2020 to take advantage of the dry season weather. The purpose of this study was explore the earliest presence of humans in Belize and Central American during the Paleoindian and Archaic Period (10500-2500 BCE). Previous research conducted by Dr. Prufer documents that these earliest pioneering hunters and gatherers in Belize and among the oldest in Central America. This project seeks to explore their presence through limited excavations in two rockshelters in the upper Bladen. Permission has also been requested from the Forest Department, in collaboration with the Ya'axché Conservation Trust, for camping permits. Funding for this project has been secured from the Alphawood Foundation. This project the sixth major phase of a long-term project of assessing human adaptation and ecology in the Maya Mountains prior to and after the development of agriculture. The results of these studies are of interest to scientists in archaeology and environmental studies, conservation planning, and the Belizean public.

We also conducted preliminary excavations at Ek Xux and Muklebal Tzul in Bladen Nature Reserve. These are reported in chapter 4 and 5, as well as a brief remapping of the location of caves in the Ek Xux valley.

The area where this proposed research took place is 50km (Figure 1) northwest from Punta Gorda and 25km west from the nearest road, infrastructure, or village. The closest communities are Golden Stream Village and Medina bank, both in the Toledo District. The two rockshelters were named Maya Hak Cab Pek (MHCP) and Saki Tzul (ST) in the 1990s. The sites of Ek Xux and Muklebal Tzul are likewise located in the upper tributaries of the Bladen Branch.

## 2022 Archaeological Research Objectives

The 2022 archaeological objectives were to gain a better understanding of the occupational history of the civic ceremonial cores of Ek Xux and Muklebal Tzul are they articulate with the broader, and well-studied, settlements in the region.

2022 field components:

- Test unit excavations were conducted at Saki Tzul rockshelter by Dr. Keith M. Prufer, Dr. Mark Robinson, Dr. Willa Trask, Erin E. Ray, and Nadia C. Neff and are reported in Chapters 2 and 3.

- Test unit excavations were conducted in the East Group of Ek Xux (Figure 4a) by Dr. Amy E. Thompson and Chris Ploetz and are reported in Chapter 4.
- Test unit excavations were conducted in Group 1 of Muklebal Tzul (Figure 4b) by Dr. Amy E. Thompson and Chris Ploetz and are reported in Chapter 5.
- A 4-day cave location survey was conducted by Chris Ploetz and Dr. Amy E. Thompson and is reported in Chapter 6.

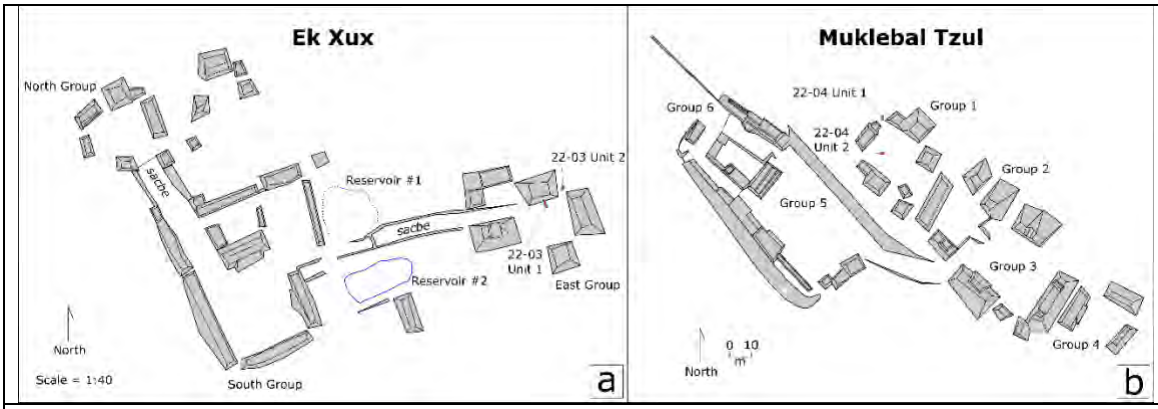


**Figure 1.2.** Locations of 2022 test unit excavations at Ek Xux (a) and Muklebal Tzul (b). (Modified from Thompson et al. 2023: Figure 2).

# Chapter 2: Saki Tzul Unit 15 Excavations

***Mark Robinson and Willa Trask***

In 2022 the BPAAP team returned to Saki Tzul rock shelter to continue excavations. The naming of the excavations continues the sequence of numbering across all years, with Unit 14 being the final previous excavation. Extensions to an excavation unit are assigned a new unit number, to maintain spatial control.

Previous excavations at Saki Tzul have focused on one broad area of the long rock shelter. The area is the most open section of the rock shelter and includes extensive sediment. The wall of the shelter faces south, running east-west. A large rock, which appears to be breakdown from the cliff wall, dominates the area, creating a distinct bounded space between it and the rock shelter wall. The area delimitated by the large rock has been the focus of previous excavations, revealing multiple human interments since the Late Pleistocene, through to the collapse of the Classic Period Maya.

The previous excavations focused on the immediate area next to the rock shelter wall, revealing a distinct stratigraphy and well-defined burials. The area adjacent to the large rock had not been explored. As such Unit 15 was placed to explore the localised stratigraphy and whether burials are present, providing insight into site formation processes, how sacred space is defined, and potential changes in burial practices throughout the Holocene.

Unit 15, an initial 3 x 1 m excavation unit was established in the area between large rock and the wall of the rock shelter, adjacent to the large rock (long axis running east-west parallel to the large rock). The discovery of burials that extended outside of the confines of the 2 x 1 m excavation required extension of the excavation, ultimately resulting in the additions of Unit 19, 20, and 21.

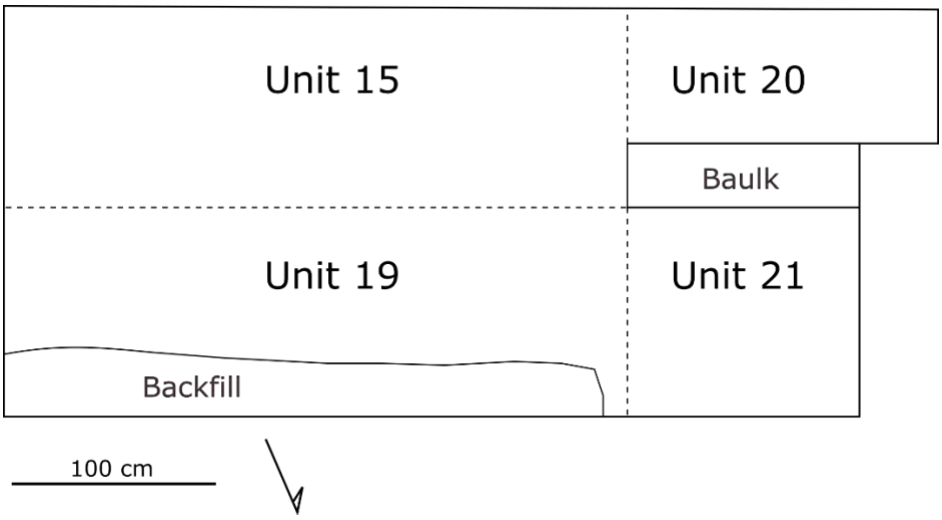


*Figure 2.1 Schematic of SubOp 22-02*

Unit 19 (3 x 1 m) extended the excavation 1 metre to the north (toward the shelter wall). The northern 15 cm of the extension overlapped with previous excavation units. The backfill that defined this boundary was left intact to maintain the previous excavation's position.

Unit 20 extended the southern edge of Unit 15, 1.4 m to the west to recover overlapping burials that were partially exposed in Unit 15. The excavation was 60 cm wide to enable full recovery of the burials, but avoid disturbance of any potential additional burial contexts.

Unit 21, extended Unit 19 to the west by 1.2 m to recover a burial that was partially exposed within unit 19.

Excavation of Units 20 and 21 were halted after the recovery of the burials, to enable focus on the primary excavations of Unit 15 and 19, and avoid potentially uncovering further burial contexts.

After the removal of extensive and complex burials, excavation continued in Unit 15 and 19 as a 2 x 2 m excavation unit, halting excavation of the western 1m of each unit. Excavation of Unit 15 and 19 was closed for the season on a distinct stratigraphic change at 110 cm below datum. Completion of the excavations, down to bedrock will be conducted in the following field season.

The excavations are documented here, focusing on stratigraphy and the definition of burial contexts. Osteological detail of the burials are reported elsewhere. The excavations followed natural and cultural contexts, assigning an arbitrary Context Number to each unique context. A context is defined by having a distinct formation process, for example a sedimentary stratum, a burial, a ceramic cache.

**Excavation**

There are extensive dried leaves and small twigs on the surface of the area (Context 1). Due to the lack of moisture, there is no vegetation growing in the area. The matrix forming the surface is a dry, loose, disturbed silt. The loose silt (C2) was removed to a slightly more compacted layer of silt (C3).

C3 surface and the supporting matrix below (C4) was removed to another more compacted surface (C5) which included charcoal fragments. A small boulder is present in the east of the unit, continuing below the surface. The matrix in the southwest (C6) is looser and probably disturbed.

The C5 surface and underlying matrix (C7) were removed to C8 surface. A distinct horizontal plane with some areas of disturbance. The rock in the east continues below and three small rocks are present in the west in a cluster. Ceramics, lithics, shell, human bone, and faunal bone were recovered in the matrix.

Removal of the C8 surface and underlying matrix (C9) revealed another distinct surface (C11). The large rock in the east continues. The western part of the surface, to the north of the cluster of

rocks from above, is disturbed, with extensive human bone present. The bones appear to be a mix of primarily unarticulated elements, designated C10. The matrix around the C10 is very loose.

Continued excavation through C11 surface revealed a complex array of disturbed primary burials alongside the C10 mix of bone elements. As the skeletal elements and their associated burial cuts, extended outside of Unit 15 to the north, Unit 19 was established parallel to Unit 15 to uncover the full extent of the contexts. Unit 19 extends 1m to the north, overlapping with previous excavations by 20 cm.

**Establishment of Unit 19**

The upper stratigraphy of Unit 19 matched that of Unit 15, Including the modern ground surface (C15), underlying fill (C16), surface (C17, matching Unit 15 C3). The previous backfill (C18) was left in-situ. C19 fill material was removed to C20 surface (same as Unit 15, C5). C21 fill and C22 surface correspond to C7 and C8. Removal of C23 fill revealed distinct matrixes across Unit 19 surface.

C24 is associated with the large rock of Unit 15, including some human bone elements.
C25 is a dense rocky matrix. C26 is a highly disturbed, soft silt. C27 is a loose matrix in the northwest of the unit. C28 is a general fill material, corresponding to C9.

Removal of C24, C26, C27, and C28, revealed a continuous surface (C29) of unconsolidated small rocks and jute shells. Two small areas (C30 and C31) appeared to have a slightly different matrix than C29 and were investigated separately, but did not yield any distinct features, increased charcoal in the matrix suggests potential thermal activity.

**Unified Unit 15 and 19**

With both units at the same stratigraphic level, full exposure of the bone feature was undertaken. The exposure revealed four disturbed primary burials and a burial pit including a mix of disarticulated elements from multiple individuals.

The primary burials are labelled C13, C14, C32, and C35. The bone mix is labelled C10.
C13 consists of the lower legs of an induvial lying prone east-west with the head (missing) to the east. The legs are on top of a large flat boulder, with he femurs broken midshaft on the edge of the boulder and by the intrusion of the C10 burial mix. Elements of the shoulder girdle of C13 were recovered under elements of C32 burial, revealing that C13 was interred prior to C32 and the C10 mix. The large boulder below the legs of C13 may be grave architecture for C13, however, the rock is more likely associated with a buried individual below, with the deposition of C13 being placed partly on the rock when the rock was encountered during the interment of C13.

C14 consists of a highly disturbed burial in the southeast of the unit. The burial consists of part of the hips, spine and arms of an individual lying east-west, with the (missing) head to the west. The legs potentially extend outside of the unit to the east, although bone elements were not present in the excavation wall. The southeast corner of the unit, cuts into the burial context,

consisting of very loose sediment, which likely indicates a later disturbance that impacted the burial preservation. The head of the C14 was disturbed by the later interment of C35 and C32 burials.

C32 is a prone individual, lying east-west, with head to the west. The intact legs are laid on top of a large flat boulder. Part of the arm is on a large sloping boulder. The boulders were likely grave architecture associated with the C32 burial. The head and shoulders of C32 are heavily disturbed by the C10 burial mix, which cuts through the burial. As mentioned above, elements of C32 are above elements of C13.

C35 is an east-west lying burial, (missing) head to the east, laying along the edge of the large boulder that bounds the area. Few elements of C35 are present, with the left humerus and scapula the main articulated elements. C35 was likely disturbed by the interment of C32.

The C10 bone mix consists of multiple crania and assorted bone. The crania and bones may originate with the primary interments, having been redeposited during each burial. Further lab work will target identification of specific elements and potential assignment to the identified primary burials.

The C10 mix likely includes at least two periods of activity based on the included matrices. The activity would have required digging into the ground surface, through any existent burials, and the deposition of skeletal elements. As C10 cuts through C32 and C13, at least one episode of activity must have occurred after C32 interment, which contextually appears to be the most recent of the primary burials. As such, as C10 disturbs C32, it is likely that this later activity deposits bones from other individuals that are not interred within the space of the excavation. This does not rule out some of the elements in C10 being from the burials within Unit 15 and 19, especially as C10 appears to include at least 2 periods of activity.

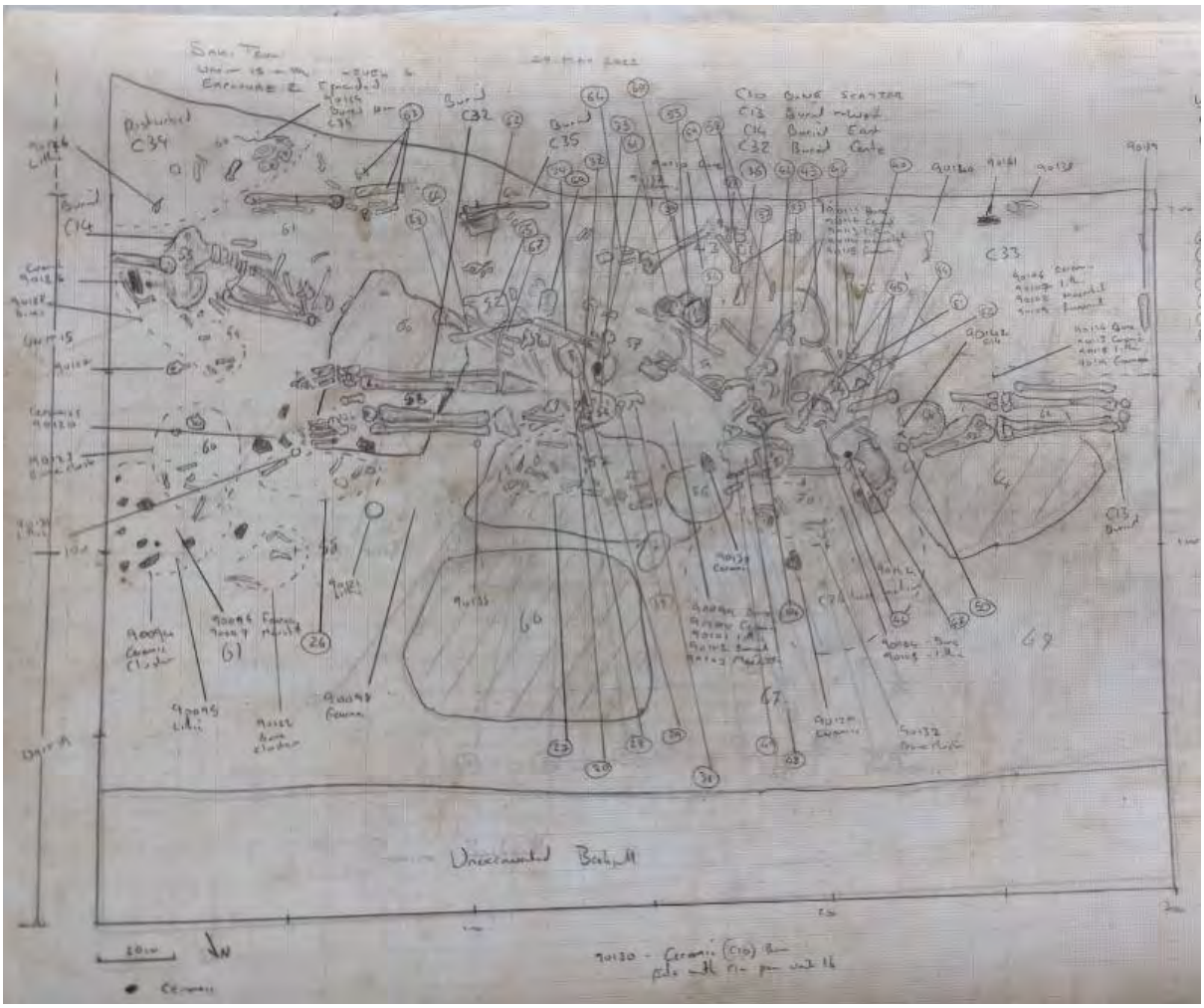

*Figure 2.2. Unit 15 – 19 Level 6 Exposure 2*

**Unit 20 Extension and C36, C39, C46 burials**

Following the excavation of the burials in Unit 15 and 19, another individual was discovered in the southwest corner of the unit, parallel to the edge of the large boulder. This individual (C36) was lying prone, east-west, with head to the east. A small boulder was placed on top of the crania. The legs extended outside of Unit 15 at the mid-femur. As such Unit 20 was established to extend the excavation to recover the complete individual.

The well-preserved and mostly intact C36 skeleton was interred with C46. The two individuals were laid on top of each other, head to toe. These two individuals appear to have been interred together as a single event.

The feet of C36, are comingled with the feet of a flexed burial, C39, which is laid east-west, head to the west, facing north. C39 was a later interment, with elements of C39 overlaying the crania of C46.

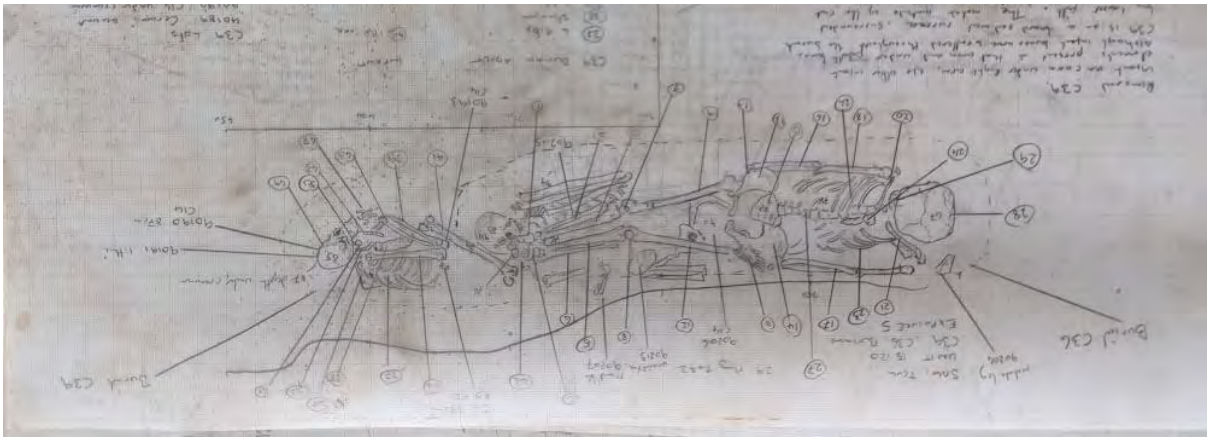

*Figure 2.3. Unit 15, 20 C39 Burial*

The sediment around C36, C39, and C46 is very loose, as is characteristic of sediment adjacent to the edge of the large boulder. The lack of clear stratigraphy and consolidated matrices in the area makes the burial cut and context difficult to define. Although stratigraphic, and therefore chronological position can be ascertained.

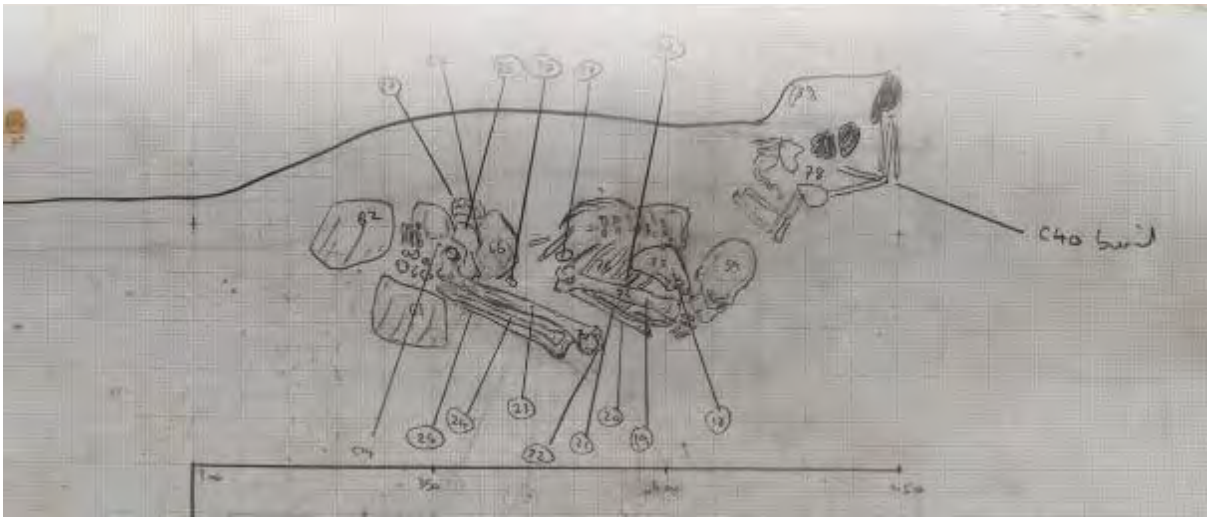


*Figure 2.4. C40 Burial*

The far southwest of Unit 20 includes infant bones (C40) and some large ceramic sherds within a very loose silt, directly adjacent to the edge of the large boulder. The infant interment is partially articulated, but the very loose sediment makes definition of the burial position difficult to discern. The C40 infant burial does not appear to be associated with C39 burial.

Excavation of Unit 20 was halted after the recovery of C36, C39, C46, and C40, to focus attention on Units 15 and 19, and avoid any further potential burials outside of the primary unit.

**C50 burial**

Back in Unit 15 and Unit 19, beneath the large flat rock that supported burial C13 was a well-preserved individual, C50. C50 is laying prone, east-west, with the head to the east. The arms are

folded across the stomach and feet crossed at the ankles. A shell bead necklace is present around the neck of C50.

Following recovery of C50, excavation was halted in the area due to temporal constraints.

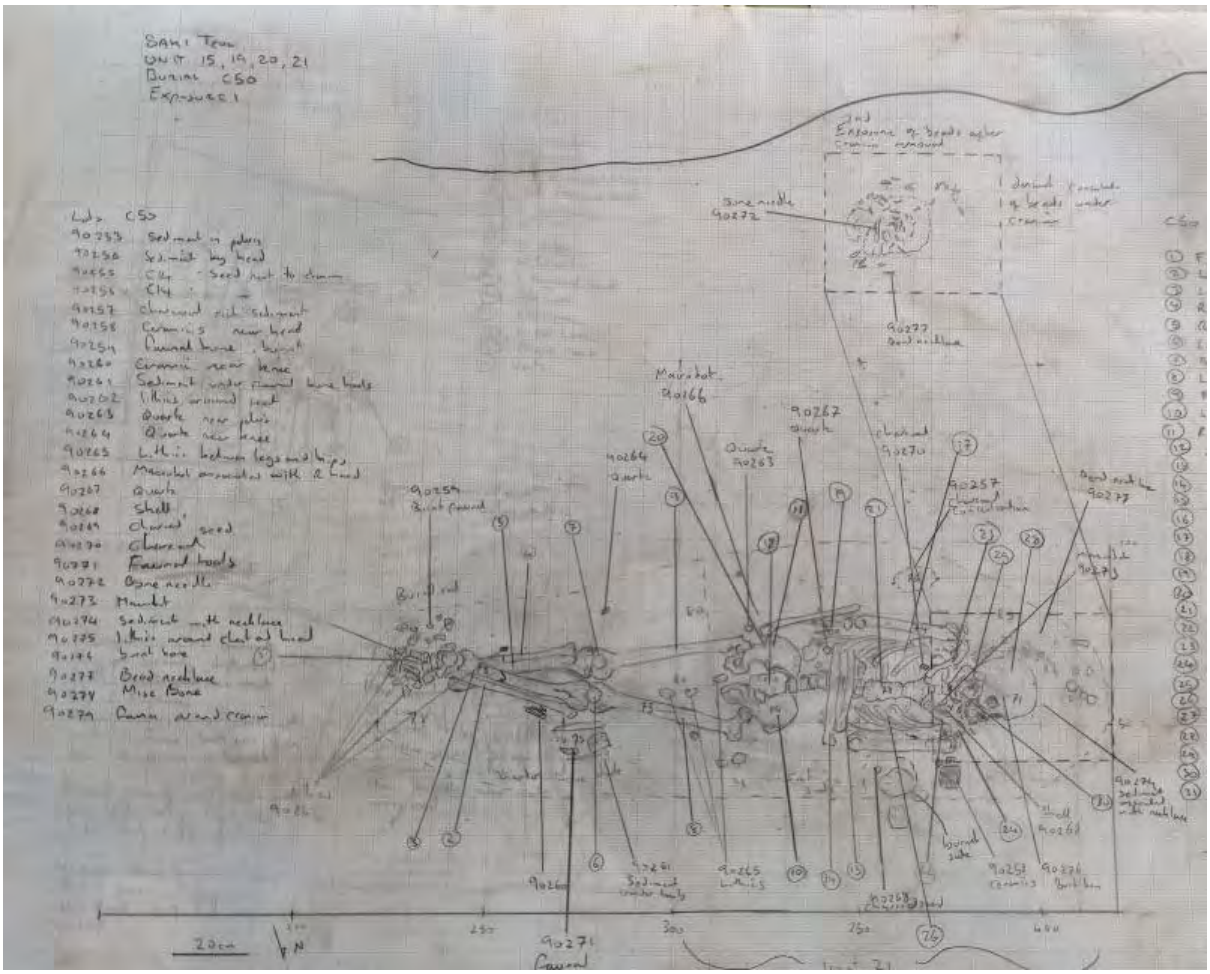

*Figure 2.5. Burial C50 Exposure 1*

The burials and their associated burial cuts covered most of Unit 15 and 19, obscuring the stratigraphy. The burials were clearly cut into the contemporary ground surface and deposited into relatively shallow graves, which were then covered with loose sediment.

Although highly disturbed by the interments, the stratigraphy does match that of the previous excavations in the area, with two distinct jute rich strata present, each of approximately 25 cm thickness. The upper jute stratum is within a darker sediment matrix and the jute are hard and intact. The lower jute stratum is far more degraded, with the brittle and often crushed jute within a lighter, sediment matrix.

All burials dug into the two jute rich strata, but they post date these horizons. All burials are expected to date to Maya occupations, which will be tested with radiocarbon dating.

Following the removal of the burials, Units 15 and 19 were excavated to a continuous stratigraphic horizon below the jute rich horizons. Excavation was halted and the units lined and backfilled, to be resumed in a future field season.

**Summary**

The excavation was placed to explore the use of space in the well-defined area between the large boulder and the rock shelter wall. The excavation demonstrates that the entire area was used as a cemetery, but also some distinct characteristics when compared to the burials closer to the rock shelter wall. Previous excavations closer to the wall show a greater range in body position and orientation, with many of the burials oriented north-south. All burials closer to the large boulder are orientated east-west, parallel to the large boulder (which is also parallel to the rock shelter wall).

The presence of the C10 bone mix is particularly distinct, with no other deposit previously encountered at Saki Tzul. Lab work with assess whether the bone elements can be assigned to any known individual from the 2022 or prior excavations. The location of the deposit, closer to large rock than the rock shelter wall, possibly suggests the rock shelter wall was held in higher regard within the ritual space; however, the redeposition of the bones in the fairly limited space between the large rock and the rock shelter wall, demonstrates that the area was not reserved for only pristine burials.

The disturbance and removal of skeletal elements from previously interred individuals when depositing a new burial gives insight into how the (long) dead are conceived. Radiocarbon dating will provide tighter chronological information on the individuals, but the disturbances demonstrate that memory of the location of the burials is not retained, and when a previous burial is encountered, the new interment is allowed to disturb the existing grave, leaving in place any skeletal elements that do not impede the new interment.

Further excavation of Unit 15 and 19 to bedrock (or most likely rock wall breakdown) will complete the stratigraphic profile, exploring use of the area through its entire history of human occupation, which is known to extend to the Late Pleistocene.

# Chapter 3: Saki Tzul Unit 16 Excavations

*Erin E. Ray and Nadia C. Neff*

**SubOp 22-01**

A 2m x 1m unit along the southwest wall of the Saki Tzul rockshelter was excavated with the goal of identifying the spatial extent of the concentration of burials along the rockshelter face identified in previous excavations (Kennett et al., 2020; Prufer and Kennett, 2020; Prufer et al., 2021). This unit was recorded in a combination of levels and contexts following a European style. Thus, the surface of level was considered a separate context from the context of the fill and any other unique contexts that were present in the level. Additionally, some contexts cross-cut arbitrary levels. All contexts were captured together into a singular level which extended across the horizontal plane of the unit and vertically included the surface and fill of one or more contexts. Unit 16 abutted previous excavations and was likely the location of the remnants of a previous back dirt pile. Thus, we expected that leaf litter in the uppermost surfaces was from previous excavation as well as a lack of cultural materials rather than *in situ* cultural material. We also recorded this unit using digital methods including digital notetaking with the GoodNotes app and the first exposure of burials ST.22.16.13 and ST.22.16.14 was mapped using completely digital methods including a photograph and Adobe Illustrator on an iPad. This was all backed up daily to other project member's iPads and iPhones. The unit was extended twice due to early burial encounters. Unit 17 and 18 extensions were dug in sequence below C13/C14. As the matrix was the same in the extensions as it was in the primary unit 16, the contexts are reported from the primary unit. Separate lot numbers were assigned for each artifact type, context, and unit. A total of seven levels, 21 contexts, and at least 4 primary burials were excavated in sub-op 22-01. Although the unit was not excavated to bedrock due to the complexity of the features, this report will still begin with the oldest contexts.

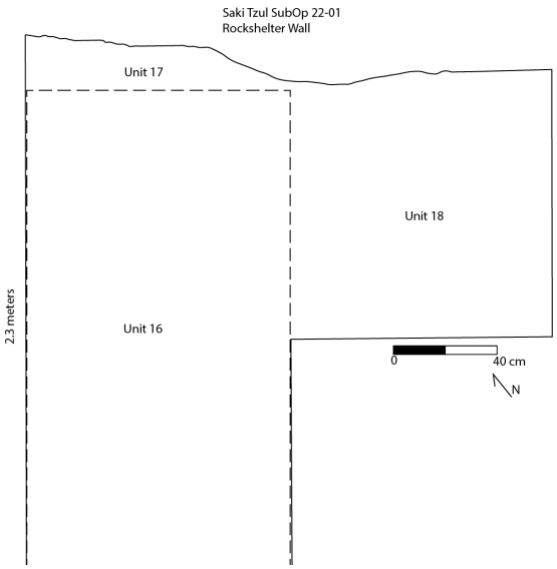


*Figure 3.1. Layout of SubOp 22-01 Units*

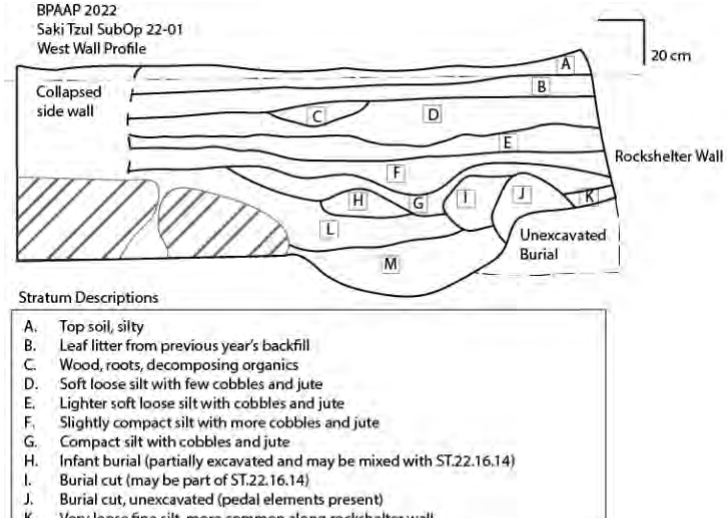


*Figure 3.2. West wall profile. Note: this was not excavated to bedrock and only includes strata excavated in 2022 season*

## Level 7

C19 – This context was the fill of the level 7 and contained some isolated remains including a radius, ulna, and humerus that might belong to a burial (ST.22.16.15b) located just north of a medium size rock. The matrix was silty with small cobbles and mixed jute.

C18 – The majority of the fill of level 7 and was characterized by the lack of human remains, isolated or otherwise. Like C19, this was loose silt with some small cobbles and mixed with jute.

C20 – Burial ST.22.16.20 This was the lowest burial and remains mostly unexcavated. During this year's excavations, only a few lower limb elements, roughly in anatomical position, were uncovered. These were left in place and protected pending subsequent full excavation next field season. Preliminary examination of the lower limb elements suggested an adult based on fully fused epiphyses. Further excavation is needed to understand the burial's association with the other burials found nearby.

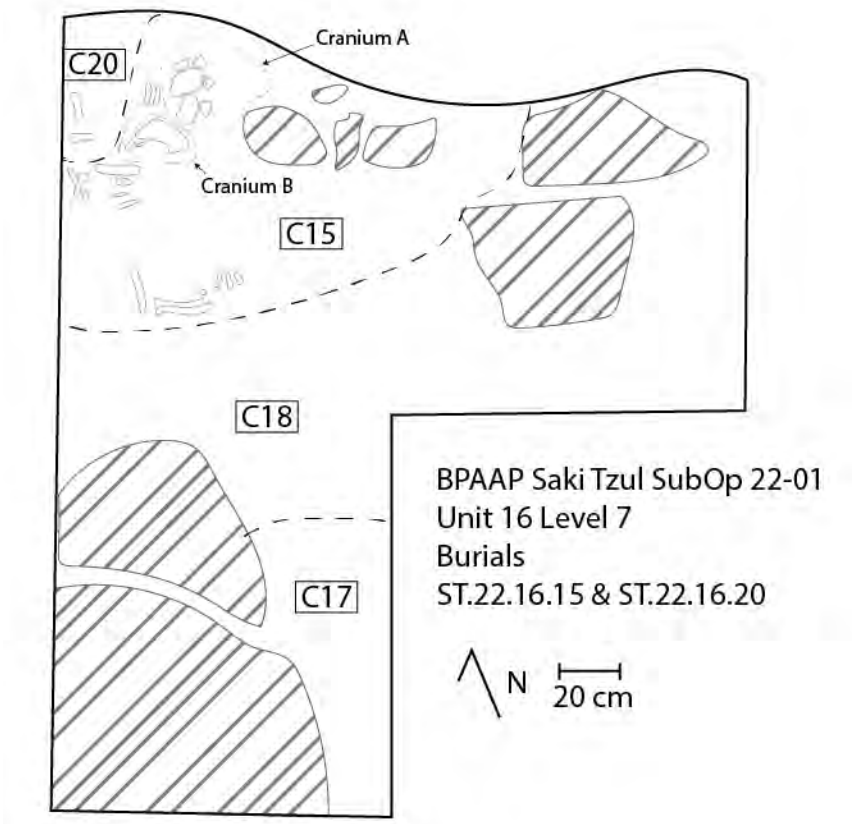


*Figure 3.3. Exposure 3 ST.22.16.15a,b. The full extent of the burials was difficult to determine due to poor preservation though cranium 'b' is likely a N-S oriented burial with head to the north. Cranium 'a' is likely associated with an E-W oriented burial with head to the west.*

*Figure 3.4. C15 Pomacea sp. feature in the bottom of the picture*

C15 – ST.22.16.15a, ST.22.16.15b (Figure 3) This context consisted of two adult individuals, labeled in the field as ‘a’ and ‘b’. These were both very poorly preserved and highly fragmentary. It was not clear from the excavations which elements in the northwest corner of the unit belonged to which individual nor was it possible to discern a definitive temporal relationship between the two. As such, the individuals were excavated in sections with each group of elements removed and assigned separate lot numbers. The MNI of this context was primarily based on the presence of two crania though other duplicate elements may be identified in the lab. The post-cranial remains of one individual (likely burial ‘a’) were mostly articulated and follow a west – east orientation with the head to the west. The second individual (likely burial ‘b’) had a north – south orientation with head to the north. No lower limb elements associated with this burial have been found yet, but it is possible they are a bit lower or extend into the west wall. Future excavations will be necessary to locate additional elements and fully assess the burial position. Based on the co-mingling it is possible that these burials are coeval though it appears that the north – south oriented burial occurred earlier relative to the east – west burial though large rocks both above and below the burials confound this relationship. Also found in this context was a *Pomacea sp.* feature (Figure 4) which was given a different lot number due to similarity in the matrix surrounding both the burials and the feature. The entire matrix of this context was loose silt with mixed jute. The sediment density increased relative to distance from the rockshelter wall.

**Level 6**

C21, no level but likely level 6 – This context was identified by the juvenile/infant crania in the sidewall of the unit. It was initially suspected that it may be associated with other juvenile/infant elements that were scattered along the west wall of the unit, but further investigation suggested that it may be a more articulated burial and more complex than time would allow for further investigation. This was left for next year’s excavation.

C17 – Level 6 fill around rocks at south end of the unit, with fewer jute and cobbles than surrounding matrix however this could be associated with the large rocks found in that region of the unit. The rocks were not removed, and this portion was not excavated further this season.

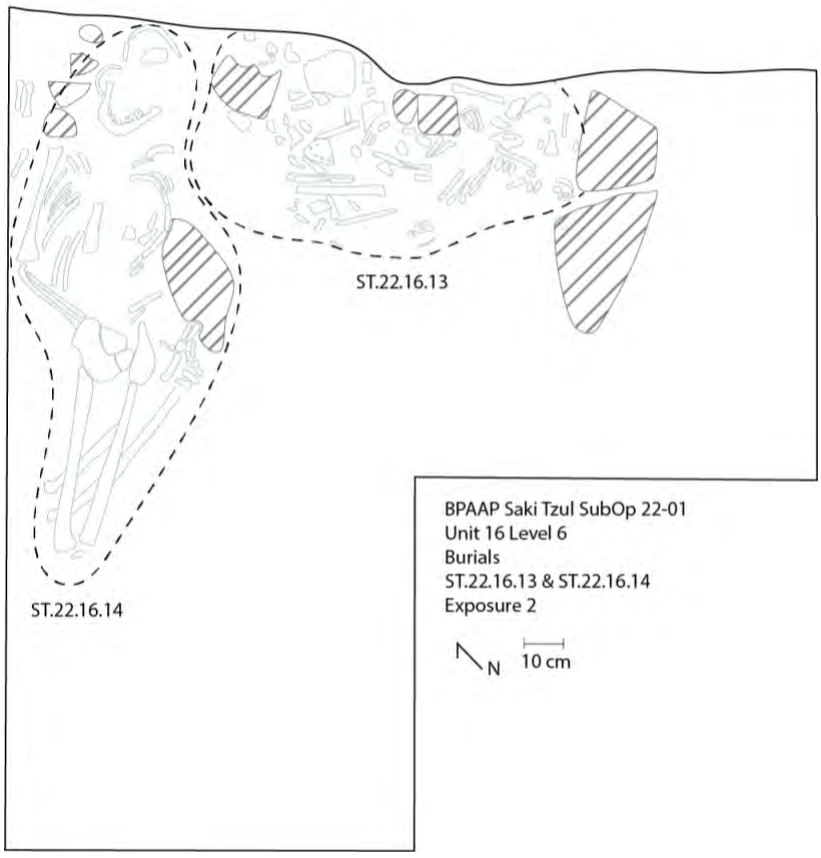


*Figure 3.5. ST.22.16.13 and ST.22.16.14 Exposure 2 map*

C16 – Level 6 fill south of the burials in the unit but north of the large rocks. It was characterized by silt with cobbles of small to medium size, and jute throughout. There was an isolated petrous and some infant remains (cranial fragment and neural arch). These were consistent with infant remains found above but will require further lab analysis to determine if they were from the same individual.

C14 – ST.22.16.14 A primary adult burial and potentially isolated juvenile/infant remains possibly associated with C21 and C16. The primary burial was a semi-flexed individual in a north – south orientation with head to the north in a prone position and face down. The upper limbs appeared to be in semi-flexure with the hands below the pelvis. The tibiofemoral joints were in tight flexure with the hips in a neutral position. The right foot was above the right ilium and the left foot was not determined though it was likely in a similar position. A large rock, possibly part of the burial furniture was in place just above the thorax and the thoracic vertebrae leading to very poor vertebral, ribs, and upper limb preservation. Additionally, the right side appeared more fragmented than the left possibly as a result of the relationship between the two burials discussed below. The matrix surrounding the burial varied slightly with the loosest silt near the cranium and increasing compaction to the south, following the gradient found in much of the excavation. Unit 17 extension was not dug in sequence with the primary unit above this context as the extension was dug as a result of this burial.

C13 – ST.22.16.13 This was a highly-fragmented primary adult burial. Fragmentation was most likely due to the large rocks placed on top of the individual probably as part of the grave architecture, including a metate fragment (collected for phytolith analysis) placed over the western-most portion of the burial (Figure 6). This individual was in a fully flexed prone position, face up. It was in an east-west orientation with head to the east facing south. Articulation was observed and is best illustrated in exposure 1 (Figure 7). Much of the right side of the individual abutted the rockshelter wall, this could be due to original burial placement or due to taphonomic processes that caused some of the elements to drift toward the loose soil in the north and underneath the overlying grave architecture that slumped toward the wall. The burial matrix was fine, very loose silt with some small fist sized cobbles and jute throughout. The unit 18 extension was not dug in sequence with the rest of the primary unit above this context as it was a result of this burial encounter. The relationship between ST.22.16.13 and ST.22.16.14 was difficult to discern and while they may be coeval excavation suggests that ST.22.16.14 was placed first and later ST.22.16.13 partially displaced the right side of ST.22.16.14. It is also worth noting that this individual was placed almost directly above ST.22.16.15a but with the opposite orientation with the crania of the former above the pedal elements of the latter and vice versa. Both burials likely to date to the Classic period as they contain a few ceramics. Of note was a well-preserved tan slipped jar fragment that refits with sherds found in the Unit 15 excavations. The integration of ST.22.16.13 burial with the sherd (the northern most sherd mapped in exposure 1) suggested a primary association of the sherd and burial and that Unit 15 represented secondary burials that were cleared from elsewhere in the rockshelter. Note that this would need to be confirmed through laboratory analysis of isolated remains, refits, and the spatial extent of their present position.

*Figure 3.6. Level 6 C13, note the metate fragment in the northeast corner of the unit which is directly above pedal elements from ST.22.16.13 and the large rock just above the trunk of ST.22.16.14*

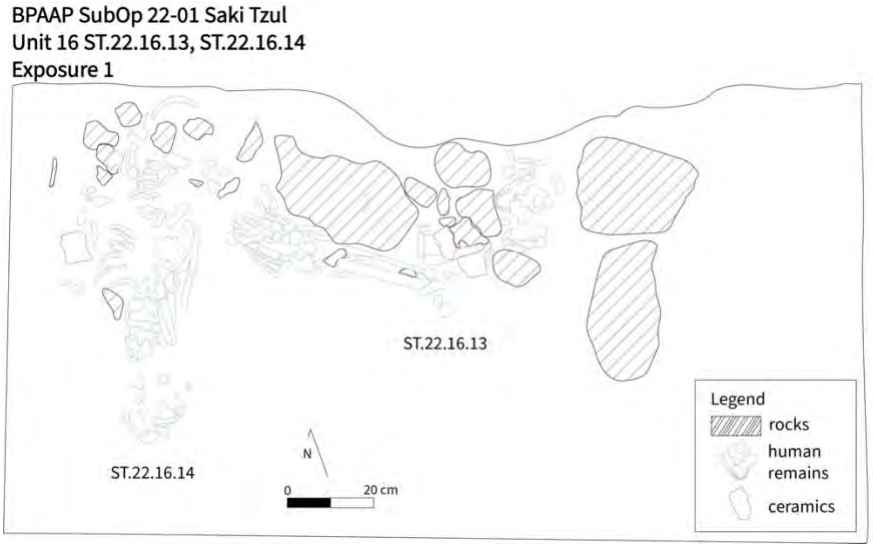


*Figure 3. 7. Burials ST.22.16.13 and ST.22.16.14 exposure 1 map, digitized directly on iPad in Illustrator*

C12 – Level 6 fill was mostly loose silt with a compaction gradient from the north to the south with the loosest sediment at the north end of the unit along the rockshelter wall. There were small cobbles throughout and sparse jute.

C11 – The surface of level 6 was defined by a large rock found in a north central portion of the unit. The matrix was silty and loose with a concentration of ceramics and some lithics in the northwest corner.

**Level 5**

C10 – The fill of level 5 was characterized by small and medium sized cobbles with some jute. An isolated proximal metatarsal was recovered from this context and may be associated with the earlier contexts.

C9 – The surface of level 5 was recognized by appearance of large rocks and cobbles. The large rocks may have been part of the burial architecture for C13 and C14 burials.

**Level 4**

C8 – The fill of level 4 had small cobbles, very soft matrix especially against the north wall and in the southeast corner. Also notable was a color gradient of the sediment with the south end being darker in color than in the north.

C7 – Surface of level 4 was marked by a series of cobbles (~10 cm in size). The increased frequency, but not size, of these cobbles marked the boundary from level 2.

**Level 3**

C6 – The fill of level 3 had some jute as well as isolated faunal and human remains with no articulation. Some groundstone lithics were also encountered in this context and a C14 sample (#90509) was also collected.

C5 – This surface marks the last of the archaeological surfaces as this was first surface encountered without leaf litter or back dirt from previous excavations. The surface was also slightly more compact than the later surfaces.

**Level 2**

C4 – Fill of level 2, and the transition between back dirt/leaf litter and *in situ* cultural material. The lowest levels of this context contained the first examples of jute, small subangular river cobbles, and ceramics. The increasing frequency of such marks the boundary between level 2 and 3.

C3 – The surface of level 2 was marked by a harder packed surface, lighter in some areas. However, leaf litter was still present suggesting we had not reached the end of the acultural levels.

**Level 1**
C2 – Level 1 fill consisting of leaf litter and back dirt also notable for its lack of cultural material lending additional evidence to the fact that this is the result of previous excavation's back dirt.

C1- Surface which contained mostly leaf litter and small amounts of remaining backdirt from previous excavations. This was cleared before photographs and depth measurements were taken for level 1.

Summary of SubOp 22-01
This operation consisted of four primary burials thus far with the potential for two additional primary burials extending into the west wall of the unit. The goal was to explore the spatial extent of the concentration of burials along the rockshelter wall. This operation thus far has confirmed the presence of burials consistent with concentrations found to the east and south of the unit. Due to time constraints and complexity of these burial sequences along with those found in Unit 15, bedrock exposure was not achieved. Subsequent excavations of this unit will be required to identify the full temporal extent of burials in this position of the rockshelter as well as further excavation to the west to delineate the horizontal extent of the burial concentration. This year's excavations also horizontal relationships between units with the refitting of ceramics and is a reminder that future work in the lab is needed to identify potential reinternments and post-depositional change that might have resulted from human rather than taphonomic processes.

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# Chapter 4: Plaza Excavations at Ek Xux's East Group

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Ek Xux was first documented by archaeologists in 1993 by the Maya Mountains Archaeological Project (MMAP; Dunham and Prufer 1998) and is in the Maya Mountains in the Bladen Nature Reserve, a 2-day walk from the nearest village (Figure 4.1). Ek Xux is a densely occupied site located in the floodplains of the Bladen River in the Ek Xux Valley. Framing the edges of the valley are steep karst cliffs, naturally bounding the settlement extent of Ek Xux, which consists of a large open plaza - the South Group - connected to two elite residential areas - the North Group and the East Group - by *sacbe'ob*, surrounded by 159 residential structures.

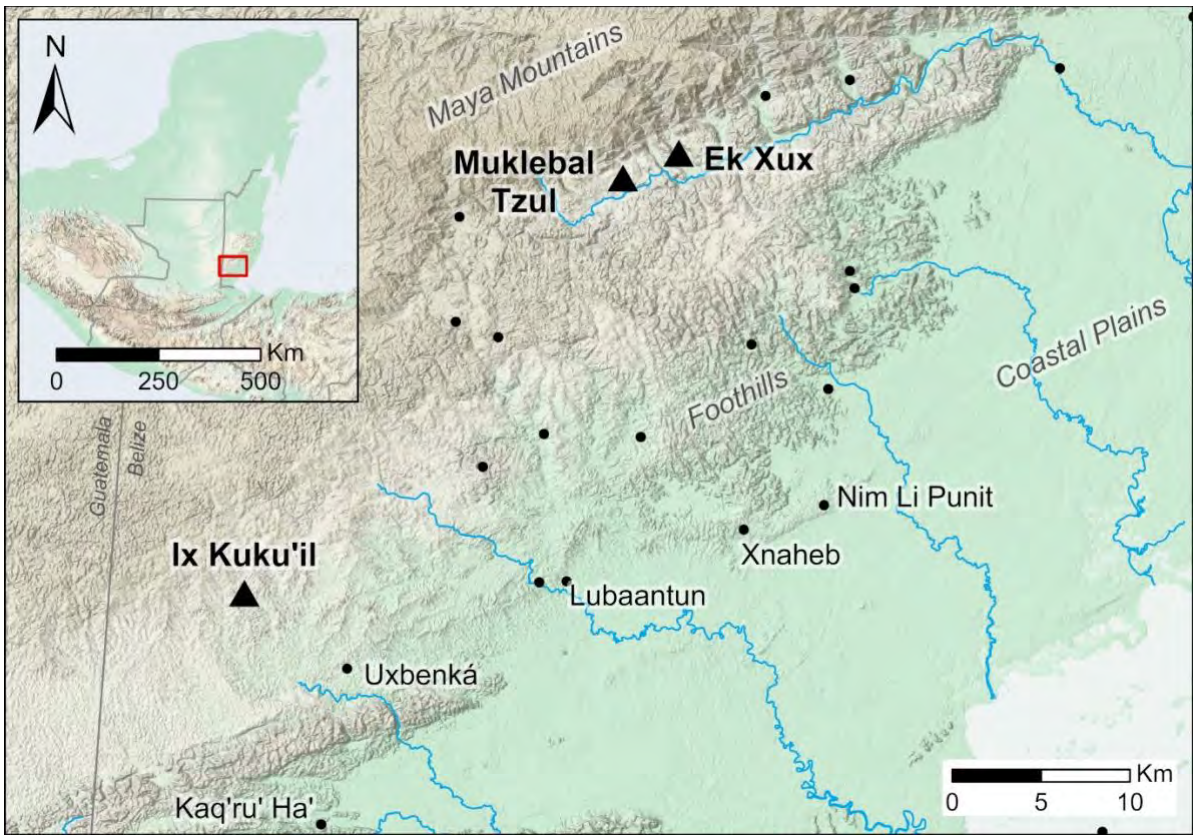



**Figure 4.1.** Location Ek Xux along the Bladen River in the southern Maya Mountains. (Thompson et al. 2023: Figure 1).

Excavations began in 1996 (Dunham 1996) with continued mapping of settlements from 1998 – 2000 (Kindon 2002). Most of the published work describing Ek Xux are by Drs. Peter Dunham, Andrew Kindon, and Keith Prufer (Dunham and Prufer 1998; Kindon 2002; Prufer and Kindon 2005; Prufer 2002; Prufer and Kennett 2020), with recent work using the legacy data (i.e., old maps) by Thompson (Thompson et al. 2021). Previous excavations focused on Structure 15 in the North Group and Structure 23 in the East Group. In total, Ek Xux contains three monuments, although no carving or hieroglyphic texts were identified.

This previous research produced rough chronologies based on local ceramic typologies and radiocarbon dates (Kindon 2002; Prufer 2002), which hinted at an Early Classic occupation. Nine

previously reported radiocarbon dates and ceramic analysis by Kindon (2002) and Prufer (2002) suggest that Ek Xux was occupied from 600-850 CE with a continued use into the Early Postclassic (Thompson et al. 2023). Our main objective of the 2022 BPAAP excavations at Ek Xux were to gain a better understanding of the chronologies with a focus on the East Group, an elite residential area. Elite residential areas have proven particularly useful for gaining chronologic information based on previous work at Uxbenká and Ix Kuku'il (Thompson and Prufer 2021). To accomplish this goal of building more robust chronological sequences, we excavated two test units in the East Group of Ek Xux.

## Field Methods

Excavations conducted at Ek Xux focused on chronology building through small (1m-x-2m and 1m-x-3m) test units. During the 10 days of excavations at Ek Xux, two units were excavated to sterile soils in the East Group. These findings provide information from some of the first archaeological excavations in the elite residential sector of the civic ceremonial core of Ek Xux and provide the foundation for future research at the Classic Maya center. Furthermore, charcoal samples from these excavations were requested to be exported in July 2022 under Dr. Keith Prufer's export request and will be submitted for radiometric dating in Winter 2022/Spring 2023. The direct dating of these materials will provide high-precision chronologies for the initial construction of the Ex Kuk elite residential plaza within the civic ceremonial core.

Preliminary artifact analysis and cataloguing occurred in Big Falls in July 2022 and Dr. Laura Kosakowsky (henceforth, LK) looked at the ceramics at the 2022 Belize Archaeology Symposium in late June 2022. Dr. Kosakowsky provided insights into general ceramic time periods and, when possible, types.

## Excavations at Ek Xux East Group

One 1m-x-3m and one 1m-x-2m unit were placed in the East Group of Ek Xux. Unit 1, the 1m-x-3m unit was placed at the plaza edge of Structure 23, capturing the plaza construction and earliest constructions of Structure 23. Unit 2, the 1m-x-2m unit, was placed between Structures 23 and 24, at the edge of the plaza (Figure 4.2) with the goal of capturing the anthropogenic landscape modifications and plaza construction, similar to what was observed elsewhere in southern Belize at Uxbenka (see Culleton et al. 2012; Prufer and Thompson 2016).

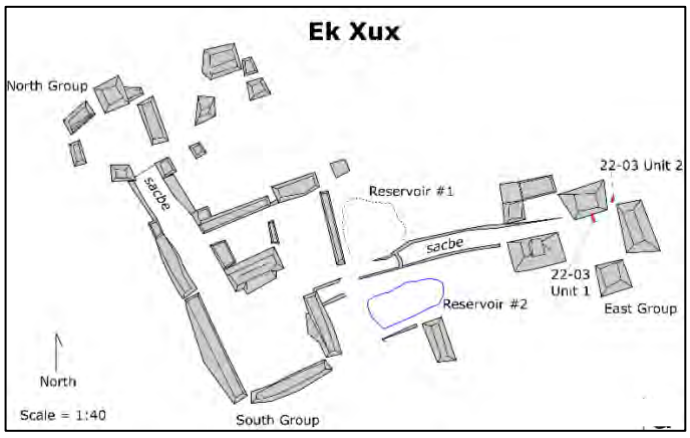



**Figure 4.2.** Location of SubOp 22-03 Unit 1 and Unit 2 in the East Group of Ek Xux. (Modified from Thompson et al. 2023: Figure 2).

### *SubOp 22-03 Unit 1*

Unit 1 was placed in the plaza of the East Group at Ek Xux south of Structure 23 to determine if the plaza group had been modified as it has been at many other sites in southern Belize. The unit measured 3m north-south and 1m east-west. It was south of a previously identified staircase on the southern side of Structure 23 in the hopes of capturing both the mound construction as well as the building construction and timeline. A datum was placed on a tree to the west of the unit at 52 cm above ground surface.

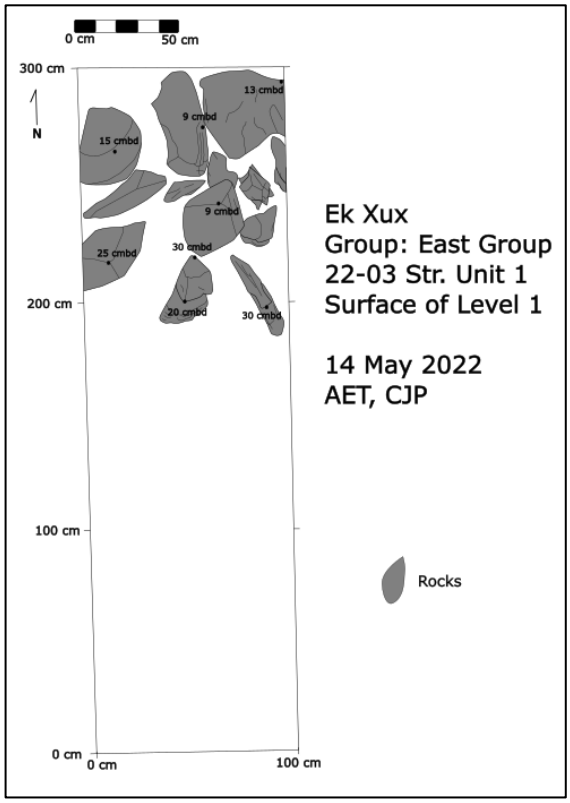



**Figure 4.3.** Ek Xux Sub-op 22-03 Str 23 Unit 1 Surface Plan view. Digitized by Y. Joshi.

Level 1 started at between 3 cmbd and 66 cmbd as it was an inclined area from north to south. The soil was a dark brown (10YR 3/3) very fine sub-angular silty loam. Collapsed rocks from the stairway feature were mapped (Figure 4.3) and removed in this level. The majority of ceramics (*91004*) and lithics (*91005*) were located in close proximity to the collapsed rocks. Feature 1 located near the center of the unit had a darker more organic rich soil and contained sherds of a possible termination vessel. Upon removal of larger rocks there was a noticeable soil change and the Level was ended at between 32 cmbd and 73 cmbd.

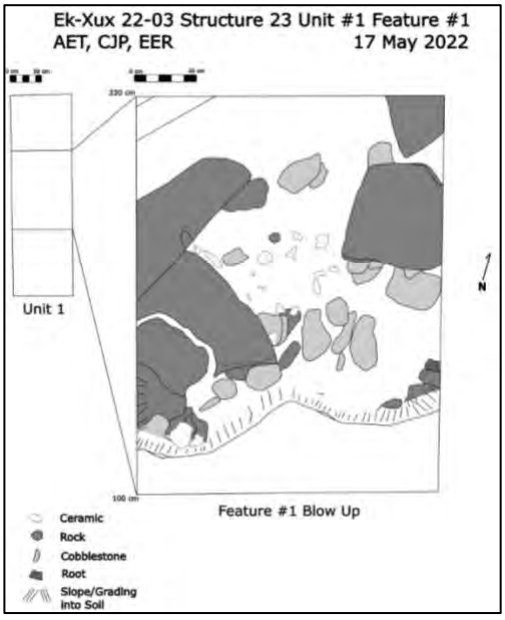
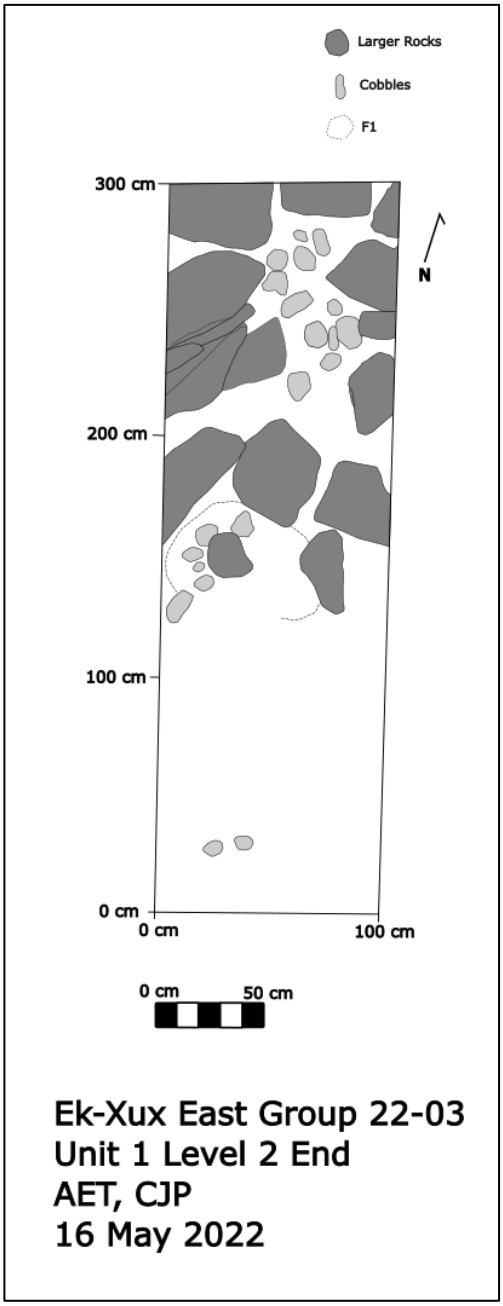



**Figure 4.4.** Ek Xux Sub-op 22-03 Str 23 Unit 1 Feature 1 Plan view. Digitized by Y. Joshi.

Level 2 was comprised of brownish very fine sub-angular silty loam that was lighter than Level 1 (10YR 3/4). Collapse from the stairs was continued to be removed. Only the north half of the unit was excavated so as to keep the context of Feature 1 intact. Charcoal (*91013*, *91014*) and ceramics (*91012*) dating to the Late Classic (Planton punctuated incised Belize Red, LK) were collected but there were no lithics found at this level. Feature 1 was a darker color more similar to the above level and was noticeably wetter. Feature 1 contained ceramic fragments of a similar type to those found in the rest of the level (Figure 4.4). The level ended at between 45 cmbd and 67 cmbd, when the texture of the soil changed to a siltier consistency (Figure 4.5).




**igure 4.5**. Ek Xux Sub-op 22-03 Str 23 Unit 1 Level 2 Plan view. Digitized by Y. Joshi.

Level 3 consisted of the southern 1/3rd of the unit that was not excavated as Level 2 and not included with Feature 1. The soil was a silt loam yellowish brown (10YR 3/4). There were ceramics (*91025*) and charcoal (*91022*) found at this level. The ceramics were identified as Puluacax, Belize Red which date to the Late Classic (700 – 900 CE, LK). The level ended between 66 and 77 cmbd with the appearance of more frequent ceramics.

Level 4 consisted of a yellow brown (10YR 3/4) fine sub-angular blocky clayey loam. The level was the lower 2/3rds of the unit which brought Feature 1 and Level 3 back together. Ceramic (*91028*) and Lithic (*91029*) artifacts were similar to those found in Level 1 and included Belize reds, a large jar, which date to the Late Classic as well as 1 Preclassic sherd (LK). The level concluded between 78 cmbd and 84 cmbd, due to the appearance of small cobbles.

Level 5 consisted similarly of yellow brown (10YR 3/4) fine sub-angular clayey loam with cobble inclusions and scattered lithic debitage. This level included only the northern 2/3rds of the unit where an obsidian blade (*91044*) was discovered below Feature 1. Charcoal (*91041*) was collected from belove Feature 1 as well, which once dated should inform as to when the vessel was placed and burned. The ceramics (*91041*from this level date to the Classic and included a monochrome red bowl (LK). The level reached between 82 cmbd and 88 cmbd, when a possible cobble floor was found, akin to the cobble floor identified in Unit 2 (see below).

Level 6 was the northernmost 120 cm of the original 3m-x-1m unit. The soil consisted of a dark brown (10YR 3/3) fine sub-angular clay-ey loam. A confirmation of a cobble floor was not possible due to extensive bioturbation of the unit, but it remains a possibility as it was comprised of a number of cable sized rocks and a large number of broken ceramics (*91049*) including a Classic period monochrome red bowl (LK). There were also numerous lithics (*91051*), another obsidian blade (*91054*), and charcoal (*91048, 91050*), which were collected in Level 6. This level continued until between 74 cmbd and 88 cmbd, when the soil color changed.

Level 7 consisted of a dark yellow brown (10YR 4/4) coarse sandy clay. While still present, there were fewer lithics (*91063*) and ceramics (*91062*) in this level. The ceramics were dated to the

Classic Period (LK). Charcoal (*91059*) was also collected, and the level ended at between 85 cmbd and 94 cmbd, when the soil color changed again to a darker color.

Level 8 consisted of a dark brown (10YR 3/3) fine clayey loam. Two more obsidian blades (*91068*) were identified among the cobbles, which were removed from the level in addition to many ceramic sherds (*91069*). Ceramics, including one possible spindle whorl, date to Late Classic (LK) and lithics (*91070*). Charcoal (*91073*) was collected from various depth throughout the level, which concluded between 85 cmbd and 91 cmbd (Figure 4.6).

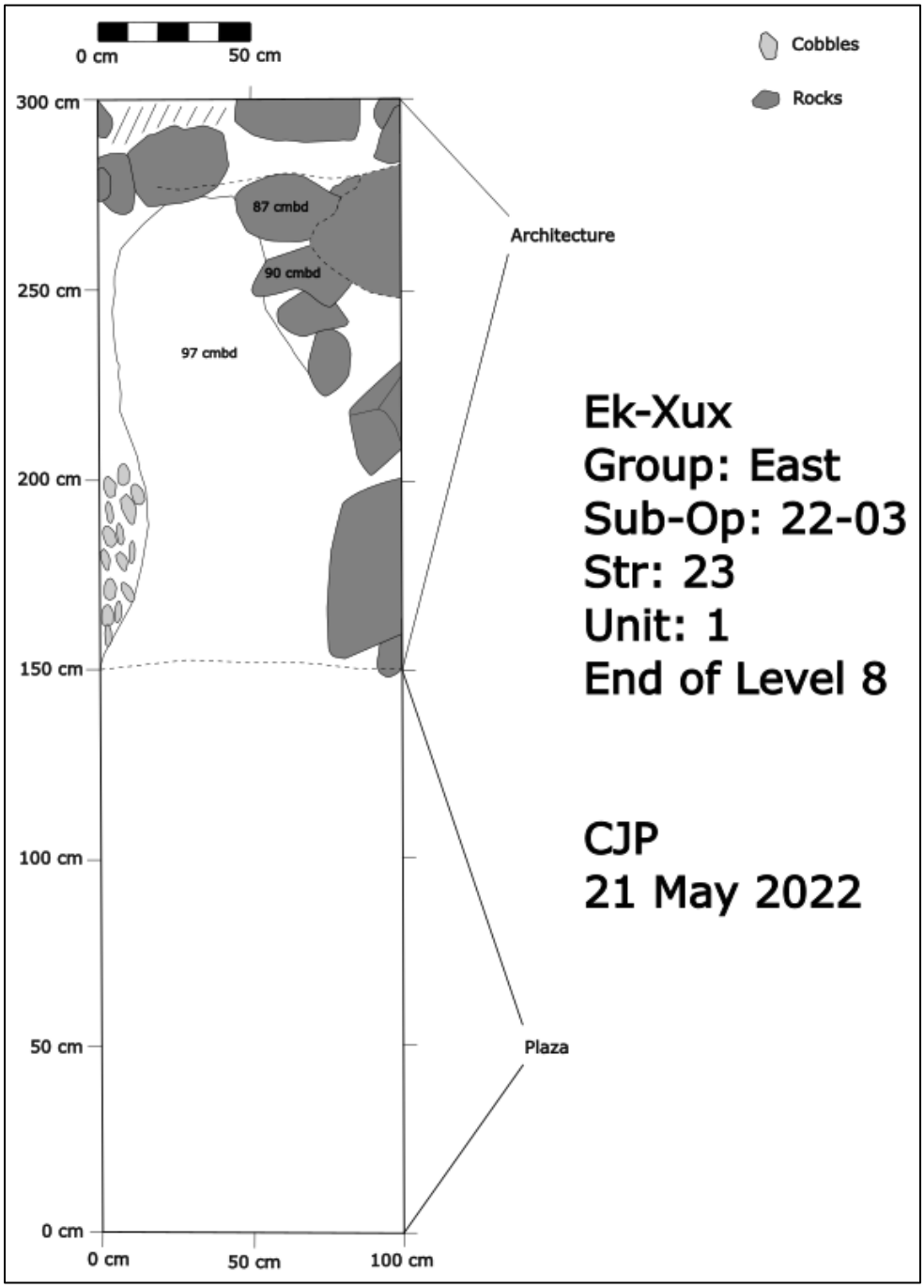



**Figure 4.6**. Ek Xux Sub-op 22-03 Str 23 Unit 1 Level 8 Plan view. Digitized by Y. Joshi.

Level 9 had a dark yellowish brown (10YR 4/6) granular sandy clay loam soil with a darker area associated with a root. An *incensario* (*91087*) made of a pink rock was collected that shows signs of burning in the center. Ceramics (*91078*, *91089*) dated to the Late Classic and charcoal (*91086*) was collected. The level ended between 119 cmbd and 133 cmbd, when soil texture coarsened and color shifted.

Level 10 consisted of a brown (10YR 4/3) very fine clay loam soil with a darker area towards the north of the unit. Two burn lenses were found with a thick clay deposit between them. Ceramics with charcoal attached to it (*91107*) was collected along with an unidentified, charred bone fragment (*91093*). The ceramics (*91100*) found at this level date to the Late Classic and were identified as Rubbercamp Brown, Achiote black, and Late Classic polychrome (LK). Lithics *(91101*) were also collected at this level as well as several charcoal samples (*91100*). Level 10 ended at between 126 cmbd and 140 cmbd, when there was a stark color change as well as a consistency change in the soil to a finer texture.

Level 11 consisted of the same brown (10YR 4/3) very fine clay loam soil. The ceramics (*91110*) were all too small to type or date. The lithics (*91111*) were also very small and consisted of mostly flakes. The level ended between 131 cmbd and 140 cmbd, with a change in soil color and consistency.

Level 12 consisted of a yellowish brown (10YR 5/8) sandy clay soil. Ceramics (*91159*) were again too small and broken to give dates but were still present in the level. Lithics (*91160*) were similarly present but smaller in size and quantity than previous levels. The level ended between 142 cmbd and 147 cmbd.

Level 13 consisted of a very dark brown soil. It contained ceramics (*91161*) which were identified as being from the Early to Late Classic (LK) and included a spindle whorl. Lithics (*91162*) bone (*91163*) were also collected from this level. This level contained one large intrusive root as well. The level ended between 162 cmbd and 168 cmbd, when the presence of large rocks was no longer being uncovered.

Level 14 consisted of a wet, very dark gray brown (10 YR 2/2) soil. It was a midden-y fill in the northern 1/3 of the unit. Artifacts recovered included ceramics (*91179*) and lithics (*91180*). The ceramics were a mix of Late Preclassic and Early Classic styles (LK). The level terminated with a change to lighter soils between 185 and 190 cmbd.

Level 15 consisted of a sandy dark yellowish brown (10 YR 4/4) soil. Far fewer ceramics (*91181*) were noted in Level 15 compared to Level 14 and most were from the top of the level, near the Level 14 transition. The ceramics dated to the Late Preclassic (LK). The level ended with a transition to sand between 218 and 219 cmbd.

Level 16 was a yellowish-brown sand (10 YR 5/6) which was excavated for 20 cm to determine if it was sterile. A single piece of charcoal (*91182*) was collected from 222 cmbd, near the transition with Level 15, and no other artifacts or ecofacts were identified. The level and unit ended at 243 cmbd.

Unit 1 was identified at the edge of the collapse of a stairway on the southern edge of Structure 23 in the East Group of Ek Xux (Figure 4.7). The soil varied in color from a dark brown to a yellow brown and texturally from a silty loam to course sand and clay structure (Figure 4.8). The upper levels of the unit were dominated by what is likely collapse from the former staircase leading up to Structure 23. Large roots and other sources of bioturbation greatly disturbed some parts of the

unit though distinct levels were still present including at least two phases of mound construction as indicated by the presence of a cobble floor. Obsidian blades found in the unit among the burned ceramics may indicate a termination ritual or use for food production. The spindle whorls also point to a form of household production for the site.

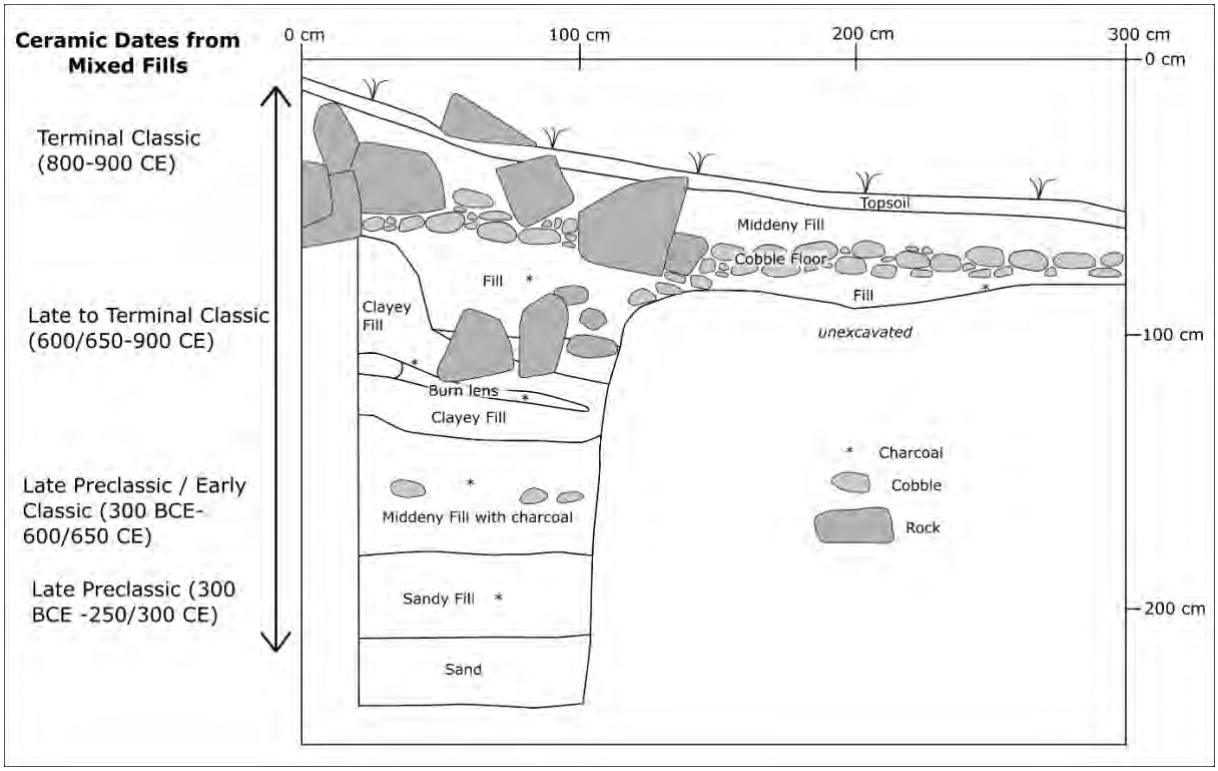



**Figure 4.7**. Ek Xux Sub-op 22-03 Str 23 Unit 1 East Wall Profile. Digitized by A. Thompson. (Thompson et al. 2023: Figure 4)

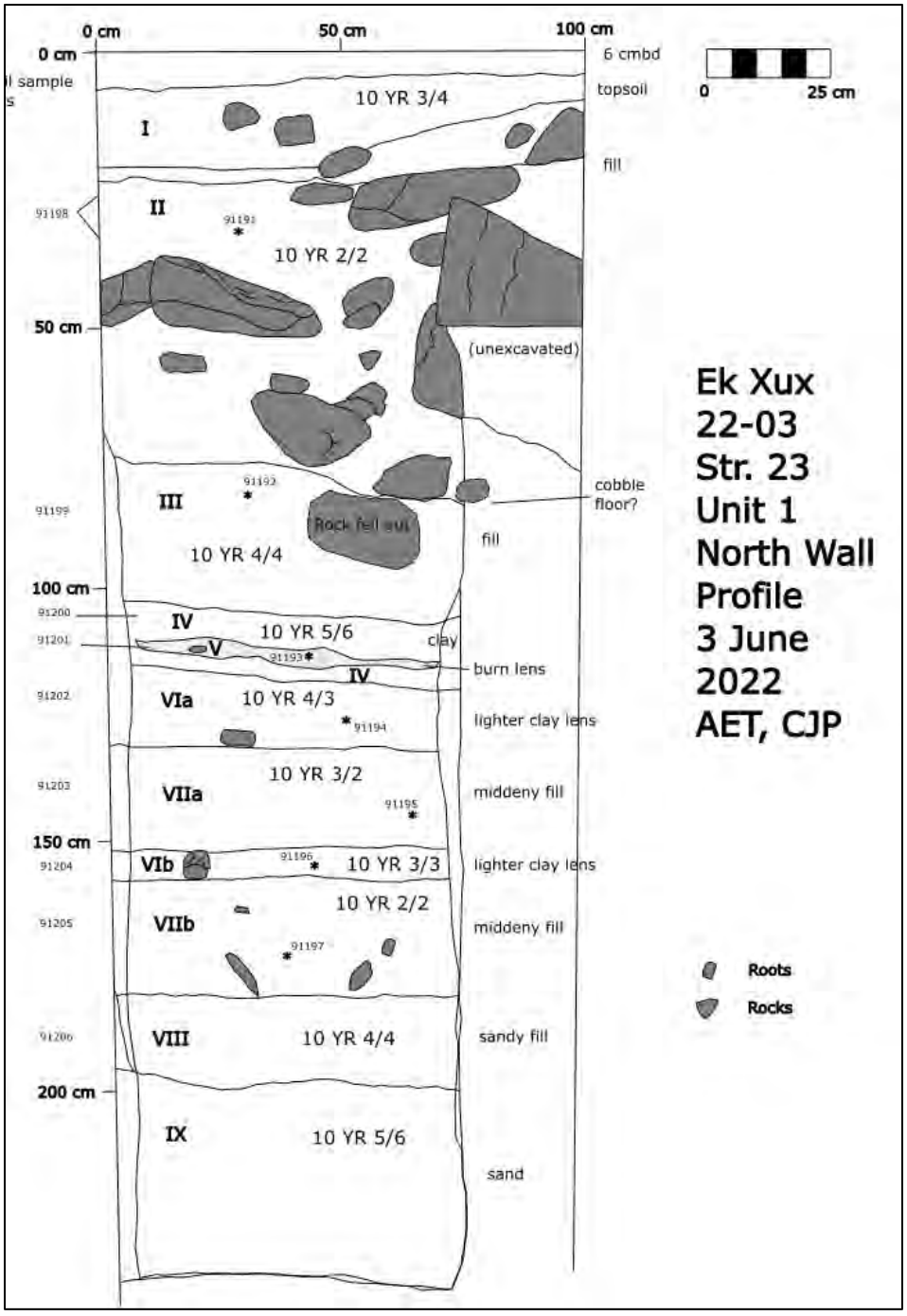



**Figure 4.8.** Ek Xux Sub-op 22-03 Str 23 Unit 1 North Wall Profile. Digitized by Y. Joshi.

### *SubOp 22-03 Unit 2*

Unit 2 was placed at the edge of the East Group plaza to test if the plaza was raised and flattened as is common at other large architectural areas in southern Belize. The unit measured 2m north-south and 1m east-west and was placed along a shallow, visible wall (Wall 1) delineating the edge of the plaza. A datum was placed on a tree near the southwestern corner of the unit at 15 cm above ground surface.

Level 1 began between 19 and 29 cmbd and included the removal of organic rich dark brown (7.5 YR 3/2) topsoils. Inclusions included roots and the soils were a very fine subangular structure. The removal of the topsoils revealed the cobble floor of the plaza. Ceramics (*91016*) and lithics (*91017*) were documented in Level 1. Ceramics included the distinct Puluacax and other Late – Terminal (700-900 CE) ceramic types (LK). The level ended between 26 and 37 cmbd.

Level 2 was a brown (10 YR 4/3) silty clay soil that was filled with cobbles, broken pottery, and lithics. Artifacts recovered included ceramics (*91018*), lithics (*91019*), and mano (*91020*), a smoothing stone (*91021*), and obsidian (*91024*). A piece of charcoal (*91023*) was collected from 41 cmbd. Ceramics included Late – Terminal Classic (700-900 CE) types (LK) including Puluacax. Level 2 ended between 33 and 46 cmbd with the exposure of the cobble floor (Figure 4.9).

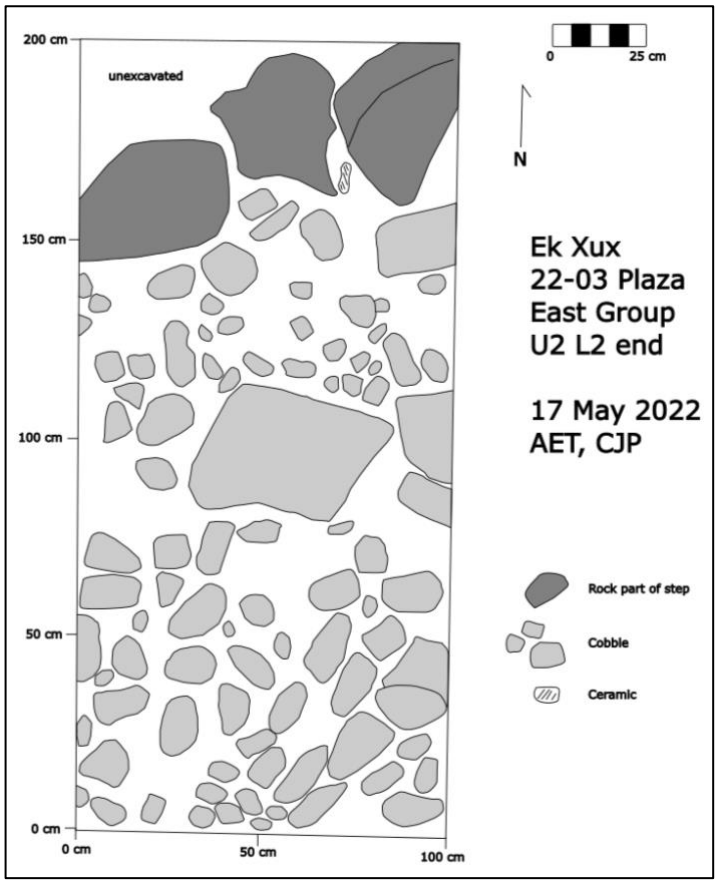



**Figure 4.9.** Ek Xux Sub-op 22-03 Plaza Unit 2 Level 2 end Plan view. Digitized by Y. Joshi.

Level 3 consisted of brown (10 YR 4/3-5/3) very dry soils. First, we lifted the cobbles from the unit, finding a compact soil with smaller rocks, which laid the foundation for the cobble floor. Fewer artifacts were noted in this level compared to Level 2. Artifacts recovered included ceramics (*91030*) and lithics (*91031*). Four charcoal samples were collected (*91032, 91033, 91034, 91035*), several of which were from a charcoal enriched area in the SW corner of the unit. A circular area of darker soil was noted near Wall 1 northern edge of the unit. Ceramics dated to the end of the 9th century or 800/900 CE during the Terminal Classic (LK). The level ended between 51 and 56 cmbd with a transition to lighter soils.

Level 4 was composed of pale brown (10 YR 6/3) dry soils. Many cobbles and rocks were in the matrix and very few artifacts, which was interpreted as a marl-y fill. The charcoal enriched area extended into this level and ceramics (*91043*) and charcoal (*91042*) were collected separately from the darker soils. The remainder of the ceramics (*91038*) in this level were too small type (LK). Lithics (91039) and charcoal were collected from the level as well. Level 4 ended at an arbitrary depth of approximately 15-20 cm, evening the level to 68 to 70 cmbd across the unit.

Level 5 was the same type of soil as Level 4 - pale brown (10 YR 6/3) dry soils of a marl-y fill. A large chert flake was noted in the northern part of the unit under the wall and ceramics (*91052*), lithics (*91053*) and three charcoal samples (*91056, 91057, 91058*) were collected. Ceramics were

too small to date/type (LK). The level ended between 84 and 95 cmbd with the appearance of more charcoal and lithics throughout the matrix.

Level 6 consisted of a small area of darker soils south of Wall 1 in the northeastern part of the unit. This area covered approximately 30cm-x-30cm. The level was unexcavated in Level 5 and was excavated from 70 cm to 90 cm. Artifacts including ceramics (*91060*) and lithics (*91061*) were recovered separately from Level 5 in case this was an intrusive deposit.

Level 7 focused on the southern 2/3 of the unit as the northern 1/3 was a noticeably darker soil, likely due to organic captured at the base of the wall. The soils of Level 7 were a light yellowish brown (10 YR 6/4) indicative of a continued marl-y fill. There were some patchy areas with charcoal (*91065, 91066, 91067*) and lithics (*91064*) but no ceramics were recovered from Level 7. Throughout the level, the soils gradually got dark, especially in the southeastern corner. The transition in soils resulted in the termination of the level between 98 and 105 cmbd.

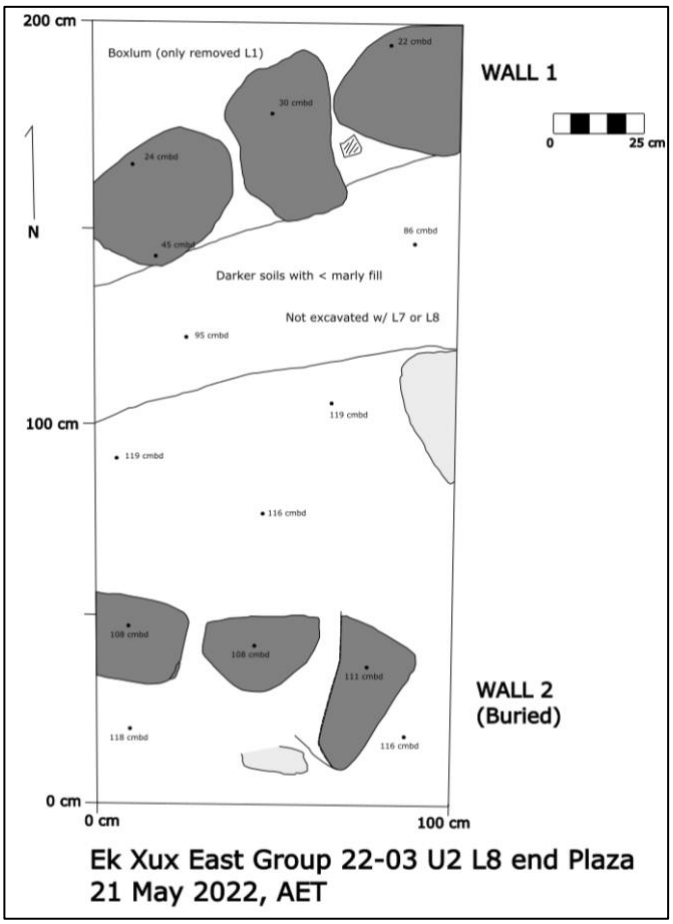



**Figure 4.10**. Ek Xux SubOp 22-03 Plaza Unit 2 Level 8 end Plan View. Digitized by Y. Joshi.

Level 8 continued to focus on the southern 2/3 of the unit. The soil matrix noticeably darker from Level 7, a grayish brown (10 YR 5/2), indicating a buried soil horizon. A lot of charcoal and ceramics that were small, fragile pieces that easily broke were noted. Artifacts included ceramics (*91071*) and lithics (*91074*) and charcoal was collected (*91072, 91075, 91077*). The level ended with the appearance of three large rocks that look like an aligned buried wall and delegated as Wall 2 (Figure 4.10). They were the only larger rocks noted during excavation. These rocks coincided with a change to lighter soils around 116 to 119 cmbd.

Level 9 continued the excavation of the southern portion of the unit. Dark soils were noted on the southern side of Wall 2 and artifacts were collected separately from the north side of Wall 2. Artifacts on the south side of Wall 2 included ceramics (*91080*) and lithics (*91081*) and artifacts on the northern side of Wall 2 included ceramics (*91083*) and lithics (*91084*). Charcoal was also collected from both sides of Wall 2 (south *91082*, north *91085*). Ceramics were dated to the Late Classic (LK). Level ended between 121 and 134 cmbd.

Level 10 was the excavation of the northern portion of the unit that as unexcavated in Levels 7-9. The soils were a yellowish brown (10 YR 5/4) and the level was excavated to match the depth of

Level 9. Artifacts recovered included ceramics (*91090*), which were too small to date/type (LK), lithics (*91091*), and obsidian (*91092*). The obsidian was a flake rather than a blade, which is uncommon among Classic centers in southern Belize. The level ended between 127 and 129 cmbd.

Level 11 consisted of brown (10 YR 4/3) soils. This level covered the entire unit and included the removal of Wall 2. Many small cobbles were noted, marking the appearance of a cobble floor. Artifacts included ceramics (*91094*) and lithics (*91095*), although the ceramics were too small to type/date (LK). The level ended with the removal of the cobbles, exposing the soils directly beneath them between 134 and 144 cmbd.

Level 12 was also composed of a brown (10 YR 4/3) soil. An abundance of charcoal was noted, along with small, fragile and soft ceramics, and small rocks. Beneath the cobble floor from Level 11, artifacts in Level 12 included ceramics (*91097*), lithics (*91098*), and a hammerstone (*91099*). Ceramics appear to be late. LK noted that there was no Late Preclassic and few jars were present in the assemblage. A piece of charcoal (*91096*) was also collected. Level 12 terminated between 145 and 153 cmbd.

Level 13 was made up of brown (10 YR 4/3) soils and contained an abundance of charcoal (*91103, 91108*). Ceramics (*91104*) and lithics (*91105*) were also recovered. Ceramics dated to the Late Classic (700-900 CE) and included an Achiote black bowl sherd (LK). Level 13 ended with the appearance of small limestone rocks throughout the unit between 159 and 162 cmbd.

Level 14 consisted of lighter soils that were yellowish brown (10 YR 5/4). The matrix was a harder limestone fill that was difficult to excavate. No ceramics were recovered but lithics (*91109*) and charcoal (*91112, 91113*) were collected. The level ended between 175 and 179 cmbd with the appearance of more yellow soils.

Level 15 was composed of yellow sandy soils. A few small ceramics were collected (*91165*) but they were too small to date/type. The level ended with the transition to sand, with little soil, between 201 and 203 cmbd.

Level 16 was the final level in Unit 2. The matrix was almost pure sand and cobbles, similar to the natural terrace deposits from a river. Furthermore, no artifacts were identified and a single piece of charcoal (*91168*) was collected. The level and unit ended between 217 and 230 cmbd.

Unit 2 was placed on the edge of the East Group plaza at Ek Xux with the goals of documenting the construction sequences and timing of anthropogenic landscape modifications to the elite residential area of Ek Xux. Throughout the unit, two walls and two cobble floors, were documented. Landscape modifications and construction sequences are visible in this unit (Figures 4.11 and 4.12). A hard, limestone rich surface may have been a living surface that was directly on top of a sandy fill. Then, a dark midden-y fill with charcoal and ceramics was laid on top of the limestone surface, raising the plaza nearly 25 cm. Ceramics from these layers date to the Late Classic with distinct Achote black sherds. Next, a cobble floor was constructed, representing a second living surface of the plaza. This cobble floor is nearly 1.25 m beneath the surface, showing the different construction efforts through time. A dark middeny fill was placed on top of the cobble floor, followed by a lighter marl-y fill. A third distinct fill which dated to the Late to Terminal Classic was topped with another cobble floor, which was near the surface. This floor likely the last cobble floor created in the plaza before abandonment. The shallow layers above the cobble floor also contained Late to Terminal Classic ceramics.

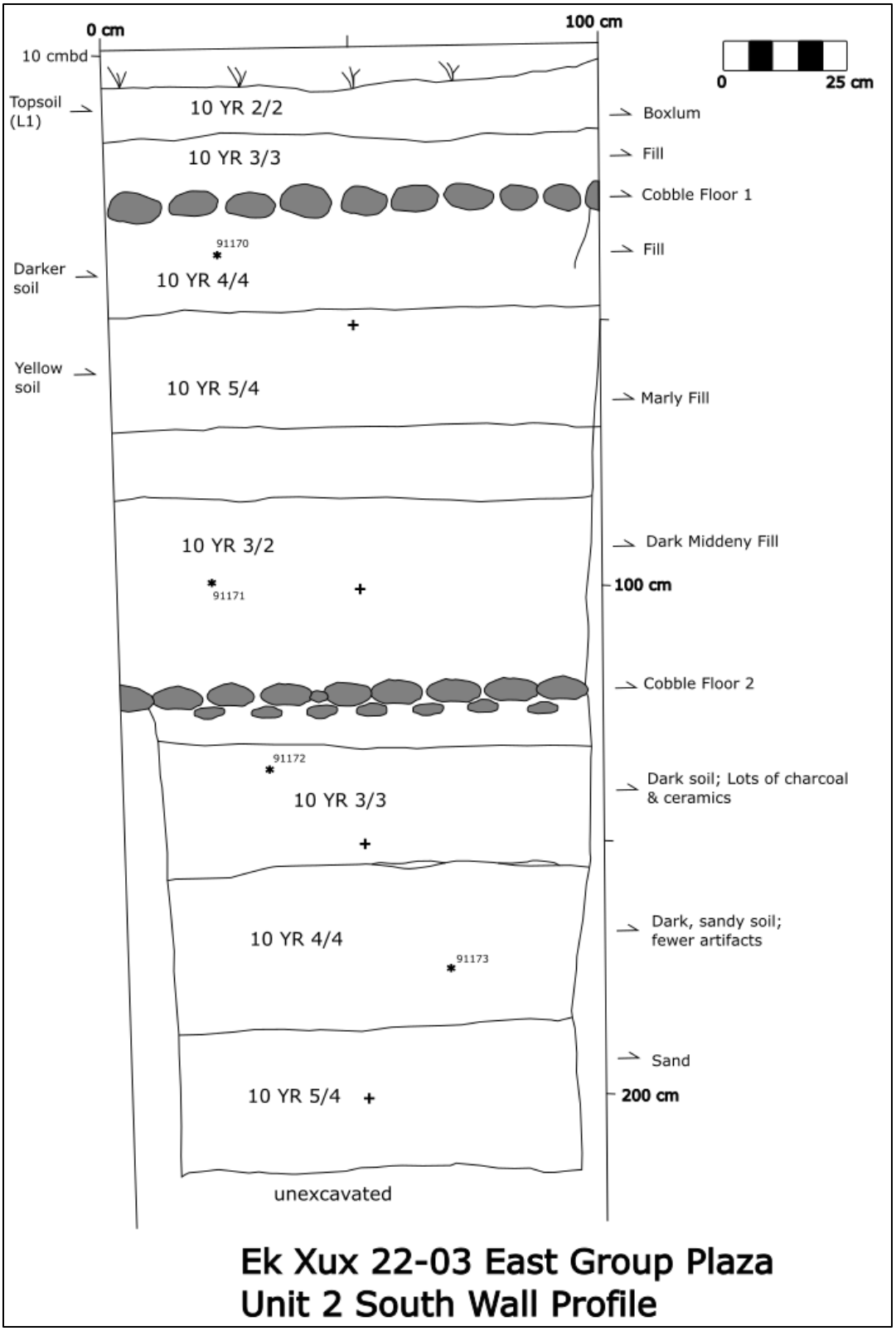



**Figure 4.11**. Ek Xux Sub-op 22-03 Unit 2 South Wall Profile. Digitized by Y. Joshi.

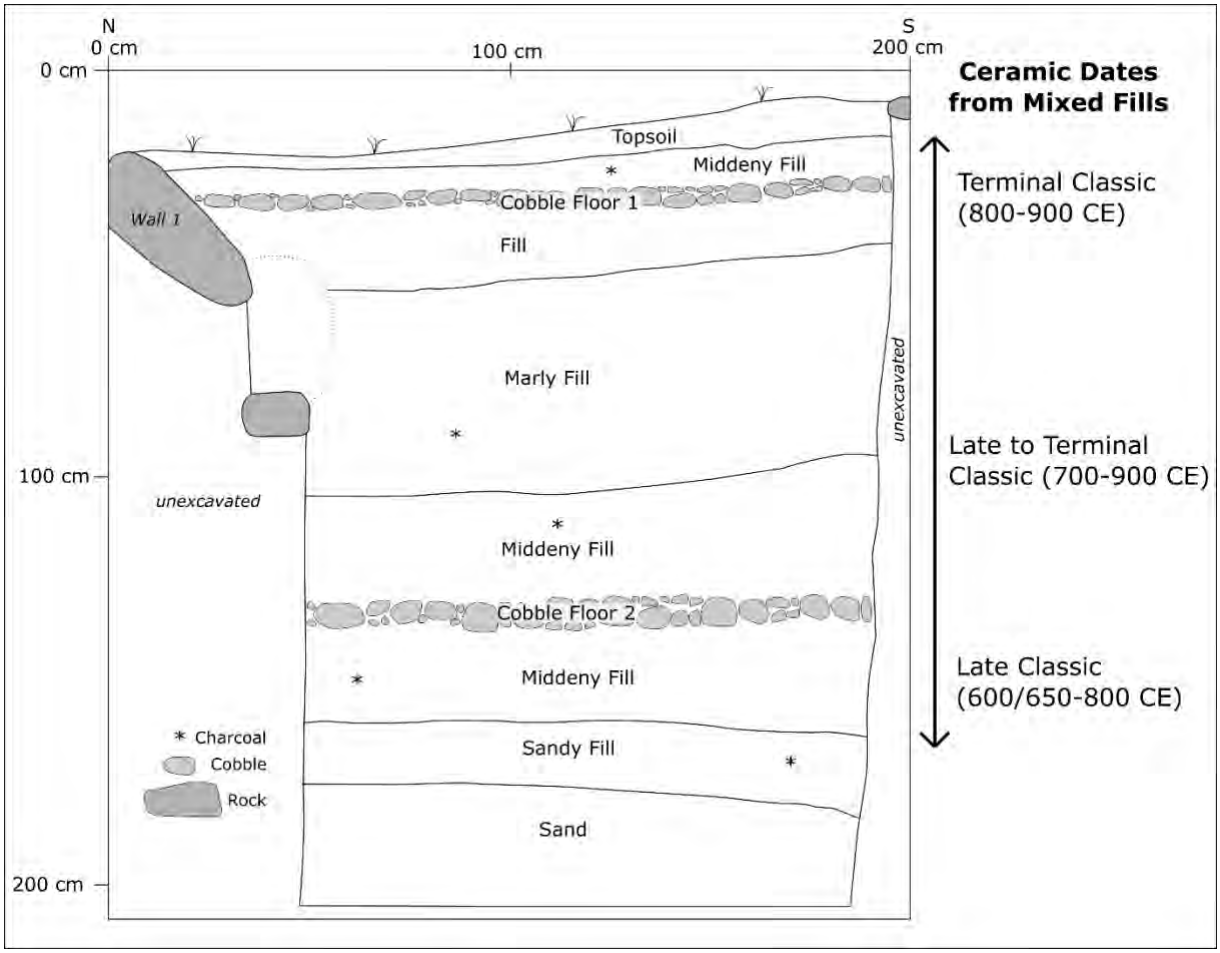



**Figure 4.11**. Ek Xux Sub-op 22-03 Unit 2 East Wall Profile. Digitized by A. Thompson. (Thompson et al. 2023: Figure 3)

## Concluding Remarks

The 2022 BPAAP excavations at Ek Xux expanded the chronological occupation of the remote Classic Maya city. Rather than Ek Xux being primarily an Early Classic center, it seems to have thrived during the Late and Terminal Classic periods based on ceramic types from both Units 1 and 2. Importantly, Unit 1 also produced ceramics from the Late Preclassic and Early from the lowest levels of the unit, associated with the foundation of Structure 23, an elite residential area. This suggests the establishment of households during the earliest occupations of the center that, over centuries, developed into the elite residences of Ek Xux (Thompson et al. 2023).

The 2022 excavations provided insights into the construction of the East Group, residential activities, and spheres of interaction. Two cobble floors with a meter of construction fill between them, were documented in both Unit 1 and Unit 2. Ceramic types align with those from both Southern Belize, such as Puluacax, and the central Maya Lowlands and Petén. Belize Red ceramics indicate connections with the Belize River Valley (Thompson et al. 2023). Several spindle whorls were identified, which may be linked to elite craft production. Future research will further explore interaction spheres and household production at Ek Xux.

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# Chapter 5: Plaza Excavations at Group 1 of Muklebal Tzul

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Like Ek Xux (see Chapter 4), Muklebal Tzul is located on the Bladen Branch of the Monkey River in the Maya Mountains (Figure 5.1). Muklebal Tzul is located in an upland karst ridgetop in a high relief valley. It is bounded by seasonally dry branches of the of the Bladen River to the south and Cave Creek to the east and north (Prufer 2002). The site core and surrounding settlement were mapped by Kindon (2002), documenting 204 residential structures in 67 plazuela groups across 2.5 km$^2$.

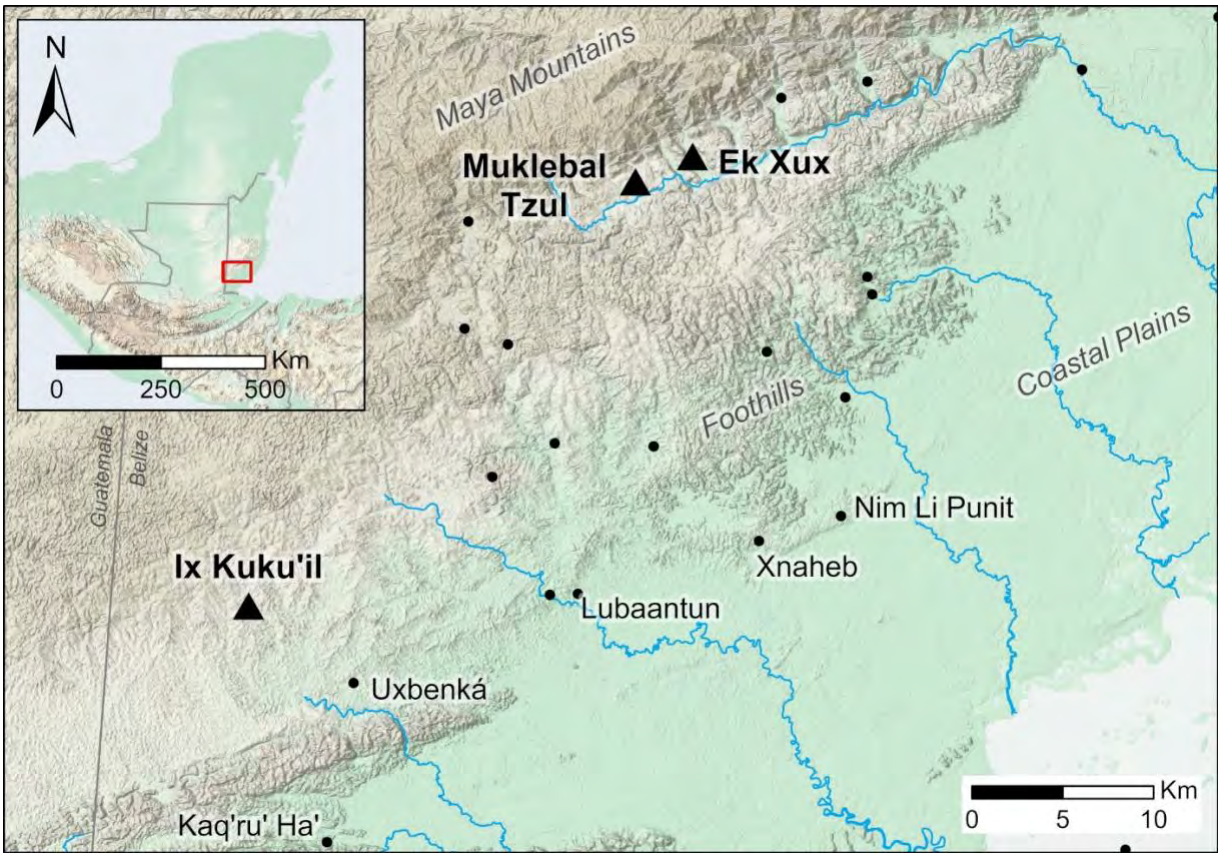


**Figure 5.1.** Location Muklebal Tzul along the Bladen River in the southern Maya Mountains. (Thompson et al. 2023: Figure 1).

The Muklebal Tzul civic ceremonial core consists of six discrete architectural groups. Groups 1 and 4 were likely elite residential spaces, while Groups 2, 3, 5, and 6 were civic ceremonial. Group 1 was the highest group, and we predicted we anthropogenically constructed using a level-and-fill methods. At Uxbenká, elite residences with expanded level-and-fill platforms, such as SG 25 (Thompson et al. 2013), yielded some of the oldest radiocarbon dates at the site (Culleton et al. 2012; Prufer et al. 2011; Prufer and Thompson 2016) and we hoped Group 1 at Muklebal Tzul would prove similar.

Previous excavations by the MMAP in the 1990s focused on tombs in several residences and pseudo-cave well (Prufer and Kindon 2005). Six previously reported radiocarbon dates (Kindon 2002; Prufer 2002) and preliminary ceramic analysis of the MMAP research (Kindon 2002) suggest Muklebal Tzul was rapidly developed and declined from 600-800 CE. Complementing these earlier excavations, our research targeted the elite residence of the civic ceremonial core to build a chronologic sequence for the area.

## Field Methods

Excavations conducted at Muklebal Tzul focused on chronology building through small (1m-x-2m) test units. During the 5 days of excavations at Muklebal Tzul, two units were excavated to bedrock in Group 1. These findings provide information from some of the first archaeological excavations in the elite residential sector of the civic ceremonial core of Muklebal Tzul, providing the foundation for future research at the Classic Maya center. Furthermore, charcoal samples from these excavations were requested to be exported in July 2022 under Dr. Keith Prufer's export request and will be submitted for radiometric dating in Winter 2022/Spring 2023. The direct dating of these materials will provide high-precision chronologies for the initial construction of the Ex Kuk elite residential plaza within the civic ceremonial core.

Preliminary artifact analysis and cataloguing occurred in Big Falls in July 2022 and Dr. Laura Kosakowsky (henceforth, LK) looked at the ceramics at the 2022 Belize Archaeology Symposium in late June 2022. Dr. Kosakowsky provided insights into general ceramic time periods and, when possible, types.

## Excavations at Group 1 Muklebal Tzul

Two 1m-x-2m units were placed in Group 1 of Muklebal Tzul. Group 1 is the highest hilltop near the civic ceremonial core and was likely an elite residential area (Figure 5.2). We hoped to find evidence of anthropogenic landscape modifications including the flattening and expansion of the hilltop. Unit 1 was placed between structures at the edge of the plaza with the goal of capturing the anthropogenic landscape modifications and plaza construction, similar to what was observed elsewhere in southern Belize at Uxbenka (see Culleton et al. 2012; Prufer and Thompson 2016). Unit 2 was placed in the center of the plaza, to test if plaza construction was similar to constructions observed elsewhere in southern Belize with shallow depths in the middle of the plaza and deeper excavations at the end due to massive anthropogenic landscape modifications and plaza construction. Excavations occurred from May 25-29, 2022. We stayed at AC camp and hiked to Muklebal Tzul each day, traversing the landscape 1-1.5 hours each way.

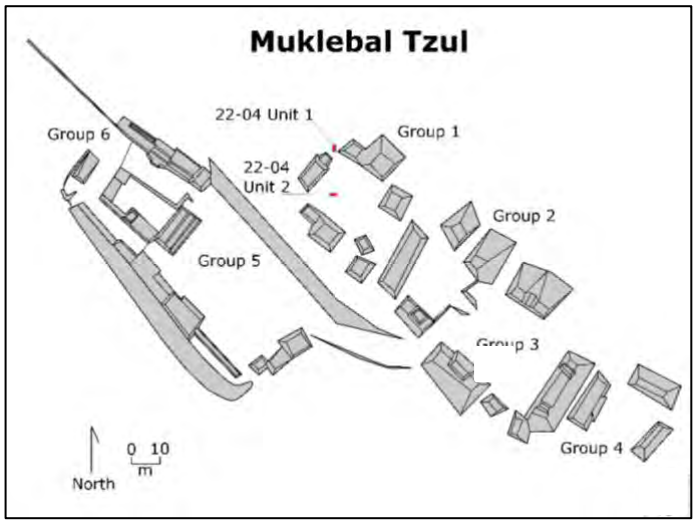


**Figure 5.2.** Location of Sub-op 22-04 Unit 1 and Zone A and Unit 2 in Muklebal Tzul Group 1. (modified from Thompson et al. 2023: Figure 2).

***SubOp 22-04 Unit 1***

Unit 1 was a 1m-x-2m unit placed along the NE edge of the uppermost plaza of Group 1. The goal of Unit 1 was to capture the construction of the hilltop as witnessed in other elite residential areas, such as Uxbenká (see Prufer and Thompson 2016). The northern edge of the unit aligned with a low rock wall that lined the edge of the plaza. The datum was on a tree on the northern edge of the rock wall, 27 cm above ground surface. A broken mano was found on the surface near Unit 1.

Level 1 began between 19 and 26 cmbd. The dark black topsoils (10 YR 2/1 Black) were rich with organics and roots. An abundance of broken pottery or ceramics (*91114*) was immediately noted in topsoils as well as an obsidian blade (*91120*), lithics *(91118*), and a metate fragment (*91115*). The granite metate fragment was from the Cockscomb region of the Maya Mountains. A figurine fragment (*91119*) was also collected from this level. There were no jute shells found in Level 1. Ceramics in this level were Late - Terminal Classic (LK). The level ended between 32 and 39 cmbd with the appearance of a cobble floor with small plaster chunks.

Level 2 consisted of very dark brown (10 YR 2/2) soils that were still rich in organics. This level focused on the remove the of cobbles and rocks, which were abundant throughout the level. Jute shells were noted in Level 2, unlike Level 1. This appears to be a midden-y fill due to the plethora of ceramics (*91121*) and lithics (*91122*). The ceramics suggest this midden-y cobble floor fill dated to the Late Classic (LK). The level ended between 44 and 48 cmbd due to the abundance of ceramics.

Level 3 was a midden-y fill above large boulders that consisted of very dark brown (10 YR 2/2) soils. A ceramic deposit (*91127*) of many broken sherds was noted in the NE corner of the unit, although none of the pottery sherds seemed articulated. Lithics (*91128*) were also in the ceramic deposit area but not elsewhere in the unit while ceramics (*91129*) in lower density were dispersed throughout the unit. One ceramic sherd has a rim with glyphs on it (Figure 5.3). This sherd is likely a Late – Terminal Classic Achote black that was imported from the Peten (LK), showing long distance trade and connections between the elite families of Muklebal Tzul and distant kingdoms. A large amount of jute was noted but not collected. Large boulder construction fill marked the end of Level 3 between 57 and 65 cmbd.

**Figure 5.3**. Ceramic sherd with a glyph block. Photo by A. Thompson

Level 4 was the removal of large boulder construction fill with very dark grayish brown (10 YR 3/2) soils. Areas of soils were lighter in color (10 YR 6/1 gray), suggesting the remains of burnt limestone. Artifacts were found throughout the unit including ceramics (*91130*), a figurine fragment (*91131*), lithics (*91132*), and bone (*91134*) as well as a piece of charcoal (*91133*) from around 84 cmbd. The ceramics from this level were a mix of Late Preclassic designs with Late Classic (500-700 CE) (LK). The level ended between 67 and 114 cmbd, which it became impossible to remove more boulders without expanding the unit; thus we opened Unit 1 Zone A to the east of Unit 1. Zone A was 1 m north-south by 80 cm east-west, abutting a large rock.

Zone A Level 1 was a black (10 YR 2/1) soil, rich in organics and roots. The level began between 20 and 36 cmbd. An abundance of ceramics (*91141*) were found in Level 1 of Zone A, just as in the Unit 1 Level 1. Additionally, lithics (*91142*) and obsidian (*91143*) were collected. The ceramics dated the Late – Terminal Classic (LK). The level ended between 40 and 43 cmbd with the appearance of small limestone fill and cobbles.

Zone A Level 2 was the same as Unit 1 Levels 2 and 3. It was composed of very dark brown (10 YR 2/2) soils and cobbles that were above the large boulder construction fill. It was a midden-y fill with ceramics (*91144*), lithics (*91145*), and a broken speleothem fragment (*91146*) possibly used for rituals due to its connection with caves and Xibalba. The ceramics consisted of primarily bowls and dishes that dated to the Late Classic (700 CE) but no big jars (LK). The level ended with the appearance of the large boulder construction fill between 37 and 57 cmbd.

Zone A Level 3 was the removal of the soils and smaller rocks to reveal only the large boulder construction fill. The soil was a very dark brown (10 YR 2/2). Ceramics (*91147*) were collected from Zone A Level 3, which dated to the late Early Classic / early Late Classic from 500-700 CE (LK). The level ended between 55 and 66 cmbd.

Zone A Level 4 consisted of very dark grayish brown (10 YR 3/2) soils with large, limestone boulders. The level was excavated until it was a similar depth to Unit 1. Ceramics (*91148*) were collected from this level, which dates to the late Early Classic / early Late Classic from 500-700 CE (LK). The level ended between 64 and 106 cmbd.

Level 5 excavations combined the areas of Unit 1 and Zone A, for a total area of 200 m north-south by 180 cm east-west. The soils remained rich in organics, even at the depth of nearly a meter beneath the surface. Soils were a very dark grayish brown (10 YR 3/2) interspersed among large, uncut/unshaped limestone boulder construction fill. Artifacts recovered included ceramics (*91149*) and lithics (*91150*) as well as two pieces of charcoal (*91151*, *91152*) both from approximately 120 cmbd. Ceramics dated to the Late Preclassic (300 BCE – 300 CE) (LK), which will be corroborated with radiometric dating in the future. The level ended with a shift to lighter soils between 111 and 126 cmbd.


**Figure 5.4.** Sub-op 22-04 Unit 1 and Zone A Plan view. Digitized by Y. Joshi.

Level 6 was the final level of Unit 1 and included the removal of additional large boulder construction fill. Soils were a dark grayish brown (10 YR 4/2). We could only safely excavate a small portion of the unit to bedrock given the instability of the large boulder construction fill and time constraints. Dense soils were noted directly above the *nib* and there were some *nib* inclusions in the soils. Artifacts from Level 6 included ceramics (*91154*) and lithics (*91156*) and two pieces of charcoal (*91153*, *91155*). The ceramics were too small to analyze (LK). The small portion of exposed *nib* bedrock near the center of the unit reached a depth of 144 cmbd (Figure 5.4).

The Unit 1 excavations reveal that Group 1 at Muklebal Tzul, like many other larger Classic Maya construction in southern Belize, had massive anthropogenic hilltop modifications. Nearly 75 cm of depth were large boulder construction fill (Figure 5.5) that were hauled to the hilltop to raise and flatten the plaza. However, the dearth of plaster floors within this fill suggests this hilltop was construction rapidly, rather than gradually raised over centuries of occupation. On top of the large boulder construction will was the remains of cobble floor, that likely was plastered in antiquity. The floor was covered with ceramics and lithic debitage, indicate of a midden or possibly a termination event. Other residential plaza spaces in southern Belize rarely have the abundance of artifacts identified in Levels 1 – 3 of this unit. Perhaps most surprisingly, all soils in the Unit 1 excavation were dark and organic rich, even at depths of over a meter beneath the surface. Few charcoal samples were identified during excavations. Preliminary ceramic analysis suggests that the earliest levels (Level 5) contained Late Preclassic pottery (300 BCE – 300 CE), while intermediate levels (Levels 3 and 4) contained late Early Classic to early Late Classic pottery (500 – 700 CE) and the latest levels (Levels 1 and 2) contained Late to Terminal Classic pottery (700 – 900 CE; LK). While the construction appears rapid with a dearth of plaster floors, the pottery suggests either the movement of older materials into the construction fill, or a gradual construction of the elite residential area. These findings will be illuminated with radiocarbon dates.

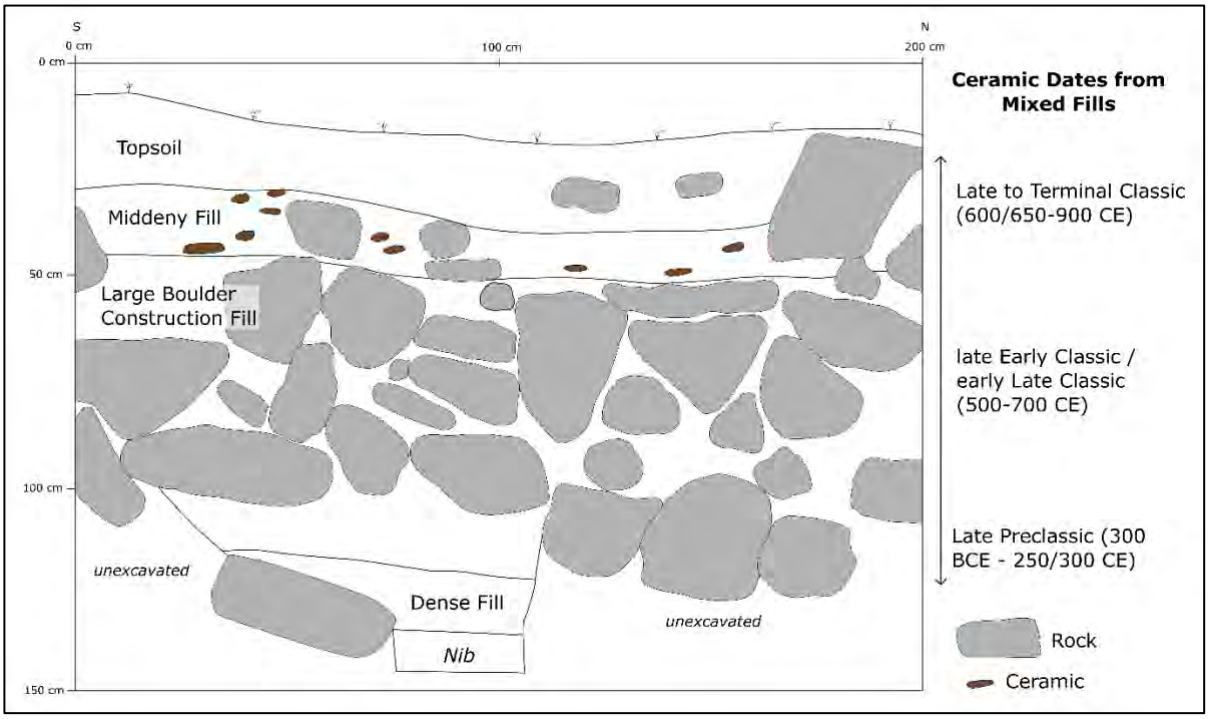


**Figure 5.5.** Sub-op 22-04 Unit 1 and Zone A Plan view. Digitized by A. Thompson. (Thompson et al. 2023: Figure 5).

### *SubOp 22-04 Unit 2*

Unit 2 was a 1m-x-2m unit placed in the central plaza of Group 1 to the southwest of Unit 1. The goal of Unit 2 was, like Unit 1, to capture the hilltop modification of the mounded area as often seen at other elite residential sites. The unit was situated between two potential structures with the goal of identifying the timing of construction of these structures as it pertains to the overall construction timeline of the hilltop. The datum was placed on a tree to the west of the unit itself.

Level 1 began between 13 and 23 cmbd. The organic rich topsoil was a black (10 YR 2/1) loamy consistency. The soil itself consisted of a matrix of broken *jute* consisting of about 5% and remnants of what was believed to be a plaster floor. An abundance of ceramic (*91116*) and lithic (*91117*) artifacts were recovered. The ceramics were analyzed by Laura Kosakowsky (henceforth, LK) and likely date to the Late to Terminal Cassic period (700-900 CE, LK). There appeared to be a possible wall like structure or other dividing feature in the unit between the two structures. The level ended between 23 and 35 cmbd with the appearance of several small rocks that may potentially be the remains of a cobble floor.

Level 2 had a soil consistency like the previous level (10YR 2/1 Black) loamy texture. The *jute* were still present but less prominent that in the previous level. The level contained ceramics (*91124*) and lithics (*91125*) like Level 1. A spindle whorl (*91126*) was also found in Level 2. The ceramics dated to the Late Classic (LK). Level 2 terminated between 37 cmbd and 43 cmbd when large rocks were uncovered at the western portion of the unit (Figure 5.6).

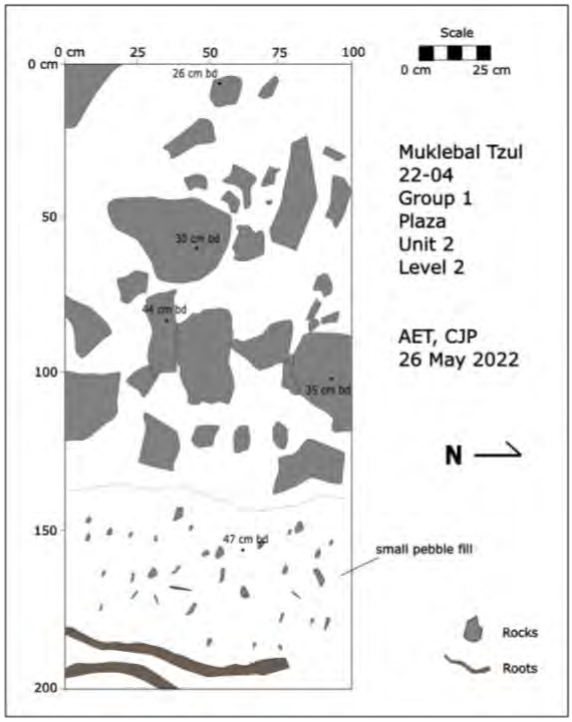


**Figure 5.6.** Sub-op 22-04 Unit 2 Level 2 Plan view. Digitized by Y. Joshi.

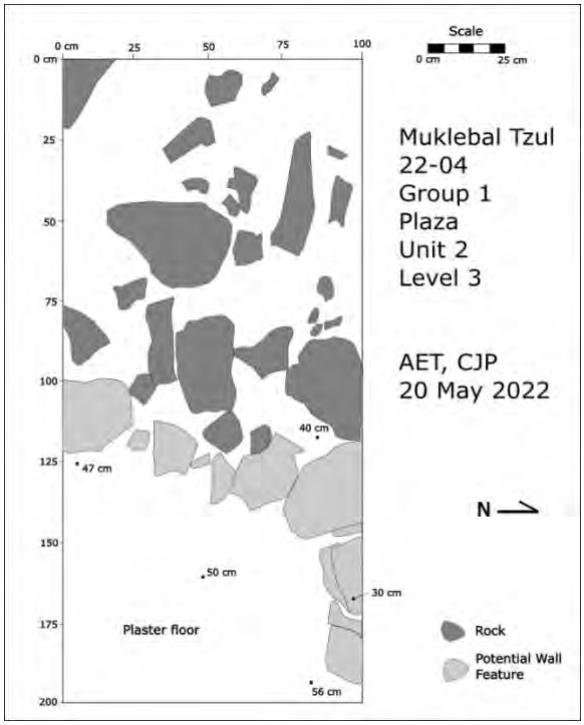


**Figure 5.7.** Sub-op 22-04 Unit 2 Level 3 Plan view. Digitized by Y. Joshi.

Level 3 has a was a black (10YR 2/2) soil with a different, more clay-y consistency than Level 2. While ceramics (*91135*) and lithics (*91136*) were present, there were far fewer than noted in Levels 1 and 2. Of note, was a small slate pendant (*91137*). The artifacts at this level were dated to the end of the Early Classic and beginning of the Late Classic. The wall-like structure present in the unit was revealed to be a line of rocks with what was thought to be a plaster floor on the eastern portion of the unit. The line of rocks itself may have been the remnants of a wall feature (Figure 5.7). The level was terminated between 56and 40cmbd, when what was then believed to be a plaster floor was uncovered. However, upon further excavation of what would have been Level 4, we discovered that the "plaster floor" was deteriorated bedrock, locally referred to as *nib*.

The Unit 2 excavations maintained a very dark soil color which is likely due to its underlying bedrock and rich organic composition (Figures 5.8 and 5.9). The location of the unit was significantly shallower than Unit 1 (see above) because it was closer to the center of the natural hilltop, whereas the edges of the hill were built up and modified as evidenced in Unit 1. Unit 2 shows that Muklebal Tzul Group 1 was potentially occupied from the Early Classic through the Terminal Classic period. There is a large amount of *jute* within the upper strata of the unit that diminishes with depth. While the "plaster floor" was ultimately found to be bedrock it does not discount the possibility that at one point there was a plaster floor where the unit was. The rock wall is similarly inconclusive. No charcoal was found in this unit.

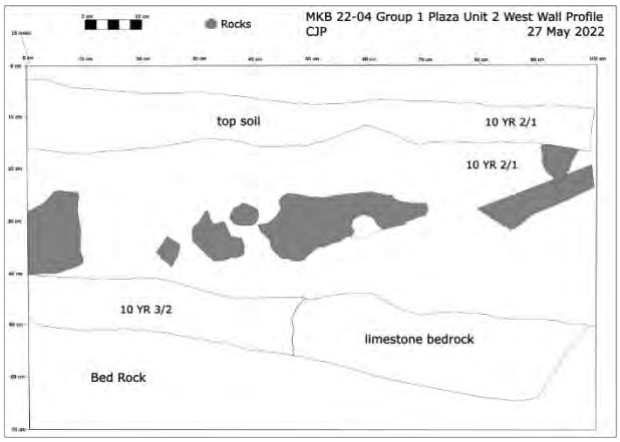


**Figure 5.8.** Sub-op 22-04 Unit 2 West Wall Profile. Digitized by Y. Joshi.

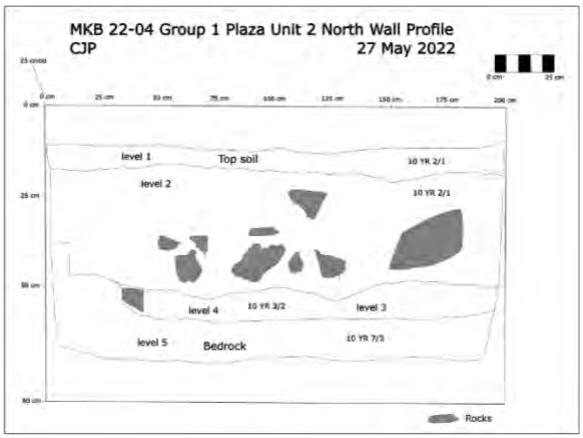


**Figure 5.9.** Sub-op 22-04 Unit 2 North Wall Profile. Digitized by Y. Joshi.

## Concluding Remarks

The 2022 BPAAP excavations at Muklebal Tzul provided greater insights into the occupational histories of the remote Classic Maya kingdom. Preliminary ceramic analyses suggest that Group 1 was initially constructed during the Late Preclassic, based on the presence of Late Preclassic ceramic types in the deepest levels of Unit 1. However, the majority of the occupation occurred from 500-900 CE, during the end of the Early Classic through the Terminal Classic (Thompson et al. 2023).

Furthermore, the 2022 excavations provided insights into the construction history of the Group 1, elite activities, and spheres of interaction. The shallow bedrock of Unit 2 and large boulder construction fill with no visible living surfaces between the base and near the surface suggest a rapid construction of Group 1 after an initial occupation on the hilltop pre-modification. The presence of spindle whorls, ceramics with glyphs, and a fine slate pendant allude to the high status of the occupant as potential artisans. The presence of Sierra Red ceramics suggests that the early occupants of Muklebal Tzul were well integrated with the regional interaction spheres of the Maya region by 250 CE. By the Late Classic, the occupants of Group 1 maintained ties to both the Belize River Valley and southern Belize based on Garbutt Creek and Vaca Falls Red ceramics as well as Remate Red and Puluacax pottery, respectively (Thompson et al. 2023). Future research will further explore interaction spheres and elite residential activities at Muklebal Tzul.

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# Chapter 6: Cave (re)Survey in the Bladen using Topographic Relief Visualizations and Lidar

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## Introduction

Given the low accuracy of earlier GPS units, the UTM coordinates for caves from the Maya Mountain Archaeological Project (MMAP) often end in "00", meaning that the point lies within a 100m radius of the coordinates. To improve these data points, a resurvey of the caves was proposed, using updated GPS units and guided by lidar. In 2022, Chris Ploetz developed a pilot study to remotely identify caves using varying topographic relief models of high-resolution, 1m DEMs derived from light detection and ranging (lidar) data collected for the Bladen in 2017. This work was presented at the American Association of Geographers (AAG) meeting in February 2022 (Ploetz et al. 2022). The resulting model was inspired by similar remote cave identification methods proposed by Holley Moyes and Shane Montgomery for the Las Cuevas region on the northern side of the Maya Mountains (Moyes and Montgomery 2016, 2019). Furthermore, in southern Belize, research by Keith Prufer and Amy Thompson have shown the utility of lidar for remotely detecting archaeological features (Prufer et al. 2015; Thompson 2020; Thompson and Prufer 2015) including the use of the Relief Visualization Toolkit (RVT 2022).

Using the RVT, we found that a combination of Topographic Position Index (TPI) and slope were most useful in the remote identification of possible cave entrances in the Bladen lidar dataset. In total, we identified more than 300 potential cave, cavern, or other openings into the earth using these topographic relief models. The potential caves were compared with legacy data points of caves documented by the Maya Mountains Archaeological Project (MMAP) in the 1990s (see Prufer 2002). These points were provided by Dr. Keith Prufer whose work in the early 2000s identified and recorded the location and contextual importance of more than 50 caves and rock shelters (see also Brady and Prufer 2005). The goals of this survey were two-fold; first, to evaluate different topographic relief visualizations for the identification of natural features used by ancient and modern humans alike and, second, to build upon the work of Dr. Prufer and generate methods that will ultimately streamline the identification of cave features for future studies.

Funding for fieldwork was provided by the Karl Butzer Excellence Fund for graduate students from the Department of Geography and the Environment at the University of Texas at Austin, as well as assistance from grants awarded to both Dr. Keith Prufer and Dr. Amy Thompson.

## Survey Methods

The survey team was guided by a lidar dataset for the Bladen Nature Reserve located in the Maya mountains. The lidar data was acquired in 2017 through the National Center for Airborne Laser Mapping (NCALM) with permissions from the Belizean Institute of Archaeology. Using the TPI and slope model (see above), possible caves were identified and points were subsequently transformed into a shapefile that was uploaded to a Garmin GPSMAP 66i handheld GPS device. Initially a grid pattern for survey was proposed but reconsidered given the time constraints, difficult terrain, and safety concerns. Instead, several potential caves were identified from both

the legacy survey data and the lidar data that would maximize the time available to the team. Ultimately, a combination of opportunistic, guided (from the work of Dr. Prufer), and Traditional Ecological Knowledge (TEK) were adopted and used to guide the survey. For the purposes of this survey, the use of the word cave differs from the traditional criteria of a dark zone and instead includes any natural cavity or entrance into the earth as well as rock shelters of sufficient size to offer sustained protection from the elements.

The survey occurred over 4 days from May 28th, 2022, until June 2nd, 2022. Chris Ploetz worked with Mr. Silvestre Rash, who has extensive experience with caves, archaeological excavation, and was among those who worked with Dr. Prufer on his initial cave survey of the area in the early 2000s. Mr. Rash's efforts and expertise proved invaluable for the successful completion of this survey. Ploetz visited cave locations using his GPS unit (Figure 6.1), noting the general size and location of the feature and if there was evidence of human activities.

**Figure 6.1.** Chris Ploetz conducting cave survey in the Bladen. Photo by A. Thompson.

## Findings

In total, we identified 36 caves, including at least one previously unidentified cave with Preclassic ceramics and animal bone fragments. Of the 86 possible caves in the survey area, many were not visited due to time constraints of the short survey. Other areas of interest were too dangerous to visit without the proper safety equipment. Many caves documented during Prufer's MMAP cave

survey were re-identified and their coordinates updated to reflect the geospatial accuracy now available due to updates to GPS technology. Previously recorded caves including Itzam Cab Pek, Saki Tzul, Ukal Pek, Chabil Ukal, Kulibal, and Mayehal Xheton (see Prufer 2002) corresponded to six of the caves remotely identified on the terrain models and ground truthed during survey. However, the other caves discussed in Prufer's (2002) dissertation were not identified during ground truthing. Confirmed cave points recorded on the GPS unit have been projected and listed below in Lat/Long (NAD 83 zone 16N).

***Cave 1*** – Lat/Long coordinates (-88.92 16.49)

The first cave identified was a small opening that was observed during travel to Muklebal Tzul. While returning to AC Camp from Muklebal Tzul, the survey team opportunistically surveyed the cave. The findings were recorded as C1. The cave was partially flooded at the time of recording. No artifacts or cultural evidence was observed around the entrance and it was not entered.

***Cave 2 (***-88.92 16.49)

The second cave identified was more of a deep rock shelter than a cave but fulfilled the requirements for a positive identification. The site was large and able to provide shelter from rain for the survey team, demonstrating one of the many functions of cave-like features. Around the entrance of the cave were scattered ceramic sherds and evidence from the modern refuse and from Mr. Rash that it was used recently, possibly by poachers.

***Cave 3*** (-88.92 16.49)

Just south of Cave 2 was another cave feature which was smaller in both height and depth. There was no evidence of ceramic or lithic assemblages at this cave.

***Cave 4*** (-88.92 16.49***) and Cave 5*** (-88.92 16.49)

While separate, these two cave features were in close proximity to one another and, as such, would have likely been used in conjunction. They did not have any noticeable signs of human activity and were partially covered by vegetation, obscuring our ability to observe what was inside the cave.

***Cave 6*** (-88.92 16.49)

This cave was small and could only fit one or two people in it at a time. It was deep enough to have a dark zone. There were small scatterings of ceramics, but all sherds were too small to type or identify occupational history.

***Cave 7 "Pemeche (Seashell) Cave"*** (-88.92 16.49)

This cave had a significant number of ceramics as well as marine shell. The interior was spacious with a reddish soil covering the ground. It is particularly noteworthy that the interior was dry and sandy, especially as it had once again begun to rain outside. In addition to the ceramic deposits in the cave entrance, there were a great many scattering of lithic flakes suggesting it may have been used as a place to craft stone tools. As an original member of the MMAP cave survey team in the 1990s, Mr. Rash informed me that this cave had not been previously identified and did not have a name so per tradition Mr. Rash named it Pemeche cave. Pemeche means seashell in Q'eqchi.

***Cave 8*** (-88.92 16.49)

The opening of Cave 8 was approximately 3 meters wide with broken ceramics at its entrance. Near the entrance but far enough away to be sheltered from the rain was an *incensario* that was still atop a small possible altar. Satellite reception on the handheld GPS unit was spotty at Cave 8, so it is unclear if this cave has been previously identified. If so, it may have been Mayehal Xheton (see Prufer 2002).

***Cave 90*** (-88.92 16.49)

Cave 9 is likely Itzam Cab Pek cave, as its location nearly matched the coordinates from the 1990s survey. The cave had scatterings of pottery as well as some lithics but the strongest evidence that this was a cave was previously documented was the presence of flagging tape that was still affixed to the cave itself. Mr. Rash also confirmed that he remembered this cave, although could not recall its name.

***Cave 10*** (-88.91 16.49) ***and Cave 11*** (-88.91 16.49)

Cave 10 and 11 were both located at the end of Cave Creek. They were located across the creek from one another in such a way that one was observable from the other. The creek itself continues over very slick rocks and was a good distance from AC Camp, resulting in the decision end the first day of survey and head back to camp after finding Cave 11. Both caves had ceramic and lithic scatters at the entrances and to a lesser degree in the interiors, but it was Cave 11 that had evidence of human use. The cave was steeply inclined after about 2 meters past the entrance. It was a dry cave and a dusty red sediment was deposited at the entrance. The most noticeable cultural artifact in the cave was a large *metate* in a clearing. After some searching Mr. Rash located the *mano* nearby as well. Both artifacts appear to have been made of granite, which is local to the Maya Mountains (Prufer 2002), and were heavily worn down.

***Cave 12*** (-88.89 16.50)

Cave 12 was a small cave located to the west of Saki Tzul rock shelter. The opening was only 2 meters wide but Mr. Rash thought it probably opened up into a larger chamber towards the back but without safety equipment we were unable to enter the cave and confirm his hypothesis.

***Cave 13*** (-88.90056000999994 16.503974972000037)

Further to the west from Cave 12 was an extensive crevasse network that was ultimately deemed too dangerous to explore further but not before confirming that the entrance continued for some distance and may have been used in the past.

***Cave 14*** (-88.90 16.50)

Cave 14 was a small rock shelter, similar in composition to Saki Tzul but on a much smaller scale. There were no cultural artifacts in the immediate vicinity.

***Cave 15*** (-88.90 16.50)

This small cave was located to the south of Caves 14 and 13. This small cave had an entrance that extended vertically straight down from the surface. Using lights, we were able to determine that this cave was quite deep, but not suitable for further exploration at the time of the survey without the use of safety equipment.

***Cave 16*** (-88.89 16.50)

This "cave" is Saki Tzul rock shelter (see Chapters 2 and 3 above).

***Cave 17*** (-88.89 16.49), ***Cave 18*** (-88.89 16.49), ***and Cave 19*** (-88.8 16.49)

These caves are in close proximity to one another making up an almost continuous series of rock shelters. They each have separate "opening" which were correctly identified by the lidar data but, in reality, are a single cave feature. They each have scatters of ceramics and lithic debitage at their entrances.

***Cave 20*** (-88.99 16.49)

This cave had been observed in the first days of the field season as it was on route to both Ek Xux and Saki Tzul. There was no evidence of humane presence save that of the survey team and rangers. The cave had running water at all times and was enterable even during pouring rain.

***Cave 24*** (-88.91 16.49)

This cave was not entered or even reached by the survey team as it was located along steep and dangerous terrain. From the ground we visually identified an entrance although it is unclear if it was a rock shelter or a true cave.

***Cave 25*** (-88.90 16.48), ***Cave 26*** (-88.90 16.48), ***Cave 27*** (-88.90 16.486386973000037)

These three caves were located at the periphery of the lidar data, demonstrating the need acquire more lidar data within the Bladen Nature Reserve to fill these gaps in our knowledge of this remote landscape. Cave 27 contained the presence of an altar-like structure.

***Cave 28*** (-88.91 16.49), ***Cave 29*** (-88. 16.), ***and Cave 30*** (-88.9116.49)

These three cave entrances collectively make up a single cave. It is perhaps the most impressive cave (Figure 6.2); this entrance is internally connected to the AC cave located directly below and with sufficient rope and safety gear, would be possible to repel to the other entrance. This cave was large enough to enter and explore to some extent. There were several chambers, some interconnecting with other chambers and some dead ending. If there was any doubt that this cave had been explored and surveyed in the past it was quickly extinguished when flagging tape and nails were seen in the cave walls. Additionally, Mr. Rash and Dr. Prufer (who was able to join the survey for this cave) both recalled the cave and pointed out notable features.

**Figure 6.2.** Entrance of a cave documented during the cave survey.

***Cave 31*** (-88.91 16.49***) and Cave 32*** (-88.91 16.49)

These two rock shelters contained no artifacts although they resemble the rock structures of Saki Tzul and would have offered some cover from the elements, thus is not possible to rule out their potential as archaeological sites.

***Cave 33*** (-88.90 16.49)

Cave 33 was one of the more notable and interesting caves found during this survey. The cave itself was nestled in an area of small rock shelters and vertical shafts. The cave opening was a vertical shaft that was not explored as we lacked proper safety gear. Just outside the cave entrance in a small rock shelter overhang was the jawbone of a porcine as well as two very large pottery

fragments that appeared to have stamping that will be analyzed at a later date. One such fragment was collected and catalogued for further study.

***Cave 34*** (-88.90605996399995 16.49910198500004)***, Cave 35*** (-88.90617798099998 16.49842497900005), ***Cave 36*** (-88.90626196699998 16.498633018000078)

These were smaller rock shelters with limited ceramics and no lithics of note.

***Cave 37*** (-88.90626196699998 16.498633018000078)

A small pseudo-cave as it surely a dark zone, but was not large enough for the team to enter. It is possible there is another entrance which would be more suitable for human entrance, but it was not seen during the time of the survey.

***Cave 39*** (-88.92 16.49)

This cave was not reached by the team as it was deemed unsafe as with many of the caves on this survey. However, it was located directly atop a small rock shelter and was visible from the ground.

***Cave 40*** (-88.90 16.49)

This small cave was noted on the last day of the survey which had to be cut short due to unforeseen circumstances that took precedence over the survey.

**Summary of Results**

Of the GPS cave points from the 1990's, between 58% and 75% overlapped with cave-like features identified on the predictive models. Considering the lower accuracy of the legacy cave points, the actual accuracy may vary. We ground-truthed potential cave locations based on the predictive model to verify the location of caves documented during the MMAP cave survey (see Prufer 2002) with more accurate GPS points. Within the limited survey area, there were 50 potential caves. In four days, we documented 36 caves (Figure 6.3). However, within the survey area, there were six possible cave features remotely identified using the lidar data that we were unable to located. Additionally, eight possible cave entrances were inaccessible and it remains unknown if they are true caves or appeared to be caves on the lidar data but are not actually caves.

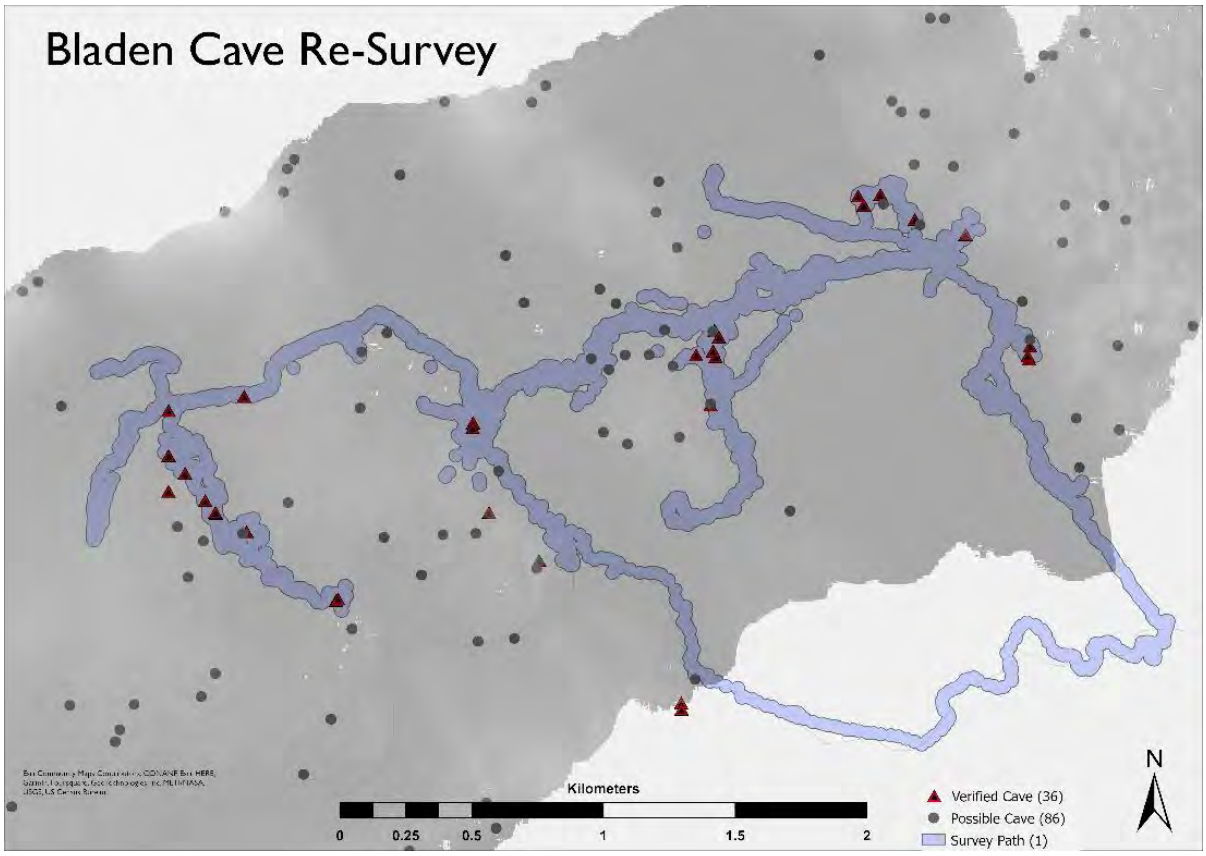


**Figure 6.3.** Map showing the potential caves (grey points), caves that were ground-truthed (red triangles), and survey track (blue line). Map by C. Ploetz.

## Conclusions

Given the uncertainty of the legacy GPS data accuracy, it is difficult to determine the effectiveness of this method in identifying previously discovered caves in the Bladen. As a method for identifying caves in the Maya Mountains, however, it has shown to be effective in highlighting potential cave and cave like features (rock shelters, chasms, etc). The effectiveness was increased thanks to the Traditional Ecological Knowledge (TEK) provided by Mr. Rash who was able to interpolate the location of nearby caves when they were geographically displaced from their expected location. It is also worth noting that the method employed to identify the potential cave entrances does not distinguish between crevasse, rock shelter, true cave, and other rock formations. In the future this methodology should be adjusted in order to incorporate TEK and geological data to eliminate some cave-like features that would likely have not been of interest to the ancient Maya and increase the efficacy of the survey. Additionally, a larger survey team and safety equipment would allow for more thorough exploration of the caves themselves and perhaps yield even better results.

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