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The potters' perspectives: A vibrant chronology of ceramic manufacturing practices in the valley of Juigalpa, Chontales, Nicaragua (cal 300 CE - present)

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5 Spatiotemporal dataset

This chapter presents the spatiotemporal distribution of the data recovered during survey, mapping, and excavation, which will be divided in three different sections. To begin with, the results of the systematic full coverage high intensity surface survey and mound recording will be briefly summarized. The surface distribution of all of the archaeological remains encountered in the area will be addressed, including man-made mounds, ceramics, chipped stone, ground stone, petroglyphs, and sculpture fragments. A deeper discussion of surface finds can be found in Donner *et al.* 2018, and a full characterization of the settlement patterns of the research area, as well as thorough site descriptions, can be reviewed in Alejandro Arteaga's Master's thesis (Arteaga 2017). Even though 52 sq km were covered by the survey, only the results from a 42 sq km subarea will be discussed, because results from the survey extensions to the south (around La Pachona) and to the southeast (at Cerro Los Andes) are still pending analysis.

Second, the specific contexts excavated to retrieve the ceramic assemblage analyzed in this manuscript will be described. As part of the fieldwork conducted for this manuscript, 52 units were excavated in 18 different sites. However, and as will be outlined in Chapter 6, laboratory methods necessitate different sampling strategies. Therefore, only the seven excavated sites and 12 stratigraphic excavations which were sampled for full ceramic laboratory analysis will be thoroughly characterized. For these case studies, a site description will be included, as well as a general stratigraphic overview and a summary of the distribution of materials within the identified stratigraphic units. For the remaining eleven excavated sites and for the excavation units not included in the full analytical procedure, a summary of the results will be provided since the morphometric characteristics of the ceramics retrieved in those excavations are included in the discussion on Chapter 8.

Last, the radiocarbon dates obtained by Accelerator Mass Spectrometry (AMS) will be presented. In total, 28 samples were processed, including charcoal, charred seeds, charred residues adhered to pot sherds, zooarchaeological remains, and organic sediment. While 17 samples were analyzed by Beta Analytic (USA), one was processed by Poznań Radiocarbon Laboratory (Poland), and the remaining ten were run by the Keck-Carbon Cycle AMS facility at University of California, Irvine (USA).

5.1 SURFACE SURVEY RESULTS

The detailed pedestrian survey was an opportunity not only to record the distribution of archaeological evidence throughout the research area, but also to become familiar with the landscape, including its vegetation, fauna, rural settlements, topography, and especially its people. The observable history of the valley of Juigalpa spans from its geological origins, goes through pre-Hispanic and colonial traces, and includes the remnants of the Sandinista revolution and civil war times, as well as the devastating effects of modern activities and their unregulated deforestation practices, all of which have had dramatic effects on the lives of humans, animals, insects, plants, soils, and water sources.

The range of pre-Hispanic evidence found on the surface included man-made mounds, ceramics, chipped stone, ground stone, mortars or polishers,[59] petroglyphs, stone sculpture, and basalt columns. The differential distribution and spatiotemporal interrelationships of these finds throughout the

59 Mortars or polishers refer to circular or quadrangular features carved on bedrock outcrops, which could have been used as mortars for grinding products (both edible and not edible) and also as polishers.

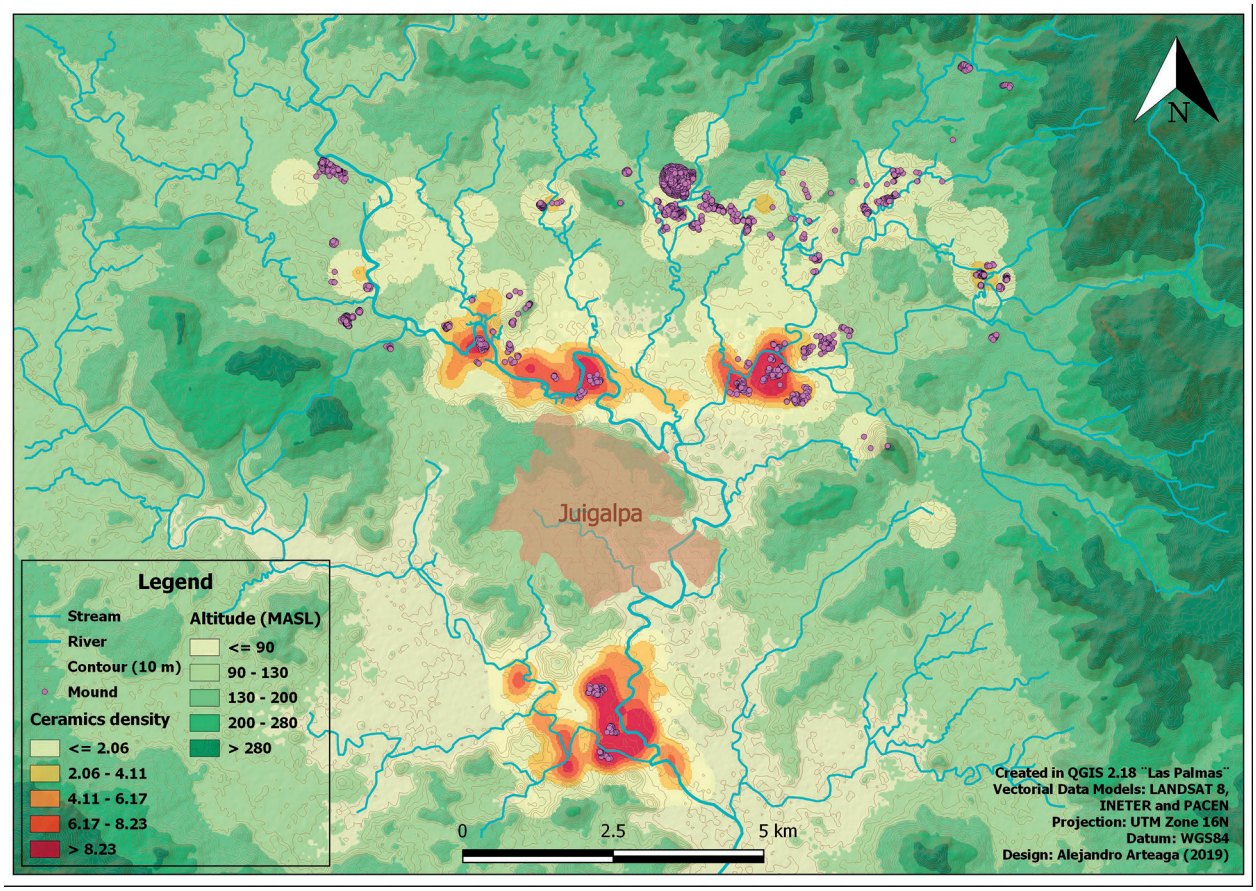

Figure 20: Distribution of surface ceramics throughout the research area (credit: Alejandro Arteaga).

valley is of relevance for understanding the history of dwelling practices, from ancient times through the present.

Surface ceramics featured varied visible attributes but are generally characterized as small fragments of usually between 3 and 4 cm, with pastes of brown to red colors, mostly undecorated. When decorations were present, they were mostly comprised of incisions and/or monochrome brown or red slips, as well as white slips in significantly lower quantities. Very occasionally, painted polychrome fragments were also identified on the surface. In one case, Sebastián Ríos Histórico, colonial sherds were identified during the survey.

Surface ceramics were found distributed throughout the research area in 250 locations, which were mainly associated to river and stream banks, as well as sites with architecture (**figure 20**). However, ceramics were absent on the floodplain located south of Aguas Buenas, in the area covered by soils that are locally referred to as *barrial* (vertisols). The highest concentrations were located south of the valley, within the section where both the Mayales and the Carca rivers show a large number of meanders and intersections with seasonal and permanent streams. These areas with high concentrations of surface ceramics are also associated to the Sabana Grande site cluster and the Roberto Amador-Inés Rocha-La Aventura-Güegüestepe site cluster.

According to the results yielded by a systematic clay survey, these two clusters also coincide with the most extensive clay outcrops within the research area (Casale 2017; Casale *et al.* 2020) and could have been used by different communities over several centuries, even before the construction of the mounded sites (Donner *et al.* 2017). Also, the area along the Mayales river that presented large amounts of surface ceramics is home to contemporary potters,

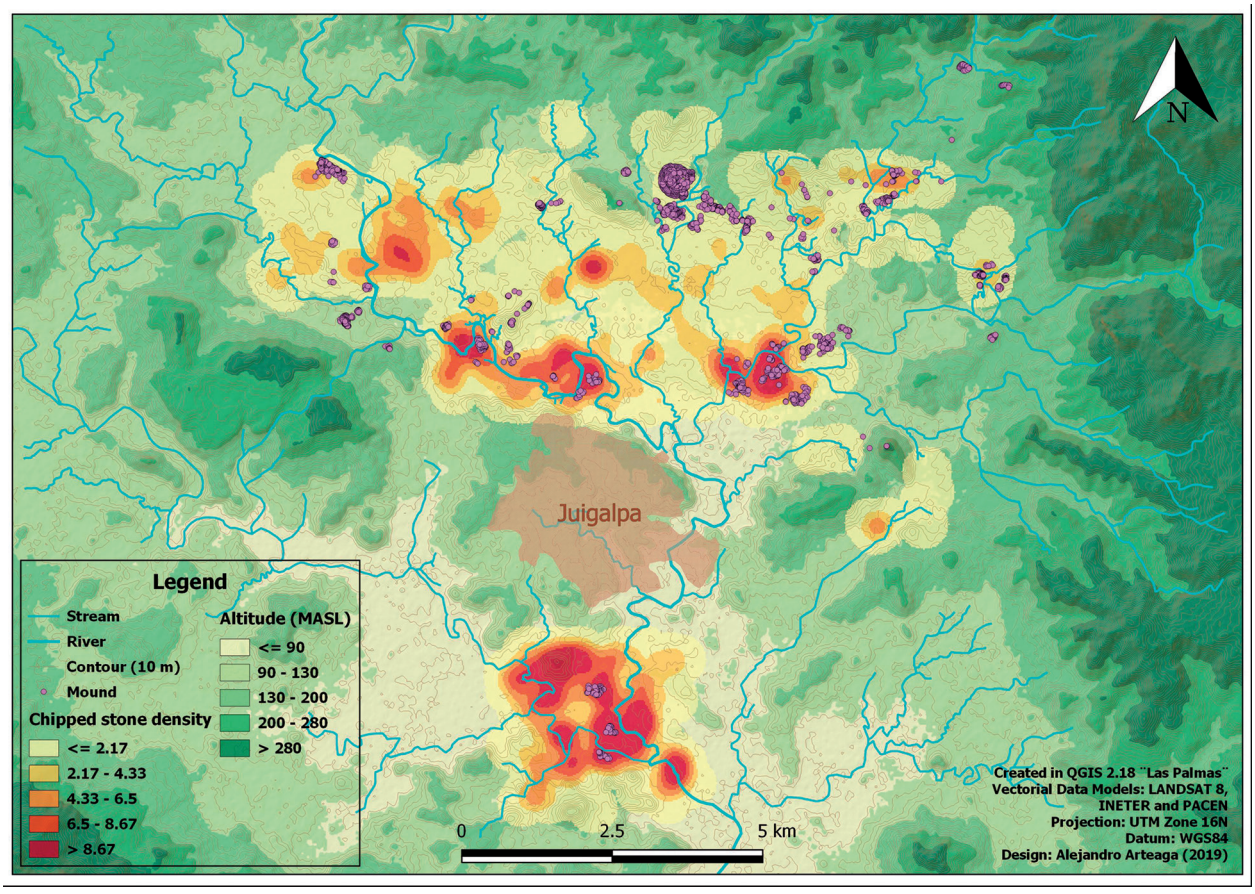

Figure 21: Distribution of surface chipped stone throughout the research area (credit: Alejandro Arteaga).

like the Güegüestepe community, which was still active by 2015 but almost completely abandoned in 2016 due to migrations connected with low demands of ceramic vessels at regional markets and the persistence of drought. Other potters were identified in this area, particularly along the road to the town of Cuapa, made visible thanks to their kilns located in front and behind their houses right by the road. In spite of these contemporary cases, recording of surface finds was carefully conducted to differentiate between contemporary and ancient pottery. In doing so, the aim of reconstructing the history of pottery-making practices throughout the research area was met.

In general, surface ceramic finds throughout the research area are low when compared to other regions of Nicaragua and southern Central America. As a result, the values in the mound recording form—as outlined in Chapter 4—established that a 'high density' was represented by 40 or more sherds per find spot. In some sites, especially Aguas Buenas and its surroundings, surface ceramics are hardly visible at all. Only in four specific cases, namely Guarida del Coyote, Roberto Amador, the Sabana Grande cluster, and La Pachona, this situation was completely different, with very high quantities of surface ceramics and materials in general. Another site outside of the research area, Santa Rita, also features such higher densities, with the possibility of counting 50 rims after walking a few steps across the site.

Chipped stone was registered in 446 loci, covering the research area with a clear pattern of higher densities along the rivers, streams, mounded sites, and on the central floodplain, where ceramics are all but absent (**figure 21**). The concentrations of chipped

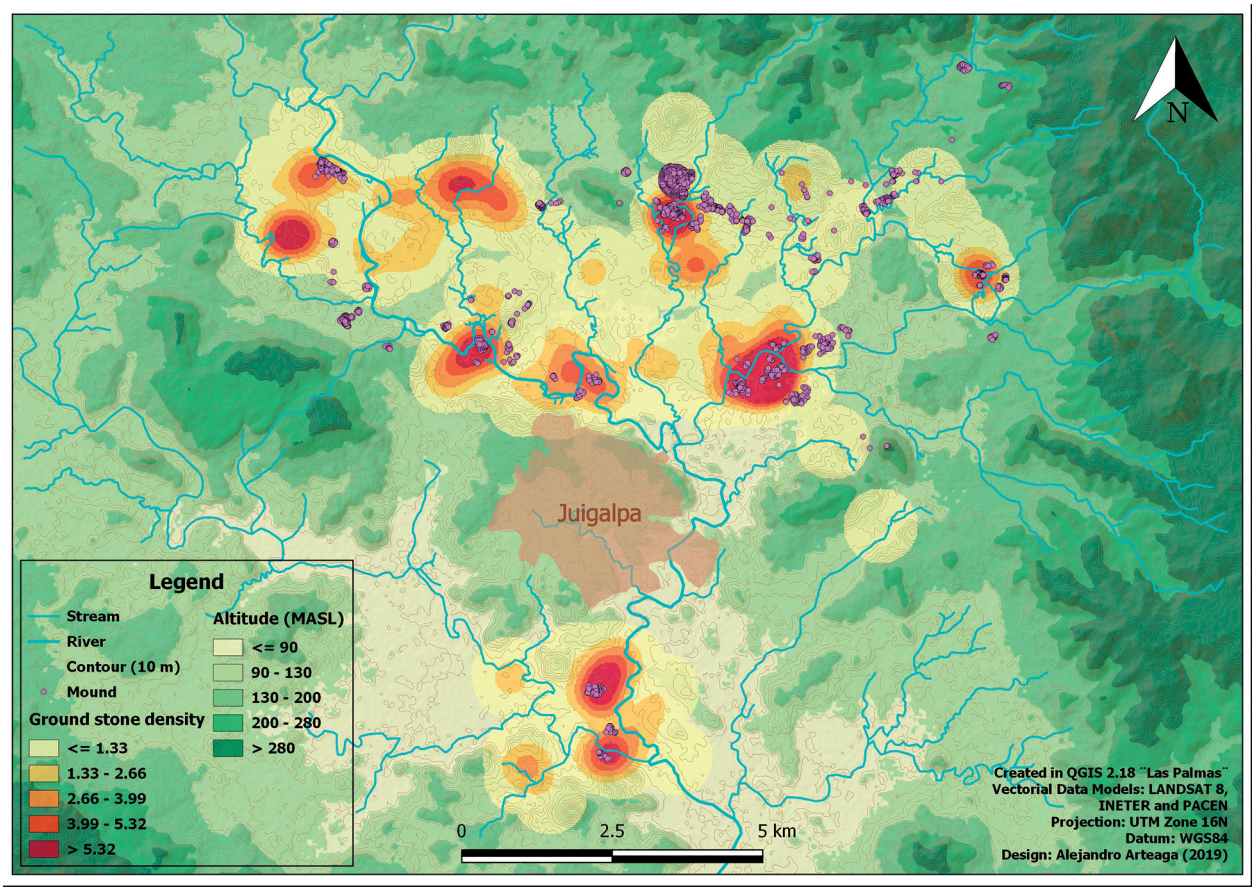

Figure 22: Distribution of surface ground stone throughout the research area (credit: Alejandro Arteaga).

stone fragments are more distributed throughout the research area when compared with surface ceramics. Also, chipped stone was the most abundant type of find recorded during the pedestrian survey, and four out of the six concentration areas with highest densities coincide with the highest densities of ceramics: Guarida del Coyote, Roberto Amador, the Sabana Grande cluster, and La Pachona.

Finds were mostly characterized by an industry of small flakes and other cutting tools such as scrapers and knives, with occasional observation of complete artifacts like arrow points or bifaces. Raw materials consisted mainly of different types of chert, and possible locations for procurement could be the rivers and streams. However, a hill situated to the northeast of La Pachona presented some evidence for raw material procurement practices and could partially explain the much higher densities of lithic artifacts on the surface of that site. This site had been previously recorded by Rigat (1992) and named I44, being characterized as both a quarry and workshop (Gorin 1990, 160). Even though the materials—identified as jasper—did not seem workable at first sight, experimental burning conducted by J.C. Moreno de Sousa and S. Castillo Jiménez showed that thermal pretreatment enhances the quality of the raw materials, making flaking possible and producing usable sharp end products. Very few obsidian fragments were observed on the surface within the survey area, with the caveat that obsidian was only separately recorded from chipped stone halfway through the survey. Therefore, localities with surface obsidian could not be quantified, but its occurrence during excavations will be addressed below.

The materials classified as ground stone mostly included grinding tools, such as fragmented *metates*, *manos*, *morteros* and *manos de mortero*. Also, a

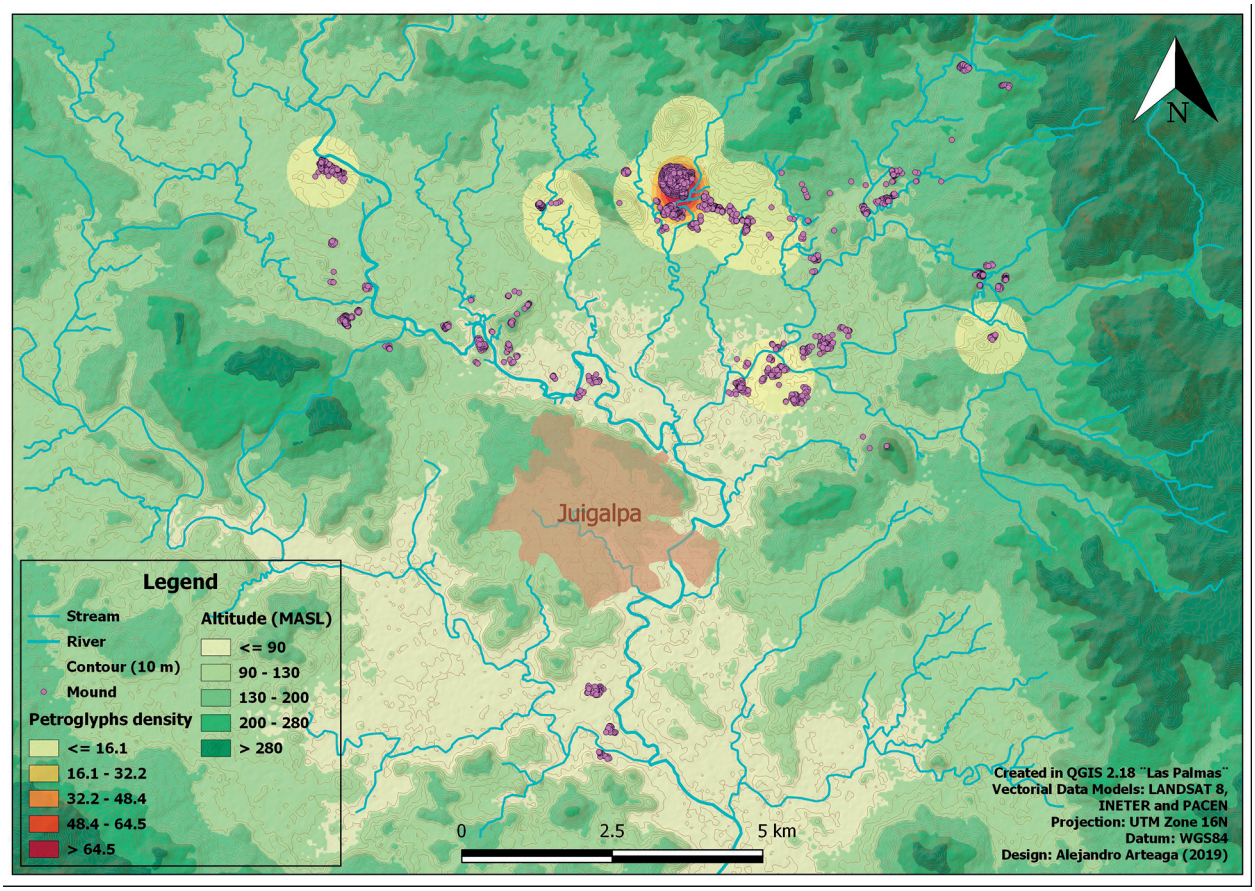

Figure 23: Distribution of surface petroglyphs throughout the research area (credit: Alejandro Arteaga).

few complete axes were recorded. Raw materials for these kinds of artifacts were likely procured from local streams and rivers, as these provide a wide variety of boulders, volcanic in origin, with highly heterogeneous rock matrices and suitable for chipping. Additional materials could have been procured from the Amerrisque mountains or nearby peaks, such as Cerro de la Cruz.

Ground stone was recorded in 158 different locations throughout the research area, associated to streams, rivers, and mounded sites (**figure 22**). The floodplain tended to feature small concentrations and the distribution pattern, in comparison with the other two industries discussed, shows clustering in a wider area. However, Guarida del Coyote, the Sabana Grande cluster, and La Pachona also feature high surface densities, as was the case with ceramics and chipped stone. Barillas and Lázaro Villegas, which have low densities of ceramics and moderate quantities of chipped stone, in contrast show high quantities of ground stone. Some unmounded sectors to the northwest of the research area featured numerous ground stone fragments.

80 different panels with petroglyphs were recorded, which were carved into either bedrock outcrops or loose rock fragments (**figure 23**). Integration between rock carving and mound construction practices is evidenced at the surface by the 16 petroglyphs that were carved on outcrops also used as mound foundations.

Additionally, 45 natural stream pools were located in the area; and one site—Las Pocitas—stands out because it integrates a seasonal stream, stream pools, and 14 petroglyph panels, with no association to any other material culture. These petroglyphs and stream pools are all located on the

Figure 24: Fragment of stone sculpture located at the Piedras Grandes II site (credit: Alejandro Arteaga).

same geomorphological unit as Aguas Buenas—the piedmont north of the plain, where bedrock outcrops, streams, and pools occur naturally. Mortars were also encountered within this section of the research area, with one additional location that corresponds to Roberto Amador, which is an exception to this geomorphological pattern.

Moreover, five fragments of stone sculptures were found near four mounds (**figure 24**), in addition to a sphere carved from igneous rock (30 cm diameter) located on the plain, near a small stream and surface chipped stone finds (**figure 25**). Finally, 31 unworked basalt columns, possibly procured at Cerro de la Cruz located 2 km east of Juigalpa, were documented throughout the research area, and they seem to have been construction materials associated with mound building.

Figure 25: Igneous rock sphere.

5.2 MOUND RECORDING RESULTS

Mound recording took place only within 48 sq kilometers of the research area, in the entirety of quadrants 1, 2, 3, 4, 5, and 8 and in parts of quadrants 6 and 7. Quadrant 7 was not completed due to lack of time and the recognition that mound morphology was distinct from the rest of the research area. This variability entailed methodological and technical challenges that exceeded the time and budget available for this research. Therefore, data analysis focused on a smaller area of 42 sq km that shows shared mound building practices throughout a period of at least 1000 years.

In total, 1671 mounds were recorded in the research area; 1300 were documented between 2015 and 2016 (Arteaga 2017; Donner *et al.* 2018) and the remaining 371 correspond to Aguas Buenas (Geurds & Terpstra 2017; Auziņa 2018) (**figure 26**). An analysis of mound morphologies and spatial arrangements of Aguas Buenas can be consulted in Dita Auzina's Research Masters thesis (Auziņa 2018). Mound morphologies outside of Aguas Buenas are diverse. From the 1300 recorded, 81% were circular, 12%

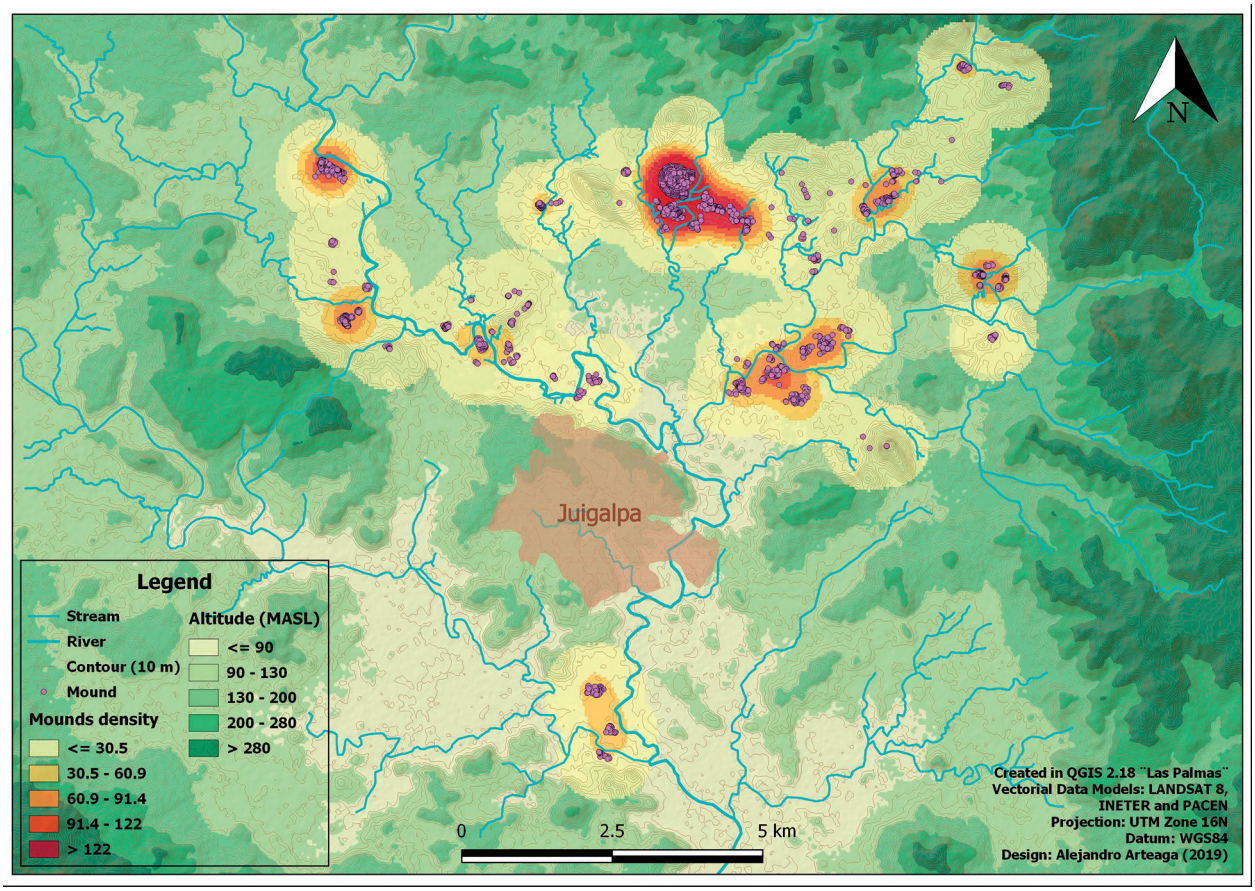

Figure 26: Distribution of man-made mounds throughout the research area (credit: Alejandro Arteaga).

were ovaloid varieties, and 3% were semi-circular or incomplete circles. The rest of the mounds, 4%, were represented by rectangular and irregular shapes, as well as stone alignments (Arteaga 2017; Donner *et al.* 2018). Overall, architectural remains average 6.5 m on their longest axis and 0.33 m in height. Construction materials consisted of bedrock fragments, river stones, and sediment, as well as chipped stone, ground stone, and ceramic fragments (Arteaga 2017; Donner *et al.* 2018).

Architectural remains were grouped in 47 different mound clusters, which were defined by creating 100 m cluster groups based on site design; mound distributions; the presence of large flat areas surrounded by mounds (*plazas*, backyards, communal localities for integrative practices); and geomorphological constraints, including rivers, streams, and elevations, among others.[60] The different mounded sites and clusters share certain patterns concerning their relationships with water sources, soil types, geomorphological units, and variability of materials found on their surfaces. First, sites are distributed throughout the slightly inclined slopes of bedrock formation north of the area, either associated to seasonal streams, such as Aguas Calientes and Aguas Buenas, or along the Mayales river and Carca stream, which have a year-round water flow. Mounded sites located on top of Cerro de la Cruz and the Aguas Calientes hills are exceptions to the previous pattern, as they are not situated immediately near water sources. Another exception are sites located on alluvial plains.

60 The term plaza is used here without implying a Mesoamerican bias related to specific schemes of social organization and distribution of power (Tsukamoto & Inomata 2014).

Second, more than 80% of the sites are associated to *tierra lanilla* (alluvial soil) surface soil, which is characterized by fragmented and weathered volcanic tuff that covers roughly 50-60% of the research area (van Dijk 2017). Sometimes, *tierra lanilla* occurs in combination with *tierra normal* (tropical brown alluvial soil) and/or *talpetate* (young volcanic ash). Sites that do not show this surface soil are usually located on hilltops, such as Güegüestepe, Cerro Aguas Calientes, and Cerro de la Cruz. Less common surface soils associated to mounded-sites are *tierra normal* and *granza*, which consist of tropical iron-rich alluvial soils with high fertility. In contrast, there is a total absence of mounded sites in correlation with *barro* (tropical alluvial soil), *arena* and *arenoso* (alluvial deposits which occur on riverbanks and along streams), as well as *barrial* (vertisol) soil types. This last category, which is characteristic of the central floodplain, features chipped stone and ground stone evidence, but no mounds or ceramic finds. A few mounds were encountered in *barrial*, but they are located at the edge of archaeological sites and at the bottom of slopes, where alluvial soils concentrate. Finally, the majority of sites are located on slopes, elevated platforms, natural rock formations, or hills. Exceptions are sites placed on the alluvial plains covered by *granza* and *tierra normal*, or along seasonal streams.

In spite of the good surface visibility rates throughout the research area, ranging from medium to high with grasses not exceeding 40 cm in height, more than half of the mounds (65%) did not yield archaeological materials on their surface (Arteaga 2017, 132). Ceramics were the most ubiquitous finds associated to mounds, present on 46%, followed by chipped stone (40%) and ground stone (13%). Other material culture was only documented on less than 3% of the recorded mounds.

5.3 EXCAVATED CONTEXTS

5.3.1 AGUAS BUENAS

Site description

The site traditionally known as Aguas Buenas (Gorin 1990; Lange *et al.* 1992; Geurds & Terpstra 2017; Auziņa 2018) spreads throughout plots of land that are currently owned by Don Juan Suárez, Rolando Montes Suárez and Lázaro Villegas. Specifically, it is located west of La Garnacha stream, on the meander formed by the junction between this water source and another seasonal stream called Quebrada de Ánimas.

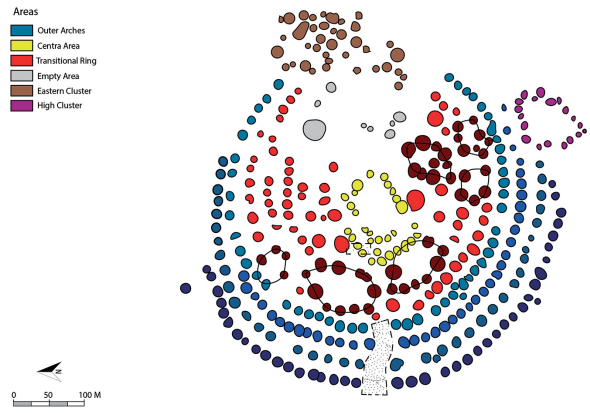

Figure 27: Map of Aguas Buenas highlighting the six different areas identified by Auzina (redrawn from Auziņa 2018, 89, fig. 29).

The site is covered by *lanilla* and *talpetate* soils (alluvial soils and litosol), which are currently employed for cattle pasture and maize agriculture. Therefore, the lots are mainly deforested and feature an assortment of grasses, but also a variety of trees such as Jiñocuabo (*Bursera Simaruba*), Jícaro (*Crescentia cujete* and *Crescentia alata*), Cortés (from the Tabebuia genre), Aceituno (*Simarouba amara*), Igualtil (*Genipa americana L.*), Chiquirín (*Myrospermum frutescens*), Cedro espinoso (*Pachira quinata*), and Nancite (*Byrsonima crassifolia*).

Modern use of the land includes habitation in rectangular houses that combine modern architectural features—mainly comprised of nails, tile, and zinc roofs—with more traditional construction practices that involve clays, grass, different types of wood, thatch, and occasionally some rocks (Llaudet 2019). Daily practices involve cattle ranching, agriculture—mainly corn and beans—and preparation of foodstuffs to be sold at the Juigalpa market.

The site features architectural intentions of symmetry and geometrical patterning that combine both circular and angular rationales; it covers approximately 28 hectares and comprises of at least 60 clusters of rock carvings and 371 man made mounds, which were grouped in six areas by Auzina (2018) (**figure 27**). These categories include the *Outer Arches*, the *Central Area*, the *Transitional Rings*, the *Empty Area*, the *Eastern Cluster*, and the *High Cluster*. A summary based on the findings provided by Auzina (2018) is provided in **Appendix 7**.

Mounds feature a combination of shared characteristics and variability. Both surface and excavation work conducted by PACEN (Geurds 2012; 2013a; 2014) suggest that these mounds were built directly on top of the bedrock, mostly using extracted bedrock blocks of 20 to 60 cm long, mixed with sediment (*tierra lanilla*) as well as ceramic and chipped stone fragments.[61] However, mounds show high variability in size, shape, construction materials, relationship to the landscape, and distance from each other. Still, the majority of the mounds (87%) have a circular shape; only 3% are oval, while the rest have an irregular outline. Auzina (2018, 61) characterizes five groups of mounds according to their diameter and five groups according to mound height. Her analysis reveals that only size and surface materials are relevant variables for examination, since the rest of the attributes show more regularity than variability. This homogeneity of construction practices, together with the clear architectural configuration, suggests an intended construction endeavour (Joyce 2004). Auzina's spatial analysis indicates a non-dichotomic combination of organic growth and planned development. According to Auzina's (2018, 83) calculations, the site was probably constructed over a period of 100 and 400 hundred years.

Material culture densities on the surface of the site are very low, meaning that very few fragments of ceramics and lithic artifacts are visible on the ground. While 89% of the mounds had no association to surface finds, only 11% of the man-made structures featured material culture on their surface. This exceptional trait is almost exclusive to the northeastern section of the site, which showed surface materials that suggest a more intensive use of the area (Auziņa 2018, 105). Mounds at the *Eastern Cluster* also feature differential shapes (oval and rectangular) that stand out from the rest of the site (see **Appendix 7**).

The extension of the site beyond the geometrical pattern is still under examination. However, survey on the highlands north of AB confirmed that it served as a natural boundary. Also, the cliff located to the south and the east, which precedes La Garnacha stream, functioned as a natural boundary for the mound configuration. To the south and the west, Las Ánimas stream forms a natural boundary together with La Garnacha. However, it is important to mention that there is a gap of 250 m between the outermost arc of mounds and this other stream, where no structures were built. Therefore, the west boundary of the site is unclear. The Aguas Calientes hill offers unique visibility of the site, allowing a viewer to perceive the geometric patterns of the mounds and the main access (Auziņa 2018, 131), so it could also be considered a natural boundary. Beyond these ideas on the site's boundary, the relationships between the Aguas Buenas complex and the hundreds of mounds surveyed and mapped around it, especially south and southeast of it, are still under examination.

According to Gorin (1990), Aguas Buenas' chronology spans the Cuisalá (400 - 800 CE) and Potrero (800 - 1200 CE) phases in the northern sections, with a Cuapa (1400 - 1600 CE) component. This later moment, as mentioned above, included building practices that do not follow the previous site design and was interpreted as domestic, in contrast to the rest of the site (A. Geurds, pers. comm. 2014). Spatial analysis of the site also suggests different developmental phases that included both highly planned areas and naturally grown sections, corresponding with Gorin's assessment based on surface ceramics that includes the three phases mentioned above. According to Auzina (Auziņa 2018, 130), the earliest moments of Aguas Buenas are related to the construction of the *Central Area*, the *Outer Arches*, and probably the *High Cluster*. In its original configuration, it is feasible that the *Outer Arches* covered the *Transitional Ring* and maybe also the *Empty Area* as well (Auziņa 2018, 136). Then, possible changes in the use or meaning transformed the spatial logic, and the *Transitional Ring* was built. Finally, the *Eastern Cluster* corresponds with a later phase of occupation, oriented towards daily practices. Due to the multicomponent characteristics of the site and the spatial distribution of its surface materials, six different 2x2 m stratigraphic pits were placed in different portions of Don Juan Suárez' lots, covering the following sections of the site: the *Eastern Cluster*, the *Empty Area*, the *Central Area*, and the *Transitional Ring* (**figure 28**). Previous excavations led by Geurds have already sampled the *Outer Arches*, and materials from Mound 1 are briefly discussed in Chapters 7 and 8.

61 Mound 34 also yielded a loose bedrock fragment with carvings, and Mound 1 featured small complete vessels, including a shoe pot (coiled) and a calabash shaped vessel (the only vessel within the whole dataset fashioned from a clay mass).

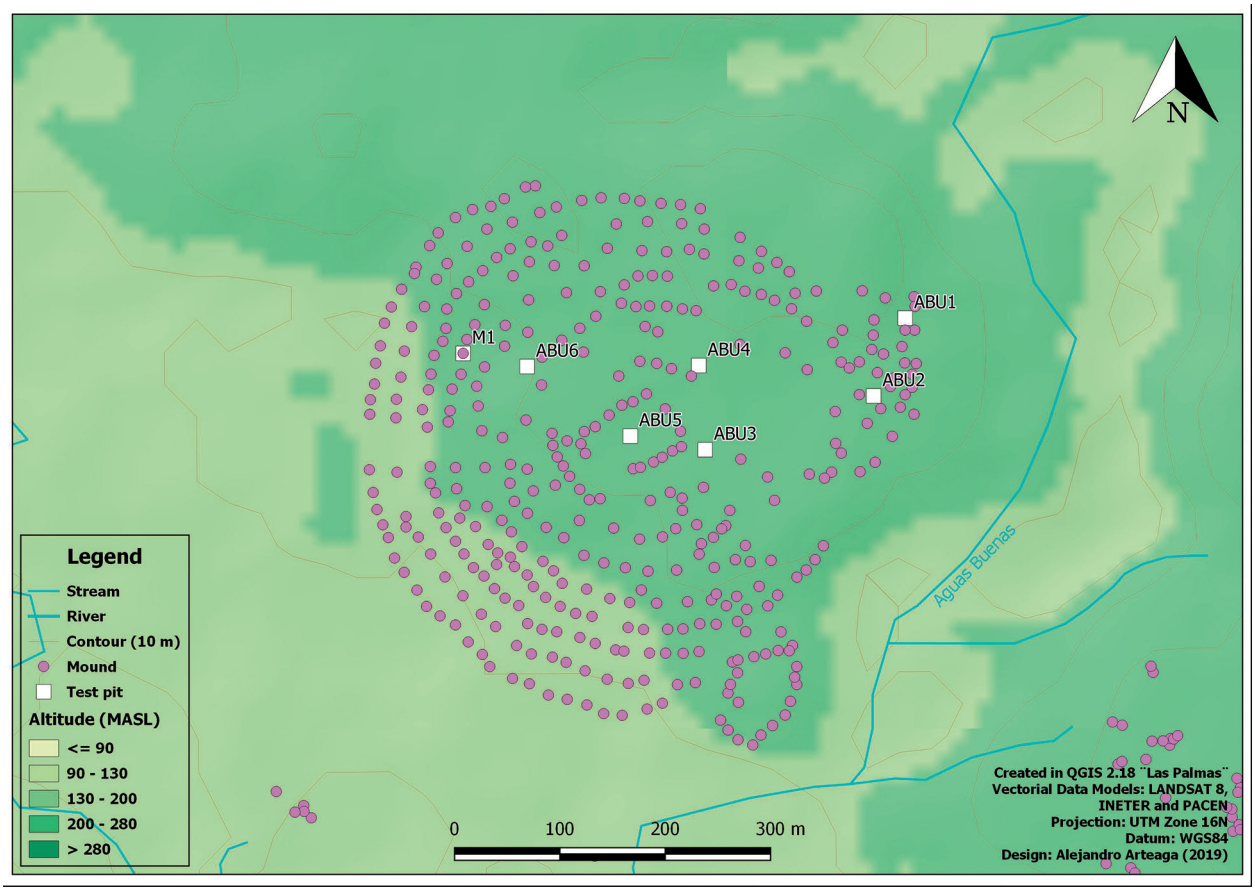

Figure 28: Map of Aguas Buenas including the location of the six different test pits excavated in 2015 and highlighting M1, excavated in 2012 (credit: Alejandro Arteaga).

Excavation units 1 and 2 (AB1, AB2) were placed within the *Eastern Cluster* to test the hypothesis of its later development based on surface materials, spatial organization and morphology of the architectural remains through controlled stratigraphic excavations. AB1 was located on the highest part of that portion of the terrain, between Mounds 365 (7 m wide, oval shape) and 367 (circular). AB2, on the other hand, was placed on the lower side of the lot, in order to compare its cultural and geological stratigraphy to AB1. Excavation units 3 and 4 (AB3 and AB4) were located in the *Empty Area*. While AB3 was specifically situated in the southern portion of this section, east of the *Central Area*, AB4 was placed at the northern part of the *Empty Area*, approximately 30 m west of Mound 272, the largest structure of the site. Excavation unit 5 (AB5) was positioned at the core of the *Central Area*, a low plain terrain that gets flooded every rainy season. Excavation unit 6 (AB6) was situated on the northwest side of the *Transitional Ring*, specifically within one of the mound clusters located on elevated land. Rodrigo Angeles Flores tried to set up a seventh excavation unit on the northwesternmost sector of the *Outer Arches*; however, bedrock was found a few centimeters from the surface, so the pit was discontinued. As a result, materials from Mound 1, located on the *Outer Arches* (fourth arch counting from outside to inside), were then included in this analysis. The only area that was not excavated was the *High Cluster*, due to time and logistical issues. In spite of that, sampling of all the areas mentioned above should generate sufficient data to test Auzina's temporal hypothesis for Aguas Buenas.

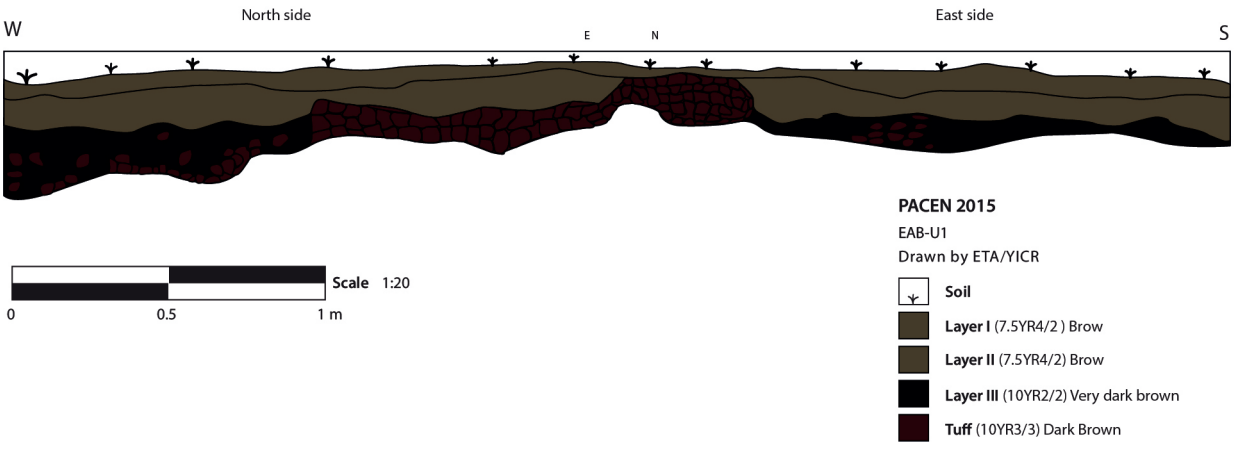

Figure 29: Drawing of Aguas Buenas excavation unit 1 (EAB1), northern and eastern profiles.

Figure 30: Photograph of Aguas Buenas excavation unit 1 (EAB1), eastern profile.

Stratigraphy at Aguas Buenas

All units excavated in Aguas Buenas feature similar stratigraphy (**figures 29 and 30**), characterized by a minimal presence of the O soil horizon, which is a consequence of the modern use of the land, which has turned it into grasslands. Within the eluvial zone, horizon A (the topsoil) was a light grey *lanilla*, full of organic materials, such as grass roots and insects, as well as low densities of material culture in all units, except for AB6. Horizon AE had a slightly lighter color, possibly due to the combination of the loss of humidity and the appearance of volcanic tuff particles, which are light grey. This horizon presented the majority of the material culture remains (AB3 is the only exception), so it is considered the core cultural stratigraphic portion of human presence in the site. In the illuvial zone, horizon AB consisted of a more iron, clay, and aluminum rich soil, with a darker color. It still presented material culture remains but in lower densities than the previous horizon. AB3 is an exception to this, with the bulk of its material culture evidence present within this horizon. Horizon C, or the partially altered parent rock, was characterized by the strong presence of fragmented volcanic tuff, which could still yield some material culture. Finally, Horizon R, the bedrock, consisted of continuous masses of hard rock, which were archaeologically sterile.

EAB1

Five arbitrary levels of 10 cm each were excavated, and four stratigraphic units were identified, which all yielded ceramic and chipped stone fragments. Levels 3 and 4 also presented burnt clay, and Level 3 yielded organic remains as well. Also, fragments of stone were retrieved consistently (R_1 and R_2), which seem to have been a product of the degradation of surrounding mounds. This hypothesis is supported by the fact that archaeological remains were found both on top (Layers T, II_1, II_2, and III), in between (III) and underneath these rocks (III and IV). Therefore, the structures were possibly filled with sediment, small rocks, and archaeological materials, which were deposited first on top of the last occupied surface as a product of the collapsing process of the structure. Then, larger rocks used to build low retaining walls collapsed (R_1 and R_2),

Layer/Level Graph	I1(3,00-10,00 cm)	II2 (10,10-20,00 cm)	III3 (20,10-30,0 cm)	IV3 (20,10-30,00 cm)	V4 (30,10-40,00 cm)	V5 (40,10-50,00cm)	Totals
CER #	78,00	1751,00	11,00	55,00	0,00	0,00	1895,00
CER w	372,60	8226,50	88,20	378,00	0,00	0,00	9065,30
CS #	75,00	699,00	6,00	12,00	0,00	0,00	792,00
CS w	44,90	1166,10	14,30	24,90	0,00	0,00	1250,20
GS		X					
AB		X					

Table 4: Distribution of materials collected from Aguas Buenas excavation unit 2 (EAB2). CER # accounts for the number of sherds retrieved, while CER w stands for the weight (in grams) of the ceramic fragments. CS refers to chipped stone, GS to ground stone, and AB to animal bone.

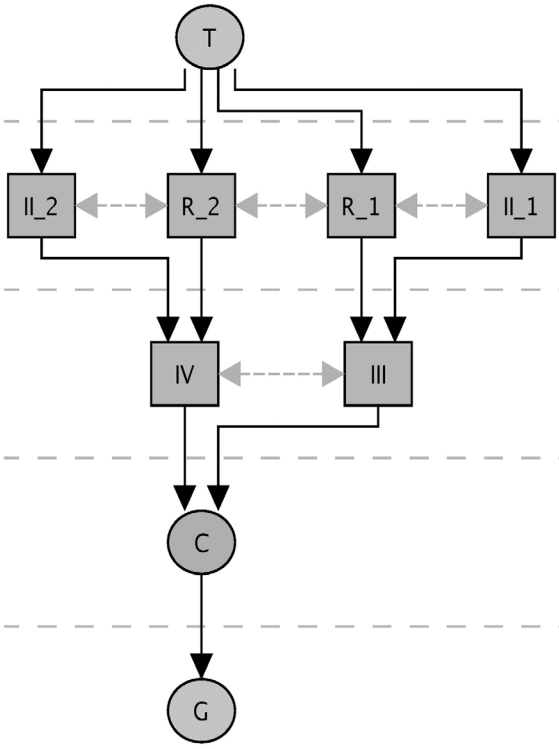

Figure 31: Harris matrix model for Aguas Buenas excavation unit 1 (EAB1).

to finally give way again to more of the filling, no longer contained by the rocks (**figure 31**). Finally, towards the northeast corner of the unit, a possible leveling of the bedrock was identified (C). The deepest sections of IV (55 to 60 cm) were sterile, and bedrock (G) was reached afterwards, with some outcrops as shallow as 10 cm.

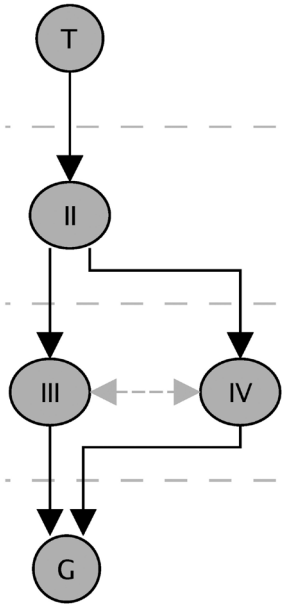

Figure 32: Harris matrix model for Aguas Buenas excavation unit 2 (EAB2).

EAB2

In this unit, five arbitrary metric levels of 10 cm were excavated, and five different stratigraphic units were identified (**figures 32 and 33**). Sterile bedrock (V or G) was reached at 20 cm at its shallowest point and 50 cm at its deepest. Layers I (T), III, and IV yielded both ceramics and chipped stone (see **table 4**), while II also featured those types of material culture, but also ground stone, burnt clay, and an animal tooth fragment identified as *Odocoileus virginianus* (White-tailed Deer).III appears to be a floor and/or leveling of the bedrock, and IV featured a burnt clay concentration

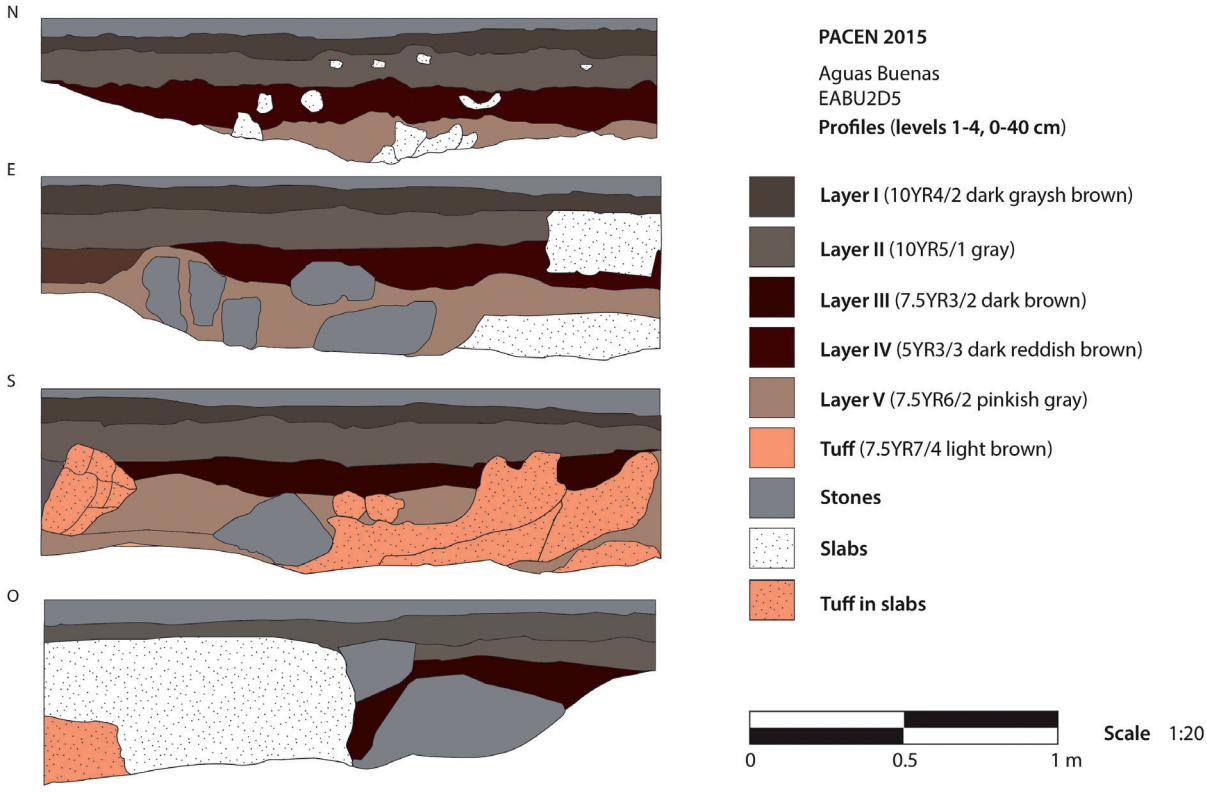

Figure 33: Drawing of Aguas Buenas excavation unit 2 (EAB2) profiles.

towards the north profile of the pit, as well as a very small fragment of faunal bone (<3 mm), which was recovered through flotation. II is the stratigraphic unit that yielded most of the materials found in the excavation unit.

EAB3

Five arbitrary metric levels of 10 cm were excavated, and the same number of stratigraphic units were identified (**figures 34 and 35**). Layer I only featured chipped stone, while II, III, and IV yielded both ceramic and chipped stone fragments. Ceramic densities were higher within the first levels, and the sherds' size also reduced when reaching deeper levels (see **table 5**). This unit did not feature large rocks or any evident modification of the terrain, so the materials might have come from the surrounding mounds or practices performed in the area. V (G) consisted of the bedrock.

Right - **Figure 34:** Harris matrix model for Aguas Buenas excavation unit 3 (EAB3).

Layer/Level Graph	I (0,10-10,00 cm)	II2 (10,10-20,00 cm)	III2 (10,10-20,00 cm)	IV2 (12,00-20,00 cm)	II3 (20,10-26,00 cm)	III3 (20,10-28,00 cm)	IV3 (20,10-30,00 cm)	V3 (20,10-30,00 cm)	IV4 (30,10-40,00 cm)	V4 (30,10-40,00 cm)	V5 (40,10-50,00 cm)	Totals
CER #	0,00	51,00	0,00	0,00	0,00	160,00	0,00	0,00	31,00	0,00	0,00	242,00
CER w	0,00	201,90	0,00	0,00	0,00	700,20	0,00	0,00	188,10	0,00	0,00	1090,20
CS #	60,00	20,00	6,00	0,00	0,00	0,00	0,00	0,00	2,00	0,00	0,00	88,00
CS w	45,90	35,20	22,70	0,00	0,00	0,00	0,00	0,00	7,70	0,00	0,00	111,50

Table 5: Distribution of materials collected from Aguas Buenas excavation unit 3 (EAB3).

Figure 35: Photograph of Aguas Buenas excavation unit 3 (EAB3), western profile.

EAB4

Five arbitrary levels were excavated, and four different stratigraphic units were identified (**figures 36 and 37**). The first three layers (I or T, II, and III) yielded ground stone, chipped stone, and ceramic fragments (see **table 6**). SIII only featured archaeological materials in level 3 because in deeper levels, a transition to the next stratigraphic unit was marked by tuff fragments and bedrock outcrops. In contrast to the previous excavations in the site, stratigraphy in this unit was uniform, and a sterile layer (III) was identified before the bedrock (IV or G).

Right - **Figure 36:** Harris matrix model for Aguas Buenas excavation unit 4 (EAB4).

Layer/Level Graph	I1 (0,1-10cm)	II1 (4,00-10,00 cm)	II2 (10,41-20,00 cm)	III2 (19,00-20,00 cm)	II3 (20,10-28,00 cm)	III3 (20,10-30,00 cm)	III4 (30,10-40,00 cm)	III5 (40,10-50,00 cm)	IV5 (46,00-50,00 cm)	III6 (50,10-54,00 cm)	IV6 (50,10-60,00 cm)	Totals
CER #	0,00	3,00	65,00	1,00	7,00	0,00	0,00	0,00	0,00	0,00	0,00	76,00
CER w	0,00	17,30	655,00	4,70	76,90	0,00	0,00	0,00	0,00	0,00	0,00	753,90
CS #	4,00	5,00	37,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	46,00
CS w	2,80	4,70	119,10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	126,60
GS						X						
BC			x									

Table 6: Distribution of materials collected from Aguas Buenas excavation unit 4 (EAB4).

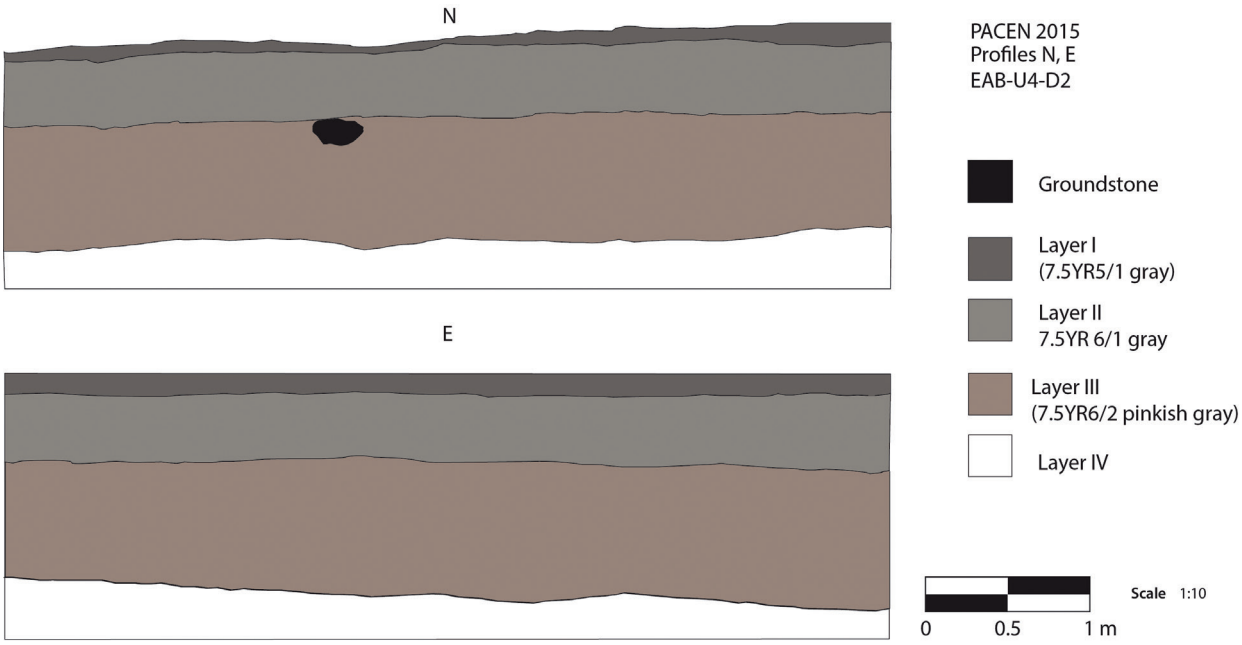

Figure 37: Drawing of Aguas Buenas excavation unit 4 (EAB4) northern and eastern profiles.

EAB5

Seven arbitrary levels were excavated, and five stratigraphic units were recognized (**figures 38 and 39**). Only layers II and III yielded ceramics (see **table 7**). Additionally, II featured chipped stone and ground stone fragments. Except for these two layers, the rest of the stratigraphic units consisted of sterile clayish soils, which flood seasonally in a way that modern cattle come to drink water at this location. Due to the low material culture densities, excavations of the sterile V (or G, bedrock) were continued from level 6 (50-60 cm) in half of the pit (1 x 2 m), whereas the last level (until 70 cm) was reduced even more to a 0.5x1 m window. Throughout the unit, several dark brown spots were found, which could indicate higher

Right - **Figure 38:** Harris matrix model for Aguas Buenas excavation unit 5 (EAB5).

Layer/Level Graph	II1 (2-10 cm)	II2 (10.1-20 cm)	III2 (10.1-20 cm)	III3 (20.1-30 cm)	IV3 (27-30 cm)	III4 (30.1- 40 cm)	IV4 (30.1-40 cm)	IV5 (40.1-50 cm)	IV6 (50.1-52 cm)	V6 (50.1-60 cm)	V7 (60.1-70 cm)	Totals
CER #	3	12	2	4	0	1	0	0	0	0	0	22
CER w	2.2	105	1.4	11.8	0	2.1	0	0	0	0	0	122.5
CS #	1	15	1	0	0	0	4	0	0	0	0	21
CS w	2.7	70.9	66.7	0	0	0	116	0	0	0	0	256.3

Table 7: Distribution of materials collected from Aguas Buenas excavation unit 5 (EAB5).

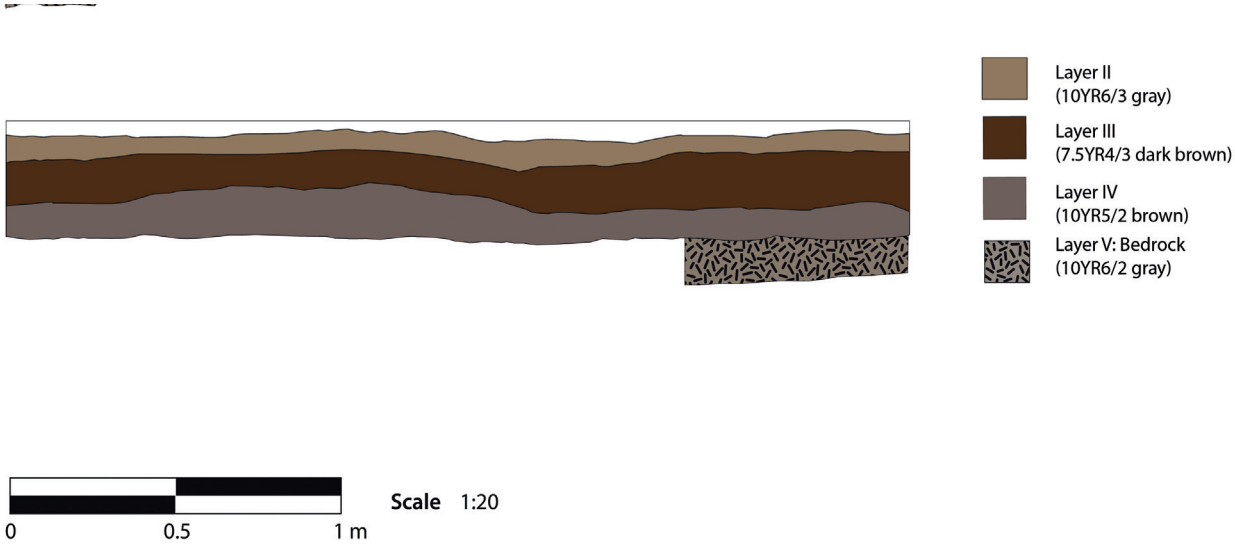

Figure 39: Drawing of Aguas Buenas excavation unit 5 (EAB5) northern and southern profiles.

Figure 40: Harris matrix model for Aguas Buenas excavation unit 6 (EAB6).

organic content; however, no macroremains were recovered during the flotation process. This unit is different from the rest because the bedrock was not preceded by a layer that already included fragments of eroded tuff (Horizon C). The density of material culture was minimal in comparison with the rest of the units, which is probably related to taphonomic processes linked to the flooding episodes as well as to the original use of the space.

EAB6

In this unit, we excavated four arbitrary 10 cm levels and three stratigraphic units (**figures 40 and 41**). Layers II and III yielded ceramic fragments, but II also featured chipped stone and ground stone (see **table 8**). Only the first two levels yielded archaeological materials, and the rest were completely sterile. Stratigraphy of this unit was very similar to AB3 and AB4, so we can infer that the taphonomic processes of these open areas, and/or the practices associated to them, were similar.

Layer/Level Graph	I1 (0,10-10,00 cm)	II1 (4,00-10,00 cm)	II2 (10,10-20,00 cm)	III2 (12,00-20,00 cm)	II3 (20,10-30,00 cm)	III3 (20,10-30,00 cm)	III4 (30,10-40,00 cm)	III5 (40,10- 50,00 cm)	III6 (50,10-60,00 cm)	Totals
CER #	0,00	0,00	27,00	0,00	26,00	0,00	0,00	0,00	0,00	53,00
CER w	0,00	0,00	84,00	0,00	113,90	0,00	0,00	0,00	0,00	197,90
CS #	0,00	0,00	8,00	0,00	5,00	0,00	0,00	0,00	0,00	13,00
CS w	0,00	0,00	16,90	0,00	23,10	0,00	0,00	0,00	0,00	40,00

Table 8: Distribution of materials collected from Aguas Buenas excavation unit 6 (EAB6).

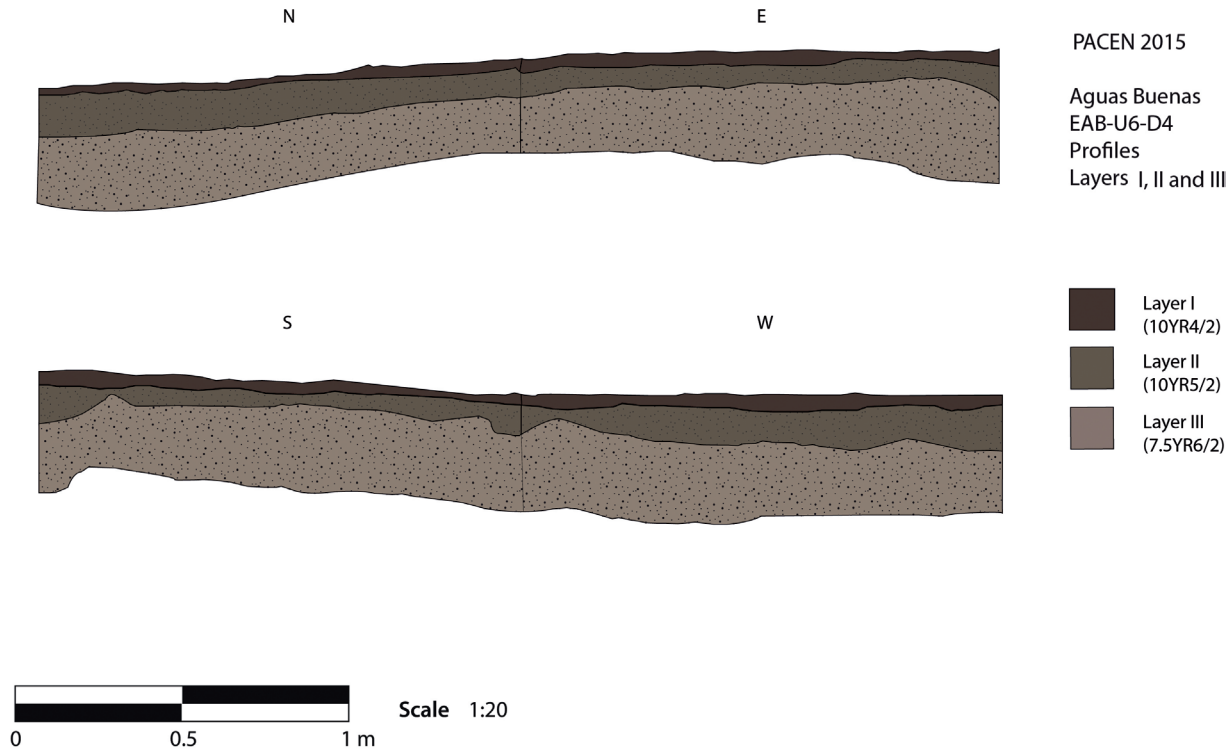

Figure 41: Drawing of Aguas Buenas excavation unit 6 (EAB6) profiles.

Figure 42: Photograph of M1 after quadrant excavation (courtesy of Roosmarie Vlaskamp) and Harris matrix model.

Mound 1

M1 was excavated during the 2012 season, using the quadrant method to expose the northeast and southwest portions of the structure (Geurds 2012). Stratigraphic analysis of the excavation data suggests the presence of five stratigraphic units, of which two are geological and three archaeological (**figure 42**). Following the order of the construction practices, it is probable that the first layer was formed by an outer ring of large rocks (R, measuring 50-60 cm), which served as a retaining wall for the foundation of the mound. Afterwards, a layer comprised of ceramics and sediment was placed right above the bedrock (SIII), which was in turn covered by another stratum made of rocks and sediment (90% and 10% respectively), which comprised the bulk content of the mound (II). Finally, a thin depositional stratigraphic unit was found on top of the structure. In general, material culture was mainly recovered from stratigraphic unit III, which was placed at the beginning of the construction.

5.3.2 ALBERTO OBANDO

Site description

The lot owned by Alberto Obando is located 500 m west of Aguas Buenas's northernmost *Outer Arches* and northeast of the Aguas Calientes hill. Also, the site is situated in the foothills of the Amerrisque mountains to the north and west of Quebrada de las Ánimas, the stream that flows into La Garnacha and serves as a possible boundary for AB. Since the lot is used exclusively for cattle pasture, surface soil and vegetation are similar to AB, but modern houses were not built within its boundaries.

The site is covered by *lanilla* (alluvial) soil, which is covered by improved grasses. The type of *lanilla* found in AO is considered by locals as a special, or pure, kind, since it has the best qualities for making clay houses in the traditional way. Even though the lot is mainly deforested, it features a variety of trees such as Jiñocuabo (*Bursera Simaruba*), Jícaro (*Crescentia cujete* and *Crescentia alata*), Chiquirín (*Myrospermum frutescens*), and Pochote (*Bombacopsis quinata*).

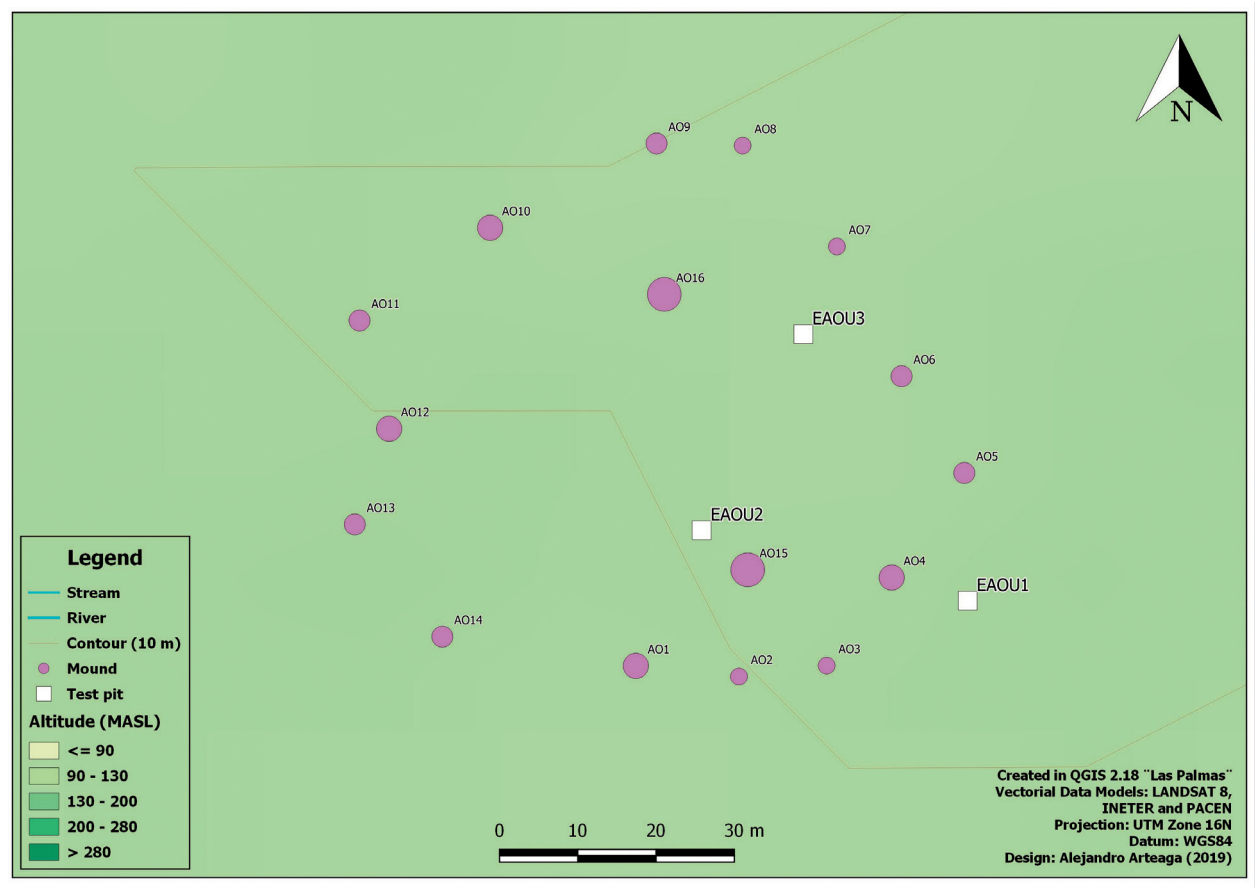

Figure 43: Alberto Obando site plan featuring excavation units (credit: Alejandro Arteaga).

The site is comprised of 16 circular mounds (**figure 43**) that average 31 cm in height and 589 cm in diameter, built on a flat terrain that softly slopes towards the south—where a creek is found—and towards the east, a terrain that floods seasonally. Currently, a dirt road that connects the Aguas Buenas and Aguas Calientes communities cuts the site in two, leaving one mound (M14) in the middle of the road. Structures are all circular and homogeneous in size, except for mound 17 (M17), placed at a central location within a circular arrangement of mounds. This resembles the spatial logic present in AB, especially the *Outer Arches* and the *High Cluster*, as well as similar mound clusters within Lázaro Villegas' terrain. This central[62] mound is 1100 cm wide and 130 cm height, which contrasts with the rest of the structures, which do not exceed 70 cm. Morphologically speaking, it is also different, because it consists of an elevated foundation, whereas the rest of the site is comprised of circumscribed leveled elevations. The other mound located within this circular arrangement is mound 16 (M16), which is also larger—800 cm diameter and 69 cm in height—than the rest. Construction practices seem to have been homogenous; the majority of the mounds feature an outer ring formed by blocks from extracted bedrock, then filled with a mixture of sediment, rock, and material culture.

Most mounds featured materials visible on the surface in low and medium densities, and chipped stone was more commonly found than ceramics. Ground stone or other types of archaeological evidence were not visible at the surface. As this was a previously unrecorded site, no chronological hypotheses were available by the time the excavations took place.

Three different stratigraphic pits of 2x2 m were placed throughout the site (see **figure 43**). Excavation unit

62 This is not a hierarchical assessment; "central" refers to its location within the mound arrangement.

Layer/Level Graph	I1 (8,00-10,00 cm)	I2 (10,10-20,00 cm)	II2 (13,00-20,00 cm)	II3 (20,10-30,00 cm)	III3 (27,00-30,00 cm	II4 (30,10-33,00 cm)	III4 (30,10-40,00 cm)	IV4 (36,10-40,00 cm
CER #	0,00	0,00	0,00	0,00	687,00	0,00	0,00	69,00
CER w	0,00	0,00	0,00	0,00	2560,70	0,00	0,00	314,40
CS #	0,00	3,00	5,00	0,00	362,00	0,00	0,00	52,00
CS w	0,00	1,20	3,00	0,00	633,40	0,00	0,00	60,60
BC					X			

Layer/Level Graph	III5 (41,00-46,00 cm	V5 (40,10-50,00 cm	V5 (44,00-50,00 cm	IV6 (50,10-60,00 cm	V6 (50,10-60,00 cm	IV7 (60,10-69,00 cm	V7 (60,10-70,00 cm)	V8 (70,10-80,00 cm)	Totals
CER #	0,00	56,00	0,00	0,00	0,00	0,00	0,00	0,00	812,00
CER w	0,00	200,00	0,00	0,00	0,00	0,00	0,00	0,00	3075,10
CS #	24,00	0,00	1,00	0,00	0,00	0,00	0,00	0,00	447,00
CS w	61,90	0,00	71,40	0,00	0,00	0,00	0,00	0,00	831,50
BC									

Table 9: Distribution of materials collected from Alberto Obando excavation unit 1 (EAO1).

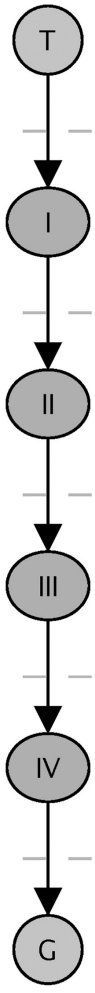

Figure 44: Harris matrix model for Alberto Obando excavation unit 1 (EAO1).

AO1 was located south of the site, on a flat surface between mounds M5 and M6. Excavation unit AO2, on the other hand, was placed west of the main mound. Finally, excavation unit AO3 was situated on the flat part of the terrain, outside of the circular mound arrangement.

Stratigraphy at Alberto Obando

All units excavated in Alberto Obando were characterized by a very thin O soil horizon, usually 1-3 cm deep, which is possibly a consequence of the modern use of the land, which has turned it into grasslands. Excavation unit EAO1 featured its core archaeological stratigraphy within Horizon AB, while excavation units EAO2 and EAO3 showed their cultural component within Horizon AE. Horizons A, AE, AB, C and R showed very distinct characteristics within each unit, or were absent or not excavated, so they will be described separately.

EAO1

Six arbitrary metric levels of 10 cm each were excavated, and five different stratigraphic units were identified (one cultural, four geological, see **figure 44**). After the minimal O horizon, within the eluvial zone, followed horizon A (the topsoil), a brown soil with moderate content of organic materials, such as roots, grass, and seeds, as well as a few fragments of chipped stone (I, or T). Horizon E (II) had a lighter color—gray—possibly due to the loss of humidity and organic matter and continued with a very low density of chipped stone fragments. Within the illuviation zone, Horizon B (III), of a pinkish gray color (darker than Horizon E) was rich in iron, clay, aluminium and organic compounds. Also, it presented the highest density of material culture of the excavation unit, including ceramics, chipped stone and burnt clay—which was exclusive to III (**table 9**). Therefore,

Figure 45: Photograph of Alberto Obando excavation unit 1 (EAO1) northern profile.

Figure 46: Photograph of Alberto Obando excavation unit 2 (EAO2) southern profile.

this cultural stratigraphic unit is interpreted as the core cultural layer of the excavation unit, also containing the highest density of finds throughout the site. Horizon C (IV), of a very dark gray color, was characterized by an abrupt decrease of finds and the presence of fragmented volcanic tuff. Finally, horizon R, the bedrock (V), almost did not contain any soil at all, but only fragmented bedrock and bedrock masses, with a minimal quantity of chipped stone fragments. The northeast section of the unit features a depression (**figure 45**), which is not necessarily interpreted as a cut, but could correspond with natural wear of the bedrock resulting from practices that took place around mound M16, such as walking, channeling water, or construction traces, for example. Excavations of V deeper than 60 cm were continued on a 50x50 cm window at the northeast section of the pit (**figure 45**), and these last 10 cm were completely sterile.

EAO2

Five arbitrary 10 cm levels were excavated, and eight stratigraphic units were identified (one cultural, the rest geological, see **figure 46**). Generally, the stratigraphy of this unit, located northwest of the central mound, was more complex than in the other two excavation units. After the minimal O horizon and within the eluvial zone, followed horizon A (I), a light brownish grey *lanilla*, with low contents of organic materials, mainly seeds as well as very low quantities of ceramic sherds and chipped stone. Horizon E (II) had a lighter color—gray—possibly due to the combination of a loss of humidity and organic matter together with the presence of tuff inclusions. Material culture density increased (also ceramics and chipped stone finds) and several fragments of charcoal (<2 mm) were present. Also, stratigraphic unit II showed the highest density of material culture and featured medium sized stones (15 cm wide) oriented towards the mound. This soil profile was characterized as an AC soil because Horizon B was absent; however, one stratigraphic unit (V), of a dark brown color, could represent some accumulation of minerals transported from above. Below, Horizon C was divided into two groups of stratigraphic units. First, (III, VI, VII, VIII), of a whitish color, were characterized by fragmented parent material and minimal material culture. In this respect, III yielded ceramic sherds, and chipped stone, while VI and VIII only presented chipped stone and VIII was archaeologically sterile. Second, IV, of light grayish brown color, contained some small fragments of charcoal and fragmented volcanic tuff. In this unit, horizon R was not reached and after a depth of 50 cm, excavations continued only on the south section of the pit, where 60 cm in depth was reached. This last arbitrary level, part of VI, was sterile.

Figure 47: Photograph of Alberto Obando excavation unit 3 (EAO3) taken from the west.

Figure 48: Photograph of Alberto Obando excavation unit 3 (EAO3) taken from the north, featuring the visible SIII modifications of the bedrock.

EAO3

Six arbitrary metric levels of 10 cm each were excavated, and eight stratigraphic units were identified (one cultural, one geological but modified, six geological, see **figure 47**). This excavation unit yielded the lowest quantity of material culture. Excavation unit EAO3 was characterized by a minimal Horizon O, followed by Horizon A (I) of a brown color, which lacked material culture but included organic remains such as roots, charcoal, grass, and insects. Within the eluviation and leaching zone, Horizon E (II), of a grayish brown color, still contained the same type of organic matter as the horizon above, but was the only one to feature archaeological finds, comprised of both ceramics and chipped stone. This stratigraphic unit also featured a tooth fragment that belonged to *Bos taurus* (Domestic Cow) within the first 15 cm of excavation, so it could correspond with bioturbation. This soil profile was, as in EAO2, an AC soil because it lacked Horizon B. Therefore, Horizon C (IV and V) was found immediately below Horizon E and was sterile. Horizon R (III), with minimal ceramic finds, featured a unique modification: bedrock was intentionally cut 11 cm below surface level, with an almost perfect north-south orientation, creating two features. First, a semi-circular 40 cm wide carving created a set of two steps (approximately 15 cm high each) and a base for placing a semi-rounded feature (**figure 48**). Second, this intentional removal of the bedrock created a bedrock platform, elevating the architectural portion of the site. This could have served many purposes, such as a raw material resource for mound building practices, channeling of rainwater, enhanced visual exposure of the mounded area, or access to the mounded sector of the site, for example. The feature resembles a kiln, but the absence of charcoal and minimal material culture finds recovered make that hypothesis hard to verify. After a depth of 60 cm, excavations continued only within the eastern portion of the pit. No archaeological materials were found between 60 and 70 cm, so the excavations were stopped.

5.3.3 LA AVENTURA

Site description

The farm called “La Aventura” is owned by Jackson Arellano and is located on elevated terrain, at the south foot of the Güegüestepe hill, less than 100 m east of the Mayales river and 800 m northwest of Juigalpa. This area of the Mayales river is characterized by three pronounced meanders. The site is situated east of one of these curves in the river course, within Mr. Arellano’s and Irene Rocha’s lots, which are separated by a fence that runs in an east-west direction. Additionally, four mounds were placed on Lenin Molina’s land, to the east. The area is accessible on foot by pedestrian paths that run through the valley, but locals—including the people who live in the Güegüestepe community—prefer to enter the farm by crossing the Mayales river and then connect with the Juigalpa-Cuapa road. The crossing of the Mayales in this area is possible by car (in

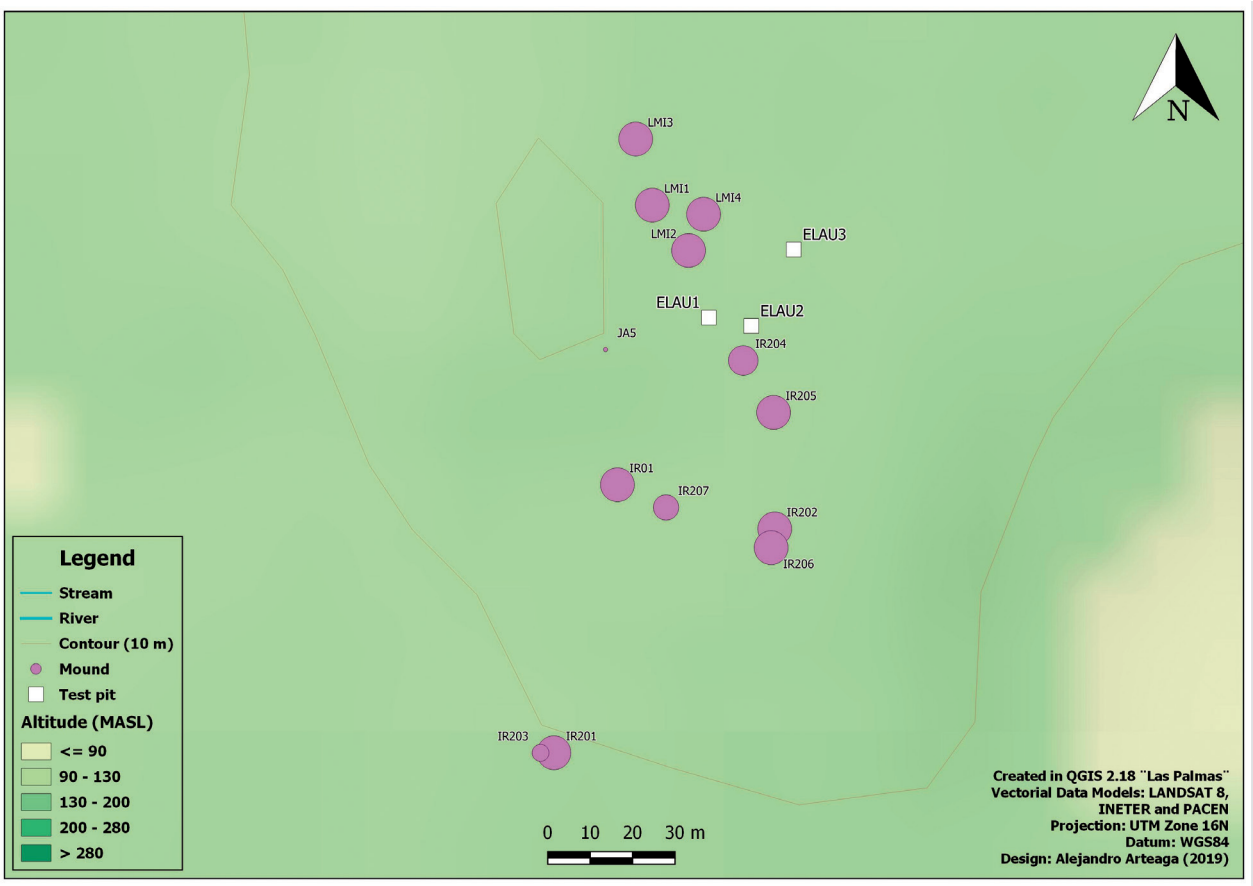

Figure 49: La Aventura site plan featuring excavation units (credit: Alejandro Arteaga).

both seasons), and foot, horse, donkey, bicycle, and motorcycle (only during the dry season).

Nowadays, the lot, which features *lanilla* (alluvial) soil and lithosols, as well as bedrock outcrops, is used for cattle ranching. Vegetation is mainly comprised of grasses due to deforestation, but various tree varieties are found within the lots, such as Jiñocuabo (*Bursera Simaruba*), Tamarindo (*Tamarindus indica),* Jícaro (*Crescentia cujete* and *Crescentia alata*), Madero (*Gliricidia sepium*), Chiquirín (*Myrospermum frutescens*), Igualtil (*Genipa americana L.*), Guasimo (*Guazuma ulmifolia*), and Chiquirín (*Myrospermum frutescens*). Even though the main activity is cattle ranching, Jackson Arellano's land, where we conducted the majority of the excavations, also features a modern house, built with concrete walls and floors, as well as zinc roofing. Also, there are two sheds and a latrine next to the house. Currently, nobody lives at the farm, since the family moved to Juigalpa.

The site is comprised of 22 man-made mounds and archaeological finds on the surface (**figure 49**). Architectural remains consist of circular and ovular structures, forming three different clusters plus an isolated mound. Two of these clusters were built on the floodplain and one on the Güegüestepe foothill, while an isolated mound (IR01) was placed on the riverbank. Mounds average 49 cm in height and 766 cm in diameter, with six mounds (27% of the total) having diameters exceeding 900 cm and three of those featuring heights of 100 cm or more (120 cm maximum). No clear site design was identified, except for some clustering on the highest part (Jackson Arellano's section) that follows the slope and also features a rock alignment east of JA2 circumscribing the area around the mound, which is a large platform located at the foothill. This clustering also contains a relatively open area surrounded by mounds.

Construction practices involved first the placement of a circle made up of medium to large sized

rocks (quarried bedrock), filled afterwards with an assortment of extracted bedrock fragments of small to medium sizes, and possibly archaeological materials. Four mounds, with various sizes and heights, also featured river stones in the filling of their structures, a property only observed at the Barillas site, located a few kilometers north of La Aventura (see below). Also, excavation of the bedrock prior to building structures is a possibility backed up by excavation unit ELA2 (see below).

More than half of the mounds had visible archaeological finds on the surface, mostly in high and medium densities. Surface materials included ceramics (the most ubiquitous), chipped stone, ground stone (an axe fragment), a basalt column located in the open area of Jackson Arellano's lot, a few meters off of mound JA01. Also, tile roof fragments were abundant, especially at the northern portion of the site. As this was a previously unrecorded site, no chronological hypotheses were available by the time the excavations took place, but the possibility of contamination of pre-conquest contexts due to modern construction activities was taken into account.

Three different excavation units of 2x2 m each were excavated. ELA1 was placed on the open area between mound JA2 (1365 cm diameter, 96 cm high) and the rock alignment previously described. ELA2 was situated as an approximation pit to JA5 (125 cm diameter, 13 cm high), a low circular mound located north of JA2, that featured a visible circle of rocks surrounding the structure. Only the off-mound portion of the mound was excavated, as part of the excavation strategies outlined in Chapter 4. Finally, ELA3 was located on the flat terrain surrounded by mounds at Ines Rocha's lot, crossing Jackson Arellano's land to the south.

Stratigraphy at La Aventura

The three excavation units were shallow, only 30 to 40 cm in depth below the surface before reaching the bedrock. Excavation unit ELA1 featured the highest densities of archaeological finds, while ELA2 featured tile roof fragments in almost all layers. Soil Horizon A featured the highest densities in archaeological finds for units ELA1 and ELA2, while Horizon O was the densest at ELA3. Stratigraphic units were extremely varied, and very few were present across the excavation units. Therefore, description will be approached separately.

Figure 50: Harris matrix model for La Aventura excavation unit 1 (ELA1).

ELA1

Four arbitrary metric levels of 10 cm each were excavated, and five different stratigraphic units were characterized (I, II, IV, C, and R) (**figure 50**). Two of these stratigraphic units were geological, while one was cultural. Horizon A1 (I, or T) was of a dark gray color, and it contained organic matter such as roots, grass, and insects, as well as ceramics, chipped stone, zooarchaeological remains, and fragments of glass bottles (see **table 10**). Horizon A2 (II), which was also present in excavation unit ELA2, was of a dark brown color and still contained some organic matter (roots, charcoal, and grass). This stratigraphic unit featured the highest density of material culture of the excavation unit and the whole site, including ceramics, chipped stone, ground stone, zooarchaeological remains, as well as glass

Layer/Level Graph	I1 (4,00-10,00 cm)	I2 (10,10-16,00 cm)	II2 (11,00-20,00 cm)	IV2 (10,10-20,00 cm)	I3 (20,10-21,00 cm)	II3 (20,10-30,00 cm)
CER #	0,00	122,00	96,00	0,00	51,00	1143,00
CER w	0,00	666,20	618,90	0,00	274,00	6717,20
CS #	0,00	1,00	0,00	0,00	0,00	37,00
CS w	0,00	4,50	0,00	0,00	0,00	330,30
GS						X
AB		X				X
Glass					X	X

Layer/Level Graph	IV3 (20,10-30,00 cm)	II4 (30,10-40,00 cm)	IV4 (30,10-40,00 cm)	II5 (40,10-42,00 cm)	IV5 (40,10-50,00 cm)	IV6 (50,10-54,00 cm)	Totals
CER #	0,00	102,00	0,00	0,00	0,00	0,00	1514,00
CER w	0,00	641,00	0,00	0,00	0,00	0,00	8917,30
CS #	0,00	8,00	0,00	0,00	0,00	0,00	46,00
CS w	0,00	37,90	0,00	0,00	0,00	0,00	372,70
GS		X					
AB							
Glass							

Table 10: Distribution of materials collected from La Aventura excavation unit 1 (ELA1).

Figure 51: Photograph of La Aventura excavation unit 1 (ELA1) northern profile.

fragments. The finds were positioned horizontally and presented high compaction, so the archaeological stratigraphic unit was interpreted as a floor surface. Apart from that, this stratigraphic unit featured a possible cut (C) within its north profile, towards the west (in the direction of mound JA2), with a stone at its bottom (R, **figures 50 & 51**). Even though its inverted triangular shape could suggest a posthole or an intentional cut partially leveled with the rock, the homogeneity of II, right above and within it, argues against this interpretation. Horizons E and B were completely lacking, so below Horizon A, Horizon C was immediately found (IV). This layer was archaeologically sterile, consisted of fragmented bedrock of a greenish tone (**figure 51**) that featured silty soil inclusions. In order to confirm the absence of the remains of human practices, excavation continued at the 2x1 m western section of the pit, where materials continued to be absent up to 54 cm depth, when the excavation was closed without reaching Horizon R.

ELA2

Excavation unit ELA2 was a pilot unit for future excavations that involved the intervention of mounds since it was the only stratigraphic pit related to architectural remains excavated during 2015. The experience helped to develop the methods and techniques applied during the 2016 stratigraphic excavations (see Chapter 4). The unit was planned as a 2x2 m, only intervening within mound JA5 at its eastern section. For this reason, excavation was limited to the off-mound portions of the unit, leaving the mound untouched. However, as the profile of the mound was excavated, some on-mound stratigraphic units were observed and recorded. In total, four arbitrary metric levels of 10 cm each were excavated, and eight stratigraphic units were identified.

The soil profile was disturbed by the construction of the mound, so not all soil horizons were identified.

Figure 52: Photograph of La Aventura excavation unit 2 (ELA2) western (mound JA5) profile.

Figure 53: Photograph of La Aventura excavation unit 3 (ELA3) taken from the east.

Horizon A1 (I) was of a dark brown color, with a high content of organic matter, such as dry calabash tree fruits, roots, grass, and insects. Archaeological finds included ceramics and fragments of tile roof. Horizon A2 (III), of a reddish-brown color, contained lesser quantities of organic matter, only roots. Archaeological finds within this stratigraphic unit showed the highest densities within this pit, which could correspond with the construction use of the mound. Horizon AE (II), of a lighter brown color, shared very similar characteristics with the same stratigraphic unit excavated at ELA1 but yielded ceramics in lesser quantities. Horizon B (V) was compact and of a reddish-brown color, still contained decreasing quantities of ceramics, and was associated to the mound construction event. Horizon C (VI) was characterized by brown and reddish colors, composed of fragmented bedrock mixed with some clayish inclusions. Also, stratigraphic unit VI is a leveled, compact, and homogeneous layer throughout the excavation unit, and minimal ceramic sherds, as well as some possible tile roof fragments, were identified within it. The layer seems to constitute a leveling of Horizon C prior to the construction of the mound. The stratigraphic unit found below it (VII) consists of a clayish layer with the presence of charcoal and was archaeologically sterile.

The mound profile (**figure 52**) reveals some insights into construction practices. First, Horizon C (VI) appears to have been burned (VII) and excavated in order to provide a stable foundation for the structure. Then, stratigraphic unit V was placed on top of the modified VI—possibly for cementing purposes—and afterwards quarried bedrock blocks of rectangular shape (40x20x20 cm) were positioned vertically as an outer wall of the mound. These blocks were situated close to each other, also using V as a bond. The resulting wall served as a container for the mound's filling, comprised of sediment and smaller rocks (5-25 cm wide).

In contrast to the rest of the excavated sample both within the site and throughout the research area, this unit did not yield any lithic artifacts. Also, in comparison to excavation unit ELA1, it did not feature zooarchaeological remains. These characteristics are possibly related to both the function and chronology of mound construction and practices associated to its use, which will be discussed in Chapters 7 and 8.

ELA3

Five arbitrary metric levels of 10 cm each were excavated, and four stratigraphic units were characterized (**figure 53**). Horizon A1 (I) was dark brown, with high contents of organic matter such as roots, charcoal, grass, and seeds. Archaeologically, it yielded fragments of ceramics, chipped stone, ground stone (a *mano*), glass, roof tiles, metallic nails, and charcoal. Also, it contained the highest quantities of material culture throughout the unit, in contrast to the other two pits. Horizon A2 (III) was homogeneous throughout the site, so it featured the same characteristics as in excavation unit ELA2, with the presence of ceramic fragments. Horizon E

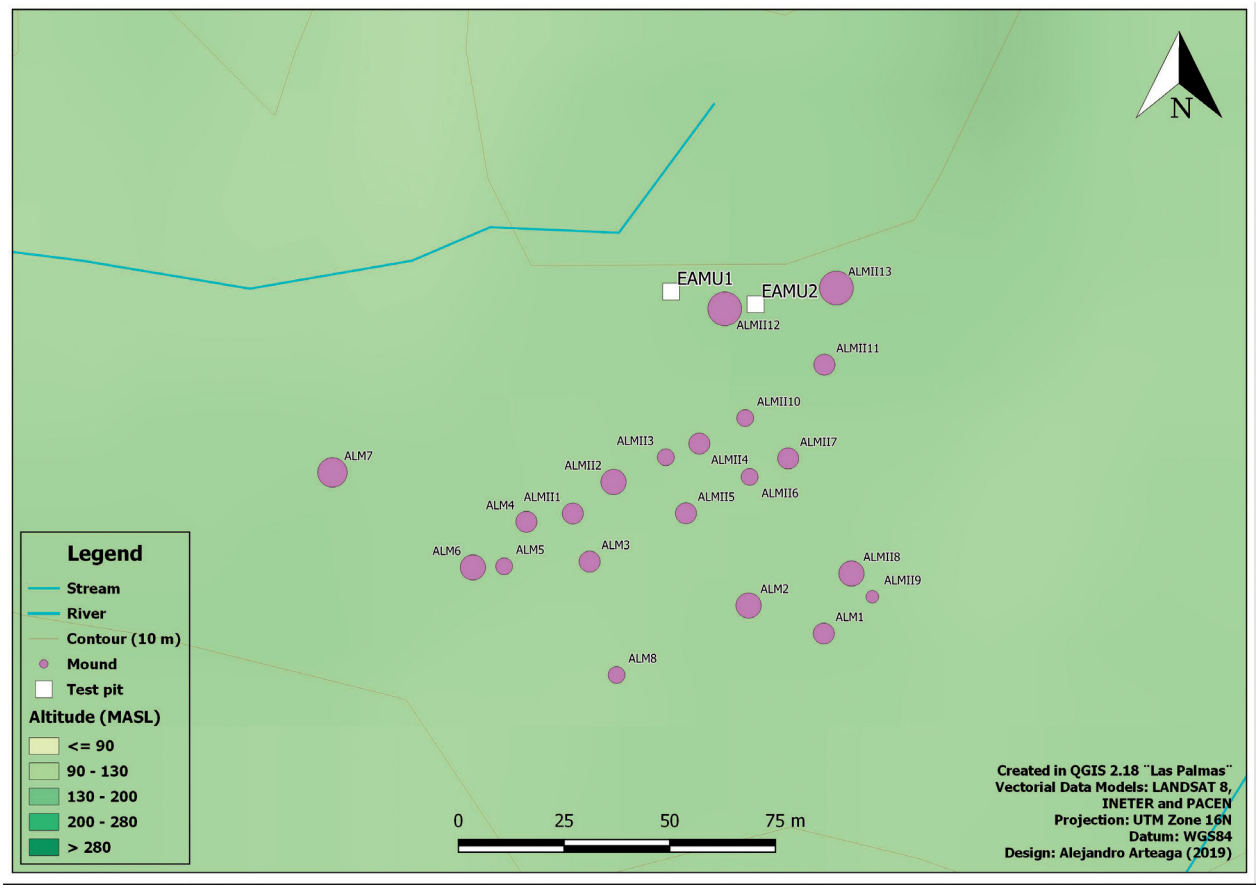

Figure 54: Alcides Montiel site plan featuring excavation units (credit: Alejandro Arteaga).

(VIII) was characterized by a lighter brown color and absence of archaeological finds. Horizon B (IX) showed high mineral and clay contents, which are characteristic within the illuviation zone. Since both VIII and IX were archaeologically sterile, excavations were interrupted before reaching Horizons C and R. This unit contained the lowest density of materials within the site; it lacked zooarchaeological finds, but it did feature the only sample of ground stone.

5.3.4 ALCIDES MONTIEL

Site description

The site coded as AM and AMII is owned by Don Alcides Montiel, spreads throughout two different lots, and is located directly east of the road leading to La Libertad, approximately 3.5 km northeast of Juigalpa. To the east, a 100 m slope connects the site with the Carca stream. Additionally, there is a stream northwest of the site less than 100 m away, which, according to satellite imaging, could have been an ancient arm of the stream. Nowadays, the land, which is covered in *lanilla* soil, is used for bovine cattle ranching. Vegetation is mainly comprised of grasses due to deforestation, but various tree varieties are found within the lots, such as *Chiquirín* (Myrospermum frutescens), *Guanacaste* (Enterolobium cyclocarpum), *Caraño* (Protium asperum), and *Níspero* (Mespilus germanica). Modern disturbances of the site are mainly due to the construction of the road, which cut at least one mound (AMII12) in half, as well as the houses constructed both west and east of the archaeological mounds. As a consequence of these disturbances to the site, it is difficult to assess the original site configuration.

The site is comprised of 21 man-made mounds, built on a soft slope, as well as some archaeological finds on the surface (**figure 54**). Half of the mounds are

shaped like half-moons, meaning that the circle of rocks that circumscribes the filling of the structure is actually a half-circle. This seems to be an adaptation of mound building practices to the topography, since the semi-circle of rocks is always oriented towards the lowest part of the mound, meaning that the slope upwards was possibly used as a containing wall. However, this feature could be related to the morphology of the structures above them, or even accesses to them. The rest of the mounds are circular in shape. Structures measured 528 cm diameter on average and 29 cm average height. However, there were two mounds that measured more than 900 cm in diameter and above 50 cm high (AMII12, and elevated foundation and AMII13, a platform). These larger mounds are also located on the highest portion of the site, and even though no clear site configuration was observed, there are two clear lines of mounds built down the slope and facing these larger mounds, together creating an open, elevated, and flat area.

Construction practices involved first the placement of a circle made up of medium sized rocks (quarried bedrock and/or river stones), mostly filled afterwards with sediment, sometimes mixed with rocks of the same types but of small to medium sizes, as well as possibly archaeological materials.

Less than 30% of the mounds featured surface finds, comprised of ceramics, chipped stone, and ground stone. These materials were only spotted in two sectors of the site: around the larger mounds described above (with medium and high densities) and following the natural slope to the southeast (in low densities). The first sector featured disturbances due to the road construction (AMII12) and bioturbations from a big tree (AMII13), which could explain the visibility of the finds. As this was a previously unrecorded site, no chronological hypotheses were available by the time the excavations took place, but some contamination was expected as the result of the construction of houses and the road in the vicinity.

Two excavation units were placed within the architectural portion of the site. EAM1 consisted of a 1x1 m pit taking advantage of the modern cut on mound AMII12. The main aim of this pit was to uncover the original mound profile to retrieve ceramics and obtain insights into construction practices. The second excavation unit, EAM2, consisted of a 2x2 m stratigraphic pit placed at the open flat and elevated area surrounded by the larger mounds. Since the latter was very shallow and only yielded two fragments of chipped stone, I will only briefly describe EAM1.

Figure 55: Alcides Montiel excavation unit 1 (EAM1) featuring a gap in the mound foundation possibly due to the presence of a post.

Stratigraphy at Alcides Montiel

EAM1

This excavation pit yielded seven different stratigraphic units and three interphases. Stratigraphic units I, IB, II, and IIA were related to the debris caused by the construction of the La Libertad road. At the bottom of II, a recent candy wrapper was found, confirming the suspicions that all stratigraphic units above this find were not primary contexts. Since the excavation unit was very small, stratigraphic assessment is limited. However, it is possible to determine that a combination of large bedrock fragments was used to build the foundation of the mound and to strengthen the structure of upper layers as well. These rocks were filled with sediment and smaller rocks (IV, V, VI, VII). At the proposed foundation (VIII, VIIIA, and VIIIB), a gap within the placement of the large rocks was identified, possibly suggesting the presence of a post at the center of the mound (**figure 55**). However, further excavations are needed in order to confirm or discard that hypothesis. Excavations were closed after several centimeters of an archaeologically sterile layer (IX).

5.3.5 BARILLAS

Site description

The site named Barillas is located in four different lots owned by Uriel Barillas, 250 m east of the Cuapa Road, and 100 m west of the Mayales river, on one of its meanders 5 km northwest of Juigalpa. The

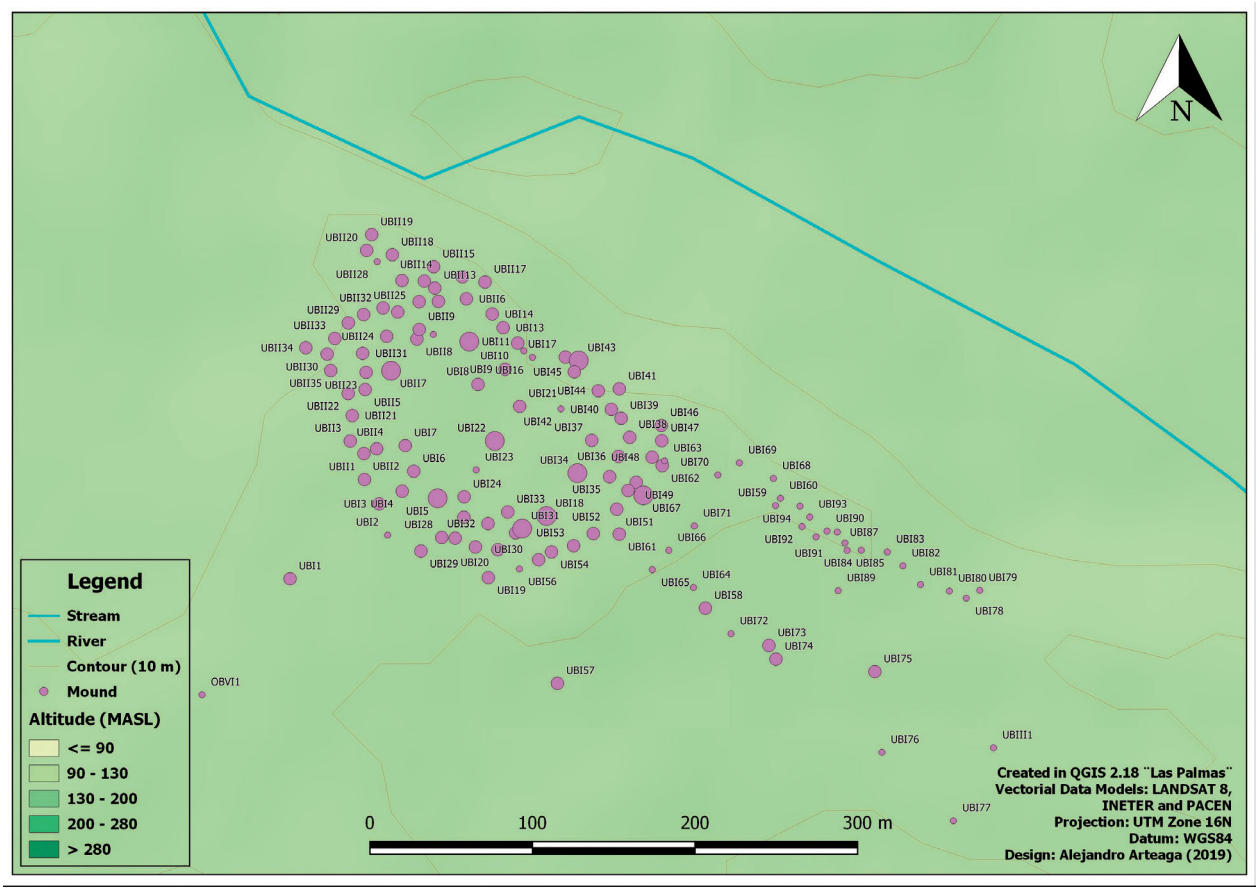

Figure 56: Map of the Barillas site (credit: Alejandro Arteaga).

site consists of 131 man-made mounds (**figure 56**) and material culture on the surface, distributed on a terrain characterized by soft rolling hills that lead to a steep cliff, which precedes the Mayales river. The archaeological site is situated on top of an alluvial terrace, which is also associated to branches of the river to the northwest and southeast. West of the site, the mild elevations are followed by the Amerrisque mountain foothills.

Surface soil is *lanilla* (alluvial soil/young volcanic ash) across the whole site, except for mound OBVI2, which is located to the west of the site, slightly isolated (80 m from the last mound), with *barrial* (tropical black soil) instead. Nowadays, the land is mainly used for cattle pasture; however, testimonies from locals indicate agricultural practices without the use of the plough as recent as 50 years ago, mainly dedicated to maize and beans. Therefore, the lots are mainly deforested and feature a variety of grasses. In spite of this, some trees are also found at the site, such as *Jícaro* (Crescentia cujete), *Guásimo* (Guazuma ulmifolia), *Cambrón* (Acacia pennatula), *Chiquirín* (Myrospermum frutescens), and *Higo* (Ficus cotinifolia), among other species. It is important to point out that the lots are divided by stone walls, so it is possible that the materials for constructing them could have originally belonged to some of the archaeological mounds. Also, two large pits were found on two of the main mounds. According to locals, those pits correspond to Richard Magnus' excavations in the 1970's. However, due to the lack of a published report on the site, it is impossible to assess if the pits correspond to archaeological excavations or looting.

Ancient man-made structures do not seem to follow a particular design; however, there is a clear clustering of mounds along the cliff. Apart from that, there is an alignment of structures along a hill located southeast

Figure 57: Mortars found on bedrock outcrops at Barillas varied in shapes: ovular (57a), rectangular (57b), and "D" shaped (57c).

of the site, with an orientation towards the northwest. Additionally, the mounds on the northern portion of the site seem to form a circular arrangement, which is divided in two, leaving two large flat open areas surrounded by mounds.

Mounds vary widely in shape and size; for example, diameter ranges span from 150 cm to 2150 cm, while average diameter is 650 cm and height is 45 cm. The 66 mounds exceeding this average diameter can be split into two groups. The first group includes 50 mounds between 650 cm and 1000 cm, with an average height of 50 cm. The second group is comprised of 16 larger mounds, with diameters larger than 1000 cm and an increase of average height to 75 cm. All of these larger mounds are located within the two open space configurations previously described. Additionally, 69% of the mounds are circular, 24% oval, 1% semi-circular, 1% half moon, 1% rectangular, and 4% with irregular shapes. Mound morphologies are extremely varied, with presence of elevated foundations (50.38%), circumscribed leveled elevations (4.58%), piles of rocks (6.10%), small piles of rocks (16%), stone wheels (3.05%), whereas 19.84% corresponded to irregular types.

Construction practices were variable, combining the regional tradition of using extracted bedrock, sediment, and fragments of archaeological materials with river stones as well as sand. Barillas was one of the two sites—along with La Aventura—that featured small pebbles, as part of the construction materials of the main plaza or patio mounds. Barillas features more surface materials than most other sites. Also, the mounds are larger than the rest of the sites examined. Even though sites like Lázaro Villegas might have more mounds (n=146), Barrillas features specific areas that could be interpreted as *plazas* or patios, with large mounds surrounding flat areas.

Apart from the architectural remains, archaeological materials found on the surface include fragments of ceramics, chipped stone, ground stone, a spiral-shaped petroglyph carved on a fragment of quarried bedrock, and a basalt column, as well as mortars that are ovular (30 to 40 cm diameter, **figure 57a**), rectangular (40x20 cm, **figure 57b**), and D-shaped (20x20 cm, **figure 57c**), carved into bedrock outcrops. These mortars were found associated to mounds located on the hill southeast of the site, as well as on the rocky slopes to the southeast, with no clear association to architecture. Ground stone fragments on the surface feature sporadic axe fragments, as well as stone grinding tools. Chipped stone finds on the surface included finished artifacts, flakes, and worked and unworked cores. Lastly, six different clay outcrops suitable for ceramic manufacture were identified within a 2 km radius from the site (Casale 2017; Casale *et al.* 2020).

According to Gorin (1990), who visited the site during his research project and also reviewed Magnus' notes on the site's ceramics, Barillas belongs to the Cuapa phase (1400 - 1600 CE). However, recent accelerator mass spectrometry (AMS) radiocarbon 14C dates (Donner & Geurds 2018) and re-evaluations of the Cuapa phase (Geurds 2013b; Donner *et al.* 2019) challenge its chronological position as well as the foundations for the phase itself (see Chapter 8).

Three different excavation units were placed at the site (**figure 58**). Unit 1 consisted of an approximation trench of 3x1 m south of mound UBI61, a circumscribed leveled elevation. The main aim of the pit was to diachronically study both the stratigraphy of the mound and its surroundings. Unit 2, on the other hand, consisted of a 2x2 m test pit located at a central spot in the southern "*plaza*", and its goal was to examine off-mound stratigraphy

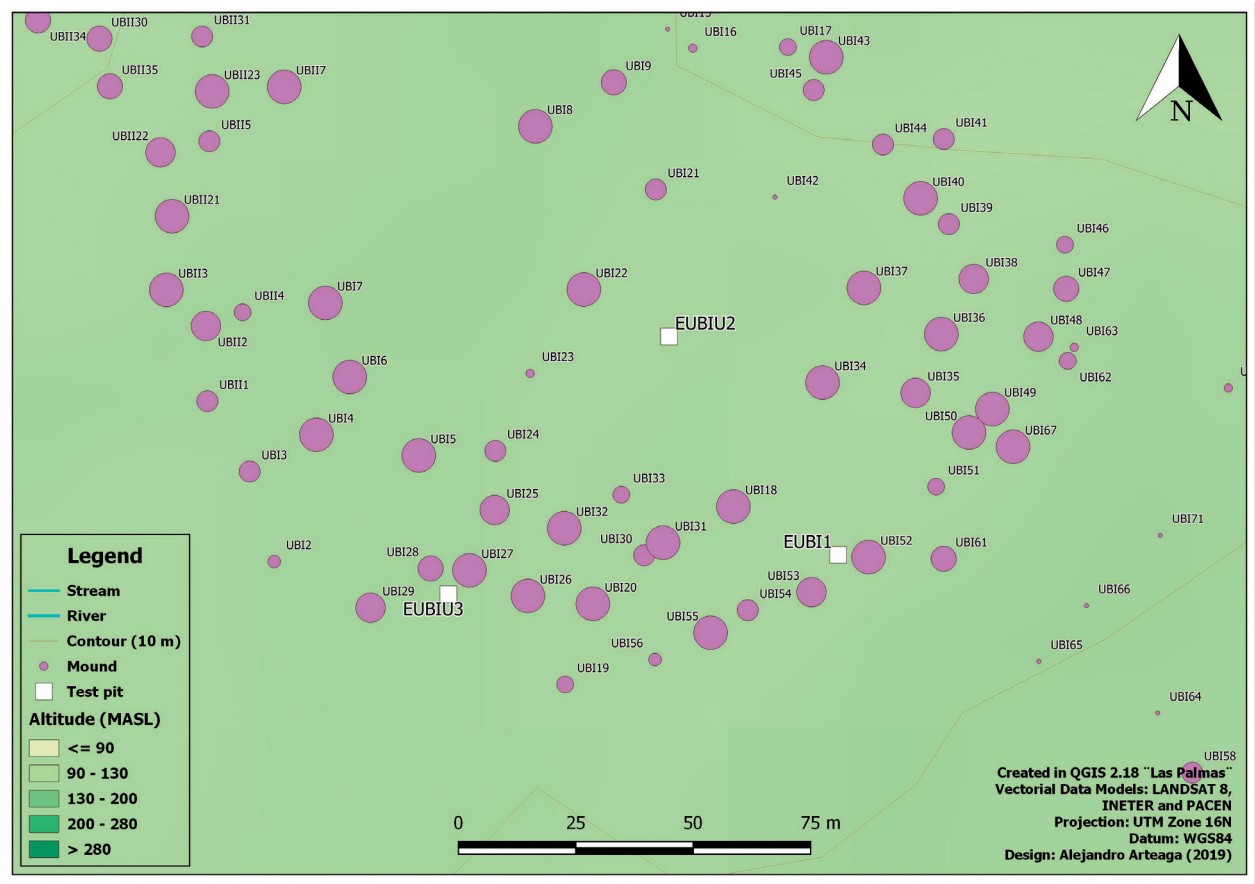

Figure 58: Close-up of Barillas with excavation units (credit: Alejandro Arteaga).

at the site. Last, Unit 3 was situated west of mound UBI27 and consisted of a 3x1 m trench approaching the structure, which was classified as a stone wheel. This mound was chosen for excavation due to its morphology and the abundance of materials on its surface.

Stratigraphy at Barillas

Excavations at Barillas were challenging due to four main reasons. To begin with, soil horizons had high contents of wet clay, so both excavation procedures and sieving required extra effort. Second, excavation units EUBI2 and EUBI3 were relatively deep when compared with the rest of the research area. In particular, EAUBI3 reached 140 cm in depth, resulting in the deepest excavation within this research. Third, preservation at the site seems to be problematic, as macrobotanical and zooarchaeological remains were completely lacking. Finally, since excavations were conducted during May and June, the team was subject to harsh climatic conditions: first the last strip of the dry season, with extremely dry weather and high temperatures, and then intense rainfall, which flooded the pits.

Stratigraphy at Barillas was characterized by a minimal Horizon O, resulting from contemporary pasture practices performed at the site. Horizon E was absent, possibly due to a lack of eluviation or leaching. Soil profiles at Barillas were characterized by several A Horizons due to continued human presence at the site and by very marked illuviated zones (Horizon B) featuring accumulation of clays and minerals. Horizon C was characterized by weathered parent material (tuff) mixed with clays rich in iron. Since two of the three stratigraphic units were excavated on-mound contexts, description will be approached separately.

Layer/Level Graph	XI1 (8-10 cm)	XI2 (10,10-20,00 cm)	XI3 (20,10-30,00 cm)	I4 (34,50-42,00 cm)	XI4 (30,00-39,80 cm)	XII4 (39,20-40,00 cm)
CER #	112,00	125,00	203,00	7,00	26,00	0,00
CER w	406,60	546,00	784,50	6,40	122,60	0,00
CS #	13,00	19,00	26,00	7,00	6,00	0,00
CS w	26,50	62,90	287,00	17,40	17,30	0,00
GS						

Layer/Level Graph	XIII4	I5 (40,10-42,00 cm)	IB5 (43,70-48,50 cm)	III5 (48,50-50,00 cm)	XII5	XIII5	III6 (50,10-53,50 cm)	Totals
CER #	48,00	0,00	426,00	35,00	57,00	103,00	167,00	1309,00
CER w	185,10	0,00	1645,20	215,40	202,20	614,60	538,60	5267,20
CS #	14,00	0,00	136,00	7,00	12,00	3,00	31,00	274,00
CS w	146,40	0,00	546,80	12,00	25,30	9,50	95,20	1246,30
GS			x					

Table 11: Distribution of materials collected from Barillas excavation unit 1 (EUBI1).

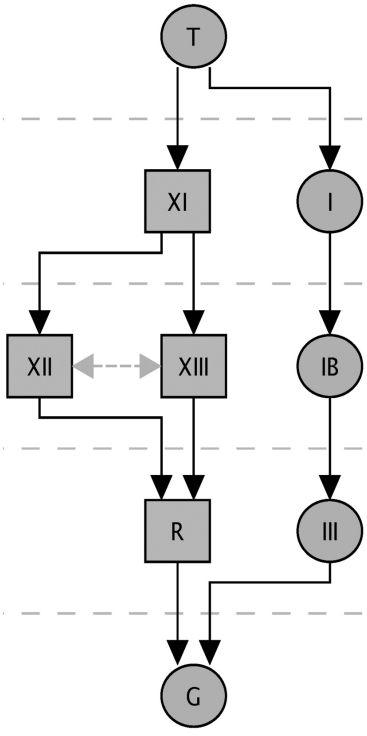

Figure 59: Harris matrix model for Barillas excavation unit 1 (EUBI1), based on the eastern profile of the pit.

UBI1

In this excavation unit, six arbitrary levels of 10 cm were excavated, as well as seven different stratigraphic units (**figure 59**). Four of these units were exclusively found within the mound (XI, XII, XIII, and R), and two were only retrieved off-mound (IB and III), while I was excavated both on- and off-mound.

Below the minimal Horizon O, Horizon A1 (I) was characterized by a grayish brown color and presence of organic matter such as grass roots. Archaeological materials, such as ceramics and chipped stone fragments, were present in very low quantities (see **table 11**). Horizon A2 (IB), also of a grayish brown color, did not contain any further organic matter but yielded the highest densities of archaeological finds within the excavation unit (ceramics, chipped stone, ground stone, and charcoal). This stratigraphic unit (IB) is interpreted as the core layer of mound use but might also contain some debris coming from the structure after its abandonment. Horizon A3 (III) contained horizontally placed ceramics, chipped stone, and minimal charcoal samples and was characterized by a brown soil matrix mixed with tuff inclusions, which belong to the weathered parent rock material. Below III, Horizon R was found, so excavations off-mound were stopped there. Apparently, Horizon R was leveled with III as either a floor that preceded the construction of the mound or for the construction of the structure, which took advantage of the bedrock's natural elevation to the south. Within the mound, quarried bedrock fragments of more than 30 cm (layer R) were placed in a circle on top of the edge of the bedrock elevation, before the start of the slope. Then, two different types of sediments (XII and XIII) were placed at the base of the mound, in its interior. Layer XII probably represents the highest densities of on-mound material culture, as well as additional structural stones. Charred organic remains were retrieved almost exclusively within the mound (XI, XII, and XIII), with only very small samples collected off-mound (IB and III). This might suggest burning practices associated to mound construction.

Figure 60: Photograph of Barillas excavation unit 2 (EUBI2) taken from the north.

UBI2

Six arbitrary metric levels of 10 cm each were excavated, as well as six stratigraphic units (**figure 60**). After the minimal Horizon O, Horizon A1 (I) was of a grayish brown color (*lanilla*), with high contents of organic matter, such as roots, herbs, insects, leaves, dry cow excrement, and seeds. Archaeological materials included ceramics and chipped stone fragments, as well as pieces of roof tiles. Horizon A2 (IA) also featured a grayish brown color and included organic matter such as grass, herbs, calabash fragments, insects, leaves, and cow excrement. In contrast to the previous stratigraphic unit, IA yielded ceramics and chipped stone positioned horizontally, and no tile roof fragments were recovered. Ground stone, river stones, and unworked chert were retrieved. This stratigraphic unit yielded the highest concentration of archaeological finds in the pit. Horizon AE (II), of a gray color, also contained material culture positioned horizontally (ceramic and chipped stone fragments) as well as river stones. Locals mentioned that this layer was comprised of pure *lanilla*, the preferred sediment for house building. Horizon Bt (IV, VI), of a dark brown color, was characterized by an increased clay content and the presence of archaeological materials such as ceramic, chipped stone, and ground stone. The clays found within these stratigraphic units were characterized by locals as a mixture of *lanilla* and *barro*, the latter suitable for ceramic production. IV also contained unworked chert and a black feather, possibly the product of contamination during the excavations.[63] VI consisted of a patch located in the middle of the North profile, with a lesser clay content than IV and with higher concentrations of river stones. Horizon C was a very dark grayish brown matrix with reddish yellow parent material inclusions, which seems richer in iron than in UBI1. This layer was archaeologically sterile, and floods caused by heavy rains resulted in the interruption of the excavation.

UBI3

In this excavation unit, 14 arbitrary levels of 10 cm each were excavated, as well as 18 different stratigraphic units (**figure 61**). Three stratigraphic units were exclusively found on-mound (XV, XVII, and XVI), and 13 were found off-mound (F1A, F1B, V, VII, VIII, VIIIA, VIIIF3, X, XIVE and XIVW, XA, C, and XIVA), while I and G were the only ones to be excavated both on-mound and off-mound. Since this excavation unit featured a lot of modification due to mound construction and daily practices, horizons cannot be applied. However, generally, Horizon O was minimal and was then followed by Horizon A (I), a dark grayish brown *lanilla* containing grass roots, ceramics, and tile roof fragments. Horizon B is clearly represented by XIV, a stratigraphic unit rich in clay and predating human practices. Horizon C (G) was characterized by a white/light gray soil matrix with high quantities of tuff inclusions. The rest of the stratigraphic units, since they were cultural, are considered various A Horizons.

All layers featured ceramic fragments, and stratigraphic units F1A, V, VIII, X, XIV (off-mound), XV and XVII (on-mound) also yielded chipped stone fragments. Layer XIV was the only one where a ground stone fragment was recovered. The excavation unit was located on the eastern section of Mound UBI27, and its stratigraphy shared some traits with EUBI1 but was different especially at the bottom off-mound layers. While Mound UBI27 was also built on top of a natural elevation, this was not composed of bedrock, but of a mix of residual and alluvial clays (XIV) that preceded the weathered parent material (G). Construction techniques involved the use of clay sediments (XV and XVII) mixed with debris

63 However, the presence of the feather elicited reactions from the local workers because the bird that it belongs to—locally known as the *tinco* (*Crotophaga sulcirostris*)—can be associated with witchcraft. In fact, locals believed that the feather was indeed ancient and that it preserved well due to its magical powers.

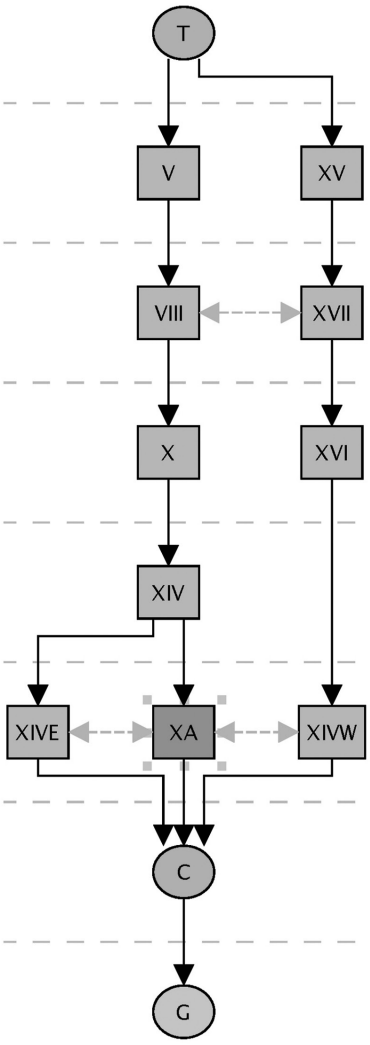

Figure 61: Harris matrix model for Barillas excavation unit 3 (EUBI3), based on the southern profile of the pit.

(ceramic and chipped stone fragments) and then compacted, possibly applied as a foundation for the structure. On top of these two layers, a wall, built using angular bedrock fragments larger than 20 cm (XVI), was placed to delimit the mound. A circle of rocks (F1A, F1B, and SVII) measuring 50x30 cm was excavated a few centimeters off the mound wall and was interpreted as either an access, hearth, or posthole trace.

Regarding off-mound stratigraphy, a collapsed posthole trace (XA and C, **figure 62**) measuring 36-

Figure 62: Photograph of Barillas excavation unit 3 (EUBI3), west profile featuring a posthole trace (credit: Matt Abtosway).

39 cm wide was located 80 cm west of the edge of the structure, directly on top of a geological stratigraphic unit, completely archaeologically sterile (G) and cutting through XIV (XIVE and XIVW). A leveling layer (X) was placed right on top of geological unit XIV and at the foot of the structure, probably indicating the age of the construction event. Then, XIV was followed by the layer with the densest material culture remains (VIII), possibly associated to mound practices. Layer V, which was the last off-mound stratigraphic unit below the topsoil (I), also featured material culture but in lower quantities than VIII, possibly due to post-occupation depositional processes. VIIIF3 consisted of an extension of the unit towards the west due to the recovery of a complete *olla*.

5.3.6 ROSA DOLORES OPORTA

Site description

A series of lots owned by Rosa Dolores Oporta is located approximately 5 km northeast of Juigalpa, 100 m north of the road to Los Cocos, and 300 m east of the La Libertad road. This archaeological site was constructed on an alluvial terrace with an irregular topography between two different streams: immediately east of the Carca stream and around 200 m west from the Las Tablas stream.

Currently, the lots feature *granza amarilla* soil (tropical iron rich alluvial soil), regarded locally as highly fertile and absent in the rest of the valley, as well as some bedrock outcrops. The land is mainly used for cattle ranching and agriculture without the use of the plough. The crops consist of wheat and

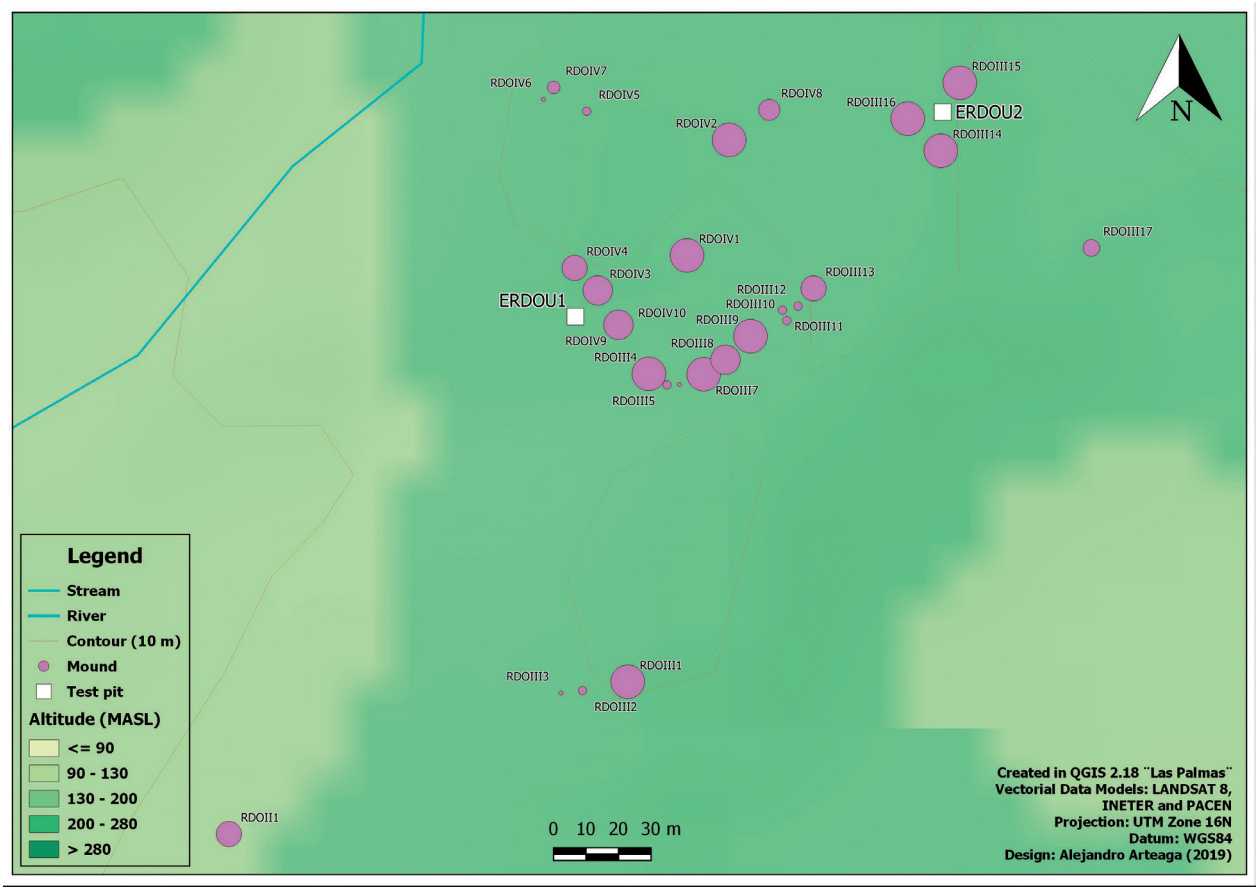

Figure 63: Rosa Dolores Oporta site plan featuring excavation units (credit: Alejandro Arteaga).

sorghum, used for human and animal consumption. Vegetation is mainly comprised of grasses, but trees are also found, such as Guilihuiste (*Karwinskia calderonii*), Mamón (*Melicoccus bijugatus*), Guásimo (*Guazuma ulmifolia*), and Jícaro (*Crescentia cujete* and *Crescentia alata*). No modern houses were built within the mounded area, but a few of them are found along the roads and the Carca.

The archaeological site is comprised of 28 man-made mounds and archaeological finds on the surface (**figure 63**). Architectural remains consist of circular, ovular, and half-moon shaped structures. Site configuration includes at least four different sections. First, there is a southern sector comprised of three mounds: a large one (RDOIII1, 1330 cm diameter, 65 cm height) along two smaller structures of less than 230 cm diameter. Second, a central area is comprised of 13 mounds (493 cm average diameter, 23 cm average height) placed on the slope of a hill forming a V shape, with a larger mound, RDOIV1 (1100 cm diameter, 42 cm height), at a central location on the upper and flat part of the elevation. This geometric configuration is oriented north, and one of the lines forming the V is oriented northeast, parallel to the Carca stream until it curves exactly where the mounds were built, while the other line forming the V is perpendicular to the Carca. The third mound cluster within the site is located northwest of the V configuration, and it is comprised of three small mounds (RDOIV5, RDOIV6, RDOIV7), measuring an average of 248 cm diameter and 15 cm high situated in close proximity. North of the V configuration, there are two mounds placed on the slope of the hill: structures RDOIV2 (945 cm diameter, 42 cm maximum height) and RDOIV8 (505 cm diameter, 16 cm high). Finally, three large mounds (1495 cm average diameter, 90 cm high) form a cluster at the flat northeast portion of the

	H	V	VA	VII	X	XI	XII	XV	XVII	Totals
CER #		7,00	18,00	2,00	5,00	17,00	17,00	26,00	8,00	100,00
CER w		54,40	135,60	2,60	33,80	141,00	110,90	235,80	119,40	833,50
CS #		13,00	1,00	4,00		4,00	8,00	7,00	9,00	46,00
OB		X								
BC		X	X		X		X	X	X	
AB					X			X		

Table 12: Distribution of materials collected from Rosa Dolores Oporta excavation unit 1 (ERDO1).

site, surrounding a flat open area. An isolated small mound (RDOIII17) is located 40 m southeast, within the same open plain.

The mound types identified are elevated foundations and small piles of rocks. For the elevated foundations, construction practices involved the placement of one or many circles of medium or large rocks as a first step (river stones in most cases, and also a combination of quarried bedrock and river stones), then filled with more rocks (of the same and/or smaller sizes), archaeological materials and sediment. On the higher parts of the site, Horizon R was used as a base for mound foundations, leveled with added sediment; while in the lowest and flat part of the site, construction took place apparently above Horizon B. Most of the mounds (82%) featured surface finds in low densities. While the southernmost cluster yielded roof tile fragments on RDOIII1, the rest of the material culture was comprised of ceramics, chipped stone, and ground stone. As this was a previously unrecorded site, no chronological hypotheses were available by the time the excavations took place, but suspicion about the contamination of pre-conquest contexts due to more recent construction activities was take into account, especially for the southern part of the site.

Two excavation units were placed on the site. ERDO1 consisted of a 2x1 m approximation trench south to mound RDOIV9, a half-moon shaped structure measuring 685 cm in diameter and 43 cm in maximum height. ERDO2 was a 2x2m stratigraphic pit located on the flat open area surrounded by large mounds, at the northeastern sector of the site.

Stratigraphy at RDO

Excavation Unit ERDO1

In this excavation, 12 arbitrary metric levels and 14 stratigraphic units (one found both on- and off-mound, six off-mound, and seven on-mound), as well as three interfaces formed by both bio and non bioturbations, were excavated in this pit (**figure 64**). Horizon O (H) was the only stratigraphic unit present in both mound and off-mound contexts, which consists of a very dark brown soil featuring the roots of grasses. No material culture was recovered within this unit (see **table 12**).

In the off-mound section of the excavation unit, stratigraphy continued with Horizon A1 (V), a dark brown layer with high organic content such as grass, roots, and insects. Apart from that, V contained small and medium sized rocks, ceramics, chipped stone, obsidian, and burnt clay. Charcoal was also recovered and is the result of recent burning of the land. Right underneath, Horizon AC (VA), of a dark brown color, had no organic matter, as well as medium to large sized rocks and tuff fragments. Ceramic densities increased, but only one fragment of chipped stone was recovered within this layer. Also, some sherds, especially the ones situated at the foot of the structure, were found in horizontal position. This stratigraphic unit seems to correspond with the surface in use simultaneous to the mound. Beneath VA, we located Horizon B1 (VII), of a dark reddish-brown color, with some organic content (roots), tuff inclusions, and minimal ceramics and chipped stone quantities. Towards the northwest (in the mound's direction), the profile shows a slope, so it is possible that a natural elevation on the bedrock and geological stratigraphic units on top of it were used as a foundation for mound construction. Below this layer, Horizon B2 (VIII), of a yellowish-red color, was excavated. This stratigraphic unit yielded no archaeological materials. Off-mound stratigraphy below VIII featured two layers on the same levels. On the one hand, the southwest section of the unit was characterized by Horizon B3 (IX) of olive brown color, right beneath VIII and archaeologically sterile. On the other hand, the east profile featured Horizon C1 (TC), a light gray tuffaceous layer with small and medium sized rocks.

Stratigraphy within the mound is complex due to the different geological stratigraphic units described above and the slope present on the west profile of the excavation unit but absent on the east profile.

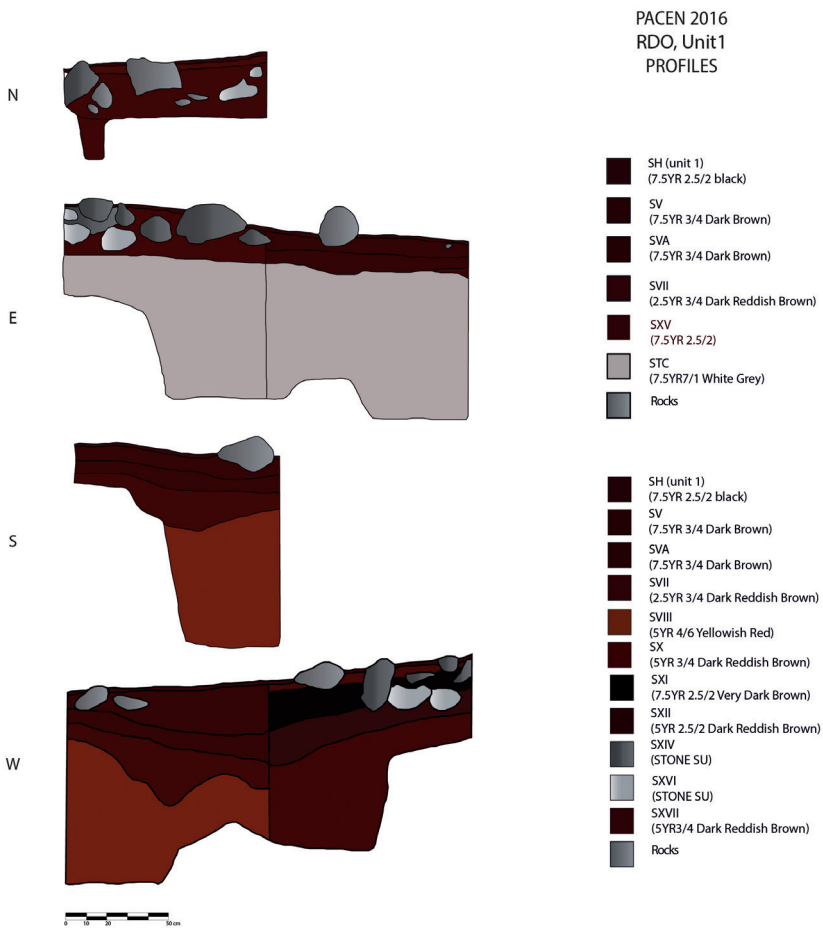

Figure 64: Profile drawing for Rosa Dolores Oporta excavation unit 1 (ERDO1).

Therefore, mound construction practices will be described separately according to the data recovered through the analysis of each profile and then integrated. On the east profile, building practices started taking advantage of a natural elevation of Horizon C(2) (TD), of yellowish brown color, with no archaeological materials and presence of medium sized rocks. Right on top of Horizon C2, we found Horizon A2 (XV), of a very dark brown color with organic matter (roots) and small fragments of tuff, as well as horizontally positioned ceramics, chipped stone, animal bone, burned clay, and charcoal. This layer, which has the highest density of material culture when compared to the rest of the stratigraphic units, served as infilling between the rocks that form the outer wall of mound RDOIV9 (XVI and XIV, see **figure 65**). The rocks that form XVI were placed first, in combination with XV, and then the rocks that comprise XIV were placed. Within XV, a feature that included ceramics, chipped stone, burnt clay, charcoal and animal remains (teeth) were found in the middle of the wall, with no indication of corresponding to later practices, but with the appearance of a hearth used during the construction process.

On the west profile, the mound was constructed on top of Horizon B4 (XVII), a dark reddish-brown layer with some organic matter (roots), tuff inclusions, ceramics, chipped stone, and burnt clay. Even though this stratigraphic unit is very similar to VII, it was named differently to separate off-mound and mound deposits and surfaces. Approximately half of the unit (the deepest 30 cm) was archaeologically sterile. On top of this layer (in the contact with XII), horizontal ceramics were recovered right below XVI. An

Figure 65: Photograph of Rosa Dolores Oporta excavation unit 1 (ERDO1), north profile, showing mound stratigraphy.

interface (XVII) was created for a soil with exactly the same characteristics but of a darker color (black). On top of XVII, Horizon A3 (XII and its interface XIIA) was very different from XV, located at the same level on the east profile of the excavation unit. XII also serves as the filling between the rocks that form the outer wall of the mound (XVI and XIV), is of a dark reddish-brown color, with some organic content (roots) and small and medium sized stones that apparently were used to consolidate the wall. The layer contained ceramics, chipped stone, and burnt clay. Interface XIIA consisted of a tree root. On top of XII, also serving as filling of the rocks forming the mound's wall (XIV, on the upper level, on top of XVI), was XI, Horizon A4. This layer featured a very dark brown color, grass roots, ceramics, chipped stone, and charcoal. According to one of the locals, this layer looked burnt due to its color and texture (*tierra Roja*). On top of this, we found X, Horizon A5, also associated to XIV. This stratigraphic unit contained low densities of ceramics but high contents of charcoal and burnt clay fragments, suggesting that the intentional burning of the filling sediments could be possible.

In general, mound stratigraphy suggests the use of natural elevations on Horizon C (TD) as foundations for structures, but also of Horizon B4 (XVII) when necessary. Sediments used as infilling were of the type available at the lot, with no indication of preference towards *lanilla* or other sediments not immediately available. The walls of the mound correspond to two different stratigraphic units (XIV and XVI), which

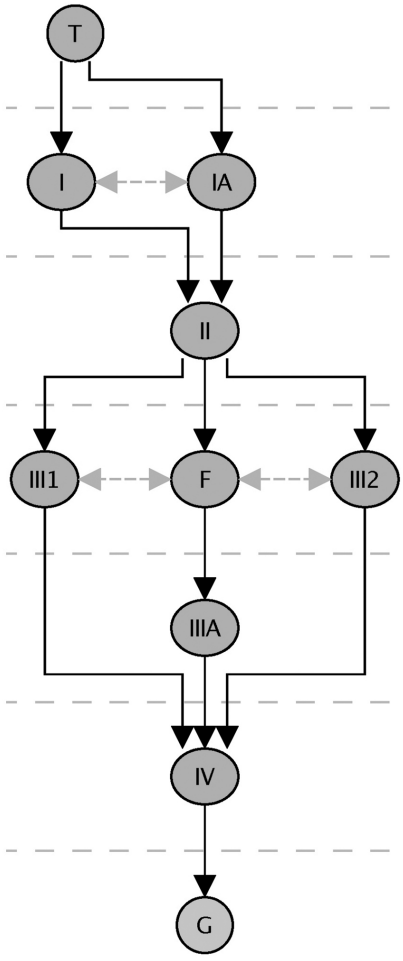

Figure 66: Harris matrix model for Rosa Dolores Oporta excavation unit 2 (ERDO2).

could mean that the construction took place in two different moments. The presence of the possible hearth within the mound and in association to XVI, the rocks positioned on the lowest levels and therefore first, could support that hypothesis. However, it is also possible that the hearth was in use during construction practices and does not necessarily imply two different moments with a larger time gap. Surface materials were scarce, so the function of the mound remains unclear.

Excavation Unit ERDO2

Seven arbitrary metric levels, six stratigraphic units, and four interfaces were excavated at ERDO2 (**figure 66**). Horizon O (H) was of a dark reddish-brown

Figure 67: Photograph of Rosa Dolores Oporta excavation unit 2 (ERDO2), SIIIA.

color and featured high contents of organic materials (mainly roots) and small rocks, as well as minimal amounts of ceramics and chipped stone. Horizon A1 (I), of a dark reddish-brown color, also yielded high organic content (roots—IA—and insects) and higher quantities of rocks than in H but with similar characteristics. The bulk of the archaeological materials within this excavation unit are found within this layer, both in the case of ceramics and chipped stone. Horizon A2 (II), consisted of a dark reddish-brown layer with high organic content (roots and insects), tuff inclusions, small rocks, ceramics, and charcoal. Horizon BC1 (III1 and III2) featured medium sized stones and was archaeologically sterile. However, an ancient cut through that stratigraphic unit, IIIA, was performed to place a complete vessel (F), which was found in a horizontal position with no other associated artifacts (**figure 67**). This cut is clear on the unit profiles, especially on the eastern one. Right underneath IIIA, two geologic stratigraphic units were identified: Horizon BC2 (IV), a yellowish brown "*tierra iguana*", and Horizon C (T, TA, TB, summarized as G), rich in tuffaceous inclusions of various colors.

Since excavations were not conducted in the mounds surrounding ERDO2, it is not possible to assess whether the placement and burial of the vessel is contemporaneous with the construction of the mounds or not. However, the stratigraphy strongly suggests that human practices related to the surfaces above (I and II) were later than the interment of the vessel.

5.3.7 OPORTA

Site description

The lot owned by the Oporta brothers is located on a plain at the foot of a curve of the Copelitos stream, a few meters north of its intersection with the Las Tablas stream. The archaeological site is situated approximately 5.5 km northeast of Juigalpa and less than 100 mts east of the La Libertad road.

The surface is covered by *tierra negra* (tropical black soil) and is nowadays used for cattle ranching. Vegetation is mainly comprised of grasses, but a variety of trees are found as well, such as Chiquirín (*Myrospermum frutescens*), Caoba (*Swietenia macrophylla*), Madero Negro (*Gliricidia sepium*), Guilihuiste (*Karwinskia calderonii*), Cincho (*Lonchocarpus spp.*), Guásimo (*Guazuma ulmifolia*), Quebracho (Lysiloma auritum), and Espavel (*Anacardium excelsum*). No modern houses were built on the lot; however, the construction of the La Libertad road and the Camino a Los Cocos might have affected the conservation of the site.

The site consists of 33 man made mounds (**figure 68**), built right next to the Copelito stream, which bends at that point due to a geological fault (B. Acevedo, pers. comm. 2016). Architectural remains consist of circular (73%), oval (15%), and half-moon (12%) shapes. Mounds can be divided into two groups, roughly separated by a 30-meter gap of flat terrain. The northern cluster features a semi-circular arrangement comprised of nine mounds, measuring 660 cm diameter on average and with an average height of 32 cm. Structures surround a flat open area, and a triad of larger mounds (OP8 with 1575 cm diameter and 90 cm high, OP9 with 950 cm diameter and 29 cm high, as well as OP5 with 705 cm diameter and 38.5 cm high) is located on the western part of this arrangement, next to each other in a plaza-like configuration resembling the eastern cluster at RDO. The southeast cluster includes the remainder of the mounds, with no clear arrangement—except for a possible circular configuration at its northern top—which are placed throughout a flat area and across a small creek that separates three mounds (OP14, OP15, and OP16) from the rest. These mounds average 639 cm in diameter and 30 cm in height; however, ten of the 24 structures that comprise this section of the site exceed the average measurements, and mounds OP22, OP26, and OP27 stand out for their diameters exceeding 1000 cm.

Construction practices involved first the placement of a circle made up of mostly small to medium

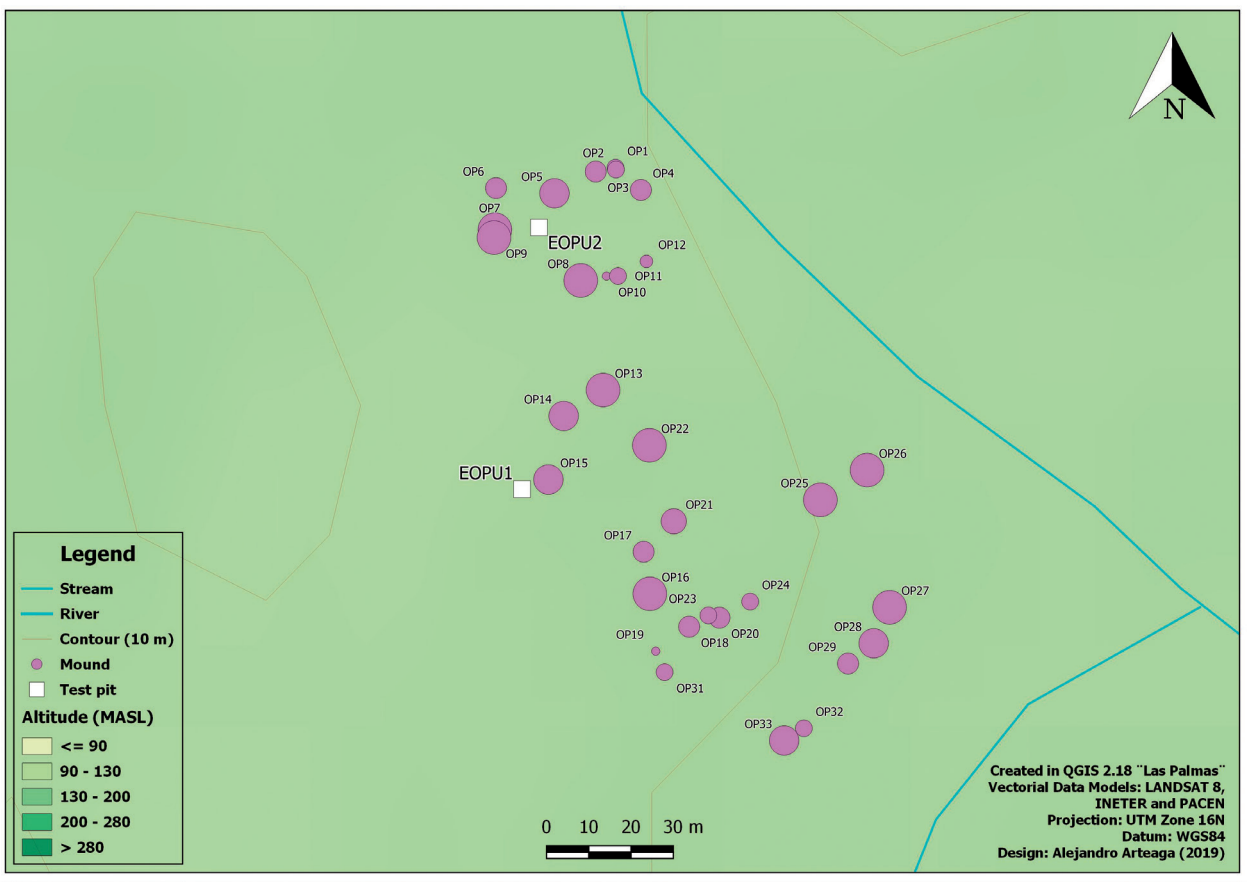

Figure 68: Map of Oporta archaeological site featuring excavation units (credit: Alejandro Arteaga).

sized rocks (all riverstones, except for one featuring quarried bedrock), filled afterwards with an assortment of rock fragments also of small and medium sizes and possibly archaeological materials. The site stood out during the survey due to the presence of some large mounds in contrast to the majority of lower and smaller structures, as well as some areas with visible surface materials in low, medium, and high densities. In fact, 82% of the mounds featured materials on their surface, which contrast with the majority of the sites studied in this research. Surface finds most commonly included ceramics, alongside chipped stone, a basalt column, and an obsidian fragment. As this was a previously unrecorded site, no chronological hypotheses were available by the time the excavations took place.

Two excavation units were planned and executed for this site (see **figure 68**). EOP1, a 2x1 m approximation trench, was placed on the west side of mound OP15, a medium-sized mound (820 cm diameter, 26 cm height) situated at the northernmost portion of the southeast cluster, within a circular arrangement of mounds. EOP2 was a 2x2 m stratigraphic pit located at the center of the northern cluster, almost equidistantly (circa 5 m) from the largest mounds (OP5, OP8, and OP9).

Stratigraphy at OP

EOP1

Seven arbitrary metric levels (3 to 9), fourteen stratigraphic units (four both off- and on-mound, three off-mound, and six on-mound) and several interfaces formed by both horizontal and vertical tree root (Papamiel, Chiriquín, Madero, Moranga, Cavazo, and Plomo) disturbances were excavated in this pit (**figure 69**). Horizon O (H) was the only stratigraphic unit present in both on-mound and off-mound contexts, which consists of a very dark brown

Figure 69: Harris matrix model for Oporta excavation unit 1 (EOP1), east profile (mound).

alluvial soil deposit, possibly associated to the Carca stream. It featured grasses, as well as Papamiel and Carazo roots, insects, and small (<5 cm) and big (>15 cm) rocks; material culture was represented by a minimal presence of ceramics, chipped stone, and burnt clay (see **table 13**), which was denser on the subunit next to the mound, EOP1B. Layer H featured four different interfaces, which were interpreted as bioturbations caused by tree roots: HA, HB, HC, and

Figure 70: Stone circle (SIV) located next to the mound wall (stones visible at the bottom right angle of the picture).

HD, with no archaeological evidence except for HB, which had only minimal quantities.

In the off-mound section of the excavation unit, stratigraphy continued with a stratigraphic unit (IV) comprised of a stone circle found within levels 3 and 4, formed by rocks between 10 and 20 cm in size and in different shapes (round, oval, and angular) (**figure 70**). As in Barillas (EUBI3), the stone circle was located right next to the visible surface of the mound, but once the excavation continued, it was revealed that the sloping wall of the mound extended slightly underneath this circle, so IV is later than the mound wall. In turn, this could correspond with a posthole trace as in EUBI3, but in spite of the similarities, no clear trace of a posthole was identified, so its interpretation remains unclear. The stone circle could have served many different purposes, such as

	1	2	3	4	5	6	7	8	9	Totals
CER #	0,00	64,00	51,00	242,00	217,00	55,00	2,00	0,00	0,00	631,00
CER w	0,00	267,80	260,80	1573,80	1413,10	212,00	12,50	0,00	0,00	3740,00
CS #	0,00	52,00	40,00	232,00	235,00	69,00	2,00	0,00	0,00	630,00
CS w	0,00	104,00	117,40	757,90	882,10	67,00	0,80	0,00	0,00	1929,20
GS		X		X						
OB		X		X	X	X				
BC		X	X	X	X	X	X			
AB		X			X					

Table 13: Distribution of materials collected from Oporta excavation unit 1 (EOP1).

for leveling the floor, an access, or a hearth—though no charcoal was recovered—or to hold a sculpture, for example. A distinction was made between the soil within the stone circle (II) and outside of it (III).

Horizon A1 (II) consisted of a dark reddish-brown color with rocks (small, medium, and large) and featured two tree root interfaces (IIA and IIB). Material culture in II included ceramics, chipped stone, and burnt clay. Interface IIA also yielded obsidian fragments, but due to the vertical movement of bioturbation, these finds could correspond with other layers. Horizon A2 (III), the stratigraphic unit situated off the stone circle, was of a dark reddish-brown color and included medium sized rocks, as well as an interface (IIIA), also formed by a tree root. III yielded ceramics—some in horizontal position—and chipped stone in comparable quantities to II; obsidian, shell and burnt clay were present as well. Additionally, ground stone and zooarchaeological remains were also collected within this layer. The bulk of archaeological materials within this excavation unit was recovered in these last two stratigraphic units (II and III). Right below, Horizon A3 (VII), a very dark brown burnt surface with small and medium rocks, featuring interface VIIA (root), was found. This stratigraphic unit consisted of mostly burnt clay and was found both on- and off-mound (named VIIM for the mound portion). Since some fragments of fired clay evince architectural characteristics, such as log marks in the "interior" surface and a flat area on the "outer" surface, together with the fact that the bulk of the material culture within this unit is either in the stratigraphic units above this one (32% of the materials) or within the mound as a filling (50%), it is possible that layer VII corresponds with the burning of a previous structure. After cleaning the surface soil at the time (X?), a fire was set, and the remaining debris was used as a foundation for both the construction of the mound and the floor surface. Therefore, materials within the mound and below VII should be earlier than those recovered on the off-mound stratigraphic units above VII. Horizon AB (X) was excavated right below VII; this layer was of a dark reddish-brown color and contained small and medium river stones (including river pebbles and tuff), as well as ceramic sherds, chipped stone, obsidian, and burnt clay. This stratigraphic unit was also identified beneath VIIM on the mound section of the excavation unit but was named XM. Below X, Horizon BC (XIV), a dark reddish-brown stratigraphic unit featuring river stones of medium and large sizes, as well as tuff fragments, was archaeologically sterile; this unit was also found underneath the mound (XIVM) and could suggest flooding episodes before the construction of the first structure. Also, we may hypothesize that possible subsequent floodings might have been involved in decisions connected to building the second mound; it is probable that these types of episodes might have required a higher mound and floor level, for example. Stratigraphy within the mound is very different from the off-mound portion of the excavation unit, except for Horizon O (H) on the surface and Horizons A3 (VIIM), AB (XM), and BC (XIVM). The rest of the stratigraphic units, all cultural surfaces and deposits, were therefore classified as different A Horizons. Horizon A4 was comprised of stratigraphic units XII, XV, XVI, and XVII. Layer XII, of a very dark grayish brown color, with roots and angular and subangular stones of small, medium, and large sizes; consisted of the sediment filling the lower levels of the sloping wall. The stones placed to form the wall at this level were classified as XVII. Material culture within XII consisted of obsidian, burnt clay, and zooarchaeological remains. Root interfaces, XIIA, XIIB, XIIB, XIIC, and XIID (same as HA, HB, HC, and HD but in a lower level), were created to assess bioturbations caused by tree roots. The upper level

of stones forming the mound wall (XVI) was filled with a very dark grayish brown layer (XV). This layer contained rocks of all sizes, as well as minimal quantities of ceramic and chipped stone. Horizon A5 was comprised of two stratigraphic units. First, XIX was found right underneath the previously described layers and consisted of a dark brown stratigraphic unit with very similar characteristics to XII and XV. However, the sediment here was mixed with small stones instead of big stones forming a wall, as on the levels above. Material culture recovered in XIX consisted of ceramic and chipped stone in low quantities, as well as obsidian and burnt clay fragments. Second, XX, of a dark reddish-brown color and similar small stones, featured ceramics, chipped stone, and burnt clay. Cutting across these two stratigraphic units, we excavated Horizon A7 (XVIIM), the burnt portion of VII that was found within the mound. This unit featured small angular stones, ceramic, chipped stone, obsidian, burnt clay, and zooarchaeological remains. A horizontal root disturbing this unit, VIIMA, was identified. Horizon A8 (XXI), a reddish-black thin layer with no rocks, was found immediately below VIIM. Since XXI was exclusively found on the sections below VIIM, it was probably placed before the burning event. Material culture unearthed within this stratigraphic unit consisted of ceramic, chipped stone, and burnt clay. An interface (XXIA, which is a continuation of XVIIA and XVIIMA) included ceramic finds only and consisted of disturbances caused by a tree root. Immediately below, Horizon AB (XM), a dark brown layer featuring subangular small stones, was excavated. Archaeological finds within this unit consisted of ceramic, chipped stone, obsidian and burnt clay. Interface XMA (a continuation of VIIA, VIIMA, and XXIA) was related to a horizontal tree root disturbance. Finally, Horizon BC (XIVM), of a dark reddish-brown layer containing rocks of all sizes, was—as was its off-mound counterpart XIV—archaeologically sterile.

To summarize, practices that took place before the construction of the mound (X and XIV for the off-mound portions, XM and XIVM for the on-mound section) are divided from the ones associated to the mound construction by VII (and VIIM), which is the apparently intentionally burnt layer. The presence of river pebbles in the layers and levels underneath this burnt surface, in contrast to their virtual absence on top of it, could mean that the surface prior to the mound suffered from flooding from the Carca stream. Presence of archaeological materials in both X and XM and their absence in XIV and XIVM could support this hypothesis. Additionally, burning surfaces can turn a soil hydrophobic, preventing water filtrations. Aside from a functional explanation, burning a previous structure can entail several meanings and respond to different practices, so all possibilities need to be taken into account.

Figure 71: Photograph of Oporta excavation unit 1 (EOP1) featuring a mound profile (east wall, opposing the scale) that shows leveled stratigraphic units and the perpendicular wall (south) with a sloping stratigraphy.

Even though mound layers are leveled (**figure 71**), the west profile wall of the excavation unit features a slope with a south-north orientation. It is unclear if this corresponds with a natural elevation of XIV or an intentional excavation of this natural layer for drainage purposes. Either way, this possible excavation took place before the mound construction, because X is deposited on top of it. These practices performed prior to the construction of mound OP15 are reflected in X and XM. A structure was possibly burnt to create a foundation (XX, XXI, VII, and VIIM) for both the mound and its surrounding area. Then, the surface was leveled with XIX before placing the stones and filling that would form the mound's wall (XII, XV, XVI, and XVII). The surfaces located off-mound and on top of the burning event are possibly associated with practices from when OP15 was in use.

EOP2

Six arbitrary metric levels and nine stratigraphic units were unearthed in this excavation unit. Additionally, 13 interfaces corresponding with horizontal and

vertical tree roots (Papamiel, Caobo, and Chiriquín) were identified (**figure 72**). Horizon O (H) was the only layer that was present in both EOP1 and EOP2. It was of a grayish-brown color and featured numerous tree and grass roots, as well as rocks of all sizes (including river pebbles), chipped stone, ceramics, and burnt clay.

Horizon A1 (I) was dark brown due to its high organic contents, which were mainly comprised of roots (interfaces IA, IB, IC, ID, IE, IF, IG, IH/K, IL). This stratigraphic unit included medium-sized stones, ceramic, chipped stone, a ground stone fragment (at interface IE), and burnt clay. Horizon A2 (V) was of a dark grayish-brown color and featured high organic contents—mainly roots. This layer was characterized by the presence of small and medium sized rocks (including river pebbles and tuff fragments), as well as ceramics found in horizontal position. The amount of rocks was high (>100), and V is the core archaeological stratigraphic unit, with 53.37% of the ceramics. Also, it contained large amounts of chipped stone and burnt clay fragments. The combination of the large amount of rocks with the position of the finds indicate that this surface was a walking space, possibly related to the mounds surrounding the open area where the excavation unit was placed. Below this dense layer, Horizon A3 (VI), of a dark brown color, was excavated. The tree roots continued to be present, and we recovered small stones (including a few river pebbles and tuff fragments), ceramics, chipped stone, obsidian, burnt clay, and charcoal. Ceramic density dropped dramatically when compared to the previous stratigraphic unit (V). There is also a decrease in chipped stone but not as pronounced as that of the ceramics; while ceramics decreased 93.38%, chipped stone was reduced 63.46%. Two interfaces were created for VI (VIA and VIB) due to tree roots. Below this stratigraphic unit, we dug Horizon A4 (VIII), which was of a dark brown color with higher iron input due to the continued presence of tree roots. Additionally, the layer yielded small and medium sized stones (including river pebbles and tuff fragments), ceramics, chipped stone, obsidian, burnt clay, and zooarchaeological remains. Ceramic quantities increased 86.13%, whereas chipped stone remained almost equal to the previous layer (n=38 for VI and n=44 for VIII). Right underneath this unit, Horizon AB (IX), of a dusky red color, was found. The presence of tree roots started to decrease, and high quantities of small and medium sized stones (including small river pebbles and tuff) were unearthed. Material culture

Figure 72: Photograph of Oporta excavation unit 2 (EOP2), west profile.

was comprised of horizontally positioned ceramics, as well as fragments of chipped stone and burnt clay. Two interfaces (IXA and IXB) were created as a result of Caoba roots disturbing the unit. Even though the amount of material culture decreased when compared to the stratigraphic unit above (VIII), the position of the finds suggests that this layer consisted of a surface where people and/animals walked. Right beneath it, we excavated Horizon B (XI), of a very dark grayish brown, containing roots and small, medium, and large rocks (including small river pebbles). Material culture was minimal, with a presence of ceramics, chipped stone, zooarchaeological remains, and charcoal samples. This stratigraphic unit looks extremely similar to a layer observed on the stream profile a few meters away from the excavation unit, which shows a violent episode involving transport of large rocks. Therefore, this layer was interpreted as a flooding event that either took place before consistent human presence at this site or washed away any previous presence, as material culture is minimal and could be the result of contact with the stratigraphic unit above, IX. The soil horizon excavated below, BC1 (XIII), was of a very dark brown color due to the presence of roots. Apart from that, it contained high quantities of small and medium sized stones as well as tuff inclusions and was concluded to be archaeologically sterile. This unit was also interpreted as a result of flooding from the Carca stream, but with less strength than in XI. Apart from that, this layer is extremely similar to XIV at excavation unit EOP1; however, the frequency of rock inclusions at XIII (EOP2) is 60% in

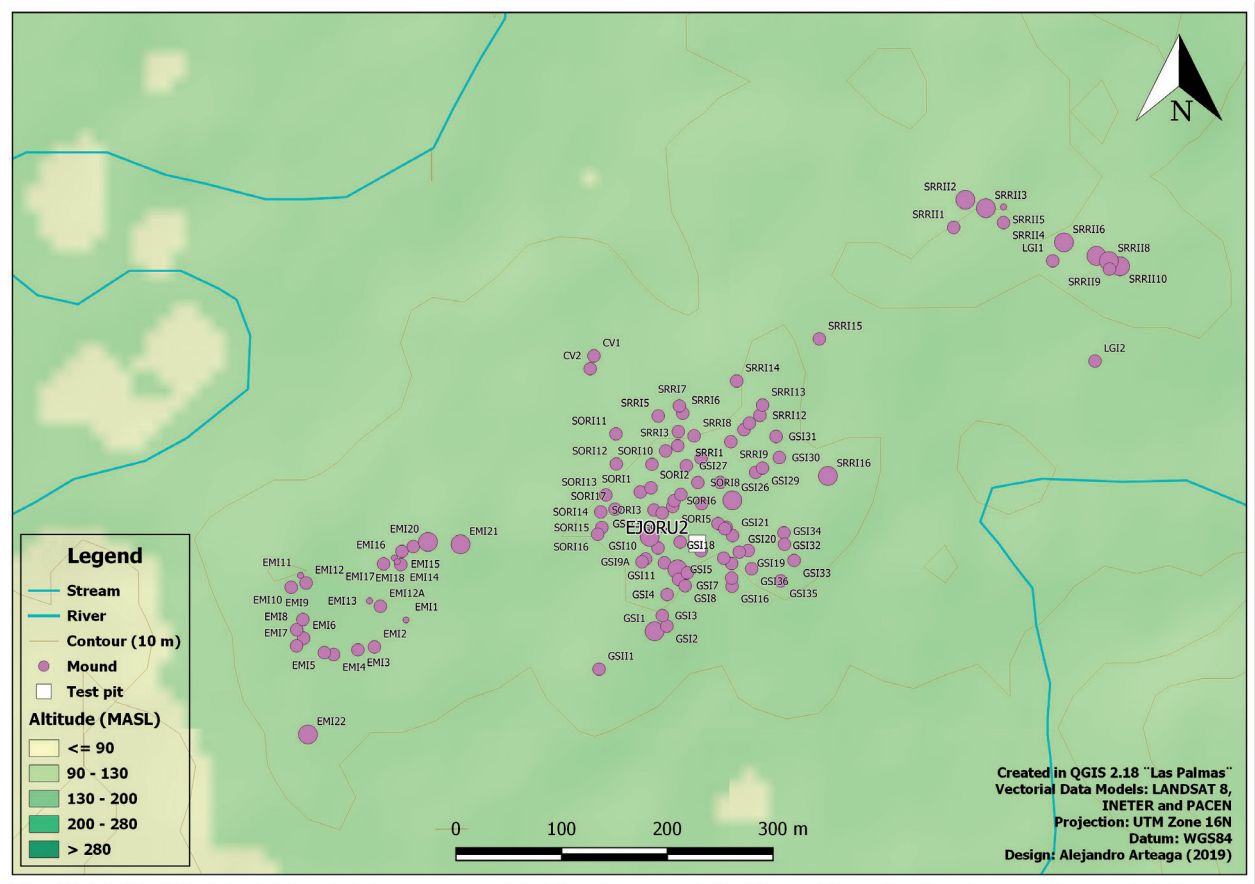

Figure 73: Map of Josefa Ocón Robleto (Piedras Grandes II) archaeological site featuring excavation units (credit: Alejandro Arteaga).

relationship to the soil matrix, while in XIV (EOP1) it is 30-40%. One explanation for this discrepancy could be the fact that EOP2 is located much closer to the shores of the Carca, facilitating transport and deposit. Finally, Horizon BC2 (XVIII), of a dark brown color, containing very small pebbles and tuff inclusions (all rounded), was again archaeologically sterile. This stratigraphic unit was interpreted as another flooding event, the least violent of the three positively identified.

In summary, EOP2 possibly consisted of a floor surface located among larger mounds, which were constructed after an episode in which the Carca stream suffered from progressive—and maybe seasonal—growth (XVIII, XIII, and XI). The first floor corresponds mainly with IX, but also with VIII, and was possibly disrupted by smaller flooding episodes (VIII and VI). The second floor surface is V, which also represents the densest cultural layer. Afterwards, the site was probably abandoned.

5.3.8 JOSEFA OCÓN ROBLETO

Site description

The lot owned by Josefa Ocón Robleto is located on a soft slope north of the intersection between the Manigua and Carca streams, 2.5 km northeast of Juigalpa, approximately 1 km east of La Libertad road (**figure 73**). The site is cut by a dirt road and spreads through the lots owned by Edy Molina, Socorro Robleto, César Báez, and Luisa Galeano. This archaeological site is comprised of 108 man-made mounds, was named Piedras Grandes II, and is part of the Sabana Grande cluster, located southeast of the research area (Arteaga 2017). The site was divided by Arteaga in three different mound clusters: the northeast, central, and southeast groups (Arteaga

2017, 307). Since the site is extensive and excavations only took place in the central cluster, I will describe in detail the portion excavated, while a description of the whole site can be found in Arteaga's thesis (2017, 306-311).

The surface soil is *lanilla*, and it is covered by grasses and a variety of local trees. Land use is mainly related to cattle ranching, though agriculture is also practiced. Several modern houses were built within the lots that contain mounds, as well as three roads that have caused disturbances in the architectural remains.

The central cluster of the site is comprised of 73 mounds of circular (90%), ovular (7%), and half-moon (3%) shapes. Average mound measurements are 437 cm in diameter and 28 cm in height. However, due to the large number of mounds, Arteaga's subdivision of mounds is followed, which groups them as large (>100 cm diameter),[64] medium (between 590 and 100 cm diameter), and small (<590 cm diameter). In total, there are nine large mounds, which average 1147.5 cm diameter and 435.5 cm in height; 56 medium sized structures, with 722.5 cm average diameter and 25 cm height; and eight small mounds, with an average diameter of 460.5 cm and 19 cm height. No clear site design is recognizable, but open flat areas surrounded by and between mounds are visible throughout the lots.

Construction practices involved first the placement of a circle made up of medium to large sized rocks (river stones or quarried bedrock), filled afterwards with medium sized rock fragments and possibly archaeological materials. Excavations on mounds were not conducted at this site, so observations regarding building materials and techniques are based on surface recordings.

Archaeological surface finds were present on 34% of the mounds within this central cluster, and they appeared in low to medium densities. Surface materials included ceramics, chipped stone, and ground stone. It is important to mention that fragments of carved sculpture were found within the northern cluster, while a basalt column was identified in the southern group of mounds (Arteaga 2017, 307). However, these types of artifacts were not present within the excavated section, the central cluster.

One test pit was excavated for this site (EJOR2), consisting of a 2x2 m situated in the flat terrain between mounds GSI14 and GSI15. The context excavated at JOR2 differs slightly from the other 2x2 m undertaken

64 Mounds within this category are the following: GSI1, GSI13, GSI26, GSI5, SORI14, SORI15, SRRI1, SRRI15, and SRRI16.

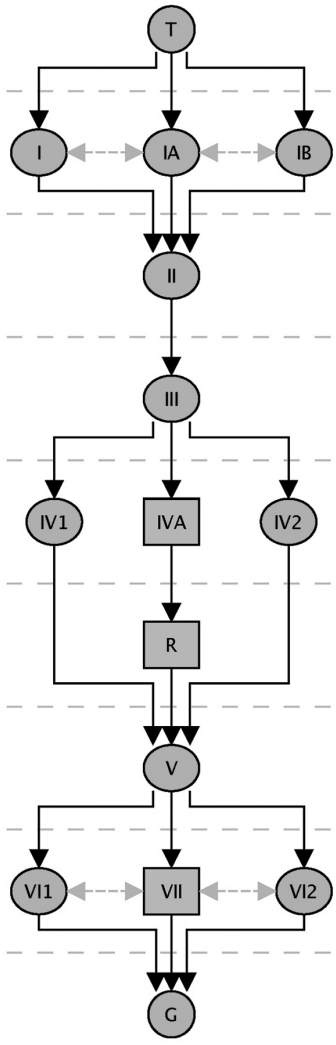

Figure 74: Harris matrix model for Josefa Ocón Robleto excavation unit 2 (EJOR2).

in the rest of the sites because it was placed right between two mounds and not on flat open terrain surrounded by structures, such as in OP1 or UBI2, for example. Therefore, some differences between the practices inferred at JOR2 and those identified at contemporaneous sites could be related to a contextual bias.

Stratigraphy at JOR

JOR2

Nine arbitrary metric levels of 10 cm each were excavated, as well as 12 stratigraphic units (**figure 74**). After the minimal Horizon O, Horizon A1

	H (37,00-40,00 cm)	I (40,10-46,10 cm)	IA (41,50-43,00 cm)	IB (45,00-46,00 cm)	II (46,10-56,80 cm)	III (56,8-60 cm)
CER #	1,00	102,00	0,00	0,00	273,00	194,00
CER w	18,40	643,62	0,00	0,00	3488,70	1195,00
CS #	2,00	11,00	0,00	0,00	50,00	72,00
CS w	1,60	11,70	0,00	0,00	194,40	165,70
GS						
BC		X			X	X

	IV (48,30-56,80 cm)	IVA (56,80-?? cm)	V (55,60-66,80 cm)	VI (66,80-84,70 cm)	VII (84,70-91,90 cm)	II (91,90-116,60 cm	Totals
CER #	51,00	54,00	151,00	173,00	75,00	0,00	1074,00
CER w	573,60	727,10	2482,10	1705,80	623,10	0,00	11457,42
CS #	12,00	34,00	89,00	66,00	27,00	0,00	363,00
CS w	6,00	71,60	167,00	118,50	183,90	0,00	920,40
GS				X			
BC	X	X	X	X	X		

Table 14: Distribution of materials collected from Josefa Ocón Robleto excavation unit 2 (EJOR2).

Figure 75: Photograph of Josefa Ocón Robleto excavation unit 2 (EJOR2) showing SIV and SIVA, a possible hearth feature.

(H) was of a dark brown color (*lanilla*), with high contents of organic matter, such as grass roots and charcoal fragments possibly resulting from periodic burning related to modern agricultural practices. Archaeological materials included only a few chipped stone fragments and one ceramic sherd (see **table 14**). Horizon A2 (I) featured a grayish-brown color and organic matter such as grass and tree roots, insects, and charcoal. This stratigraphic unit, I, yielded ceramics, chipped stone, and burnt clay; tuff fragments and charcoal were also retrieved. IA was interpreted as an interphase of I, was of a grayish-brown color, and featured grass roots but no archaeological materials. It possibly resulted from the decomposition of a tree root. IB, another interphase of I, was similar to IA but much more compact, of a dark gray-brown color, and featured no organic matter or archaeological materials. Horizon A3 (II), of a dark brown color, contained Chiriquín roots and insects, as well as <5 cm rock fragments. Archaeological materials were extremely abundant (for ceramics, 30% of the total retrieved in the excavation unit), consisting of horizontally positioned sherds, chipped stone and burnt clay fragments. A clay ball and a fragment of

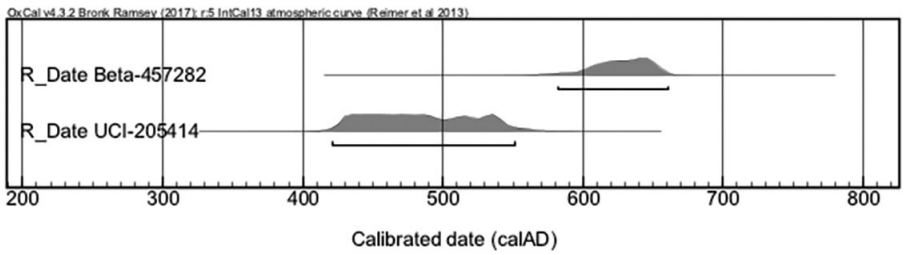

Figure 76: Multiple plot featuring the non-contaminated AMS dates for Aguas Buenas.

a seal were unearthed within this stratigraphic unit. Due to the characteristics of the stratigraphic unit, it was interpreted as a floor level. Horizon AE1 (III), of a grayish-brown color, still contained some roots and subangular 5-15 cm rock fragments. Archaeological materials included ceramics in decreasing densities, chipped stone, and burnt clay. Within the same level (6), Horizon AE2 (IV and its interphase IVA) consisted of a feature located in the south of the unit, of a dark brown color and angular rocks of more than 15 cm in size, which yielded small fragments of charcoal, as well as ceramics, chipped stone, and burnt clay fragments (**figure 75**).

Due to the characteristics of the layer, it was interpreted by the excavators as a hearth. Therefore, a sample from this horizon (JOR2IVA7) was sent to Beta Analytics for absolute dating. However, the 18.6 mg of material contained almost no carbon and appeared to be mineral matter instead. According to the lab specialist, the sample could correspond with material with high manganese content (D. Hood, pers. comm. 2017). Since manganese is an effective fire starter (Heyes *et al.* 2016; Sørensen *et al.* 2018), the hearth hypothesis could be accurate. Immediately below, Horizon AB1 (V), of a very dark brown color with the presence of rocks smaller than 15 cm, featured horizontal ceramics both in the beginning and end of the layer, as well as chipped stone and burnt clay fragments. Like III, this stratigraphic unit was interpreted as a floor level; therefore, feature IV (which includes interphase IVA) would have been first associated to V (and possibly VI), and later to II. Horizon AB2 (VI), of a dark reddish-brown color, showed some bioturbations caused by Chiriquín and Papamiel roots. This stratigraphic unit yielded ceramics, chipped stone, ground stone, and burnt clay fragments. A feature (VII) was contemporaneous to VI and was the first stratigraphic unit that had higher clay contents; rather than being classified as *lanilla* (alluvial soil), it was identified by local residents as red clay. VII consisted of a clay spot with some rocks with traces of burning activities. Finally, Horizon BC (VIII) consisted of a brown sterile stratigraphic unit with tuff fragments.

5.4 RADIOCARBON DATES

In total, 28 samples were sent to three different labs to obtain accelerator mass spectrometry (AMS) radiocarbon 14C ages. These samples consisted of charcoal fragments (n=14), charred seeds (n=1), zooarchaeological remains (n=3), organic sediment (n=8), and charred residues on sherd (n=2). The dated samples were retrieved from eleven different archaeological sites: Aguas Buenas, Alcides Montiel, Oporta, Rosa Dolores Oporta, Roberto Amador, Barillas, Josefa Ocón Robleto, Sabana Grande, La Aventura, Sebastián Ríos Histórico, and Lázaro Villegas. Calibrations were run through OxCal v4.3.2.2 (Bronk Ramsey 2017) using the IntCal13 curve (Reimer *et al.* 2013) and CalPal online employing the CalPal_2007_HULU curve, Bomb13NH2 Curve (Bomb13NH2.14c), and post-bomb atmospheric NH2 curve (Hua *et al.* 2013). Results are summarized in **table 15** and described below.

Samples dated from Aguas Buenas were excavated from excavation units EAB1, EAB3, EAB4, and M177. Of the four samples dated, only two yielded viable results (**figure 76**). Sample Beta-457282 was procured by taking advantage of a cut made to mound M177, located in the *Outer Arches* sector, as a result of road construction work. An organic sediment sample was collected using the technique described in Donner and Geurds (2018). Dates using OxCal v4.3.2 were between cal 582 and 661 CE with 95.4% probability (a span of 79 years), while Online CalPal yielded cal 622 ± 20 CE. Sample Beta-443735

Lab No	Lab	Site	Excavation Unit	Layer	Depth (cm)	Material	14C Dates BP	δ13C (‰)
Beta 457282	Beta Analytics	Aguas Buenas	177 (mound)	N/A	N/A	organic sediment	1420 ±30	-17.9
Beta 443735	Beta Analytics	Aguas Buenas	1	II	20-30	charcoal	4780 ±30	-27.2
Beta 457266	Beta Analytics	Alcides Montiel	1	VII	60-70	charcoal	1260 ±30	-25.4
Beta 457280	Beta Analytics	Oporta	1B	XIX, XX, VIIM, XXI	40-50	organic sediment	920 ±30	-18.5
Beta 457274	Beta Analytics	Oporta	1A	X	40-50	charcoal	940 ±30	-25.7
Beta 443733	Beta Analytics	Rosa Dolores Oporta	2	IIIA	30-40	organic sediment	570 ±30	-12.8
Beta 457277	Beta Analytics	Rosa Dolores Oporta	1B	X	20-30	charcoal	210 ±30	-25.6
Beta 457268	Beta Analytics	Rosa Dolores Oporta	1B	XV	30-40	charcoal	110 ±30	-24.8
Beta 457281	Beta Analytics	Roberto Amador	RAI25 (mound)	N/A	N/A	organic sediment	1010 ±30	-18.5
Beta 457270	Beta Analytics	Roberto Amador	1	V	40-50	charcoal	1020 ±30	-25.3
Beta 457276	Beta Analytics	Barillas	3	XF2	130-140	organic sediment	730 ±30	-13.6
Beta 443734	Beta Analytics	Barillas	1C	XII	40-60	organic sediment	670 ±30	-14.7
Beta 457279	Beta Analytics	Josefa Ocón Robleto	2	IV	50-60	organic sediment	990 ±30	-15.9
Beta 457273	Beta Analytics	Sabana Grande	1A	VI	30-40	charcoal	870 ±30	-8.6
Beta 457278	Beta Analytics	Sabana Grande	1	XVII	50-60	organic sediment	870 ±30	-19.8
Beta 457272	Beta Analytics	Sabana Grande	1A	XV	50-60	charcoal	1020 ±40	-25.7
Beta 457275	Beta Analytics	Sabana Grande	2	XII	40-50	charcoal	120 ±30	-24.6
UCI-198121	University of California, Irvine	Rosa Dolores Oporta	1B	XV	30-40	animal bone	160 ±15	-9.3
UCI-198122	University of California, Irvine	La Aventura	1	II	20-30	animal bone	145 ±15	-8.5
UCI-198123	University of California, Irvine	Sebastian Rios Historico	1	IIA	20-30	animal bone	100 ±15	-21.7
Poz-96201	Poznan Radiocarbon Laboratory	Lazaro Villegas	1	II	oct-20	charred seed	-556 ±26	N/A
UCI-205413	University of California, Irvine	Alberto Obando	1	III	20-30	charred residue on sherd	1645 ±25	N/A
UCI-205414	University of California, Irvine	Aguas Buenas	3	III	20-30	charred residue on sherd	1565 ±25	N/A
UCI-205415	University of California, Irvine	Aguas Buenas	4	II	oct-20	charcoal	145 ±25	N/A
UCI-205416	University of California, Irvine	Oporta	1A	III	30-40	charcoal	175 ±25	N/A
UCI-205417	University of California, Irvine	Barillas	1B	IB	40-50	charcoal	4240 ±280	N/A
UCI-205436	University of California, Irvine	Josefa Ocón Robleto	2	VII	70-80	charcoal	5285 ±20	N/A
UCI-205437	University of California, Irvine	Barillas	1B	III	40-50	charcoal	1795 ±15	N/A

Table 15: Radiocarbon assays analyzed through AMS for dating.

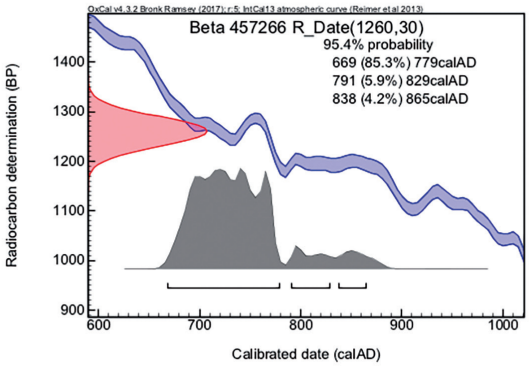

Figure 77: Single plot for sample Beta-45726, retrieved from Alcides Montiel.

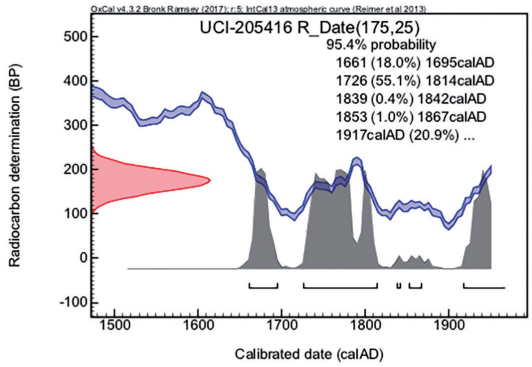

Figure 78: Multiple plot featuring the non-contaminated AMS dates for Oporta.

consisted of a charcoal fragment recovered from unit EAB1, stratigraphic unit II, arbitrary level 3 (20-30 cm below surface). This pit, which was excavated in the *Eastern Cluster* of the site, dated between cal 3641 and 3519 BCE with 95.4% probability (a span of 122 years) using OxCal v4.3.2 and cal 3583 ± 42 BCE with Online CalPal. Results were interpreted as contaminated tree remains located near the bedrock (Donner & Geurds 2018). UCI-205414 consisted of a sherd featuring charred residues, which was retrieved from excavation unit EAB3 at layer III, level 3 (20-30 cm), situated at the south section of the *Empty Area* (Donner & Geurds 2020). The sample yielded a date between cal 421 and 551 CE (a span of 130 years), with 95.4% probability in OxCal v4.3.2 and cal 485 ± 41 CE in Online CalPal. The last dated sample from Aguas Buenas, UCI-205415, consisted of a charcoal fragment extracted from excavation unit EAB4, stratigraphic unit II, level 2, positioned at the *Empty Area* near the largest mound of the site (M272). Results dated between cal 1668 and 1946 CE with 95.4% probability (span of 278 years) using OxCal v4.3.2 and cal 1813 ± 106 CE through Online CalPal. Therefore, the sample was interpreted as charred organic materials from contemporary burning practices (Donner & Geurds 2020).

A single sample, found in association to three ceramic sherds, was dated for the site Alcides Montiel (**figure 77**). Beta-457266, a charcoal fragment, was collected at excavation unit EAM1, so it is associated to mound AMII12. The date, which corresponded to layer VII and level 7, yielded dates between cal 669 and 865 CE (a 196 year span) using OxCal v4.3.2 with 95.4% probability, and cal 734 ± 38 CE through Online CalPal.

Three samples were dated from the Oporta site, of which two yielded suitable results (**figure 78**). Beta-457280 consisted of organic sediment excavated from unit EOP1B, associated to mound OP15, layers XIX, XX, VIIM, and XXI level 5, so it is connected to mound construction practices. Dates obtained ranged between cal 1028 and 1184 CE (a span of 156 years) with OxCal v4.3.2 with 95.4% probability and cal 1099 ± 47 CE with Online CalPal. Beta-457274 was retrieved off-mound from excavation unit EOP1A, stratigraphic unit X level 5. Results were between cal 1025 and 1160 CE (a span of 135 years) with OxCal v4.3.2, 95.4% probability and cal 1090 ± 46 CE with Online CalPal. Sample UCI-205416 was retrieved from excavation unit EOP1A, stratigraphic unit III level 4, consisted of a charcoal fragment which dated between cal 1661 and 1917 CE (a span of 256 years) with 95.4% probability through OxCal v4.3.2 and cal 1802 ± 123 CE with Online CalPal, so it was interpreted as a recent contamination (Donner & Geurds 2020).

For the site of Rosa Dolores Oporta, four different samples were run, of which one was not contaminated (**figure 79**). Sample Beta-443733 consisted of organic sediment from excavation unit ERDO2, stratigraphic unit IIIA (associated to a complete vessel), levels 4 and 5, at least 10 cm below the core cultural layers, and with virtually sterile stratigraphy in between (only 6.44% of the ceramic materials were found there). This complete vessel was apparently placed and buried before the use of the space, which has been characterized as a plaza configured by three large mounds with a flat area in between, where the excavation unit was placed. Results were between

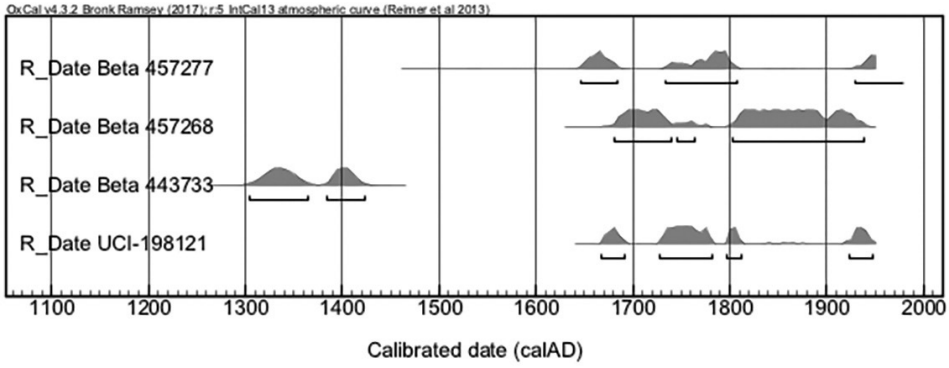

Figure 79: Multiple plot showing the four samples analyzed through AMS for Rosa Dolores Oporta.

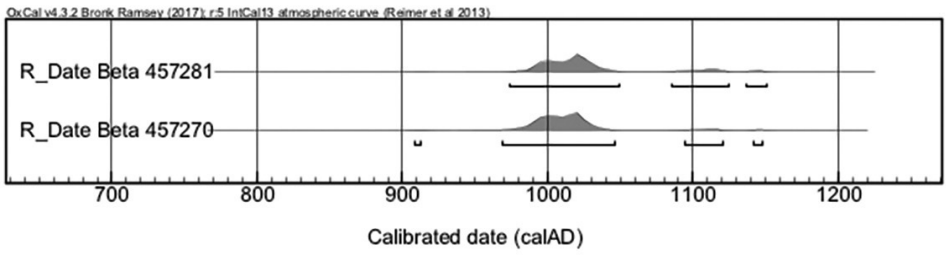

Figure 80: Multiple plot with samples dated for Roberto Amador.

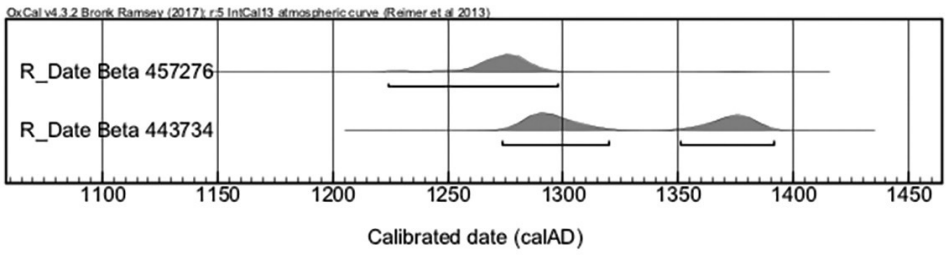

Figure 81: Multiple plot featuring the non-contaminated AMS dates for Barillas.

cal 1295 and 1433 CE (a span of 138 years) with 99.7% probability using OxCal v4.3.2 and cal 1360 ± 40 CE through Online CalPal. Beta-457277 was comprised of a charcoal fragment from excavation unit ERDO1B, stratigraphic unit X level 3, associated between cal 1528 and 1916 CE (a span of 388 years) with 99.7% probability using OxCal v4.3.2 and cal 1729 ± 69 CE through Online CalPal. Beta 457268, a charcoal fragment, was retrieved in excavation unit ERDO1B, layer XV level 4 and yielded dates between cal 1699 and 1945 CE (a span of 246 years) with 99.7% probability through OxCal v4.3.2 and cal 1808 ± 97 CE through Online CalPal. UCI-198121 consisted of a faunal bone excavated from ERDO1B stratigraphic unit XV level 4. Dates obtained were between cal 1665 and 1916 CE (a span of 251 years) with 99.7% probability through OxCal v4.3.2 and cal 1806 ± 121 CE through Online CalPal.

At the Roberto Amador site, two different samples were dated (**figure 80**). Beta-457281 consisted of an

organic sediment sample recovered taking advantage of a cut made for construction purposes on mound RAI25. The sample yielded dates between cal 973 and 1150 CE with 95.4% probability (a span of 177 years) through OxCal v4.3.2 and cal 1013 ± 17 CE with Online CalPal. Sample Beta-457270 was a charcoal fragment obtained at ERAI1, stratigraphic unit VII, level 5, which dated between cal 909 and 1147 CE (a span of 238 years) with 95.4% probability through OxCal v4.3.2 and cal 1006 ± 16 CE with Online CalPal.

From the Barillas site, four samples were selected for absolute dating, of which two yielded non-contaminated results (**figure 81**). Sample Beta-457276 consisted of organic sediment obtained at excavation unit EUBI3B, stratigraphic unit XF2, 50 cm below surface, at the foot of mound UBI27. Dates obtained were between cal 1224 and 1298 CE (a span of 74 years) with 95.4% probability on OxCal v4.3.2 and cal 1268 ± 12 CE with Online CalPal. Sample Beta-443734 consisted of organic sediment excavated at EUBI1C, at the foundation of mound UBI61 (stratigraphic unit XII, between levels 5 and 6). Results were between cal 1274 and 1391 CE (a span of 117 years) with 95.4% probability on OxCal v4.3.2 and cal 1329 ± 44 CE with Online CalPal. UCI-205417 was comprised of charcoal fragments excavated at the foot of mound UBI61, from EUBI1B stratigraphic unit IB, level 5. This sample dated between cal 3634 and 2138 BCE (a span of 1496 years) with 95.4% probability on OxCal v4.3.2 and cal 2862 ± 391 BCE with Online CalPal. Therefore, it was interpreted as a contamination resulting from the deposition of older charred organic materials in the context of a shallow horizon associated to bedrock. UCI-205437 consisted of a charcoal fragment found in excavation unit EUBI1B, stratigraphic unit III level 5. This sample yielded dates between cal 137 and 320 CE (a span of 183 years) with 95.4% and cal 209 ± 30 CE with Online CalPal. These last two samples were taken from the same metric level and were both considered contaminated (Donner & Geurds 2020).

For the Josefa Ocón Robleto site, two different samples were dated, but only one yielded non-contaminated results (**figure 82**). Beta-457279 consisted of organic sediment retrieved from excavation unit EJOR2, layer IV level 6. Results indicated that the sample dated between cal 989 and 1153 CE (a span of 164 years) with 95.4% probability through OxCal v4.3.2 and cal 1059 ± 47

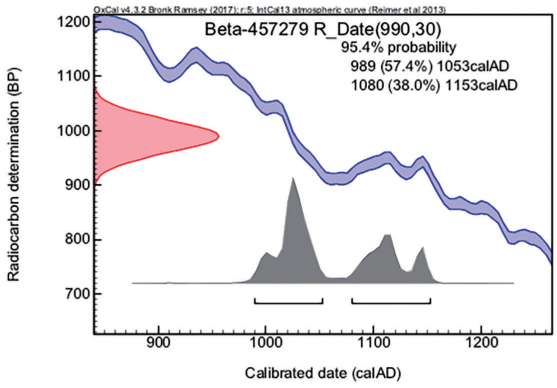

Figure 82: Single plot featuring the non-contaminated dated sample for Josefa Ocón Robleto.

CE with Online CalPal. Sample UCI-205436 was a charcoal fragment retrieved at JOR2, stratigraphic unit VII level 8, which yielded an age between cal 4231 and 4005 BCE (a span of 226 years) with 95.4% probability through OxCal v4.3.2 and cal 4138 ± 72 BCE with Online CalPal.

At the Sabana Grande site, four samples were run for absolute dating, of which one was contaminated (**figure 83**). Beta-457273 was comprised of charcoal fragments collected from excavation unit LD1A, layer VI level 4. Results placed the samples between cal 1045 and 1250 CE (a span of 205 years) with 95.4% probability at OxCal v4.3.2 and cal 1139 ± 61 CE through Online CalPal. Beta-457278, an organic sediment sample retrieved from ELD1, layer VII level 6, dated between cal 1045 and 1250 CE (a span of 205 years) with 95.4% probability at OxCal v4.3.2 and cal 1139 ± 61 CE through Online CalPal. Beta-457272 consisted of a charcoal fragment collected from ELD1A, layer XV level 6. The sample was dated between cal 900 and 1152 CE (a span of 252 years) with 95.4% probability at OxCal v4.3.2 and cal 1012 ± 31 CE through Online CalPal. Beta-457275 was a charcoal fragment excavated at ELD2, layer XII level 5 whose age was estimated between cal 1679 and 1940 CE (a span of 261 years) with 95.4% probability through OxCal v4.3.2 and cal 1809 ± 98 CE through Online CalPal.

For the remaining four archaeological sites that were dated through AMS, only one sample was suitable for determining age. In the case of sample UCI-198122, a faunal bone excavated from ELA1 (**figure 84**), stratigraphic unit ll level 3, results indicated

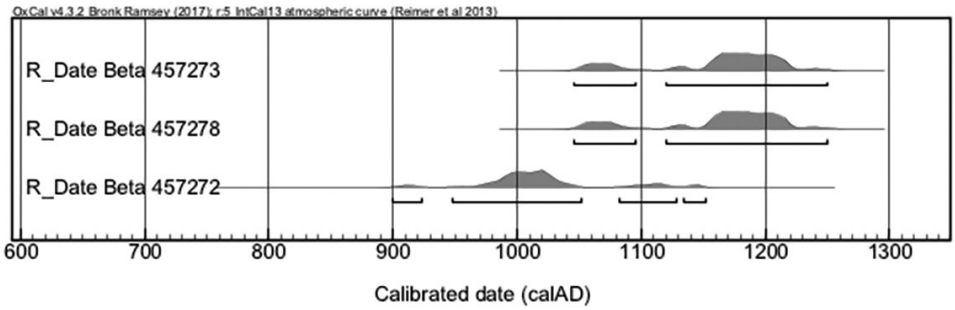

Figure 83: Multiple plot featuring the non-contaminated AMS dates for Sabana Grande.

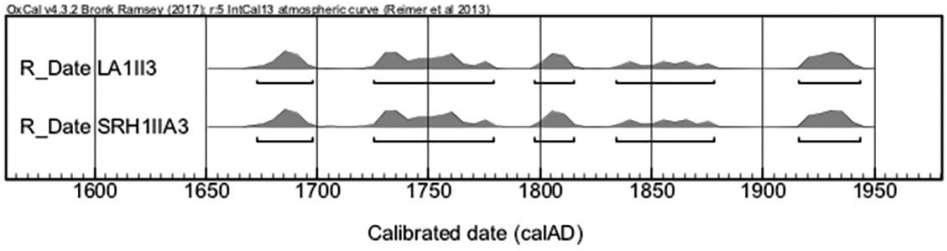

Figure 84: Multiple plot showing samples dated from La Aventura and Sebastian Ríos Histórico.

a range between cal 1673 and 1943 CE (a span of 270 years) with 95.4% probability at OxCal v4.3.2 and cal 1812 ± 112 CE with Online CalPal. Sample UCI-198123, another faunal remain but excavated at ESRH1 (**figure 84**), layer SllA level 3, was dated between cal 1692 and 1920 CE (a span of 228 years) with 95.4% probability OxCal v4.3.2 and cal 1803 ± 93 CE with Online CalPal.

Poz-96201 consisted of a charred seed excavated at ELV1, layer II level 2. This sample yielded contaminated results. Sample UCI-205413, a sherd fragment with charred residue collected at EAO1, stratigraphic unit III level 3, dated between cal 337 and 530 CE (a span of 193 years) with 95.4% probability OxCal v4.3.2 and cal 399 ± 22 CE with Online CalPal (**figure 85**).

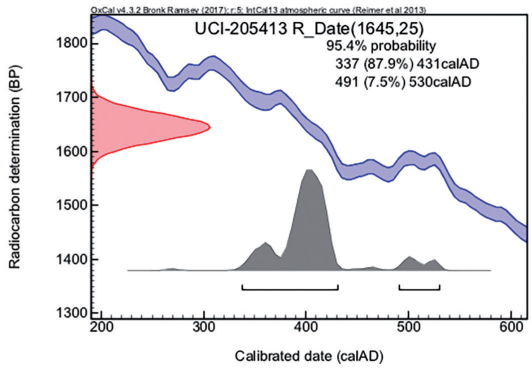

Figure 85: Single plot featuring the AMS date for Alberto Obando.