During the Xibun Archaeological Research Project (XARP) 2001 field season, approximately five weeks were dedicated to surveying and mapping natural and cultural features in the vicinity of the Hershey site. Located just below the Sibun Gorge at the edge of the Maya Mountains, the Hershey site is the largest known Maya site in the Sibun River Valley. Natural features in the area, such as rivers, terraces, and ponds, as well as some cultural features such as mounds, roads and orchards were mapped using Global Positioning System (GPS) instrumentation. The GPS system also served as an excellent reconnaissance tool that could be used to create spatially accurate sketch maps. Architectural mound features and adjacent areas were mapped at the Hershey site using a total station (a theodolite with an Electronic Distance Measurement device, or EDM). Several areas within the Hershey site were surveyed using a magnetometer to identify subsurface features for future investigation.

David Buck conducted the majority of the GPS data collection and was responsible for post-processing the GPS data. Total station mapping was accomplished by Steven Morandi, with Tara Bermingham, Christa Cesario, Daniel Leonard, and Kristen Marx. Daniel Welch was responsible for the magnetometry survey at the Hershey site. Brian Norris, of the James W. Sewall Company of Old Town, Maine, designed and set up the ground control network, coordinated procedures for the GPS ties to survey points with established horizontal and vertical control, and provided general land surveying guidance. Dave Carlson’s technical assistance was instrumental to the maintenance and management of the SurvCADD surveying software used in the field. A final contour map of the Hershey site based on both the total station and GPS field-collected data was created by Joe Beaulieu at the James W. Sewall Company. The ground control survey would not have been possible without the assistance of the several local macheteros who cleared the dense foliage on a daily basis so that we could see significant distances between control points and features to be mapped. From the local village of Saint Margaret’s, the cutters included Alejandro Davila, Rigaberto Galdemez, Celestino Hernandez, Rolando Hernandez, Rudolfo Hernandez, Saul Ortiz, and Rigaberto Veron.

Getting Started

One of the first steps taken in surveying the upper Sibun River area was to conduct research at the Government of Belize Survey Department to obtain existing control records that contained spatial coordinate data from the area of interest. Once this was accomplished, field reconnaissance was performed in an attempt to locate these published control markers. The next step was to establish a GPS base station at Hummingbird Haven. This base station was tied into recovered official Survey Department of Belize Control Points along the Hummingbird Highway. Once the coordinates and elevation of the base station were established this station was used to tie the total station mapping into the project datums (both horizontal and vertical).
Of the four published Department of Overseas Services (DOS) survey markers located between the Hummingbird Citrus Ltd. citrus and cacao farm and the village of Saint Margaret’s along the Hummingbird Highway (miles 31 - 36), two appeared to have been disturbed and moved from their original locations. The remaining two markers, DOS 96 and DOS 99, were used to confirm the location of the base station, referred to as Hummingbird Haven. DOS 96 (mile 35.2) is located at 323460.9 mE and 1890359.5 mN with an elevation of 86.4 m MSL (above mean sea level). DOS 99 (mile 31.6) is located at 329128.2 mE and 1889785.2 mN with an elevation of 105.1 m MSL.

Using these markers, it was determined that the Hummingbird Haven base station was located at 323210.93 mE and 1891042.45 mN with an elevation of 79.855 m MSL. After installing the GSR1000 base receiver, this location was confirmed by conducting field observations with the Rover unit at the known DOS 96 location. The difference between the actual DOS 96 location and the calculated DOS 96 (using GIR 1000) was .23 mE and .47 mN with a difference of 2.32 m (MSL). From this field test, it was determined that the accuracy associated with post-processing data using the Hummingbird Haven Base station was within our expectations. All GPS work within the upper valley during the XARP 2001 season was post-processed against the Hummingbird Haven base. The base station located at the Hummingbird Haven was in use from 31 January, 2001 to 2 March, 2001. The Monkey Bay base station, established during the 1999 season, was used for work in the lower reaches.

**GPS Data Collection Methodology**

GPS work during the XARP 2001 field season was accomplished using a Sokkia/ GIR 1000 Workabout system. The Sokkia system consists of two GSR1000 receivers (“base” and “rover” units) with GPS antennas, a PSION workabout handheld controller installed with FAMlog (Field Asset Management) data collection software, and interface cables which allow for data processing and communication between the controller, receiver, and PC computer used during data processing.

GIR 1000 (version 3.5) software was used for post-processing of the GPS data. Post-processing of field data, which compared rover and base unit data to achieve greater precision and accuracy, was necessary because the single rover GPS, by itself, would have been accurate to only 100 meters. With post-processing the instruments yield an expected accuracy of one to three decimeters under favorable conditions.

The rover unit was used for data collection. Point data was collected for five minutes in areas of dense vegetation and one minute in areas of no vegetation or low canopy unless otherwise noted. In order to achieve the desired decimeter resolution, a minimum of five satellites were tracked during field operations. The PDOP index was maintained at or below 4.0. In the event that the PDOP index rose above this value, the duration of the session was extended to ensure a more accurate measurement.

Post-processing of field data was completed at the end of each field day. Session files of the base and rover receiver were transferred to the computer via the interface cables and named according to the corresponding Julian calendar day on which the session occurred. Project files were created using the corresponding base and rover files.
Total Station Survey Methodology

The methodology and instrumentation associated with the total station have been described in detail in a previously published report (Morandi and Norris 2001: 5-6), and will not be reiterated here. As in previous seasons, the XARP 2001 survey project was designed to recover a maximum amount of data while providing students with training in surveying skills.

Most of the XARP 2001 total station survey was carried out in overgrown cacao orchards rather than in tropical rain forest. The orchard road network, crisscrossing the Hershey site, was heavily utilized for lines of sight and for establishment of new traverses. Surveying structures and the surrounding area was accomplished by establishing “spurs” off of an orchard road traverse loop to the tops of structures after they had been cleared of vegetation. The cacao tree canopy was relatively low and dense, making low total station and prism setups a necessity. In addition, the cacao of the previous year had not been harvested due to a poor market, and most of the trees were inundated with both new and rotted pods that hung off even the lowest branches. Still, the cacao groves proved advantageous for the survey due to open rows between trees (additionally, they provided shade and more than a few good snacks in the oppressive heat). Even very low mounds could be seen with some ease in the thin leaf litter, though few of these existed, perhaps due to preparation of the orchard rows, or past burial in alluvial sediment.

Changes in data processing were made for the XARP 2001 season. SurvCADD software (version CES) was generously supplied by David Carlson of Carlson Software in Brighton, MA, and was used along with AutoCAD 2000i for data entry and computer generated field maps. Data were entered into a computer on a nightly basis to ensure their integrity and accuracy before moving on to new survey areas the following day. First, the traverse observations (angles and distances) were entered. Next, the SurvCADD software was used to close the loop by averaging the error across all of the loop segments. The traverse and field point data were entered each night as dictated by the data collected in the field. Contour maps were created as check prints on a daily basis to check the quality of the survey as it was carried out.

Magnetometry Survey Methodology

In 2001, XARP was able, for the first time, to conduct geophysical prospection at various sites. The goal of these investigations was to locate subsurface features that could then be the focus of an excavation. As this was the first time we were using these methods we felt it was necessary to detail the methods and the process.

Background and Technical Theory

Magnetic gradiometry, commonly called gradiometry, is a specific refinement of another related geophysical technique called magnetometry. In fact, a magnetic gradiometer may be thought of as nothing more than a pair of magnetometers connected to a computer and set to record measurements over a given location at exactly the same time. A magnetometer is an instrument that measures the strength of the earth’s magnetic field at a particular area. The background magnetic field of the earth is thought to be generated by the movement of molten heavy metals in the planet’s mantle and core, and is affected by external inputs from the sun and outer space (Reynolds 1997).
Depending on the location on the globe, it has a particular strength range (expressed in nanoTeslas, nT) and angle of strike relative to ground surface (magnetic declination, or flux). The magnetic field is affected by various factors and is hugely variable both in its temporal and spacial extents. As magnetometers are moved over the ground surface, they respond to shallowly buried materials, geology, and even minute dissimilarities in soil chemistry. It is the challenge of the surveyor in archaeological geophysics to separate the anomalies caused by man-made features from natural interferences that obscure the more ephemeral archaeology. This is made easier with gradiometry because the paired magnetometers act as a high-pass filter which helps to remove the gradual low-frequency changes caused by soil chemistry and geology, leaving visible the near-surface, high-frequency anomalies (Breiner 1973).

While it is the variation over the ground surface that is most important to archaeology, it is the field’s variation over time that has most governed the development of gradiometry. The strength of the earth’s magnetic field is hugely variable throughout a given day. While no one is certain of all the affecting factors, the greatest source of interference is from the sun. The sun, and to a lesser extent outer space, constantly bombards the earth with electromagnetic energy. While the atmosphere stops most of this energy, some penetrates and causes spikes in the magnetic field. During periods of intense sunspot or solar flare activity, magnetic storms descend on the earth and cause enormous variations. Generally speaking such storms are rare, and do not often pose a great problem. The natural daily oscillation in field strength is called the diurnal effect, and it would pose significant problems to archaeological magnetic survey done without gradiometers. To give an example, the earth’s field strength can vary by as much as hundreds of nanoTeslas over the course of several hours, while archaeological features may have signal strengths of only a few nanoTeslas.

As noted earlier, a gradiometer is made up of two paired magnetometers. In archaeological exploration, one magnetometer passes as closely as possible to the ground surface, while the other passes over the same area at a greater height, typically 50-75 cm. While both magnetometers measure the diurnal effect and cosmic interference, and to some extent changes in geology, the bottom magnetometer also measures archaeological inputs. Since the weak signals generated by archaeology fall off dramatically with distance, readings from the top magnetometer are considered to be uninfluenced by archaeology. These magnetometers are set to record readings at exactly the same time. The top reading is then subtracted from the bottom reading to remove the diurnal effect and other gradual interferences. The resultant value is termed the magnetic gradient and is measured in nanoTeslas.

The equipment used in the XARP survey was a Geometrics G-858G Cesium Vapor magnetometer configured in gradient mode. The G-858G represents current state-of-the-art, high-resolution magnetics and a sensitivity increase of an order of magnitude over other more commonly used types. A detailed discussion of the Cesium magnetometer’s theory of operation can be found in Smith (1997). The equipment consists of a pair of sensors aligned one on top of the other, a control unit to record measurements and set field survey parameters, and a battery pack (Figure 2.1). The sensor setup is located on a long boom to remove the influence of the battery pack and the control unit.
Archaeological Applications

Geophysics is solely concerned with contrasts. Every geophysical technique measures the contrast in some physical property across an area. Most techniques accomplish this by sending a pulse of energy into the ground and measuring changes in its transmission velocity or strength as it passes through the subsurface. These techniques are termed ‘active’ and the most commonly used are ground-penetrating radar, electrical resistivity, and EM conductivity. In contrast, magnetometry is a passive geophysical technique that simply records already present interferences in the Earth’s natural magnetic field. These interferences can vary with the scale, depth, mass, and composition of the affecting object or area. While there are plenty of natural geological phenomena in the surficial area which cause interferences in earth’s magnetic field, human activity influences the subsurface in a number of ways which are readily detectable with magnetometry. These interferences are caused by a variety of materials including: ferrous metals, organic-rich soil, volcanic stone, kilns, and hearths (Clark 1996).

In New World prehistoric archaeology, the presence of ferrous metals can often be an excellent hallmark of disturbance, particularly in agricultural fields or in areas near to roads. Farm machinery and vehicles commonly throw off all manner of metallic parts, the signals of which are easy to separate from the dataset because there are often the strongest signals. If time and funds permit, a quick metal detector survey is the most useful method for locating and removing recent intrusive metal (Heimmer and DeVore 1995).

In most environmental zones, and especially the American tropics, the creation of topsoil through a bio-chemical process tends to imbue it with a weak magnetism. This is termed magnetic
susceptibility and is useful for identifying activities that disrupt the normal soil column (Clark 1996). Humans can alter the magnetic susceptibility of the soil with organic input from waste and middens, or by removing topsoil in the course of digging pits. The signature of such variations is ephemeral, but still detectable. Around mounds such as those at Pakal Na and elsewhere in the tropics, the washing of organic-rich materials off of the mounds to the surrounding area tends to give them a halo-like appearance.

In general, the most commonly sought targets for gradiometry are hearths and kilns. When sediments are burned so that their temperature rises above the Curie point, (different for every mineral, but around 500-700 Celsius on average), the weakly magnetic minerals are converted to oxides, including magnetite. Upon cooling, these oxides develop a fixed and permanent magnetism aligned with the earth’s field at the time of firing (Clark 1996: 64-65). This is termed thermoremanance. The principle applies to volcanic stone as well; basalts used in construction or as monuments are readily detectable.

Field Operations

Magnetic gradiometry has been used in archaeology in two ways. The first of these is known as magnetic scanning. Equipment is passed over a given area much the same way as a metal detector. There are no maps produced and anomalies are normally flagged in the field for testing. This method is extremely rapid but is usually only effective at locating isolated metallic objects or intensely burned areas such as kilns. The fact that maps are not produced makes the identification of subtle anomalies difficult.

By far the most common archaeological use for gradiometers is mapped area survey. Survey areas are defined and tied into a larger site grid system so that anomalies can be relocated for later ground-truthing. The survey proceeds over the area in a predefined pattern and every measurement is stored along with its coordinate location on the survey grid. The data are then downloaded into a computer for processing and map production. Several survey areas may be surveyed separately and then stuck together, or concatenated, into a larger area map. For the XARP survey, this second method was used to identify areas that could be tested during future seasons. All survey grids were tied to the local site grid by measuring the distance and angle from grid corners to known survey points.

Data were downloaded each evening into a personal computer in order to check data integrity, perform field processing, and generate initial interpretations. Processing was done with Geometrics MagMap2000 and Golden Software Surfer, both running on a Windows platform. Final interpretation and map production were performed after the field season.

Results of the Upper Sibun River Valley Survey and Mapping Project

The Hershey Site: GPS Mapping

The focus of GPS work within the Hershey site and surrounding orchard was two-fold. First, the traverse network laid out by the survey team using the total station needed to be tied to a known horizontal and vertical datum. Second, features that could not be tied into the Hershey site traverse
network using the total station due to distance and/or line of sight obstructions could be quickly mapped with reasonable accuracy using the GPS rover unit. The 14 traverse stations were observed using the Rover and small tripod. Satellite data was collected for five minutes at each traverse station, pertinent information was recorded in a survey book (book 1 of 2, pp. 46-49), and post-processing with the base station was carried out in the lab. The results of this session are listed in Table 2.1.

### Table 2.1 Coordinates of the Primary Survey Transect Used During the Total Station Survey of the Hershey Site.

<table>
<thead>
<tr>
<th>Structure No.</th>
<th>Easting (Precision)</th>
<th>Northing (Precision)</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>325332.17 mE (0.03 m)</td>
<td>1895508.51 mN (0.02 m)</td>
<td>65.53 m</td>
</tr>
<tr>
<td>402</td>
<td>325667.90 mE (0.03 m)</td>
<td>1895340.68 mN (0.01 m)</td>
<td>54.05 m</td>
</tr>
<tr>
<td>403</td>
<td>325488.28 mE (0.05 m)</td>
<td>1895013.03 mN (0.02 m)</td>
<td>51.99 m</td>
</tr>
<tr>
<td>404</td>
<td>325656.38 mE (0.15 m)</td>
<td>1894935.18 mN (0.06 m)</td>
<td>51.51 m</td>
</tr>
<tr>
<td>406</td>
<td>325512.32 mE (0.13 m)</td>
<td>1894658.27 mN (0.05 m)</td>
<td>54.63 m</td>
</tr>
<tr>
<td>407</td>
<td>325524.03 mE (0.18 m)</td>
<td>1894618.24 mN (0.04 m)</td>
<td>54.45 m</td>
</tr>
<tr>
<td>409</td>
<td>325456.36 mE (0.10 m)</td>
<td>1894572.72 mN (0.07 m)</td>
<td>54.82 m</td>
</tr>
<tr>
<td>411</td>
<td>325533.73 mE (0.19 m)</td>
<td>1894532.76 mN (0.05 m)</td>
<td>53.46 m</td>
</tr>
<tr>
<td>413</td>
<td>325591.78 mE (0.15 m)</td>
<td>1894491.49 mN (0.13 m)</td>
<td>53.89 m</td>
</tr>
<tr>
<td>414</td>
<td>325566.81 mE (0.04 m)</td>
<td>1894460.79 mN (0.02 m)</td>
<td>52.46 m</td>
</tr>
<tr>
<td>416</td>
<td>325521.20 mE (0.24 m)</td>
<td>1894454.89 mN (0.14 m)</td>
<td>52.76 m</td>
</tr>
<tr>
<td>417</td>
<td>325548.45 mE (0.15 m)</td>
<td>1894505.66 mN (0.08 m)</td>
<td>62.76 m</td>
</tr>
<tr>
<td>418</td>
<td>325373.46 mE (0.16 m)</td>
<td>1894619.67 mN (0.02 m)</td>
<td>55.82 m</td>
</tr>
<tr>
<td>419</td>
<td>325303.55 mE (0.31 m)</td>
<td>1894658.13 mN (0.15 m)</td>
<td>55.11 m</td>
</tr>
</tbody>
</table>

Maps of the road system within the orchard were also created using the Sokkia GPS system in order to supplement the total station survey work as well as to aid in future GIS modeling. The data for the orchard roads were collected both on foot as well as with a vehicle using the line function within the FAMlog data collector software. The road system was mapped in four separate sessions and these maps are included in Map Sheet 1.

In addition to mapping the roads, reconnaissance within the orchard was carried out as part of the on-going survey work. An archaic Lowe projectile point was found within the roadcut of an orchard road N-NW of the main entrance to the Hershey Orchard. A GPS point was collected at the location (325490.84 mE, 1896356.38 mN). Additional survey within Transect 1 adjacent to the Hershey site was carried out along the southern bank of the Sibun River. Although visual confirmation was not possible during this season, local interviews suggested the possibility of additional mounds further downstream near the confluence of Dry Creek and the Sibun River. This area is considered to be in Transect 2 and will be the focus of more intense reconnaissance and survey during future seasons.

**The Hershey Site: Total Station Survey**

Total station mapping at the Hershey site resulted in a detailed topographic map that revealed a highly organized site center (Map Sheet 1). First, a random traverse was set in the vicinity of the Hershey site. The angles and distances of the entire traverse network were accurately measured.
using the total station and tripod mounted prisms. The main traverse loop was closed around the major cultural features, and then several traverse “spurs” off the main loop were established to allow for the mapping of different mound groups at the site. The traverse loop also was connected (via a spur) to Survey Marker 420, a control point set by the Belize Department of Survey. This served as a secondary check on the spatial accuracy of the GPS ties. Most of the mounds at the Hershey site were large enough so that cacao trees were not planted on them. As a result, they were covered with dense stands of small trees and underbrush, which had to be cleared before the survey was attempted.

At the Hershey site, the Group C structures were the first to be mapped, followed by Group B, Group D, Group F and finally Group A, the largest at the site. The order of mapping was dictated by the order of clearing of the various areas, which generally proceeded from smallest to largest. A total of 32 traverse points were established at the Hershey site. Over 1500 field shots (with their coordinates in three dimensions) were recorded to create the topographic map of the site center. A total of 38 architectural mound features were identified, ranging in size from a few square meters in area and half a meter in height to the central pyramid of Group A, at roughly $25 \times 40$ m in area and over 13 m tall.

**The Hershey Site: Geophysical Prospecting**

One day of geophysical survey was conducted at the Hershey site in order to examine areas which were either partially tested by excavation or were slated for testing in future seasons. Three areas in and around the site center were selected for geophysical investigation (Figure 2.2). Arbitrary survey areas were laid out in such a way as to maximize area coverage given the uneven ground and brush. Readings were taken at an interval of 0.1 m along transects spaced 0.5 m apart. At least two corners of each survey grid were tied into the site master grid by tape-and-compass measurements to nearby survey points. No permanent markers were left in the ground.

![Figure 2.2 Hershey site center with survey area locations.](image)
Area 1 is a 15 × 5 m area partially enclosed by parallel mounds to the southeast and northwest. It was selected because the configuration of the mounds suggested that the area was a possible ballcourt. Many archaeologically known ballcourts in the Maya area contain a marker or stela in the center, and it was thought that this may be detectable by magnetic survey (P. McAnany and B. Thomas, personal communication, 2001).

Geophysical survey yielded several strong dipole anomalies (Figure 2.3). The two dipoles toward the northern area of the grid have stronger positive components than the indicated dipole to the south. This object causing the southern anomaly may be oriented so that its longer axis is closer to horizontal with respect to the ground surface while long axes of the other two anomaly causing objects may be oriented closer to perpendicular. Based on its location within the grid and the signal strength and shape, the object causing the anomaly enclosed with a green circle (the center circle) has been identified as a possible ballcourt marker. This object is likely composed of some type of volcanic stone, as weakly or non-magnetic limestone would not have produced a signal of such strength. Figure 2.4 was produced to further characterize this feature. The possible ballcourt marker anomaly is not only the strongest signal in the area but the close proximity of another dipole feature may indicate that the object is actually fractured into two pieces.
Area 2 is a $35 \times 10$ m grid located to cover nearly all the top surface of Structure 507. This area was selected because it was trenched by Dan Finamore in an effort to locate a Colonial period church which was thought to be on the site. The location of the 0.5 m wide test trench is noted on Figure 2.5 with a solid gray rectangle.
This area presented some formidable challenges for interpretation because it is a non-natural feature. Ordinarily, geophysical survey locates objects or features because their physical properties or arrangement are significantly different from the surrounding matrix, which is assumed to be nearly homogeneous. Locating an arrangement of foundation stones on top of a mound which is composed of earth and rubble is a difficult prospect. The following list of anomalies for this area is by no means exhaustive, but simply the strongest or most geometrically regular, and thus, the most likely to be of interest. The cluster of strong anomalies indicated by a dashed circle may be caused by shallow rubble. The grid-northwest corner of this area had a great deal of cobbles on the surface which may have been tumble from the mound that adjoins it to the north (Figure 2.2). The cluster has a roughly regular shape, however, and should be investigated archaeologically. The area indicated by a long, thin rectangle oriented grid-east to grid-west at about \( Y=6 \) frames a possible linear feature based on the orientation of a series of anomalies which are somewhat more easily visible on Figure 2.6.

![Figure 2.6 Contour-wireframe overlay of Area 2.](image)

Finamore’s test trench (Operation 52) revealed a high concentration of cobbles in that area (\( Y=6-7 \)); this anomaly could be caused by the ephemeral remains of a low wall (B. Thomas, personal communication, 2001). A dashed box shown on Figure 2.5 outlines the approximate size and shape of a rectangular anomaly that is most visible in Figure 2.6. This anomaly could indicate the presence of a structure and should be investigated archaeologically.

Area 3 is a \( 15 \times 6 \) m grid sited in the cleared plaza to the southeast of Area 2. During survey, it was noted that the grid-northern and grid-southern areas gave generally higher readings than the central area of the grid. It is for this reason that the total field (TF) was analyzed, as well as the
As noted earlier, TF data provides a slight improvement in depth-penetration over the G-858’s approximate maximum of 2.5 m as well as a better indication of general trends, but TF data often is not adequate for identifying smaller, more ephemeral archaeological features. The 2001 excavations did identify a stone stairway leading up to a platform fronting the largest structure on the site. This stairway is located to the south of the TF grid and to the “right” of the rectangular outline drawn at the top, shown in Figure 2.2. The generally higher magnetic values noted for this area on the TF data, and to a lesser extent in the gradient data, may have been caused by a number of activities related to the presence of the stairway. These could range from a possible paving to increased foot traffic altering the properties of the sediment in the area. The contour plot of the gradient data (Figure 2.7, right image) also exhibits some interesting anomalies. The dashed oval shows the approximate size and shape of an inferred circular anomaly. The distribution of several small high positive values in a rough ring may indicate post-holes from the remains of a structure. The generally higher, more positive values between them could be caused by a higher organic content in the sediment which may have resulted from floor sweepings collecting at the base of the walls, leaving the center organically cleaner and magnetically weaker. The parallel lines show a break in the “ring” and could signify an entrance. This anomaly needs to be tested archaeologically to confirm or refute this interpretation. The single line to the north of the oval indicates a series of four magnetically low areas which were singled out because of their alignment. These should also be tested archaeologically.
Chanona Valley and Finca Buenos Aires: GPS Mapping

Within the DOA files for the upper reaches of the Sibun River, two sites are noted approximately 1.5 km from one another. As mentioned in the above section, the XARP 2001 season located, mapped and excavated in the Hershey site (DOA #0301, site name Sibun). DOA site #0303 is shown on DOA maps to the south and east of the Hershey site, in an area today owned by the Chanona family and operated as the Finca Buenos Aires. The farm is located in the community of Saint Margaret’s, mile 31.5, Hummingbird Highway. This area was surveyed with the aim of locating DOA site #0303 (DOA site name Hershey). Although not confirmed during the 2001 season, two mounds (Strs. 700 and 701) located within Finca Buenos Aires could be associated with DOA site #0303. The long axis of Structure 700 is oriented east-west. The mound is approximately 10 x 5 m and 1 m in height. Construction material consisted entirely of limestone and the mound appears to have been looted, with a 2 m-diameter hole located approximately in its center. Structure 701, the larger of the two structures, is approximately 15 x 6 m and 2 m in height, with the long axis oriented N10E. Blocks of cut limestone were seen on the surface of the structure and uncut limestone was used as construction fill. The Finca Buenos Aires and its associated limestone hills and valleys will be the location of more intense survey during the XARP 2003 field season and the cultural nature of these mounds will be confirmed at this time.

Echo Valley and Actun Chanona: GPS Mapping

Additional reconnaissance and survey within Transect 1 was focused in and around the karst foothills and valleys of the Maya Mountains adjacent to the Sibun River. Echo Valley, as it became named due to its auditory characteristics, is located on the property of Caribbean Citrus, Ltd. The valley trends east-west and is flanked by karst hills to its north and south. The northern edge of the valley also contains an unnamed stream with an extensive river terrace draining the Maya Mountains and foothills (see Farrell, Chapter 32).

Within Echo Valley, a total of 15 archaeological structures were located. The valley was severely disturbed by agricultural development and therefore, the 15 mounds surveyed during the XARP 2001 season potentially provide only a minimum number of the structures that would have been located within Echo Valley during ancient times. The mounds are isolated structures configured in a linear arrangement along the terrace that borders the valley stream. They are flanked by the stream on the west and the karst on the east. Beyond the stream to the west is more karst. The Sokkia GPS system was used during this survey in order to secure coordinates for each mound. Satellites were tracked for one minute at the center of each mound. Additional information about the general dimensions of the structures was also obtained using the area function within the GIR 1000 Workabout. The area function provides both area and perimeter data for each structure. The extent of the river terrace was also mapped during the survey work in Echo Valley.

Transect 1 contains the largest and most significant cave site surveyed thus far by XARP, Actun Chanona. Actun Chanona is located in the Sibun National Forest which encompasses much of the headwaters of the Sibun River. The cave was extensively surveyed by Peterson and Cobb during the first half of the 2001 season (see Peterson, Chapter 3). GPS coordinates for the cave were taken from a clearing in front of the mouth of the cave. The location of the antenna was confirmed to be 321563.94 mE and 1890375.42 mN. From this location three measurements were taken to confirm the location of the cave entrance. At the base of the valley that leads to the cave we found
four ancient structures. This area has been tentatively named Sleeping Giant site after the farm owned by Johnny Zander on which some of the mounds lie.

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Reynolds, John M.

Smith, Kenneth
During gentle rains I sat at our camp in the foothills of the Maya Mountains and gazed at the karst hills, noting where clouds formed. This is one method of locating new caves. Cool air rushes out of cave mouths and mixes with hot tropical air, creating clouds of mist that seem to pour out of the hills. This meteorological phenomenon likely provided the basis on which Yucatec Maya of Chan Kom describe the Chaks, rain gods, as riding forth from their cave homes on cloud horses carrying their vessels filled with rain (Redfield and Villa Rojas 1934: 116).

Most of the clouds seemed to be clustered near the summits (some rising 120 m above the valley floor) of the hills known as the Hummingbird Karst (Day 1987). Actun Chanona, the largest known cave in the Sibun River Valley, is reached by an arduous climb up to the crest of a hill. Before describing this possible pilgrimage site, I will describe our methods of investigation.

**Mapping Archaeological Features of Caves**

The Xibun Archaeological Research Project (XARP) project began in 1997 with the purpose of archaeological investigation of settlement and sacred landscape in the Sibun River Valley. The cave team, led by Ilean Isaza (Isaza et al. 1999), explored and mapped nine caves in the Tiger Cave District. During 1999, I led an extensive reconnaissance of the Sibun-Manatee Karst in the central part of the valley in the Tiger, Thumb, and Glenwood Cave Districts (Peterson 2002). Eight additional caves were systematically mapped during the 1999 XARP field season. All caves, including those studied in 1997, were mapped using a combination of tape-and-compass and clinometer for the interior features and an Ashtec Global Positioning System (GPS) for plotting locations relative to nearby settlements (see Morandi et al., Chapter 2). The GPS points were taken outside of the cave mouths (sometimes on top of the karst hill directly above the primary cave opening) and were tied into the cave maps with tape-and-compass and clinometer.

Tape-and-compass maps of the cave floors were created in order to situate artifacts and features (hearths, altars, and artificial walls) in relation to natural cave formations, and to record the provenience of artifacts collected for analysis. Whenever possible, ceramics and C-14 samples were collected in order to reconstruct the chronology of cave use. Detailed *in situ* documentation of artifact assemblages (including photographs, drawings, and detailed descriptions) within the cave chambers was necessary since all intact vessels and artificially constructed walls were left as they were found. This strategy allows future investigators to view cave assemblages in context. However, artifacts deemed at risk of being disturbed or looted because of their location or potential commercial value were recorded and collected for analysis.

The 2001 field season posed many challenges, including an extended rainy season, a hill of mud to climb daily, and the psychological effects of light deprivation that go along with working in deep caverns. Some passages were too difficult to access without technical caving gear or too dangerous to map due to health risks imposed by disease-carrying insects or bat guano. These chambers were mapped with the aid of a laser rangefinder. The documentation of spectacular features, such as the “Great Platform” which is included in the following discussion of Actun Chanona, was well worth the challenges that we faced.
Actun Chanona

Actun Chanona is the largest known cave in the Sibun River Valley — spanning approximately 279 m in length — with a wide entrance on the east and a narrow opening on the west. The cave penetrates the top of a steep hill in the Hummingbird Karst near the opening of the Sibun Gorge. It is situated upstream from the Hershey site; both sites are located on the northwestern side of the river. It is the only known Xibun cave that contains human remains and large-scale artificial construction that must have required the efforts of a large labor force to build. The main eastern entrance is massive in size and could easily be envisioned as the gaping maw of the earth monster with its stalactite row of teeth and its deep sinkhole threshold.

Members of the Belize Department of Archaeology (DOA) have explored Actun Chanona in the past. The 1978 report states that the cave contained human remains, pottery vessels, manos and metates, and that the floor was carpeted with potsherds. During that visit, only three sherds were collected. The cave was mapped by geomorphologist Thomas Miller in 1980 (Figure 3.1). Jonny Zander, a local resident, led us to the cave in 2001.

Figure 3.1 Map of Actun Chanona (adapted from Miller).

Essentially a long, linear cave with both an eastern and a western entrance, the cave and its notable features and artifacts are described here in narrative form, beginning at the eastern entrance. The cave system is accessed by following a winding path down into a natural sink and then climbing up to a balcony where the main eastern entrance is located. At the tail end of the rainy season, in January and February, the
area just inside the entrance was filled with water so that one had to traverse the chamber by stepping on speleothems (see Parks, Chapter 19, for a discussion of these human modified features). Crabs live in this area of the cave. By the end of March, after the rains subsided, many of these gours dried up. A little farther into the chamber, a series of larger rimstone dams surround the path. At some time in the past, visitors wrote “Dios” and drew the sign of the cross on the wall above one pristine pool of water near the southern wall of the cave, attesting to the intermingling of pre-Columbian ritual practices and Spanish Catholicism in the Xibun region. Vessel 50, a small olla with a soda straw growing from it, was deposited on a slope between the northern wall of the cave and the rimstone dams.

Skeletal remains of at least five individuals were mapped and identified in Actun Chanona (see Hauksdottir & Morandi, Chapter 26). They were all deposited in wet portions of the cave, so some (Individuals 1, 2, and 5) are cemented to the floor with calcium carbonate and others have stalagmites (Individuals 3 and 4) growing on the bones (Individuals 1, 2, and 5 are indicated in Figure 3.2 and Individuals 3 and 4 in Figure 3.9). Individuals 1, 2, and 5 are located down a slope to the west of the rimstone ponds. In all cases the skeletons were incomplete and disarticulated. Judging from the excellent preservation of the bones, it is possible that they were brought to the cave in bundles for secondary deposition.

Skeletal elements were also found distributed throughout the cave in association with artifact clusters and speleothem arrangements. For example, two human ribs were discovered on the slope directly above and to the south of Individuals 1, 2, and 5. An obsidian blade, five stone net weights, and other assorted artifacts were collected from this slope for analysis (Figure 3.3). The slope leads up to a balcony with dense deposits of sherds, a red granite metate, and other artifacts found in recessed alcoves.

Actun Chanona contains the most complex artificial construction recorded by the XARP cave team — a 30 m long platform dubbed the “Great Platform” (Figure 3.4) — located approximately 100 m from the eastern entrance of the cave (see Cobb, Chapter 4, for a detailed description of the platform construction). An “altar,” composed of three large slab boulders propped up against each other, is the focal point of the eastern side of the platform. Charcoal, sherds, manos, and metates are distributed around the base of the “altar.” Vessel 45, a cream colored wide-mouthed olla with a large “kill hole” in the side, is located on the western side of the platform.

Underneath the “Great Platform” there are a series of tunnels that may have been created to facilitate mining the abundant high-quality red clay located beneath the cave floor (Figure 3.5). A speleothem “altar” surrounded by sherds and charcoal was observed in one of these subsurface tunnels. A ground slate hacha with edge-wear was found near one of the two chimney entrances to these tunnels. Large areas of speleothems situated around the base of the platform had been burned (see Parks, Chapter 19).

A fragment of a red ceramic drum (Vessel 46) was discovered to the south of the “Great Platform” in an area dubbed the “drum room” (Figure 3.4). The area is accessed either by descending the steep
Figure 3.2 Map of Individuals 1, 2, and 5.
Figure 3.3 Map of the balcony containing net weights.
Figure 3.4 Map of the “Great Platform.”
southern slope of the “Great Platform” or by crossing an area of boulder-sized breakdown. Vessel 46, the base of a “lamp-glass” type drum, is similar to those found at Barton Ramie in the neighboring Belize Valley and at Lubaantun in southern Belize (Gifford 1976: 217; Hammond 1975: 322). It is probably Late Classic Macal Orange-red type of the Macal variety (Gifford 1976: 214-215). Nearby, a crack in the floor, barely large enough for a person to enter, contained a large wooden torch, a human tibia, and a large stucco-covered sherd with a starfish relief decoration. Delicate helictites, speleothems that grow in any direction, twist from the low ceiling near the south wall in this part of the cave.

Fragments of a ball player figurine (Figure 3.6) were cached nearby in an alcove. Identical Terminal Classic clay figurines wearing hip hoops, recognizable as typical ball game equipment, were excavated in the Central Acropolis at Tikal (Jones 1985: 52, Figure 12; Christopher Jones, personal communication, 2001). The ball player is a mold-made hollow figurine, and may have functioned as an ocarina or whistle as did the ballplayer figurines found at Lubaantun (Hammond 1975: 372-373). The ultimate deposition of this artifact in Actun Chanona is particularly significant in light of the connection between the ritual ball game and the Underworld.

A Modeled-carved vase from Actun Chanona was reported by Elizabeth Graham, Logan McNatt, and Mark Gutchen (1980: 161-166) to be nearly identical to vessels from the sites of Altun Ha and Footprint Cave, the latter located in the Caves Branch region. Sherds likely from the same Terminal Classic Modeled-carved vessel were collected from a balcony above the “Great Platform” in 2001. Other artifacts in this area include two jars (Vessels 48 and 49), a human rib, six net weights, and a small jade bead. A “three-stone hearth” is located on the floor between the two complete vessels (Figure 3.7).
Figure 3.6 Fragments of a ball player figurine (Photo by Patricia A. McAnany).

Figure 3.7 Map of the balcony above the “Great Platform.”
At the back of the cave lies the western entrance, a narrow slit accessed by traversing a steep slope. Nearby, remains of Individuals 3 and 4 were discovered among and underneath stalagmite formations (Figure 3.8), evidence that the bones were deposited beneath actively dripping stalactites. Further to the east along this slope is a high ledge overlooking the “Great Platform” where Vessel 47, a cream colored wide-mouthed olla, is located.

![Figure 3.8 Map showing the location of Individuals 3 and 4.](image)

**Discussion**

Deposits of human remains (most likely secondary bundles of specific body parts) and artificial construction on a large scale attest to the importance of Actun Chanona to the Xibun Maya. Human modifications transformed this awe-inspiring natural landscape into a stage for ritual activities. The “Great Platform” was a focalpoint for ritual performance in this cave.

Yucatec Maya rain rituals include acts of sympathetic magic such as splashing water on participants and imitating thunder (Sosa 1985: 397). A fragment of a ceramic drum was discovered in Actun Chanona near the “Great Platform.” In the Yucatec Mayan language, the word pec can be used for drum and also to describe the noise that thunder makes (Thompson 1972: 94, 104). Perhaps the drum was played in the cathedral-sized chamber where it was found in order to mimic thunder, thus invoking rain.

Fire was used extensively in rituals that occurred in the dark zone around the “Great Platform.” Several large burned areas contain artifacts intermingled with charcoal and broken cave formations (Figure 3.9). Speleothems may have been burned along with pottery sherds and other artifacts in order to release the dangerous power that these objects accumulated during ritual. Thomas Gann (1971: 57) observed a Cha chaac rain ceremony in Belize in which ceremonial paraphernalia was intentionally burned at the conclusion of the ritual. To the Lacandon Maya, the burning of old incense burners in a cave symbolized the death of the vessels after which they were called ubäkel äk yum, “the bones of our Lords” (McGee 1998: 45).
Large-scale modification of the cave environment, mass burning of speleothems, and a high density of artifacts, make evident the intensive use of the cave by the Xibun Maya. Further analysis will focus on the evidence for ritual pilgrimage to Actun Chanona.

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The use of caves as a part of the sacred landscape and their use as places of ritual is well established (Brady 1989; Heyden 1981; Thompson 1975). Past studies in caves have yielded evidence for substantial constructions within caverns either to enhance ritual ambience or to aid in negotiating a pathway. Most of Mesoamerica has an abundance of natural caves but in areas where caves are scarce or nonexistent, caverns were hollowed out of bedrock (Brady and Veni 1992; Manzanilla et al. 1994). Some caves were seldom visited (judging from the paucity of artifacts and built features), while others served as pilgrimage sites attracting visitors from the far corners of Mesoamerica. The features that rendered one cave more culturally salient than another may never be understood, but the relative importance of a cave may be measured by intensity of use. One method for measuring intensity of use entails the analysis of structural alterations to a cave. A cave that exhibits intense modifications or constructions, theoretically, is a cavern that was intensely utilized and likely played a very important role in ritual practice.

An important cave, one that was used over a long period of time or one that was used frequently for ritual, will justify the time and effort required to make major alterations. Some alterations, the removal of rocks that blocked a crawlway, are simple and even occurred in caves with sporadic or limited use. Other modifications, such as transporting stone into the cave and building massive walls, are labor intensive projects and likely reserved only for more important caves. In this chapter, alterations to Actun Chanona are identified and described in an effort to show the importance of this cavern to ancient Maya visitors.

Cave Modifications Versus Cave Construction

Alterations to caves fall into two broad categories: modifications and constructions. Cave modifications are alterations that require little in the way of materials that must be manufactured or transported into the cave. Cave modifications are based on altering the natural cave by hand or with tools. Materials used in modifications typically are found at the site of the modification or at a short distance away. Cave modifications can be as simple as moving rocks, using a rock to chip steps into flowstone or mud, or lining up rocks to guide direction of travel through a cave. Cave modifications are probably more ubiquitous than reported in the literature, either because they are overlooked or considered too insignificant to mention.

The other broad type of alteration to caves is cave construction. Cave constructions can include the actual construction of a cave but, in this paper, the term applies to constructed features within a natural cavern. Cave constructions are differentiated from cave modifications by the greater amount of labor involved, the transport of worked or raw materials from outside of the cave or from distant parts of the cave, and the grander scale of alterations. Often, cave constructions are easily noted by even the most casual of observers. Cave constructions include large retaining walls, constructed stairways, altars made of stacked stone, and large multi-course walls. Some cave constructions,
however, are subtle and more difficult to identify. Subtle cave constructions include leveling, pathways that smooth rough terrain, and platforms for rituals.

The separation between cave modifications and cave constructions is not hard-and-fast. Some cave constructions involve several different types of constructions and perhaps even some cave modifications. Because Maya builders were altering an existing natural feature, the physical space within the cave often constituted the driving force that controlled how the cave was modified or what constructions were undertaken.

**Cave Modifications**

*Moved Rocks*

Cave modifications are often difficult to detect or even identify; some are incredibly subtle. One of most subtle modifications takes place in the form of moved rocks. Rocks may be moved for some religious or aesthetic reason, which may never be explained. More likely, rocks are moved to make travel through a cave easier. Moving rocks to make passage through a cave easier is difficult to identify, especially in a cave which has had visitation since the time of the ancient Maya.

To a caver, the motivation behind much cave modification appears to be an effort to facilitate painless passage, often through small spaces. It is common to see crawlways with the larger rocks tossed to the side. Moved rocks also occur along the margins of flat floored cave passages to make walking easier. This type of modification is present throughout Actun Chanona. Unfortunately, Actun Chanona has been the recipient of a number of visitors since ancient Maya times, so it is difficult to identify which alterations were done by the Maya and which have subsequently been done. Moved-rock modifications have been observed in almost all caves visited by the author throughout Mesoamerica even though it is seldom reported.

*Cut Steps*

Cut steps are another modification designed to ease travel through a cave. Cut steps are hollowed cavities carved into either rock or mud. Steps cut into flowstone are widely noted in the Sibun River Valley but less frequently reported in other Mesoamerican caves (Rissolo 2001). Flowstone is a smooth cave formation that often exhibits a steep sloping surface. Made of calcite and formed by water flowing over a surface, flowstone, over time, forms a relatively smooth, cascading surface. Steps may be cut easily into the flowstone using a rock or hammer stone. If water still flows over the flowstone, the cut step will be smoothed by additional layers of calcite. Other times, calcite may obliterage any sign of the step. In Naj Tunich, steps were cut into limestone to aid in climbing a flowstone that led to a small chamber with a stacked-stone altar. Steps also may be cut into limestone. In *Incidents of Travel in Yucatan*, John L. Stephens mentions a cenote at the village of Telchaquillo that could be accessed by “irregular steps cut and worn into the rocks (1963: 70).”

Ancient Maya cavers probably cut steps in order to move up and down slippery mud slopes. This is a common practice among cavers today, making old steps cut into mud slopes or mud banks.
difficult to date. Over time, steps likely would be obliterated by natural processes such as flooding or slumping. Old steps may also be destroyed by continued use.

Actun Chanona features two areas where cut steps have been noted. In the eastern entrance of the chamber, two steps were cut into flowstone along the back wall of the chamber. In this part of the cave, the flowstone is no longer active. The cut steps provide a much needed foothold for scrambling up or down the flowstone slope. The steps appear smooth from use but still retain somewhat angular edges with little or no deposition of calcite. Based on the weathered appearance of the steps, they are probably quite old.

Near the western entrance of the cave, there are two steps cut into clay. The western entrance is difficult to pass through due to the steeply sloping clay; the steps are located on the slope of clay about 30 m from the entrance. Judging from the high concentrations of artifacts in the western portion of the cave, ancient visitors most likely used this entrance. Maya builders most likely cut a pathway across the clay slope or used logs to construct a simple bridge. No evidence exists today to indicate how the slope was crossed. Recent visitors to the cave have caused considerable wear and erosion on the slope; however, two cut steps remain. The steps are preserved in hardened clay and show signs of considerable wear. Still used by modern visitors, this feature needs to be protected from continued use.

**Traffic-flow Designators**

Traffic-flow designators, as the name implies, direct traffic by a visitor. These do not forcibly restrict where one might walk and oftentimes consist of a simple row of rocks. Traffic-flow designators serve much the same purpose as ribbon-tape barricades found at airports, banks, and theaters. Traffic-flow designators as used in caves simply guide one through the cave. The rules of etiquette for these guided routes may have been based on religious or cultural ideas or simply on ease of travel. Traffic-flow designators may have been useful for groups of Maya moving through a cave. Visitors without torches would be more likely to follow the safe or designated route by using visual cues from traffic-flow designators that were lit by the torches of others.

Traffic-flow designators have been identified in other caves in the Sibun River Valley (Kenward 2001) and noted in Shoe Pot Cave, as well as in the Tiger Sandy Bay region of the Sibun River Valley. Traffic-flow designators also have been noted in Actun Kaua in the Yucatan. Traffic-flow designators are probably widely distributed throughout Mesoamerica, but they often go unrecognized as a cultural feature of caves.

Actun Chanona contains one clear example of a traffic-flow designator. At the eastern entrance of the cave, the passage leading into the cave is bounded by a low wall that suggests that access into the dark zone of the cave followed the right side of column (Figure 4.1). The rocks on the left side of the column are obviously placed, but consist only of a single layer. The single course wall in no way impedes access. During the 2001 season, the author observed that, without mentioning the line of rocks, modern visitors automatically moved to the right side of the column in order to enter the cave.
Figure 4.1 The eastern entrance to Actun Chanona features a low wall that forces one to enter the cave along the right side of the column.

**Trail Markers**

Trail markers are similar to traffic-flow designators in that they guide one through the cave. Only three trail markers have been identified by the author; none were found at Actun Chanona. The two caves containing trail markers are located near Dos Pilas in Peten, Guatemala. At the end of a large room near the western entrance of Cueva de Sangre, a cluster of stalactites was broken off and placed on a mud bank at a fork in the passage. This may have indicated the way into or out of that area of the cave. In two separate places at Kaxon Pec, also near Dos Pilas, stalagmites were placed at key intersections to indicate the direction of the main passage. No similar trail markers were identified in Actun Chanona. This may be due to the fact that there are no significant side passages in this cave.

**Carved-niche Altars**

Carved-niche altars are features created by modifying a natural recess in the wall of the cave. Often, the flowstone was chopped flush with opening of the niche. Such altars have been noted in Glenwood Cave in Belize and in Cueva del Las Pinturas in Guatemala. Carved-niche altars may be less than 0.5 m wide, or they may be quite large. Large carved-niche altars could have accommodated the ritual propitiations of two to three people. Some large carved-niche altars feature a modified flowstone floor.

One large carved-niche altar was located on the south wall of Actun Chanona, well within the dark zone (Figure 4.2). This altar is located approximately 100 m from the western entrance. The altar is large; fill was deposited to level the interior floor. Inside the niche altar are pottery sherds and evidence of burning.
Figure 4.2 This carved-niche altar was modified with a small retaining wall of rocks and a large speleothem to create a level floor.

Cave Constructions

Constructed Steps and Ladders

Constructed steps differ from cut steps in that they were built by adding materials. Generally, stacked rocks or cave formations were used to create treads and risers. The stairs may traverse steep slopes or span crevices. Constructed steps in the form of a grand staircase have been reported in Semay Cave in Alta Vera Paz, Guatemala (Gurnee 1965).

Constructed steps could also be made from wooden ladders. The famous staircase of Cenote Bolenchen was constructed of logs (as shown in Fredrick Catherwood’s 1842 drawing). It is likely that similar ladder-type stairways were made on a much smaller scale and used widely in caves. It is also likely that notched logs were used as simple ladders. Notched logs of modern origin have been found in caves throughout Mesoamerica. Local visitors use the notched logs to enter caves and negotiate short drops. Unfortunately, wood is seldom preserved in the wet, humid environment of caves. The ancient Maya probably also constructed wooden scaffolds to reach high and otherwise inaccessible places. Indirect but supporting evidence of scaffold construction is provided by the fact that artifacts were found at Naj Tunich on high ledges accessible only with an aluminum ladder.

Actun Chanona features several constructed stairs, most of which are found in breakdown areas and are constructed of rocks or cave formations. Materials probably were gathered within the cave.
The stairs cover crevices between breakdown blocks and provide an easy path for traversing the boulder-strewn slopes.

Altars – Slab, Upright, and Stacked-Stone

Altars are a focal point of ceremonial activity and have been widely reported in cave literature that describes religious activities of both ancient and modern Maya, as well as highland Mesoamerican peoples. Many cave altars have probably gone unnoticed, since altars may appear to be natural features, such as a cluster of stalagmites. In Cueva de Sangre at Dos Pilas, Guatemala, for instance, several areas of stalagmites were littered with pot sherds and evidence of burning. Similar areas of burning also were found in Actun Chanona, although, in some cases, they were much larger than anything previously observed by the authors (see Peterson, Chapter 3). Sometimes, altars were constructed. These types of features have been divided into three categories: slab, upright, and stacked stone.

Slab altars typically are constructed of tabular limestone or cave formations that are supported by smaller stones. Often constructed of dressed stone, slab altars may be built with materials available within the cave and with imported stone. Due to the amount of labor involved in dressing stone, it is likely that slabs were fashioned outside of a cave and then transported into the cave. In the Sibun River Valley, slab altars have been reported in Glenwood Cave and Pottery Cave (Kenward 1999) as well as in Guatemalan caves such as Cueva de Rio El Duende and Naj Tunich (Brady et al. 1992). In Actun Chanona, one dressed-limestone slab altar was recorded in a small chamber at the top of a flowstone slope, high above the main passage of the cave. The limestone slab did not come from that chamber, so it must have been brought from another location. Since the altar had been disturbed and moved, its original location and whether it was positioned on stones are unknown.

Upright altars feature a dominant vertical component rather than horizontal dimensions. Constructed of stone or cave formations, upright altars have been noted in Naj Tunich, Guatemala, and in Actun Kaua, Yucatan. Actun Chanona contains the largest example of an upright altar yet found. Two large, flat pieces of breakdown each about 1.5 × 1 × 0.3 m were positioned upright and rested against each other to form an inverted “V.” Evidence of burning and pot sherds were noted around and under the upright stones.

Stacked-stone altars are a construction-intensive type of altar made by stacking stones, or in some cases, speleothems. Reported in many parts of Mesoamerica, stacked-stone altars are known from Glenwood Cave (Kenward 2001), Naj Tunich (Brady et al. 1992), and Actun Kaua. No stacked-stone altars were found in Actun Chanona, although it should be noted that stacked-stone altars may be easily overlooked because they are often built against the wall of a cave and may appear to be a pile of rocks.

Walls – Retaining, Space-Restricting, Access-Restricting, and Passage-Sealing

The construction of walls in caves is probably one of the most easily noticed and widely reported cultural features in caves. One of the earliest reports of walls built within a cave comes from Quen Santo, Guatemala (Seler 1901). Walls probably represent one the most labor-intensive cultural features found in caves. Typically, walls were built of rocks brought in from outside the cave. Stones and broken speleothems within a cave may be used but are seldom appropriately sized to
construct massive walls. Walls may vary in height from two or three courses (such as several observed at Dos Pilas) up to the 15 m high walls found in Naj Tunich (Brady and Stone 1986). Generally, walls were constructed close to the entrance in the twilight zone, as is the case in Naj Tunich (Brady 1989) and Cueva del Las Pinturas (Brady et al. 1997). Occasionally walls are constructed well into the dark zone as reported in Cueva de Sangre (Brady et al. 1991) and Quen Santo (Seler 1901). The purpose of constructing walls within caves is not fully understood.

Retaining walls reshape a cave chamber by holding back soil and debris, and often create walkways or platform areas. The most impressive example of a retaining wall is found in the entrance chamber of Naj Tunich, where retaining walls up to 15 m tall create a series of platforms and walkways within the entrance chamber.

In Actun Chanona, a series of retaining walls were noted on the north side of the eastern entrance chamber (Figure 4.3). These walls are designated as retaining walls because they appear to have held back soil and debris that would have washed into the cave entrance. The walls may also create a zigzag pathway leading into the entrance chamber. The actual height and extent of the retaining walls as well as details of construction methods can only be revealed with future excavation. All walls appear to be at least 4 to 5 m in length and about 1 to 1.5 m high. Several of the retaining walls connected natural breakdown or speleothems in the chamber. Excavations would probably reveal that the termini of the walls exploit these natural features as anchor points for each wall segment.

Figure 4.3 Plan and profile of the retaining walls found along the north side of the eastern entrance chamber of Actun Chanona.
Another short retaining wall was noted on the south side of the eastern entrance chamber of Actun Chanona. The wall is only about 1 m long and consists of three or four courses of stone. The retaining wall was built between two large pieces of breakdown and probably served to create an overlook of the entrance chamber.

Not all walls constructed in caves are retaining walls. Some walls appear to be constructed to restrict spaces for ritual use. Some caves have a space-restricting wall built within the entrance such as occurred at Cueva de Sangre (Brady 1997a). Actun Chanona may have a similar type of restricting wall built within the eastern entrance. The edge of the entrance area appeared in several places to have been modified by wall building, but, due to the presence of leaf litter and debris, no clear evidence of a wall could be seen.

Another type of access-restricting wall is similar to the traffic-flow markers that have been previously discussed. This type of wall may have prevented entrance into dangerous or confusing parts of the cave. Several examples of access-restricting walls have been reported in the Sibun River Valley (Kenward 2001), as well as, Actun Kaua, a very complicated maze cave in the Yucatan.

Access-restricting walls may actually be a subset of space-restricting walls. The differentiation between the two lies in the fact that access-restricting walls generally define some sort of passage way. The best examples of access restricting walls occur at Cueva de Las Pinturas in Guatemala, where two large walls measuring $14 \times 3 \times 2$ m and $8 \times 2 \times 3$ m restrict access between the entrance chamber and the dark zone of the cave. Each of the two walls has a narrow pass through the wall (Brady et al. 1997:92). These walls may have served to restrict access to the dark zone of the cave to a select group of persons. In the Sibun River Valley, these types of walls were also reported in Ek’Waynal (Kenward, 1999). No access-restricting walls were identified in Actun Chanona, although further investigation at both entrances may reveal the presence of such walls.

Another type of wall found in caves is the passage-sealing wall, which either completely or mostly blocks access to a cave passage or entrance. Passage-sealing walls have been reported at the entrances to Cueva de Sangre and Cueva El Duende at Dos Pilas and at Cueva de Tecolote (Brady et al. 1997). Passage-sealing walls that block passages within a cave have been reported in Cueva de Las Pinturas (Brady et al. 1997). No passage sealing walls were found in Actun Chanona.

It is unclear whether passage-sealing walls were intended to permanently seal off part of a cave or an entrance or to temporarily seal the cave so that it may be opened at certain times or for certain types of ritual. Sealed caves and cave passages represent significant resources for studying undisturbed caves.

**Dams**

A dam represents a specialized type of retaining wall constructed to hold back water in order to form a lake or to affect water flow. Dams have been reported in Cueva de Sangre at Dos Pilas, Naj Tunich and Santo Domingo Cave (Brady and Fahsen 1991). Identifying dams in caves may be difficult, as they can be washed out by floods or may no longer hold water. Another difficulty in identifying dams is that they may only function during the rainy season when water actively flows through many caves. Because most field research in caves is done in the dry season, dams may not
be noticed or recognized. Actun Chanona did not appear to contain any dams but a thorough search should be undertaken during the rainy season before dams are declared absent from Actun Chanona.

Pathways

Pathways are features of cave construction that facilitate travel through a cave. A wide variety of techniques often were used to construct pathways. In Cueva de Las Pinturas (Brady et al. 1997), a pathway is located inside the entrance chamber that connects two divergent passages. The sloping floor was leveled, possibly with the aid of small retaining walls. In Aktun Ak’ab, pathways were constructed by filling cracks between breakdown blocks, spanning breakdown blocks with slabs, and moving breakdown blocks (Rodas 1994). In Naj Tunich, retaining walls and fill behind them serve to form pathways. In Cueva de Sangre, walkways were created using stepping stones and paving stones to keep visitors out of the mud and water during the rainy season. Pathway-building in the form of ramps and tiling with paving stones was reported in Shoe Pot Cave (Kenward 2001).

In Actun Chanona, extensive pathway-building took place. Retaining walls were used in the eastern entrance chamber to create pathways across a steep debris slope. Along the northeast wall of the entrance chamber, several large speleothems were broken and removed to make a pathway along the wall of the chamber. Along this pathway, steps were cut into flowstone. In the main trunk passage of the cave, cracks between breakdown blocks were filled with small stones, speleothems, and soil in order to level the surface. Longer spans between breakdown blocks were filled using large speleothems and other breakdown blocks. Maya builders also moved considerable amounts of breakdown to clear pathways and to cover cracks and holes in the floor. In many places throughout the cave, large rocks or speleothems were positioned to make negotiating breakdown blocks or slopes much easier.

Walkways built up with retaining walls were also noted in the dark zone. Along the south wall of the cave, below the Great Platform, a well-defined retaining wall of three courses and 7 m in length was built next to the wall of the cave (Figure 4.4). Fill was added to create a smooth walkway (Figure 4.5). Based on the large number of artifacts in the area, this part of the cave was a focus of ritual activity. This walkway was difficult to identify because the retaining wall was almost touching the wall of the cave. The retaining wall was not visible unless one squeezed down between the wall of the cave and the retaining wall.

Figure 4.4 A retaining wall used to hold back fill to create a level surface.
Platforms

Platforms are constructed features in caves that probably are underreported. Often associated with retaining walls, platforms are raised, flattened areas that can cover a large area. Naj Tunich contains platforms that extend behind the retaining walls in the entrance chamber, and are connected by pathways. Inside Naj Tunich, there is a broad, raised platform well into the dark zone.

Actun Chanona features a number of platforms. In the entrance chamber, a low retaining wall creates a small platform or overlook built against the south wall of the entrance chamber. Another platform is located at the mouth of the main passage of the cave at the point where it opens into the eastern entrance chamber. This platform has low retaining walls that hold the soil and stone fill in place. Commanding a view of the entrance chamber, this platform was built where cool air blows out of the cave.

Actun Chanona contains a large platform that is approximately 30 m long, 15 m wide, and rises about 10 m above the cave floor. Due to its size, this platform was named the Great Platform. The Great Platform is composed mostly of large pieces of breakdown. The Maya used various modification and construction techniques to reshape this natural pile of breakdown into the Great Platform. The space between the pieces of breakdown were filled with large rocks, layers of smaller cobbles, red clay, and finally capped with white earth. Other cracks were simply filled with rock (Figure 4.6).
Once the breakdown was converted to a level surface, smaller platforms were built atop the Great Platform. These smaller platforms often butted up against each other but, through the use of retaining walls, the platforms were built at different heights. Approximately 30 smaller platforms were constructed and ranged in length from about 1 to 5 m. The surface of the Great Platform contains a large, upright altar as well as manos, metates, pot sherds, intact vessels, and hearths. For a detailed map of the surface and further descriptions of the Great Platform, see Peterson, Chapter 3.

Floors

Floors may be created on the tops of platforms or on pathways. Floors represent an improved surface and may have some ritual significance. Floors have been noted in a number of caves, such as Cueva de El Duende and Cueva de Rio Murcielagos at Dos Pilas (Brady et al. 1991), and in Cueva de las Pinturas (Brady et al. 1997). There are different types of floors; for example, Cueva de El Duende had a floor made of yellow clay, Cueva de Rio Murcielagos had featured floors possibly made of plaster, and Cueva de las Pinturas contained stratified red clay floors.

No excavations were performed during 2001 in Actun Chanona. One of the white floors located atop one of the small platforms of the Great Platform could be investigated, however, because the fill had collapsed into the crack it was covering and a cross section of the floor was exposed. Over the stone fill there was 5 to 8 cm of red clay topped with 3 cm of white earth (Figure 4.7). All of the surrounding platforms were surfaced with a similar white earth. In other parts of Actun Chanona, the floors on top of platforms typically were made of red clay instead of white earth.
Cave within a Cave

Since caves were a part of the sacred landscape, a cave within a cave, by extension, would have great significance. It may be argued that niche altars represent a cave within a cave because they are an enclosed space and usually have speleothems growing in them. Upright altars, such as the one on top of the Great Platform, may also represent the concept of a cave within a cave. In Aktun Ak’ab the use of flat stones over breakdown blocks may have represented a cave within a cave because of artifacts deposited within them (Rodas 1994). However, Actun Chanona holds the best example of a cave within a cave.

The Great Platform in Actun Chanona was constructed by filling cracks between massive breakdown blocks. Instead of completely filling the space between the blocks, the Maya wedged large rocks into the cracks and then leveled the surface of the wedged rocks by adding fill. In effect, this technique created a cave under the Great Platform. Some of the smaller platforms were deliberately set at the edge of openings that extended from the top of the Great Platform to the cave beneath the Great Platform. Visual examination of these openings revealed a large quantity of broken pottery. An entrance to the cave beneath the Great Platform was discovered, and the area was explored. Many of the same constructed features found on top of the Great Platform were also present in this cave within a cave. Small retaining walls had been built and fill added to create platforms. A slab altar was noted, as well as space-restricting walls. Based on the large amount of broken pottery and charcoal, this space was heavily used for ritual.

The Great Platform and the cave beneath the Great Platform are similar to a heavily modified hill at the site of Los Quetzales in Guatemala (Brady 1997). The main structure at Los Quetzales was a natural hill with a cave in the hill. The cave had three entrances. One of the entrances was a small restricted crawlspace, while the other two entrances were vertical drops. The cave had an access-
restricting wall that blocked access to a part of the cave that contained a skylight entrance. The hilltop above the skylight entrance had been leveled to form a courtyard with a temple structure at one end and the cave entrance at the other. Excavations in the debris cone below the skylight yielded numerous artifacts. The hill-cave complex at Los Quetzales is closely mirrored by the Great Platform cave-within-a-cave complex in Actun Chanona.

Entrance Shrines

Small shrine mounds have been reported at Cueva de Sangre (Brady 1997:609) and at Cueva de Sapo (Brady et al. 1997), both in Guatemala. The shrine mound at Cueva de Sangre is located just above the entrance to the cave and is surrounded by a circular wall. The shrine mound at Cueva de Sapo, measuring $2.5 \times 1.5 \times 1$ m and trending east-west, is located in the entrance sinkhole. The remains of a temple shrine were found in the sinkhole around the eastern entrance of Actun Chanona. Located just outside the drip line of the cave and on the north side of the sinkhole, the temple shrine had been completely dug out by looters. Based on the fragmented remains, the entrance shrine probably measured about $2 \times 1.5$ m and possibly reached 1 m height. The long axis of the shrine mound was 320 degrees.

Entrance shrines may be common features at caves but may be commonly overlooked because of the emphasis on working in the cave and not around the entrance to the cave. In addition, entrance shrine mounds generally are small and easily covered with leaf litter and other debris.

Altered Entrances

Altering the entrances to caves was a common practice. In Cueva de Sangre, cut stone was used to restrict the entrance to a small crawlway (Brady et al. 1991). At Cueva de Sapo, a long, low entrance was sealed to create a dark zone in the cave (Brady et al. 1997). At Cueva de Los Quetzales, the crawlway entrance had stones to restrict the size of the opening (Brady and Rodas 1994). At Aktun Ak’ab, a retaining wall was built at the entrance to restrict the size of the entrance (Rodas 1994). In the Sibun River Valley cave of Actun Ibach, stones were added above the entrance to give the cave the appearance of a vaulted ceiling (Kenward 2001).

Actun Chanona also showed signs of an altered entrance. A large platform was built in front of the entrance. A low, single-course wall served as a traffic-flow designator to guide one to the right side of a column, giving the appearance of a narrow doorway.

Conclusions

Actun Chanona represents a major focus of cave ritual in the upper Sibun River Valley based solely on the amount of modification and construction within the cave. No other cave in the region and few other caves in Mesoamerica have been as extensively rebuilt by the Maya. The variety of modification and construction in Actun Chanona represents a considerable investment of time, effort, and resources.
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Operation 50 marked the first excavation unit undertaken at the Hershey site by the Xibun Archaeological Research Project during the 2001 field season. The operation was positioned within Group D, one of the smallest plaza groups found in the midst of a cacao orchard. Group D is located about 25-30 m west of Group A, the largest plaza group of the Hershey site (see Map Sheet 1). Group D consists of three low platforms lining the west, north, and east sides of a central patio with the south side of the plaza open. A fourth, smaller platform (Structure 531) is situated just to the east of the plaza group and appears to be associated with Structure 530, the platform lining the eastern side of the U-shaped plaza group.

Operation 50 was positioned within a saddle, measuring about 5 m in width (east-west), located between Structures 530 and 531. The excavation unit measured 1 m wide (roughly north-south) and 8 m long (roughly east-west). The elongated trench stretched across the narrow saddle between the two structures and interfaced the eastern edge of Structure 530 and the western edge of Structure 531. Operation 50 was divided equally into four squares (A-D), with Square A positioned on the eastern end of the unit, Square D on the far western end, and Squares B and C situated in the middle of the saddle. The operation is oriented 20 degrees east of north, which appears to be the orientation of Group D and the majority of architectural complexes at the Hershey site. The shared building orientation of Groups A, B, C, and D may indicate that construction of all four groups was contemporaneous.

Group D appears to have been built primarily of stone masonry construction. Structures 530 and 531 revealed a series of roughly shaped exterior limestone blocks with a river and limestone cobbles core fill, suggestive of a formal platform construction consisting of several terraces. Structure 531 appears to have been constructed primarily with limestone cobbles fill, while Structure 530 exposed a core fill of large river cobbles. The contrast in building materials may indicate a functional and/or temporal difference between the two structures. Evidence of baked clay material, several of which exhibited signs of stick impressions, indicates that perishable wattle and daub structures were perched on the surface of the two platform structures. The general shape of each structure and the number of exposed limestone blocks noted on the ground surface suggest similar exterior limestone masonry construction for all four structures in Group D. An earlier building phase of Structure 531 appears apsidal in shape and is considerably smaller in size than the other three structures of Group D, perhaps indicating that it served a special function within the plaza group. Remnants of a formally prepared plaza surface were identified within the saddle between Structures 530 and 531; this floor likely extended throughout the central patio of Group D.

**Excavation Techniques**

Excavation of Operation 50 entailed the detailed investigation of the area between Structures 530 and 531, and exposed the eastern edge of Structure 530 and western edge of Structure 531. Two Datum stakes (A and B) were placed in the ground proximate to Operation 50 and were used for relative measurement for the duration of the excavation. Datum A measured 28 cm above ground surface and Datum B measured 26 cm below ground surface and 41 cm below Datum A. Datum A was used exclusively for Squares A and B, and Datum B was used for Squares C and D. Square B, however, was
never excavated during the 2001 field season. The datum stakes offered quick and precise measurements during excavation and were later measured with the Total Station and correlated with absolute elevations above sea level. One hundred percent of all soil excavated was screened through a quarter-inch screen, unless otherwise indicated. The excavation of Operation 50 took place during the month of February. Rainy weather resulted in muddy conditions that necessitated water screening in certain cases. Trowels were primarily used in the excavation, with picks and shovels being used infrequently. Trowels (and dental tools when necessary) were utilized to define the surface of architecture and *in situ* deposits. Levels of sediment were removed in the context of defined zones within individual squares that measured 1 × 2 m in dimension, unless otherwise specified. The following presents the details of excavation, organized sequentially by zone.

**Overview of Operation 50**

**Zone 1**

Zone 1 was the topzone or humic layer removed throughout the unit, with the exception of Square B, which was not excavated during the 2001 season. Zone 1 consisted of a loose to semi-compact silty clay matrix and contained a light density of gravel-size limestone inclusions. Throughout the excavation unit the zone yielded a high density of organic material, including roots, decomposing cacao leaves and pods, along with active bioturbation caused by worms and other insects. The zone is virtually sterile; only a few pieces of baked clay material, small chips of debitage, and several sherds were recovered. The average depth of the zone was around 4-5 cm. The base of Zone 1 interfaced a slightly more compact, lighter matrix that appears to be a natural earthen alluvial deposit. According to local workmen from nearby St. Margaret’s Village and our own personal observations, the area of Group D experiences periodic flooding events during heavy rains. It is possible that over time these flooding episodes deposited alluvial sediments across the plaza group, similar to a situation documented at the site of Pechtun Ha, situated along the middle reaches of the Sibun River (Harrison and Acone 2002). A thick layer of alluvium was noted throughout the uppermost zones of the unit.

Zone 1 in Square A yielded a relatively dense amount of organic debris and natural disturbance. Evidence of burned cohune nuts and other large pieces of charred organic material were noted in Zone 1, but were likely the result of relatively recent burning events and were not collected. There was a light density of limestone gravel inclusions and soil became increasingly lighter and more compact toward the base of Zone 1 in Square A.

Like Square A, the Zone 1 matrix in Squares C and D was rich in decomposing vegetation, consisting mostly of roots and modern seeds. Some large and small pieces of charcoal were noted in the matrix of Square D, and a botanical sample was collected for wood identification. A piece of blue plastic was noted in the topzone of Square D indicating modern disturbance of the topzone. Overall, Zone 1 yielded a light density of gravel-size limestone inclusions and a small quantity of artifacts. The bottom of Zone 1 was increasingly compact and slightly lighter in color, representing the alluvium situated below the humic layer.
Zone 2

Zone 2 consists of a silty clay matrix with a light density of gravel-size limestone inclusions. Little to no river gravel was noted in the zone, which appears to be an alluvial deposit created by frequent flooding events during the rainy season. Overall, Zone 2 in Squares A, C, and D yielded a light density of artifacts. In the western end of the unit, the alluvium in Square A continued beyond the base of Zone 2. The zone in this area exhibited signs of root action that created a number of large voids in the matrix. One large limestone block, measuring approximately 18 cm in length, was noted in the western end of Square A, along the northern wall of the unit. The limestone block does not appear to be associated with any visibly intact architecture, and seems to represent tumble from Structure 530. At the base of Zone 2 in Square A, two more large stones (a river cobble and another limestone block) were removed and also are presumably collapsed debris from the nearby structure. Although artifact density was relatively light, a chipped stone biface fragment was recovered from the upper part of the zone in this area. The reddish color contains pockmark scars suggestive of heavy burning after the tool was broken and discarded.

In the eastern half of the unit, the remains of a limestone gravel and cobble surface (Zone 6) associated with Structure 531 were defined at the base of Zone 2 in Squares C and D. The rough cobble surface of the platform slopes westward off the structure and into the shallow saddle between Structures 531 and 530. The cultural surface terminates about halfway through Square C. Here, a course of stones representing the western retaining wall of Structure 531 was exposed (Figure 5.1). Zone 2 in Squares C and D yielded a higher density of limestone gravel and a very light density of river gravel where the multi-terraced platform surface of Structure 531 was exposed at the base of the zone (around 5-10 cm below the ground surface). There is some evidence of burned material (cohune nuts) that seems to be modern, but two botanical samples were collected from this area. There was a very light density of artifacts directly on top of the terrace surfaces.

![Figure 5.1 Final planview of Operation 50, showing Squares C and D.](image)

Zone 3

Zone 3 was around 20-25 cm in depth and was restricted to the alluvium and collapse debris west of the partially exposed retaining wall of Structure 531. The matrix consisted of a light to medium density of limestone gravel and a very light density of river gravel and cobbles. In addition to the western half of Square C, Zone 3 comprises all of Square A as well. The cobble surface of Structure 531, defined at the base of Zone 2, exists in the remaining eastern portion of Squares C and D (Figure 5.1). Zone 3 in Squares
A and C yielded a significantly higher density of cultural material than Zones 1 and 2, including baked clay material, pottery sherds, debitage, groundstone fragments, several pieces of obsidian, and a piece of worked shell. The artifacts found in Zone 3 were generally evenly distributed in both Squares A and C. However, a significant spike in artifact density was recorded at the base of Zone 3 in Square C, protected by the collapsed debris from Structure 531. Here, the remains of the plaza floor surface were encountered and sherds were found lying flat, indicating the level of the floor surface. In addition, an obsidian blade fragment was recovered from the surface, along with a tear-shaped groundstone fragment, possibly the remains of a chopper tool. The groundstone tool may have been left on the outside floor surface or may represent collapse debris that originally served as part of the construction fill of Structure 531. Baked clay material or daub containing stick impressions was identified in Zone 3 of Square C. The material was likely used for thatch construction and offers good evidence that a perishable structure once stood on the top of the small platform of Structure 531. There was evidence of burning at the base of the zone in Square C. Burned sherds and charcoal were recovered, and a C-14 sample was collected from Zone 3 in the northeastern corner of the square.

At the base of Zone 3 in Square A, there appears to be a line of river cobbles and limestone blocks running along the southern wall in a roughly east-west line at about 25 cm below ground surface. Judging from the surface topography, the stones appear to represent the remains of the side of a staircase leading up to the top of Structure 530 (Figure 5.2). The eastern retaining wall of Structure 530 was not exposed in Square A; however, it may exist further to the east in the unexcavated Square B where Structure 530 slopes downward toward the plaza surface identified within the narrow saddle between Structures 530 and 531. A light density of artifacts was recovered from Zone 3 in Square A. Notably, an obsidian flake and a small piece of worked shell that had been shaped into a square (0.6 × 0.6 cm) were recovered. Square A did not yield the high density of limestone tumble that was present in Squares C and D. Instead, the debris is primarily river cobbles and suggests that the fill of Structure 530 was constructed of river-derived stone material, with limestone blocks reserved for the exterior retaining walls. Alluvium continued beyond the base of Zone 3 in Square A, and the zone was changed arbitrarily.

Figure 5.2  Idealized planview of a possible architectural layout for Structures 530 and 531 with Operation 50 superimposed.
Zone 4

Zone 4 was restricted to Square A and consisted of a high density of river cobbles and gravel mixed with a silty clay soil. Artifactual material was scarce and, therefore, only every fourth bucket of dirt from Zone 4 was screened. The Zone 4 matrix was more sandy in texture compared to the layers above it, but appeared very similar in color. Embedded within this matrix were many large river cobbles that appeared to be tumble, but may represent the construction fill of Structure 530. Few limestone inclusions were noted throughout the zone. About ten large limestone blocks were defined at the base of Zone 4 and appear roughly cut, possibly functioning as part of a terrace retaining wall. Blocks ranged in size from 7.5 to 25 cm. At the base of the zone, the western wall of the unit (Figure 5.3) defined the edge of a river gravel construction fill (average size 7 cm), topped with a limestone gravel surface (average size 3 cm). The surface runs almost the full length of the western wall, but stops about 20 cm from the northern wall of the excavation unit. The orientation of this surface appears associated with a line of stones running roughly east-west that were noted at the base of Zone 3 and further defined in Zone 4. There is a high density of river cobbles throughout Zone 4; however, it became more tightly packed at the base of the zone and may represent the remains of a lower cobbled terraced construction. Poor preservation and limited horizontal exposure hinders a more complete architectural reconstruction, but it is conceivable that the eastern side of Structure 530 contained a series of terraces with the east-west wall representing an outset central staircase that allowed access to a perishable structure situated on top of the low platform (see Figure 5.2). The base of the zone was drawn and photographed and excavations stopped arbitrarily at this point in Square A.

![Figure 5.3 West wall cross-section of Square A in Operation 50.](image)

Zone 5

Zone 5 is restricted to Square C and represents the remains of an exterior plaza surface built between Structures 530 and 531. The surface consists of a compact earthen matrix mixed with a medium density of limestone gravel and a light density of river gravel. The packed, gravel-filled surface slopes downward and tapers off in the western end of Square C. The deterioration of the plaza floor may have been caused by periodic flooding and erosional processes which allowed preservation of only the areas closest to the structure that were sealed by tumble. Alternatively, the tapering of the
surface could represent the edge of another lower terrace or the purposeful modification of the plaza floor in order to facilitate drainage of the area in antiquity. Unfortunately, limited horizontal exposure to the west in Square B inhibits any solid reconstruction.

The plaza surface appeared to run underneath the two-course retaining wall built on the western side of Structure 531 (refer to Figure 5.1). The plaza floor, although it pre-dates the construction of Structure 531, appears associated with the latest phase of Structure 531, along with an earlier phase of the platform: an apsidal-shaped structure revealed in Zone 6 of Square D. Zone 5 comprised roughly 10 cm of fill that contained no evidence of a formal plaster surface, only the remains of a packed earthen layer mixed with gravel fill. The surface of the floor and its underlying construction fill contains evidence of burning. Numerous burned and brittle sherds were collected, along with a C-14 sample that was sealed within the floor construction. The carbon sample may provide a relatively solid date for the initial construction of Group D. The interface between the alluvium overlying the plaza floor (Zone 3) and the floor itself (Zone 5) yielded the highest density of artifacts. A relatively large quantity of ceramic sherds were found lying flat on the floor and embedded into the plaza surface, suggesting that it was used for some time by the occupants of Group D. Towards the base of Zone 5 about 10 cm of the plaza construction fill was excavated and a surface of large river and limestone cobbles was revealed (averaging 15 cm in length). Artifact density tapered toward the base of the zone with the appearance of larger, tightly packed limestone gravel and cobble fill, which indicated a change in the construction fill of the floor. Excavations ceased at this point in Square C.

Zone 6

Zone 6 is confined to Square D and consisted of the limestone gravel and cobble fill for the latest phase of terrace construction along the western side of Structure 531. The matrix contained primarily small, limestone gravel (average size of 5 cm), but also held a number of larger limestone cobbles (7.5 to 47 cm). Unlike the fill of Structure 530, Zone 6 contained little to no river gravel or cobble inclusions. The rough cobble surface slopes downward to the west, from Square D to Square C, where it interfaces a two-course retaining wall running roughly north-south throughout Square C. The western retaining wall, consisting of two courses of roughly hewn limestone blocks, is nicely illustrated in the north and south cross-sections of Squares C and D (Figure 5.4). The Zone 5 earthen plaza surface abuts the western wall and appears to run underneath the structure. At the base of Zone 6, an arch of pink limestone blocks were uncovered, and appear to be the remains of an earlier, apsidal-shaped structure (Figure 5.1). A very light density of artifacts was found in Zone 6. Excavations stopped at this stage and the earlier construction was not excavated.

Concluding Remarks

Group D is a comparatively small plaza group within the Hershey site, situated just 25-30 m west of Group A, the largest architectural complex at the site. Its small size and close proximity to this dominant group may indicate a subordinate role, perhaps serving the elite housed in the main site center. Time and weather conditions inhibited the excavation of Operation 50, and Square B remained unexcavated during the 2001 field season. Nonetheless, investigations revealed a considerable amount of information regarding the construction of Group D, with specific focus on Structures 530 and 531.
Square A, a 1 × 2 m unit in the far western end of Operation 50, exposed a line of stones running roughly east-west. In addition, the west wall cross-section of Square A revealed the edge of an elevated platform surface. Together, the evidence suggests that Structure 530 consisted of a series of terraces with possibly a central staircase flanking the eastern side of the structure. The presence of stairs in this locale would confirm a presumed association with Structure 531, a small platform located less than 5 m to the east. Squares C and D of Operation 50 shed light on the architectural configuration of Structure 531, a small low platform that appears to have been apsidal in shape during an earlier phase of construction. In the final building stage, Structure 531 contained at least two terrace surfaces, and remnants of a formally prepared plaza surface abutted this construction. The floor appears to run underneath the latest architectural phase and may relate to the earlier construction episode. Presumably, the plaza floor extends throughout the central patio of Group D.

Figure 5.4 North and south wall cross-sections of Squares C and D in Operation 50.

The building materials of Structures 530 and 531 were notably different. Structure 531 appears to have been constructed primarily with limestone cobble fill, while Structure 531 exposed a core fill comprised of large, tightly packed river cobbles. The contrast in building materials may indicate a functional and/or temporal difference between the two structures. The earlier phase of architecture found associated with Structure 531 may indicate this structure pre-dates Structure 530 and the other platforms within Group D. Further investigation is necessary in order to confirm the occupational history of this small plaza group and its potential role in the social, political, and economic organization of this large site within the upper reaches of the Sibun River Valley.
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Operation 51, the second excavation carried out at the Hershey site by the Xibun Archaeological Research Project during the 2001 field season, was positioned within Group A. The largest plaza group within the site, Group A was covered in thick overgrowth that involved intensive clearing. Located about 25-30 m east of Group D where Operation 50 was carried out (see Harrison, Chapter 5), Group A consists of a series of elongated platforms lining the sides of an inner central plaza. Structure 503, where excavations were focused, is a long platform that lines the southern side of the main plaza and abuts Structure 500, the largest pyramidal-shaped structure at Hershey (see Map Sheet 1).

Operation 51 was laid out as a $6 \times 4$ m unit, with the long axis oriented roughly north-south, effectively cross-cutting a portion of Structure 503. While the operation was divided evenly into six squares (A-F), only Squares A and F were ultimately tested during the 2001 field season. Squares measured $2 \times 2$ m and exposed a significant portion of Structure 503. Positioned across the center and northern side of the elongated structure, Operation 51 revealed that the structure held several phases of construction and contained a large central staircase on the northern side of the structure, at least in its final phase of construction. Square F uncovered the remains of at least four plaster floors. Several terraces also were exposed on the northern edge of the structure, within Square A, along with the western side of the staircase flanking the northern side of the structure. All structures at Hershey appear to be oriented 20 degrees east of north and excavations were aligned accordingly. The shared building orientation of Groups A, B, C, and D may indicate that construction of all four groups was contemporaneous.

Group A appears to have been built primarily of stone masonry construction. The excavation of Structure 503 revealed nicely cut exterior limestone blocks with a limestone and river cobble core fill, indicative of formal platform construction. Several terraces were defined with a nicely preserved basal molding positioned along the base of a nine-course high exterior northern wall. Structure 503 was constructed primarily of limestone cobble fill with floor and wall surfaces covered in plaster. The general shape of each structure and the high density of exposed limestone blocks noted on the ground surface suggest all-stone masonry construction for every structure in Group A. Remnants of a formally prepared plaza surface were identified within Square A of Operation 51, to the north of Structure 503. This floor likely extended throughout the central plaza of Group A.

Excavation Techniques

Excavation of Operation 51 entailed the detailed investigation of an area along the southern side of Structure 503. As noted, only Squares A and F were excavated. Square A was located in the northwest corner of the large $4 \times 6$ m unit, while Square F was positioned in the far southeastern corner of the unit. Square A exposed the northern edge of the exterior terrace facing wall and the western side of a staircase leading up to the top of the elongated platform of Structure 503. Wedged in the corner, created by the outset staircase, a rich midden deposit was found heaped against the northern side of the structure and western side of the stair side wall. Square F, positioned on the top of the elongated platform, exposed a
portion of the interior of Structure 503 and revealed a series of plaster floors associated with four distinct phases of construction.

In an effort to glean a maximum level of information, one hundred percent of all soil excavated was screened through a quarter-inch screen, unless otherwise indicated. Trowels were primarily used in the excavation, with picks and shovels being used infrequently. Trowels (and dental tools when necessary) were utilized to define the surface of architecture and *in situ* deposits. Levels of sediment were removed in the context of defined zones within the individual squares that measured 2 × 2 m in dimension, unless otherwise specified. The following presents the details of excavation individually described for Square A, followed by Square F. Descriptions of zones are found under the associated square in which they were excavated. Squares A and F do not share any of the same zones, with the exception of Zone 1, which represents the top soil found across the surface of the excavation unit.

**Overview of Operation 51: Square A**

Square A, a 2 × 2 m unit in the northwest corner of Operation 51, was positioned along the northern side of Structure 503, where the mound slopes down to the north. A narrow terrace surface was exposed along the southern edge of Square A. Another tier of stones exists further to the south in Square C and appears to represent an upper terrace. This square, however, remained unexcavated during the 2001 season. A series of eleven zones were excavated in Square A of Operation 51. All zones and associated deposits are discussed below, presented sequentially as they were found.

**Zone 1**

Zone 1 consisted of a top soil that covered the surface of Structure 503. The top zone contained a relatively high density of roots, but less roots than Operation 50 (see Harrison, Chapter 5). A high density of limestone tumble was recorded at the base of Zone 1 in Square A, the remains of debris falling from the northern side of Structure 503. Few artifacts were recovered from this organic-rich humic layer.

**Zone 2**

Zone 2 is the matrix located to the north of the northern exterior wall of Structure 503 and to the west of the outset staircase wall of Structure 503. The matrix is tumble, collapsed debris fallen from both walls. Large, cut limestone blocks and smaller cobbles and gravel are abundant in the silty clay matrix. There is only a light density of artifacts present in the zone. Notably, a groundstone fragment and a possible speleothem or cave formation were noted in the fill of Zone 2.

**Zone 3**

Zone 3 is a mix of tumble and soil, similar to Zone 2, that was created arbitrarily after about 20-25 cm of tumble was removed. Located directly below Zone 2, Zone 3 is situated to the north and west of the two perpendicular walls that were further defined with the removal of the Zone 3 tumble in Square A. The zone featured a high density of medium to large limestone cobbles mixed with a semi-compact silt. Like Zone 2, artifact density was light, and another groundstone fragment was recovered.
Zone 4

Zone 4 is located directly below Zone 3, comprising the northwest corner of Square A with intact architectural walls forming its boundaries to the south and east. The removal of the tumble in Zone 4 worked to further define the two perpendicular walls. The 7th and 8th courses of the northern wall of Structure 503 were exposed at the base of Zone 4. The matrix of the zone contains a mix of limestone tumble from the walls and a semi-compact silt. At the bottom of the zone in the southeast corner, a mound of dark, organic-rich soil, identified as the midden heap, was found wedged in the corner where the two perpendicular walls of Structure 503 come together. A cross-section shows the midden sloping downward to the north (Figure 6.1). The artifact density in Zone 4 was heightened because the highest point of the midden heap was interfaced at the base of the zone in the southeast corner of the unit. Only a small portion of the midden was excavated in Zone 4, however, with the bulk of the deposit being removed in Zone 8. In the portion of midden that was excavated in Zone 4, a fragmentary vessel that was about 40 percent complete was recovered. It comprised a shallow bowl with a ring base that was smashed and inverted on top of the trash heap. López Varela (personal communication, August 2002) has tentatively identified the vessel as Roaring Creek Red, a type typically associated with the Late to Terminal Classic period (ca. AD 600-900). The deposit, positioned on the top of the midden, may signify the terminal period of occupation for the main site center of Hershey.

![Figure 6.1 Cross-section of the midden deposit.](image)

Zone 7

Zone 7 entailed defining the surface of the midden and the extent of the deposit in Square A. Zone 7 consisted primarily of tumble from Structure 503 and its outset staircase positioned along the center of the northern side of the platform. The tumble contains a high density of limestone cobbles and gravel, some of which appear to have been worked and likely were the facing stones of the two walls exposed in the unit. Like the tumble excavated in Zones 1-4, Zone 7 contained a relatively light artifact density. The collapse
debris removed in Zone 7 covered the midden deposit and part of the plaza floor (Zones 8 and 11, respectively). The base of Zone 7 interfaces the sloping midden deposit, signified by a slightly darker soil and a significant spike in the density of cultural material. Another groundstone tool and two possible speleothems were recovered. In addition, large fragments of one or two partially reconstructable vessels were recovered on the surface of the midden, with at least one that appeared inverted. The vessel fragments were all located along the western wall, mostly in the southeast corner of the zone where the highest peak of the midden heap was defined.

Zone 8
Zone 8 comprised the bulk of the midden deposit heaped in the corner where the two perpendicular walls of Structure 503 came together. The midden measured roughly 20-25 cm in depth within the southeast corner, which represented the deepest section of the trash heap (Figure 6.1). The matrix was a semi-compact silty clay with a medium density of limestone gravel. The cultural deposit included pottery sherds, jute or land snail shell, debitage, and animal bones, including fish remains. Artifact density was heaviest along the western wall of the staircase. Dirt from the midden deposit was collected in several different samples. A 30-liter flotation sample was collected (FCB #’s 5047, 5051, 5052). In addition, a sediment sample (FCB # 5050) was collected, along with pollen (FCB# 5048) and phytolith (FCB# 5049) samples.

The zone ended at what appeared to be the surface of a deteriorated plaza floor, and no further courses of stone were found beyond the level of this surface. A total of nine courses of stone were preserved on the northern exterior wall of Structure 503, with the bottom course forming a basal molding that presumably lined the full extent of the exterior wall of Structure 503 (Figure 6.2). This decorative element typically adorns the outside of buildings and platforms in strictly elite architectural complexes. The basal course of stone of the northern wall rests on the plaza surface, which is poorly preserved as evidenced by the small patch of preserved plaster found against the western wall of the staircase. The best preserved sections of plaster were located in the central area of the wall, along the first course of stones. Plaster was likely intact due to the midden deposit that effectively protected this section of the wall.

Zone 11
Zone 11 consisted of the plaza floor surface and its underlying construction fill. Only the western half of the plaza floor exposed in Square A was excavated, an area measuring roughly 130 (north-south) by 80 cm (east-west). The bulk of the fill contained a high density of river gravel and cobbles, measuring between 7 and 12 cm. The river cobble layer measured roughly 15 cm in thickness. There was a light density of limestone used in the floor construction, which comprised only a thin surface layer. The plaza likely contained a plaster layer that has since deteriorated, leaving only a packed earthen layer with small limestone gravel inclusions. This compact surface and underlying 15 cm thick river cobble construction appears consistent throughout the western half of Square A, except in the northwest corner where it appears disturbed. In this area, only alluvial soils with very few inclusions exist. Erosional processes appear to have cut deeply into this area of the floor, and intruded into Zone 14, a modified earthen layer that underlies the plaza floor construction. Artifact density tapers significantly in Zone 11, consisting of ceramic sherds, a C-14 (burned wood) sample and other organic material.
Zone 14

The Zone 14 matrix underlies the plaza floor construction of Zone 11 and is virtually devoid of inclusions. The change in the matrix is clearly discernible as a shift to a fine silty clay texture. The matrix contains only a very light density of limestone gravel (3 to 0.2 cm) and river gravel (6 to 0.2 cm). The zone measures approximately 30 cm in depth and the few artifacts found within this zone included small pieces of debitage, sherds, and baked clay material. Zone 14 appears to be a modified earthen layer that may have functioned as a subfloor construction that leveled the patio area prior to the construction of the plaza floor.

Zone 15

The matrix of Zone 15 is similar in texture and color to Zone 14, which lies directly above it. The deposit type seems to be a natural earthen layer that may have been modified slightly prior to the construction of Group A. Limited horizontal exposure prevents a more solid reconstruction. The zone contains only a very light density of cultural material in the form of sherds, baked clay material, debitage, and a small carbon sample that may provide a good C-14 date for this initial phase of site construction. Toward the bottom of Zone 15, the matrix becomes relatively sterile and very sandy, and the density of river gravel increases slightly.

Zone 20

Zone 20 consists of a shovel test pit, roughly 34 cm deep, positioned at the base of the excavation in the center of the western half of the unit (Figure 6.2). The matrix is sand mixed with river gravel and small cobbles. It appears to be a natural deposit that underlies the modified earthen layer defined in Zones 14.
and 15. The zone is devoid of artifacts and appears to be an old river bed that predates the construction of Group A. Excavations in Square A ceased at this sterile level.

**Overview of Operation 51: Square F**

Square F, a 2 × 2 m unit in the southeast corner of Operation 51, is positioned in the central portion of Structure 503, on the top of the elongated platform. Square F is situated just north of Structure 501, which represents another platform possibly with stairs leading to an intermediate level terrace on the west side of Structure 500, the tallest pyramid-shaped structure within the Hershey site. A series of four floors associated with Structure 503 were identified during excavation, three of which contained the remains of a plaster surface (plaster floors 1-3). A fourth floor initially was unrecognizable due to its deteriorated state; it is the uppermost in the sequence and was highly weathered due to its exposure to the elements for an extended period of time. A series of twelve zones were excavated in Square F of Operation 51 (Table 6.1). All zones and associated deposits are discussed below, presented sequentially as they were found.

**Zone 1**

Similar to Square A, Zone 1 in Square F consisted of a top zone containing a relatively high density of roots. There was little to no stone visible on the surface of Square F. Large pieces of burned wood were recovered just below the ground surface. A line of stones exposed on the surface of Square C appears to represent a northern retaining wall of the uppermost platform surface of Structure 503. Based on the elevation of the top surface of this wall, the remains of the ancient living surface was just below ground surface. Therefore, it is conceivable that the carbonized wood is ancient material, but it was recovered from a modern root mass. A sample was collected for identification, but it may be contaminated by the modern debris. A few concentrations of limestone gravel were noted at the base of the zone and represent the surface of Zone 5.

**Zone 5**

Zone 5 is directly below Zone 1 in Square F and consists of a semi-compact earthen layer mixed with a medium concentration of limestone gravel. The concentrations of limestone inclusions are located mainly in the eastern half and southwest corner of the square and likely represent the disturbed remains of the final platform surface of Structure 503. Zone 5 also contains a light density of river gravel, and a few limestone cobbles measuring about 12 cm, which seemingly represent tumble debris fallen from Structure 501, rather than any in situ architecture on the surface of the platform. Some earthen deposits were noted toward the base of Zone 5, which may be run-off from the northern side of Structure 501. There is a light concentration of artifacts located mainly toward the bottom of the zone. A number of small sherds and some baked clay material were recovered, but very little diagnostic material was noted. At the base of Zone 5 there is a high density of limestone gravel that appears to be the remains of a ballast construction fill for the final floor surface of Structure 503. Presumably, a thin layer of plaster similar to floors 1-3 (see below) originally overlay the ballast fill and has since deteriorated.
Zone 6

Zone 6 is restricted to Square F and consists of the ballast construction fill of Structure 503. The density of gravel-size limestone inclusions increases toward the base of Zone 6. The fill contains mostly limestone, but some river gravel was noted. In addition, a number of flowstones, possibly travertine formations, were identified in the fill, and several specimens (FCB# 5040 and 5043) were collected for further analysis. The flowstone was found in situ and appears to be an integral part of the construction fill. The formations range from gravel to cobble size and were found predominantly in the northeast corner of the unit. The ballast fill does not appear evenly distributed across the unit, but is somewhat disturbed and concentrated in the northeast, southeast, and southwest corners. There is a medium density of artifacts, including sherds and baked clay material. Notably, two obsidian blade fragments and some fish bone were recovered. At the base of the zone, a deteriorated plaster floor (Floor 1) was defined, however, it was only preserved along the eastern edge of the square (Zone 10).

Zone 9

Zone 9 is positioned directly below Zone 6 and is an area of exposed construction fill in the western half of the unit, which measured roughly 1.3 m (east-west) by 2 m (north-south). Here, the plaster of Floor 1 was not preserved. The construction fill is similar if not identical to the overlying fill in Zone 6. A strip of deteriorated plaster floor (Floor 1) comprises the remainder of the 2 × 2 m unit of Square F and was removed separately as Zone 10. The cobble-filled matrix of Zone 9 measures about 15 cm in depth and appears to be the associated fill of Floor 1. There is a light density of artifacts in the Zone 9 fill, with a few diagnostic ceramic sherds that could possibly date the fill layer. There is some evidence of burning in the form of charcoal smears on the gravel fill (one piece large enough to be sampled) and some burned, gray-colored limestone inclusions. At the base of Zone 9, another plaster floor (Floor 2) was encountered, this one much better preserved throughout the unit. A large depression, however, was found intruding into both Floors 1 and 2 in the northern end of the unit and appears to be the remains of tree fall (Figure 6.3).

Zone 10

Zone 10 comprises Floor 1, a highly eroded plaster surface with approximately 15 cm of underlying ballast construction fill. The floor appears associated with the remainder of the fill that was found in the western half of the square, which was removed as Zone 9. Extending only about 70 cm from the eastern edge of the square, the poorly preserved plaster floor is illustrated in the east wall cross-section (Figure 6.3). A plaster sample (FCB #5059) was taken from this area. Very few artifacts were found in the floor and fill of Zone 10. Like Zone 9, a beautifully preserved plaster floor (Floor 2 - Zone 13) was found beneath Zone 10. The base of Zone 10 defined the surface of the plaster floor and identified a large disturbance along the northern, eastern and southern edges of Floor 2 in Square F, most likely due to a tree fall. The disturbed area was removed separately and labeled Zone 12. The tree disturbance caused the plaster in both Floors 1 and 2 to bulge in the northeast corner of the unit and slope up toward the north, where a large root had apparently once existed.

Zone 12

Zone 12 appears as a deep depression, likely the remains of a large tree which cut through both Floors 1 and 2 (Figure 6.3). The zone is located along the northern side of the square. The matrix of the disturbed area consists of a loose, silty clay soil with a high density of limestone gravel and large limestone cobble inclusions. There are little to no river cobble inclusions in Zone 12. Uneven sections of Floor 2 (Zone 13) which surround the tree disturbance are likely the result of old roots pulling up the plaster surface.
The loose, dry matrix of Zone 12 contained a very light density of artifacts. At the base of the zone, there is a high density of tightly packed, large limestone cobbles that appear to be *in situ* core fill (Zone 16), which underlies Floor 2 (Zone 13).

Zonal 3

Zone 13 represents the remains of Floor 2, a plaster surface disturbed due to tree fall along the northern edge of the square. Floor 2 is located roughly 15 cm beneath Floor 1 (Zones 9 and 10), and only the plaster was removed as Zone 13. Two samples of the plaster (FCB# 5062 and 5065) were collected from Floor 2. The plaster contains many inclusions and therefore is not smooth in cross-section but appears relatively smooth on the surface. There were no artifacts found in the plaster surface; however, a round hammerstone and a chert flake found at the base of Zone 10 may have been associated with the surface of Floor 2.

Zone 16

Zone 16 comprised two layers of distinct gravel and cobble fill underlying the plaster surface (Zone 13). The construction fill consisted of about 20 cm of tightly packed small gravel and cobble-sized limestones, followed by a layer of larger limestone cobbles measuring about 25-35 cm. Only a light density of cultural material was recovered within these underlying construction fill layers, including two C-14 samples and a botanical sample. Several flowstone formations were collected from Zone 16, possibly travertine mined from across the nearby Sibun River. At the base of Zone 16, the surface of a sloping, packed earthen mound was defined, which showed signs of basketload stratigraphy (Zone 17). The surface of the earthen mound appeared uneven where it interfaced the large cobbles (Figure 6.3). At the base of
Zone 16, a slipped ceramic sherd and a large C-14 sample were found on the surface of the clay-filled matrix, positioned over a meter below ground surface.

**Zone 17**

Zone 17 consists of a compact, clay-filled mound directly below the layers of cobble fill identified in Zone 16. Together, Zones 16 and 17 appear to comprise the core fill of Structure 503, which formed the bulk of the platform. The artifact density in Zone 17 was slightly higher than the overlying fill layers in Zone 16, and included animal bone (possibly a small rodent), pottery sherds, unworked shell, and charcoal. Two C-14 samples, sealed inside the fill, were collected from the zone. Basket load stratigraphy is reflected in the mottled-clay construction fill of Zone 17. There were no rock inclusions in this compact clay construction fill. The zone was arbitrarily changed to Zone 18 after 20-25 cm of fill was excavated.

**Zone 18**

Zone 18 represents the bottom half of the earthen construction fill, with basket load stratigraphy still present. The earthen fill was extremely compact and yielded a light density of artifacts. Only the eastern portion of the square (a 1 × 2 m area) was excavated in Zone 18. At the base of the earthen fill, a level floor surface (Floor 3) was interfaced.

**Zone 19**

Zone 19 represents the surface and some of the underlying fill of Floor 3. The surface is very level and well preserved. Composed of a mixture of plaster and earth, the floor appears to have been tamped down, rather than formally prepared. Covered over in antiquity, it was protected and able to survive intact. The fill below it is a clayey silt with gravel-size limestone inclusions. Excavations ceased at this level.

**Concluding Remarks**

Square F of Operation 51, positioned on the top of the platform surface of Structure 503, revealed at least four distinct construction episodes, indicating a relatively long length of occupation in this central locale. Square A, situated along the northern side of Structure 503, confirmed that the elongated platform contained a centrally-located, outset staircase on the northern side of the structure, at least in its final phase of construction. In addition, Square A and the surface of Square C exposed the remains of at least two terraces flanking the northern side of the platform. A rich midden heap was found in Square A, wedged in a corner between the northern facing wall of Structure 503 and the western wall of the central staircase. Preliminary analysis of the diagnostic sherds found within the midden deposit indicates Late-Terminal Classic period material (S. L. López Varela, personal communication August 2002). At the base of excavations in Square A, the northern facing wall of Structure 503 was defined, with basal molding adorning the base of a nine-course high wall. Excavations confirmed that platform structures in Group A were oriented 20 degrees east of north. If all structures in the main group are comparable to Structure 503, each was constructed primarily of limestone cobble fill with floor and wall surfaces covered in plaster. The general shape of each structure and the high density of exposed limestone blocks noted on the ground surface suggest all-stone masonry construction for all of Group A. Remnants of a formally prepared plaza surface were identified within Square A of Operation 51, to the north of Structure 503. This floor likely extended throughout the central plaza of Group A.
Excavation of Squares A and F in Operation 51 yielded a considerable amount of information regarding the occupation of Group A, the largest plaza group that presumably housed the elite occupants of the Hershey site. The two squares were strategically positioned across the center and northern side of Structure 503, an elongated platform lining the south side of the plaza group. Investigations shed light on the construction techniques and architectural phases associated with Group A, possibly the founding settlement group of the Hershey site. Further testing, planned for the 2003 field season, aims to clarify the construction sequence of a wider range of structures at the Hershey site.
Operation 53 was a 1 × 2 m excavation unit located on Structure 517 in Group C of the Hershey site, spatially oriented with its long axis lying approximately 10 degrees east of north. Structure 517 is a large basal platform that supports Structures 518 and 519. The excavation unit extends from the northern edge of Structure 518 to the saddle located between Structures 518 and 519. The goal of the excavation was to expose a section of the retaining wall of Structure 518. Secondary to this goal was an attempt to ascertain the function of Group C and determine its relevance to the site when compared to larger mound groups in the area.

Zone 1, the topzone, consisted of fine silt overlaid by heavy amounts of leaf litter and organic debris. Surface collection in the immediate area yielded several poorly preserved pottery sherds. The poor preservation was most likely due to the effects of weathering at the surface of the platform. A few small pieces of debitage were also collected from the surface. On clearing away the organic material we uncovered several large limestone rocks erupting through the surface of the silty matrix in the southern section of Zone 1. These limestone rocks were exposed as a separate deposit labeled Zone 2, as they might have once been part of the retaining wall for Structure 518 or perhaps part of the construction fill behind that wall. Zone 1 was brought down approximately 10 cm until a slight color change was noted transitioning from the 10YR 3/3 dark brown of the silty matrix to a darker 7.5YR 3/3 brown of what was labeled the surface of Zone 3.

Zone 2 was comprised of the limestone rocks and underlying matrix located in the southern end of Operation 53 (Figure 7.1). As the rocks were exposed it became clear that not only had we identified what seemed to be cobble fill that had slipped down from Structure 518, but perhaps we had also uncovered what looked to be the remains of a small two or three course retaining wall. The limestone uncovered ranged from 3 to 25 cm in length, with the larger ones forming the base layer at the bottom of Zone 2 and the smaller construction fill located primarily to the south. In addition to the limestone we discovered a medium density of poorly preserved pottery sherds much like those uncovered in Zone 1, and a negligible amount of small chert debitage flakes. The presence of the pottery sherds and the debitage seems to point to them being part of the run off from Structures 518 and 519, caused by centuries of annual flooding. Zone 2 ended when it was determined through probing that only two courses of large limestone rocks were present and represented what remained of the retaining wall for Structure 518. Though the wall may have had more courses in antiquity, no evidence could be found to confirm that hypothesis. We then turned our attention to the area of the excavation unit to the north of the wall.

Zone 3 was a semi-compact layer of a silty clay matrix that ran from the retaining wall to the northern terminus of the excavation unit (Figure 7.2). A much higher density of poorly preserved pottery sherds was uncovered as we took down Zone 3 an additional 10 cm. Though most of the sherds appeared to be in the same weathered condition as those already found at higher elevations, there was one that maintained its integrity over the years and had retained its slip. Yet another pottery sherd showed signs of incising, a feature until now only exhibited by sherds found in the
larger groupings at the Hershey site. Excavation in Zone 3 also yielded 5 beautifully preserved, obsidian blade fragments of varied length, the highest density of such fragments that had been found during the season up to that point. Zone 3 ended as we came down upon a densely packed layer of river cobbles at 56 cm below datum ranging in size between 2 and 8 cm.

![Figure 7.1 Plan view of Operation 53, Zone 2.](image1)

Zone 4 was a layer of densely packed river cobbles and limestone rocks ranging in diameter from 2 to 25 cm locked in a matrix of silty clay and gravel. This appeared to compose the construction fill for what seemed to be the overlying plaza surface that was Zone 3. This fill was similar to that held behind the retaining wall in the southern end of the excavation unit, though evidence of the utilization of river cobbles was more apparent in the case of Zone 4. Excavation yielded a medium density of poorly preserved pottery sherds, some chert debitage, and an additional two obsidian blade fragments of equal quality to those found in Zone 3. Additionally we uncovered what appeared to be a broken net weight, which might have been cast aside in antiquity and used as part of the construction fill of Zone 4. After approximately 25 cm of excavation there was a marked increase in the size and density of the limestone, which prompted us to call an end to Zone 4 and delve deeper below the surface of the initial layer of construction fill.
Zone 5 consisted of massive limestone boulders and river cobbles ranging in size from 5 cm in diameter near the surface of the zone to at least 75 cm at the maximum depth that time and safety would allow us to explore (Figure 7.3). These giant rocks must have been transported at considerable cost and expenditure of energy to provide the ballast layer on which to build structures high enough to resist annual floods. While the matrix remained consistent with that of Zone 4, the rocks were so large that air pockets existed between many of them as the soil was cleared down around them (Figure 7.4). Relatively light quantities of pottery sherds were excavated along with another single obsidian blade.

Figure 7.3 Profile of Operation 53, west wall.

Figure 7.4 Final plan view of Operation 53, Zones 2 and 5.
Unique to Zone 5 was the discovery of what appeared to be a piece of flowstone buried deeply within the limestone ballast. This would cast an interesting light on the significance of Structures 518 and 519, as flowstone brought from the sacred space of the local cave system and included in the construction material could denote an area of ritual importance. In addition to the presence of what appeared to be flowstone, a piece of unworked shell was also uncovered while excavating Zone 5. It is unclear whether the flowstone and shell were included in the fill purposely, or rather the unique environment caused by such massive rocks served as a catchment area for these artifacts. Excavation continued to a depth of 147 cm below datum, when it became physically impossible to remove any more limestone from the unit due to their sheer size and weight.
During the 2001 season of the Xibun Archaeological Research Project, a three-week field investigation was undertaken to assess the possibility of locating evidence of occupation in the Sibun Valley during the Spanish Colonial period, specifically the location of the town and Catholic visita church mentioned in several early seventeenth century Spanish sources. Although the archival evidence documents the existence of the settlement, it is insufficient to assist in locating the remains of the historical settlement within the river valley. Therefore, a survey was designed to identify and investigate appropriate geographical features in the fertile valley surrounding the Hershey site. Initiated in 2001, the survey investigated the southernmost arable reaches of the Sibun River Valley. In future seasons, investigations will work progressively north and eastward down the river.

Historical Sources

According to Grant Jones (1989: 288), documents in the Archivo General de Indias, Seville, Spain, indicate that the town of Xibun was located “somewhere upstream on the Sibun River” but that “none of the documentation provides specific clues concerning its precise location.” In 1631, several members of a party gave testimony about their experiences on a trip to Xibun during the previous year. Their testimonies state that on their arrival they found the town to be deserted. Descriptions of events also indicate that the ornaments of the church had been removed and the bells taken from the belfry by the residents as they departed (Petición de Cristóbal Sánchez, 1631, quoted in Jones 1989: 199-201). Although the residents were discovered living in a forest enclave five days’ walk away and were returned to the town, Xibun was found similarly deserted when visited again in 1638 (Jones 1989: 208). These testimonies constitute the extent of historical documentation known for the existence of a Christian church at the Spanish Colonial period town of Xibun, as well as the latest known date for a concentrated settlement of Maya population in the valley.

British occupation of the Sibun began sporadically in the eighteenth century, although they were not granted rights to settle there until the treaty of 1786. At the time of the treaty, many settlers already occupied downriver portions of the valley illegally, but very few had settled upriver of the confluence with Caves Branch and none above Dry Creek (PRO CO 700 BH no.13). British settlers did not explore the headwaters of the “River Sheboan” until August 1787, when it became an important strategic location that defined the new southwestern boundary of the region ceded by the Spanish government for logging (PRO CO 123/5).

Incidents recorded during the nineteenth century indicate that the Sibun remained a marginal area of British settlement. When a group of slaves ran away in 1823, some going up the Sibun and others up the Belize River Valley, it was decided to pursue only those in the Belize Valley, since the British military garrison was too small to pursue them in such a remote area as the Sibun (NAB; R4B pp. 77-78)
In 1869, the Colonial government sponsored a visit to the Sibun by Father Avarro “for the purpose of visiting the Indian Settlement.” There is no indication of where the settlement was located or whether these were residents of longstanding or new immigrants to the region, but even at this late date it was apparently unusual to make such a trip (NAB; R.101 p.295).

Criteria for Testing Locations

The limited extant documentation offers no immediate insights into the location of the town and church, so a survey strategy was employed based on topographical features that possess attributes similar to those that have yielded Spanish Colonial and later Historical period deposits from river valleys elsewhere in central and northern Belize (Finamore 1994: 176-177; Graham, Pendergast and Jones 1989; Pendergast, Jones and Graham 1993; West, Masson, Finamore and Rosenswig 1998). High priority localities for investigation were flat, well-drained areas with the following characteristics:

1) close proximity to the locus of a dense concentration of Postclassic period artifacts (exclusive of ceremonial cave contexts) presumed to exist in the central portion of the Hershey site;
2) elevation above the seasonally inundated plain. In cultivated areas this was defined as the zone separating low-lying cacao fields from slightly higher citrus orchards;
3) a prominent placement that is visible from the surrounding region, and within a few hundred meters of the Sibun River, either on a natural rise, or on an artificially elevated Maya mound.

Unfortunately, development is more extensive in the Sibun Valley than in many other parts of Belize, particularly where terraforming for modern citrus orchards has significantly altered the natural landscape to elevate trees and create furrows between rows of trees.

According to the historical maps referenced above, as well as others held in an array of archives, the Hershey site is situated farther up the Sibun River than any settlements of eighteenth-or early-nineteenth century British woodcutters who accessed the valley from the river mouth (Calderon Quijano 1944). The upper reaches of the Sibun were marginal to British settlement that was oriented toward the coast, probably because the upper reaches of the river were simply too shallow to float mahogany down. Spanish travelers, on the other hand, would have accessed the Sibun Valley from inland routes via the Belize River, and the upper reaches around the Hershey site would have been among the most accessible for them.

Field Testing and Results

Following surface survey within the orchards, pastures and wooded areas of the upper Sibun River Valley, a testing program was undertaken targeting the following four areas in the upper valley: Hershey site, Goodliving Camp, St. Thomas, and Branton Trail/Chanona Farm.
**Hershey Site**

Located along the west bank of the Sibun River, the site is situated in the center of the largest stretch of relatively flat arable land for many miles around. Currently this portion of the valley is under intensive citrus and cacao cultivation. Its position and proximity to resources within the valley are discussed at length elsewhere in this volume (see McAnany and Thomas, Chapter 1).

**Plaza Group C**

The central plaza within this group was tested with a grid of fifteen shovel test pits, each approximately 50 cm on a side. Every unit yielded approximately the same profile of 70 cm of alluvium over crumbled cobbles that were probably plaza fill. No identifiable Postclassic or Historical period artifacts were recovered.

**Group A**

The west range structure (507) of Group A is a platform of approximately 34.5 m in length, with a top that offers the largest flat elevation within the Hershey site proper. A 50 cm × 12 m test trench (Operation 52) was laid laterally across the center of the structure, perpendicular to its long axis and 16 m from its north side. Excavation of this trench yielded what appeared to be a footing wall for a building that sat atop the platform, with a courtyard facing into the plaza interior. There was no evidence of any Historical period occupation and the structure footing most likely dates to the same period as the platform construction, likely the Terminal Classic period.

**Other Areas of the Site**

What appeared to be a cement piling at the southeast point of Group B attracted the attention of those working in that area. Although it was of porous and eroding low-grade cement, it was determined to be of fairly recent origin. According to local informants a small water tank used to irrigate the adjacent fields once stood at this location.

The developed area near the entrance of the farm where the Hershey site is situated also contains several elevated areas that fit the above-listed criteria for further investigation, but which, according to the current manager, had been heavily disturbed by bulldozers when the farm was modernized between 1979 and 1987.

During investigations of undisturbed high ground, a brass military uniform-style button (Figure 8.1) was recovered from near the east foundation wall of the management building at the main entrance to the farm. The button was covered with a hard accretion of red silt and will require conservation prior to identification, but it appears to be embossed with two rampant lions flanking a coat of arms. It is no surprise that British military buttons would be found in a “backwoods” context such as this, given the regular surveys and patrols that were undertaken for purposes ranging from marking the legal boundaries of the settlement to the pursuit of escaped slaves.
Good Living Camp

Good Living Camp is a series of wood-framed buildings on both sides of the Hummingbird Highway, to the west of the bridge over the Sibun River. Subsurface testing was undertaken on a series of small rises located both north and south of the highway. Three 50 cm square shovel test pits were placed on a wedge-shaped promontory of high flat land approximately 100 m northwest of the structures on the north side of the highway.

Two additional test units were placed atop small knolls on the south side of the road to the west of the house near the river. The alluvial soils were much deeper here than elsewhere, but no Historical-period artifacts were recovered.

St. Thomas

Although largely low-lying, the farm to the north of the Hershey site, known as St. Thomas, was of interest because local informants indicated that was where the gravestone of Robert Gentle (d.1812) had been initially discovered (McAnany 2001: 229-31). The overgrowth that followed abandonment made survey of this region very difficult. The majority of the area was covered in dense bush and could not be adequately surveyed in the short period of time allotted.

Although no Spanish Colonial period artifacts were recovered, two discoveries of interest were made in the region. An abandoned lime kiln of traditional barrel construction, associated with the remains of a small wood-frame house that appeared to have been occupied until recent times, was discovered on the north side of a large karst hill near the river.

Of greater interest was a large projectile point (Figure 8.2) found on the surface inside a meander of a small stream flowing into the west bank of the Sibun. The large tangs, bifurcated base, and alternate beveled margins suggest that the point is coeval with the Lowe phase of the late Lithic stage in Middle America (MacNeish 1986: 104). Other surface finds of this point type have been made in Belize, notably around Sand Hill and Ladyville. Additional investigations near the location of this find may yield a rare pre-ceramic activity area or stratified deposit.
Figure 8.2 Lowe point.

Branton Trail/Chanona Farm

Branching off due south from the Hummingbird Highway at the farm of Tony Chanona is a small road called Branton Trail. According to local informants, this road predates construction of the Hummingbird Highway, and was probably a logging road that also once headed north roughly parallel to the Sibun. The road continues south and curves east paralleling the river, passing through citrus orchards, stopping at the southernmost extremity of arable land at the bottom of the steep and nearly inaccessible Sibun Gorge. At this southern extremity is a large flat pasture, elevated to the extent that it has the most expansive view of any point in the southern end of the Sibun Valley. This flat area of land, with its striking view, could at once be perceived as both a central location visible to much of the southern end of the valley, but also peripheral to the movement of people through that region.

A series of eight shovel test pits were aligned in a transect along the western edge of this pasture, near the slope down to the river. Another four test units were placed atop small knolls within this pasture. No Spanish Colonial period deposits were recovered, but among the Precolumbian artifacts was an undecorated drilled slate pendant (Figure 8.3). This pasture yielded evidence of off-mound Precolumbian Maya habitation, possibly warranting more extensive examination in future seasons.
Future Prospects

Intensive citrus cultivation in the southern Sibun River Valley has caused far more surface disturbance than in river valleys in the northern part of the country. Nonetheless, there is still significant prospect for locating the remains of the Colonial period town mentioned in the Spanish archives. In future seasons, investigations should continue working down river to the north, concentrating in vicinities near any documented Late Postclassic period settlements. Continued investigations will undoubtedly be labor intensive, requiring exhaustive testing to execute an essentially non text-aided survey strategy.

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