FINAL REPORT

A CULTURAL RESOURCES RECONNAISSANCE AND SURVEY OF THE RIO PUERTO NUEVO FLOOD CONTROL PROJECT, SAN JUAN, PUERTO RICO

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ABSTRACT

A cultural resources survey and reconnaissance was conducted by Garrow & Associates, Inc. for the Jacksonville District, U.S. Army Corps of Engineers within the Río Puerto Nuevo Flood Control Project area in metropolitan San Juan, Puerto Rico. These investigations sought to identify any prehistoric or historical archaeological and architectural resources within the area of proposed channelization and bank stabilization along the Río Piedras, and to determine their eligibility for nomination to the National Register of Historic Places. These investigations included archival research, oral interviews, on-site inspection and recordation of standing structures, and archaeological site reconnaissance. Archaeological subsurface testing included surface survey and screen shovel tests.

The results of these investigations show that structures associated with a mid-nineteenth century sugar mill, Hacienda San José, are present within the proposed direct impact area. In association with these mid-nineteenth century structures are other standing structures and a water reservoir believed to be associated with a water filtration and aqueduct system constructed in the late nineteenth century. Standing structures exhibit sufficient architectural integrity to warrant further attention. It is recommended that this building complex be considered eligible for nomination to the National Register of Historic Places, and that further construction activities within the Río Puerto Nuevo Flood Control Project include a plan for mitigating potential adverse impact to this property.

ACKNOWLEDGEMENTS

A number of individuals contributed to the successful completion of this project. We would especially like to thank Dr. Rona Mazer, Technical Representative with the Jacksonville District, Corps of Engineers. At the State Historic Preservation Office in San Juan, our special thanks to Hugh Tosteson, acting Commonwealth Archaeologist, and Robert Sackett, architectural historian and preservation officer for providing access to the site files, and for offering guidance and assistance during the field phase of the project. Carlos Mantaras, agronomist with the Agricultural Station was especially helpful in pointing out the potential value of the lands bordering the Río Piedras in the southern section of the project area. The archaeological field crew included Jaime A. Velazquez and Miguel A. Cruz, who admirably carried out the project in field conditions often less than ideal. The project graphics were expertly prepared by Vince Macek and Jeff Holland.

It should be noted that a major portion of the Cultural Overview in Chapter II used in this report was taken directly from other Garrow and Associates, Inc. proposals and project reports. A number of staff members contributed to the development of these sections over time, and the documents on which the most recently updated version of the summaries were based are credited at the appropriate places in this report.

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I. INTRODUCTION

This report documents the results of a cultural resource survey and archaeological testing conducted by Garrow & Associates, Inc. at two locations within the Río Puerto Nuevo Flood Control Project area in the south central portion of the San Juan metropolitan area, Puerto Rico (Figures 1 and 2). The study was conducted for the Jacksonville district, U.S. Army Corps of Engineers under contract No. DACW17-88-D-004. Proposed channelization of portions of the Río Piedras established the need for these investigations, which sought to identify any significant historical or prehistoric archaeological and architectural remains prior to their destruction by proposed construction activities, and to determine site eligibility for nomination to the National Register of Historic Places.

Previous cultural resource reconnaissance of the proposed project area conducted by the U.S. Army Corps of Engineers, Mobile District (1980) recommended additional investigations of three areas within the Río Puerto Nuevo project. One of these areas, the Norzagary Bridge, is not to be affected by proposed construction, and was outside the scope of the present investigations. The remaining two areas are the subject of the following report (Figure 2). The combined study areas equal approximately 277,974 square meters, or 27.8 hectares (68.7 acres).

Area 1, the northernmost section, consists of approximately 28,284 square meters (2.8 hectares or seven acres) located on the east bank of the Río Piedras immediately south of the parking lot of the Coliseo Municipal Roberto Clemente and the Estadio Municipal Hiram Bithorn. Area 1 is presently being developed as part of the Parque de Las Américas.

Area 2 is located approximately 2.5 kilometers upstream from Area 1. Area 2 extends over approximately 249,690 square meters (25 hectares or 61.7 acres) and is located on both sides of River Río Piedras in the municipal district of Río Piedras. The southern portion of Area 2 is located on the east bank of a bend of the Río Piedras. Several standing structures associated with a former water treatment plant and the U.S.G.S. laboratory are located within this bend of the river. The southern portion also includes and a small parcel of land within the Estacíon Experimental Agrícola (Jardin Botanico). The middle portion of Area 2 includes properties on the west bank of the Río Piedras south of Highway PR 1. This area is largely commercialized. The northern section of Area 2, located west of the Río Piedras and north of Highway PR 1 includes a large section of bottom lands administered by the Agricultural Experimental Station.

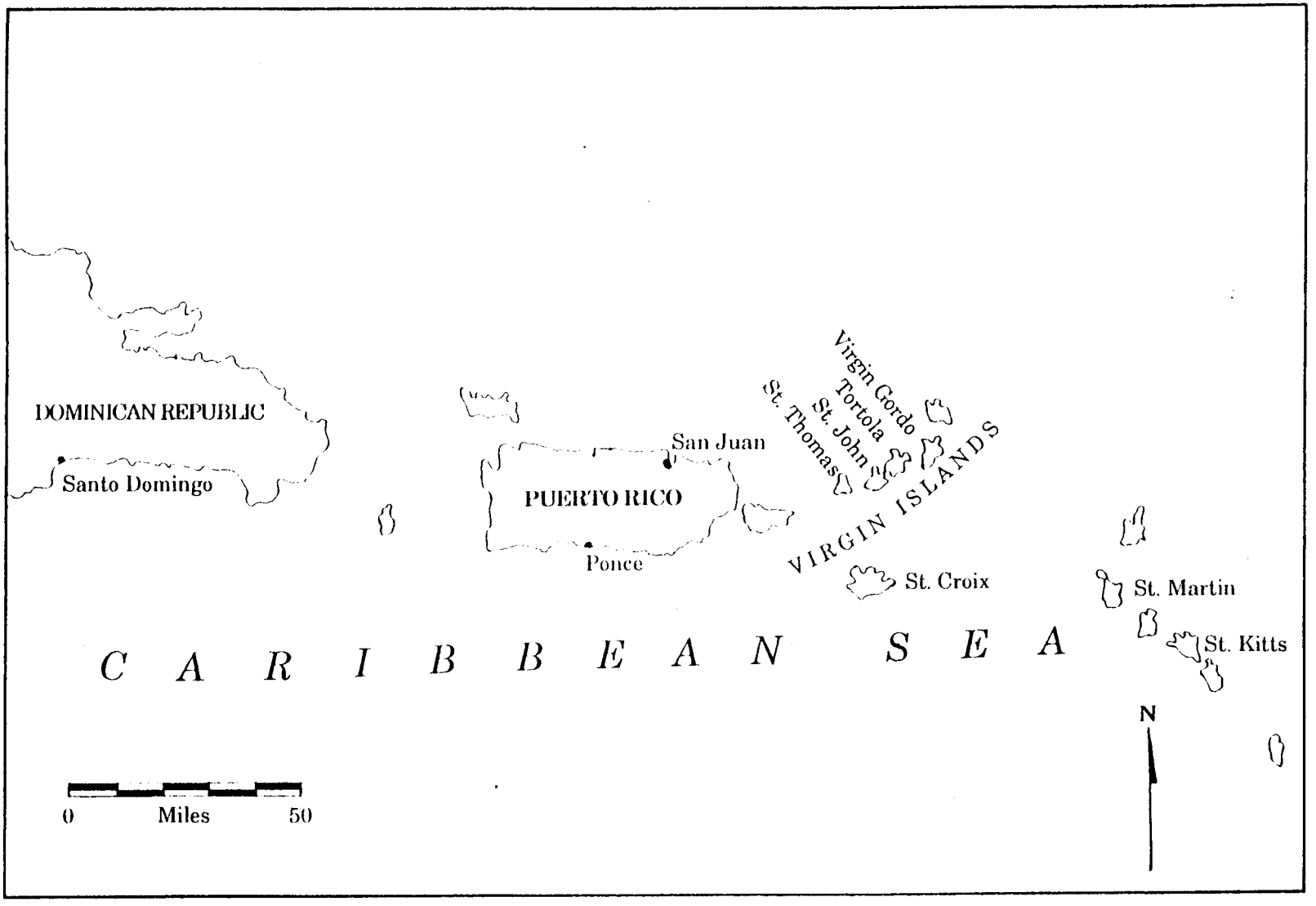

Figure 1. Site Location Map.

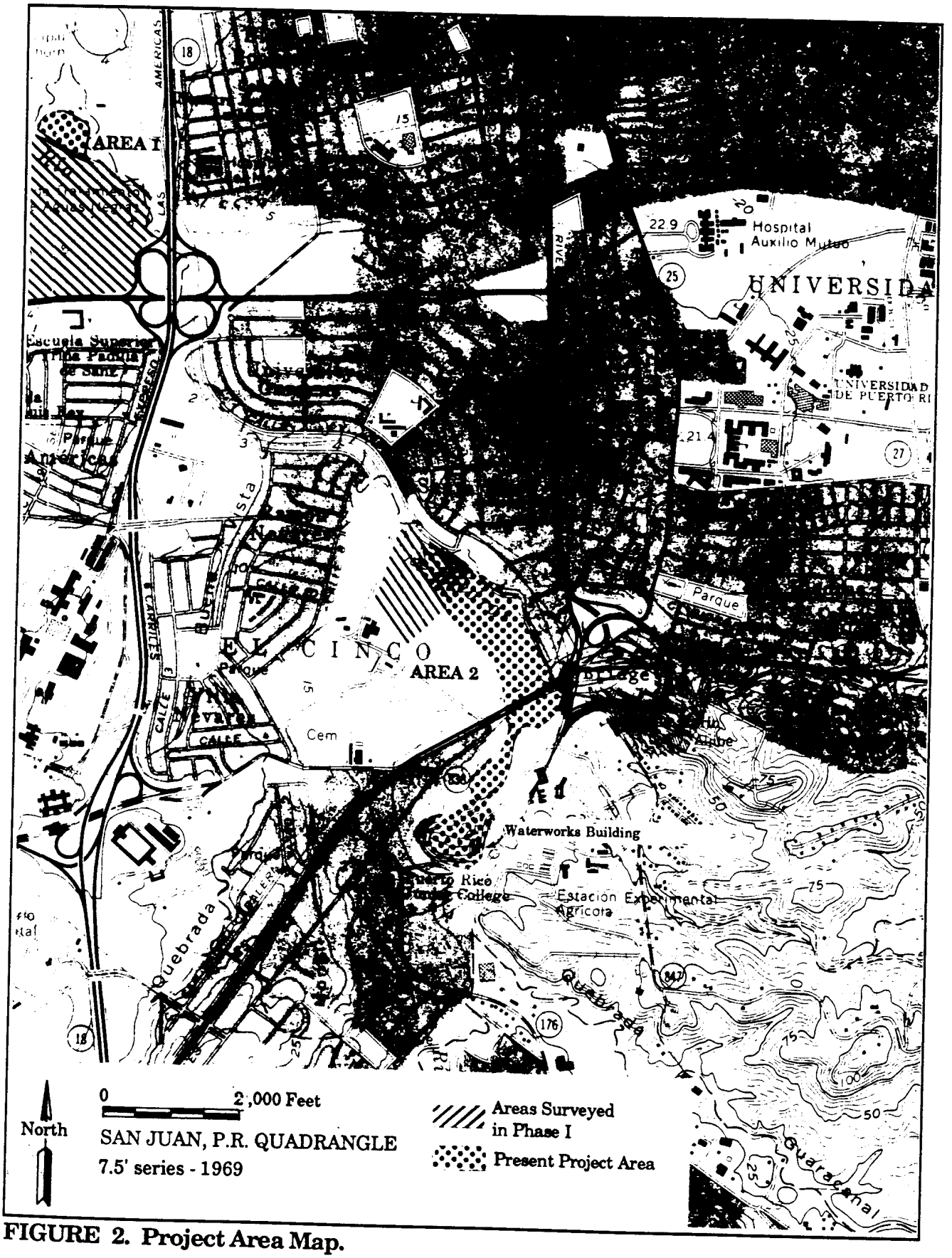

FIGURE 2. Project Area Map.

The survey and testing methodology involved an archival search and a pedestrian survey of the project area with screened shovel tests excavated at 30 meter intervals. Results of the investigations indicate development of the Parque de Las Américas, including land contouring and filling, has disturbed the majority of Area 1. Archaeological investigations in Area 1 revealed no significant cultural resources, and no further work is recommended. Commercialization and recent fill has disturbed most of the middle portion of Area 2, while dense vegetation, overbank siltation and low lying wetlands hampered survey coverage in the northern portion of Area 2. No significant historical or archaeological resources were encountered in these areas. However, standing structures associated with Hacienda San José, a early to mid-nineteenth century sugar processing plant, and the water filtration works believed to be part of a late nineteenth century aqueduct system are present in the southern section of Area 2. Standing structures present within this complex are potentially significant cultural resources and should be considered eligible for nomination to the National Register of Historic Places.

The remainder of this report documents the background, methods, results and recommendations developed during the course of the investigations. Chapter II provides a review of previous research in the Puerto Rico and the San Juan area, as well as an overview of the environment and cultural sequence of the island. Chapter III presents a review of the research methodology utilized during the survey. Chapter IV discusses the results of the work. Conclusions and recommendations are provided in Chapter V.

II. CULTURAL AND ENVIRONMENTAL OVERVIEW

ENVIRONMENTAL OVERVIEW

Both Areas 1 and 2 are located in the Río Piedras drainage basin. The Río Piedras, forming in the uplands south of San Juan, originally flowed north into San Juan Bay. In the mid-1950s, the stretch of the river from the confluence of Quebrada Margarita to the mouth was channelized. The outlet to the bay was moved some 1.5 kilometers to the east (USACOE 1980:12). This new section of the waterway is referred to as Río Puerto Nuevo, or Río Piedras Nuevas.

The study areas are located within the Northern Coastal Plan physiographic province of Puerto Rico (Lobeck 1917). The major geological features of this province include two major units. The surrounding uplands consist of a series of unconsolidated limestone, probably of lower Miocene age, forming small, angular hillocks at the periphery of alluvial plains. In the southern portion of the project area, the limestones rest unconformably on sedimentary and volcanic rocks, possibly dating from the Paleocene. Only a small section of uplands, located at the extreme southern edge of Area 2, was within the boundaries of the study area. The majority of the project area is situated on younger Quaternary units, primarily alluvial, located along the Río Piedras. These deposits include an older alluvial unit of Plio-Pleistocene age overlain by Pleistocene and Holocene sediments (USACOE 1980:5).

Soils within the project areas are included within the Almirante-Vega Alta-Matanzas soil association (USDA,SCS 1978). These soils are formed in transported materials, and are described as deep, gently sloping to sloping, well drained soils on terraces and alluvial fans of the coastal plains. In Area 1, the major soil present is classified as Bajura clay. These soils consist of fine, mixed, nonacid isohyperthermic Vertic Tropaquepts, and are described as being deep, nearly level, poorly drained soils on river flood plains. Permeability is slow and available water capacity is high. A small, tongue-like area along the east side of the river in Area 1 is classified as Toa silty clay loam. The Toa series consists of fine, mixed isohyperthermic Fluventic Hapludolls found on nearly level, moderately well drained river flood plains. Toa silty clay loam is also present along the west bank of the river in the northern and middle sections of Area 2. West of the river in Area 2, soils are classified as Vega Baja silty clay. These soils are classified as fine, mixed isohyperthermic Aeric Tropaqualfs on nearly level, somewhat poorly drained soils on coastal plains and alluvial fans. Soils on the east side of the river in Area 2 are classified as Coloso silty clay loam. The Coloso series consist of fine, mixed, nonacid isohyperthermic Aeric Tropic Fluvaquents

on nearly level, somewhat poorly drained soil on river flood plains. A small, urbanized portion of Area 2 south of highway PR 1 is classified as Urban land-Vega Alta complex. The landscape in this area has been heavily altered by cutting, filling and urban construction.

Some indication of the original vegetation present in the project area can be derived from the reconstruction by Gleason and Cook (1926). The two principal associations found within the immediate vicinity of the project area include the mesophytic forests of the limestone hills and the mangrove forests along the northern segment of the Río Puerto Nuevo and Río Piedras flood plain, and the southern margins of San Juan Bay. Both of these associations would have provided significant habitats for faunal and floral resources utilized in prehistoric subsistence. Although the area has been severely altered by urbanization, mangrove stands are still present on the banks of Río Puerto Nuevo from the confluence of Quebrada Margarita to the outlet into San Juan Bay (USACOE 1980:13)

Descriptions of topography, physiology and present-day vegetation patterns for each of the project areas are presented in Chapter V.

CULTURAL OVERVIEW

The Prehistoric Occupation

Much of the specific prehistory of Puerto Rico is poorly understood at present, as many of the major habitation sites of the region have been lost to modern development. The general overview presented here is based largely on the chronological scheme presented by Allaire and Rouse (1978) and Espenshade et al. (1987), as discussed by Joseph and Rodríguez (1987), with regional specific information incorporated from Rodríguez (1984) where appropriate. The primary divisions within this scheme are the Archaic and the ceramic, with the latter continuing into the historic era. The most recent definition of the culture areas of the Greater Antilles is provided by Rouse (1982:48), who traces the evolution of the present concept of prehistoric culture areas in the region:

> Like the other archaeologists working in the Greater Antilles, I originally assumed that each island constituted a separate culture area, and that each island's pottery should therefore be stylistically homogeneous. In effect, we projected the present cultural distribution back into prehistory... When I began to trace the distribution of the prehistoric styles, I was surprised to find that their main boundaries cut across the islands instead of passing between

> them... When I subsequently grouped the styles into series, I was gratified to find that they, too, center around the passages rather than the islands.

Rouse concluded that at least four prehistoric culture areas can be identified for the Greater Antilles, with some questions remaining about the cultural status of central Hispaniola. These areas include the Western Periphery, the Windward Passage Area, the Mona Passage Area, and the Vieques Sound Area (Figure 3). Eastern Puerto Rico is included in the Vieques Sound Area, and this overview concentrates on the chronology established for this cultural unit. A chronological chart showing the cultural sequence applicable to Puerto Rico (from Rouse 1982) is provided in Figure 4.

The Archaic (2000 B.C. - 100 A.D.). The preceramic occupation of Puerto Rico is termed the Archaic. The distinguishing characteristics of this period include lithic tools and a subsistence strategy focused on hunting, fishing, and gathering. The is no evidence for either horticulture or a ceramic tradition during the Archaic. The Archaic population represents the first occupation of Puerto Rico, and apparently derived from a migration from the mainland of South America via the arch of the Greater Antilles (Veloz Maggiolo and Vega 1982).

The earliest researcher to clearly recognize the preceramic culture of the island was Irving Rouse. His fieldwork in the late 1930s resulted in the recording of several sites with the following characteristics: limited lithic artifacts; no ceramics; and small, discrete shell midden deposits (Rouse 1952a). While Rouse was suspicious that these sites represented a true Archaic manifestation, he also considered alternative explanations, including: (1) the sites were special function loci of a ceramic people; and (2) the sites were generated by the Spanish (Rouse 1952a:355). Rouse was faced with a phase defined on the basis of absence (ceramics) rather than presence (possible shell tools, pebble grinders, flakes, and hammerstones). The five sites which Rouse tested suggested a hunter-gatherer-fisher pattern of high mobility. Rouse termed the preceramic manifestation the Coroso tradition, after the type site near Cabo Rojo.

The preceramic tradition proposed by Rouse was given support by the work of Ricardo Alegría at Cueva de María la Cruz (also called Loiza Cave) in north-central Puerto Rico. Preliminary work in 1938 and subsequent excavations in 1954 resulted in the documentation of a clearly preceramic tradition underlying deposits of the Igneri (ceramic) phase. In addition to much ash, carbon, and faunal remains, the sparse assemblage included hammerstones, pebble choppers, utilized flakes, shell scrapers, shell plates, and the distinctive pebble grinder (Alegría et al. 1955).

While the understanding of the Archaic period in Puerto Rico must still be

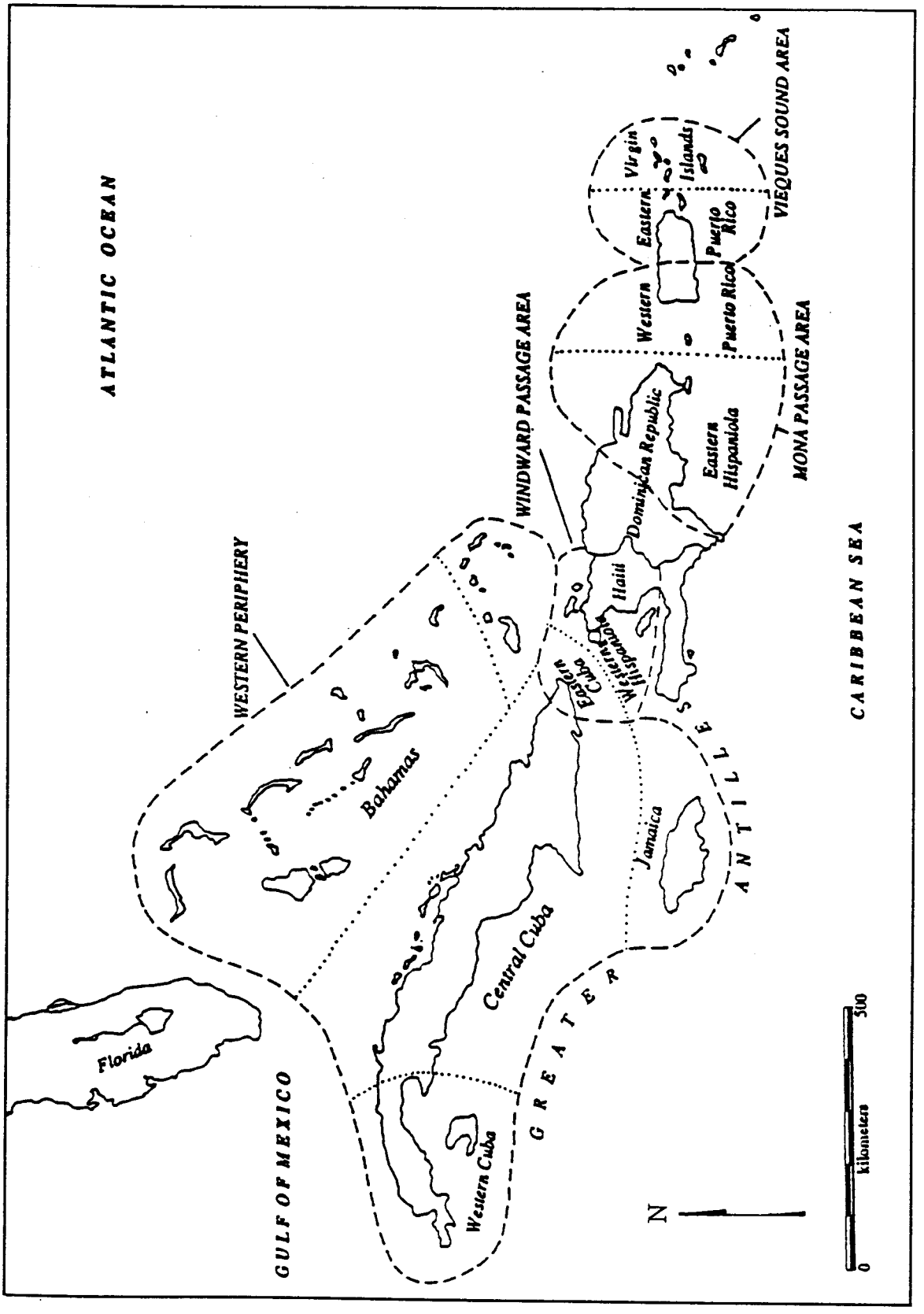

Figure 3. Cultural Areas of the Greater Antilles.

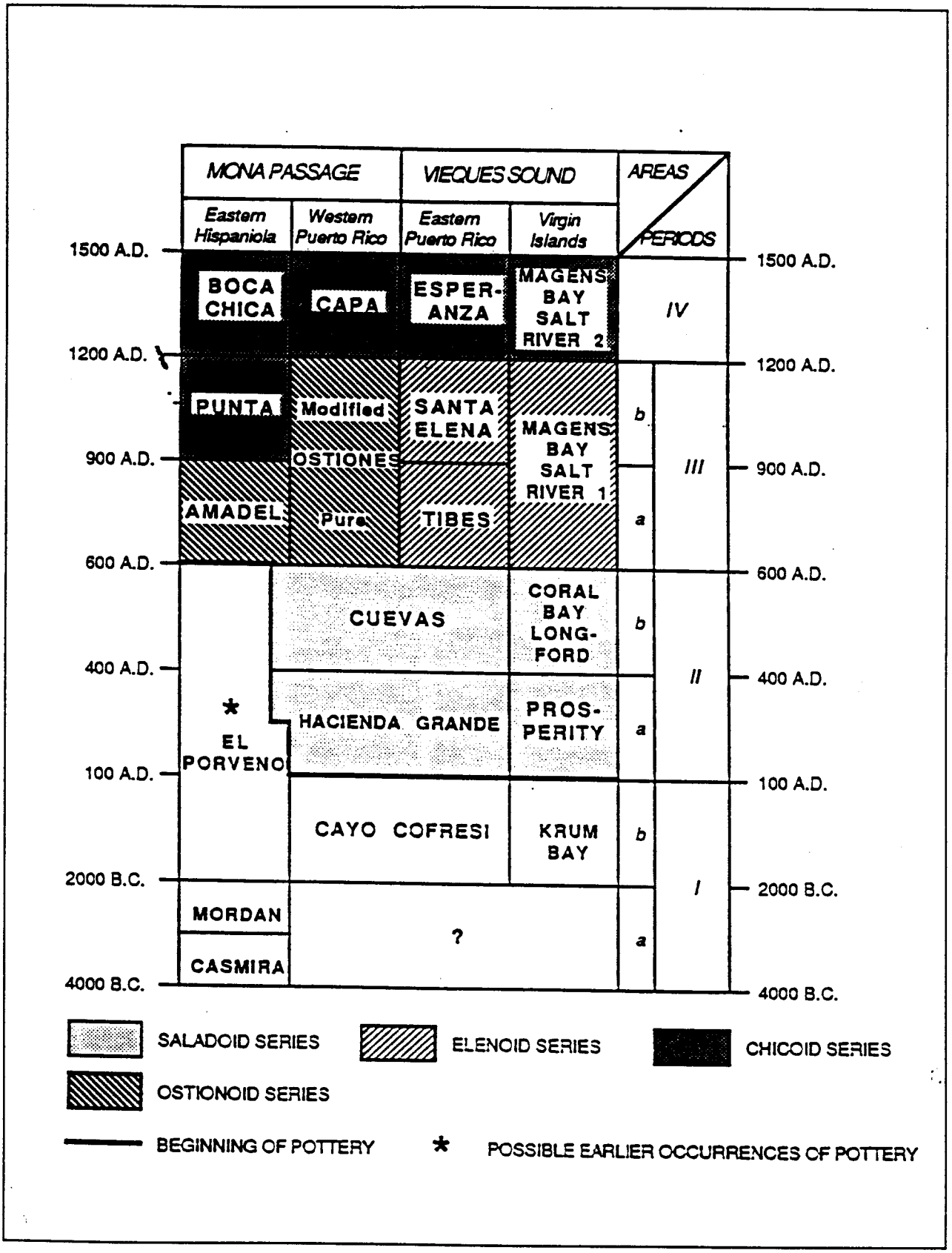

Figure 4. Chronological Chart Showing Culture Sequence Applicable to Puerto Rico (from Rouse 1982).

considered as in a developmental stage, certain attributes can be assigned to the Archaic. The population of the island during the Archaic probably consisted of local adaptations within a single, shared lifeway. The variations noted in the archaeological record apparently represent responses to specific microenvironments. In general, the present evidence indicates that the coastal strand was the preferred settlement location, with short forays into the foothills to exploit seasonally available resources and suitable raw material outcrops.

Cultural identity, interaction, and boundaries in Puerto Rico have been classically interpreted from ceramic remains. The ceramic period on the island is characterized by a number of temporally and regionally distinct manifestations; Carbone (1980a) and Rouse (1982) provide solid overviews of this period on the island. The advent of manioc cultivation apparently coincided with the appearance of ceramics, and hence the ceramic period occupations are characterized by a more sedentary settlement pattern and a more developed material assemblage. Within the eastern portion of the island, the prehistoric ceramic period is divided into the Saladoid, Elenoid, and Chicoid traditions. It should be noted that the typology of the Puerto Rican Ceramic Period tends to emphasize the ceramics of a particular phase in its purest form, with only minimal consideration of temporal-stylistic and geographical-stylistic transitions.

Saladoid (A.D. 100 - 600: Rouse's Periods IIa and IIb). The Saladoid manifestation in Puerto Rico (Rainey's Crab culture) includes the Hacienda Grande and Cuevas complexes. In general, the Hacienda Grande complex (A.D. 100 - 400) is marked by fine zone crosshatched incisions, white on red painting, or white filled incisions on red painting. D handles are characteristic of this complex, and graceful vessel forms are typical (Alegría 1965; Davilla 1979, as cited in Carbone 1980a). Rouse (1982:49) presents the following scenario:

> hemispherical) and simple decorative designs. Esperanza vessels werebetwe
>
> Painting was approaching its climax, with more colors and more elaborate designs than on the mainland. Modeling-incision, however, was on the decline... On the other hand, there were complex incised designs, characterized by zoned, fine line crosshatching.
>
> These decorative features gradually disappeared after the Saladoid series reached the Greater Antilles. Polychrome painting, modeling-incision, and incision were first to go, during Period IIa [Hacienda Grande]. White on red painting continued through Period IIb [Cuevas] but gradually degenerated and was gone by its end,

leaving only monochrome painting and simply molded face lugs. At this point we may say that the Saladoid series had come to an end.

The Cuevas complex (A.D. 400 - 600) was defined by Rouse (1952a:336-340) on the basis of the following ceramic traits, as seen at the type site Cuevas: (1) well-made, thin (5 mm average) sherds; (2) graceful vessel forms often with a reverse curve at the shoulder; (3) typically circular vessels (top view) with an inverted bell shape (side view); (4) thickened rims with an infacing bevel or lip; (5) D shaped handles; (6) flat or concave annular bases; (7) red painting limited to specific designs usually on the shoulder or lip bevel; (8) polishing; (9) polishing over painting; and (10) white on red painting on vessel exteriors only. Some of these traits obviously represent an evolution of traits from the earlier Hacienda Grande complex. Griddles are apparently more common in later Saladoid inventories.

Excavations by Luis Chanlatte Baik at the site of La Hueca on Vieques island have expanded the knowledge of Hacienda Grande culture and raised pertinent questions regarding the cultural affiliation of the agrarian tradition in Puerto Rico. The assemblage from La Hueca is distinctive to the degree that Chanlatte has postulated it may represent a separate culture. The traits exhibited at La Hueca include: (1) unpainted ceramics with zoned cross-hatched incising, modeled and incised figures as handles, and white painting within incisions; (2) amulets produced in zoomorphic and anthropomorphic forms from exotic stones; and (3) an extensive woodworking technology represented by shell and stone axes, adzes and other implements. These characteristics suggest to Chanlatte that the "Huecoid" and Saladoid peoples arrived in Puerto Rico contemporaneously, and that the subsequent Hacienda Grande style is a product of the intermixing of their ceramic traits: incising and modeling, and painting respectively (Chanlatte Baik 1979; Carbone 1980:A-41). Rouse (1982:49), however, argues that materials from La Hueca have not yet been augmented by other findings, and that La Hueca may be "a place where, for some reason, the Saladoid potters practiced only part of their total ceramic repertoire."

Two dimensions, time and space, must be considered in evaluating the transition from Archaic into Saladoid. If the spatial dimension is held constant (i.e., diachronic change in a single locale is examined), this transition was apparently quite rapid. The technological advantage of pottery and the subsistence stability afforded by manioc agriculture (where feasible) would have guaranteed the rapid acceptance of the Saladoid lifestyle. A rapid and clean change from the Archaic to the Saladoid pattern is evidenced by the general lack of sites occupied in both periods. Temporally, the transition appears to have been almost immediate. Spatially, however, the transition appears to have occurred from east to west, and, may have consisted of two distinct cultural groups merging within Puerto Rico.

Elenoid (A.D. 600 - 1200; Rouse's Phases IIIa and IIIb) Before characterizing the

material culture of the Elenoid period, it is appropriate to review recent views on the origin of this and the contemporaneous Ostionoid culture. Carbone (1980:A-43) summarized the situation as of his writing:

> The period between AD 600 and AD 800 to which the Late Cuevas complex is assigned is generally assumed to be transitional although the nature of this transition has engendered considerable debate. Whether there was an *in situ* development, which ultimately culminates in the Ostionoid tradition or whether the Ostionoid manifestation represents an actual migration of new peoples bringing with them new systems of reference (e.g. in ceramics, subsistence, settlement pattern and beliefs) has yet to be settled. Rouse believes in the former while Alegría asserts the latter. The answer is probably somewhere in between with both stimulus diffusion and environmental change being the possibly significant factors.

While earlier researchers (Rainey 1940; Alegría 1965) posited that the development of the Ostionoid culture was the result of a second wave of ceramicist migration through the Antilles, recent work has suggested a clear, direct evolutionary relation between late Saladoid and early Ostionoid material (Rouse 1982). Rouse's (1982:50) latest statement on the subject is unequivocal, as he argues:

> It is obvious that the Saladoid series must have developed into the Elenoid series in the Vieques Sound area and into the Ostionoid series in the Mona Passage area. The latest Saladoid pottery in both areas is virtually indistinguishable from the earliest Elenoid pottery in the former area and the earliest Ostionoid pottery in the latter area. From this common base, the Elenoid and Ostionoid series began to diverge in much the same way that two dialects become differentiated when their speakers cease to communicate closely because of geographic separation.

Not considered by Rouse is the potential implication of Chanlatte's hypothesized Huecan culture. Chanlatte has argued that the Huecoids evolved into the Ostionoid culture, basing his argument on their emphasis on modeling and incision, and complex stone working, all of which were also traits of the Ostionoid (Carbone 1980:A-41). A corollary of this hypothesis might be that the Elenoid culture evolved from the Saladoids, and hence the variation demonstrated by the Ostionoid and Elenoid assemblages may be the result of cultural evolution from two distinct groups, and not of cultural divergence from a common stock.

The Elenoid phase ceramics became cruder, thicker, and coarser than those

produced in the Late Cuevan. During period IIIa strap handles continued to be produced, but these had disappeared by period IIIb, leaving only vestigial ridges on the vessel wall. Serving and storage vessels became increasingly more upcurving rather than outsloping during this period, and were capped with cylindrical coils of clay. Red slip and polishing continued as a decorative motif during period IIIa but was abandoned by period IIIb. Red painted simple designs were present during both periods. Modeling and incision reappeared during period IIIb, but of a cruder, more rectilinear variety, than had been characteristic of the Saladoid (Rouse 1982:50).

Chicoid [Historic Tainol (A.D. 1200 - 1500: Rouse's Period IV) The last period of aboriginal occupation of Puerto Rico was characterized by two major variations within the Chicoid series: Esperanza and Capá. The two are associated with the Vieques Sound and Mona Passage cultural areas respectively. Esperanza apparently represents an acceptance of Chicoid decorative and ideological traits into the local traditions of the east, while the Capá presence may reflect an actual migration of people and the establishment of a few key settlements. To further confuse matters, there is a minor presence of the western Capá ceramics in eastern sites.

It is interesting at this point to consider Rouse's original explanation of the ceramic distributions of the Chicoid phase. The following remarks summarize Rouse's (1952a:354) concepts:

> Just as the Capá style may have developed from Ostiones, so it is believed that the Esperanza has developed from the Santa Elena. This is indicated not only by the coincidence of distribution of the two but also by the carry over of Santa Elena traits onto Esperanza pottery. In particular, the roundness of Esperanza shapes and the simplicity of its designs are grounds for concluding that it is in the Santa Elena tradition
>
> The shift from Santa Elena to Esperanza, like that from Ostiones to Capá, may have been touched off by the appearance of the Boca Chica style in Puerto Rico. The Cayito and Villón sites, where we found the latter style, are on the boundary between the respective areas of distribution of the Santa Elena-Esperanza and Ostiones-Capá styles. It would have been quite possible, therefore, for the Boca Chica style to have influenced the former development as well as the latter. The series of incised motives which are characteristic of the Esperanza style may be copies of the Boca Chica motives in the simpler form characteristic of eastern Puerto Rico and the Virgin Islands.

The Esperanza style ceramics, named for the type site on Vieques Island,

resemble the earlier Elenoid material in their vessel form (almost always simple hemispherical) and simple decorative designs. Esperanza vessels were sometimes red painted, most commonly all over the vessel, but the most prevalent decorative technique was incising. The incising is characteristically broad lined and widely spaced, and usually in patterns formed by pairs of parallel lines.

The aboriginal culture which the Spanish encountered on their arrival in Puerto Rico was a highly complex society. The population density in Puerto Rico has been estimated as anywhere between 30,000 and 600,000; Anderson Cordova considers the lesser figure to be the more accurate (Anderson Cordova 1980:B-3). At the time of contact the island was divided into a series of chiefdoms (*cacicazgos*) ruled by chiefs whose authority was hereditary. There is evidence to suggest that this society was undergoing the development of social differentiation, and that this process was terminated by the Spanish arrival. Settlements appear to have ranged from single structures to villages organized around ball courts which served as the focus for social and religious gatherings (Anderson Cordova 1980:B-5/7). Coll y Toste (1979:90) provides the following summary of village organization and appearance:

> El bohio del régulo, llamado *caney*, tenía configuración cuadrilonga con un pequeño pórtico, frente al *batey* o plazoleta; las de las demás indígenas eran circulares, y procuraban construirlas dejando un callejón entre ellas y dos calles prinicipales. [The ruler's house, called a *caney*, had a rectangular shape with a small porch, in front of the *batey* or small plaza; the houses of the other Indians were circular, and it was attempted in constructing the dwellings to leave alleys between them and two main streets.]

The subsistence strategy of the historic Taino focused on agricultural production, primarily of manioc, sweet potatoes, peanuts, beans, and fruits such as *jobo*, *guava*, *gaunabana*, *mamey*, and *papaya*. This was augmented by fishing and shellfish collecting (Anderson Cordova 1980:B-7/11). These strategies suggest that the preferred settlement system would have featured dispersed permanent villages within the coastal plain with collection sites located in the foothills and on the immediate coast.

Historic Occupation

This section considers the historic occupation of Puerto Rico, based on the material and chronological sequence presented by Joseph et al. (1988). Unlike the prehistory of the island, the historical chronology is not easily segmented by changing stylistic and cultural attributes. The scheme presented below is thematic in nature, with each period intended to represent a shared historical

and cultural tradition.

Contact and Conquest (1493 - 1600). Columbus was the first to reach the island of Puerto Rico, arriving on November 14, 1493 and christening the island San Juan Bautista (Morrales Carrión 1983:6). It was not until 1508, however, that the potential resources of the island were explored. In that year Juan Ponce de Leon and a group of settlers from Hispaniola reached the island, were received cordially by the *cacique* Agueybaná, and established a small settlement at Caparra, west of present day San Juan. This hospitality was not returned by the Spanish, who sought to establish additional settlements on the island, first in the area surrounding Caparra, then in the river valleys of Cibuco and Loiza, and then further west, near the present port of Aguada, where the village of Sotomayor was established. Settlement also expanded to the east, with the village of Daguao near the present location of Humacao (Anderson Cordova 1980:B-19/20).

Under the *encomienda* and *repartimiento* the Spanish settlers were authorized to "hold" the tribute and labor of designated Indian families, usually consisting of entire towns or even clusters of towns under the leadership of one *cacique*. The effects of this system were devastating to the Indian population. First, since the labor which the Spaniards valued was in the mines, village life was disorganized, men separated from women, and no effort was given to maintaining adequate agricultural production to support the native population. While the physical demands of labor in the mines was debilitating, it was probably famine which was responsible for the majority of deaths (Anderson Cordova 1980:B-16). Adding European diseases, to which the aboriginal populations had no immunity, to famine and forced labor, and the death toll which occurred in Puerto Rico during the first decades of the sixteenth century becomes understood. It is estimated that at the time of the Spanish arrival in Puerto Rico the native population was somewhere between 30,000 and 50,000. By 1511 the Spanish recorded only 5,150 natives (this number would not have included those living in the interior of the island), and by 1530 the population had decreased to 1,148 (Brau 1969; Fewkes 1907; Anderson Cordova 1980:B-18/19).

Resistance to the Spanish occurred early in the occupation. In 1511 an Indian war party under the leadership of Agueybaná II attacked the village of Sotomayor and burned it to the ground. This success was made possible by the element of surprise, and the Spanish retaliation was swift. Two hundred Indians were either killed or taken prisoner in an attack led by Ponce de Leon on the village of Agueybaná II (Anderson Cordova 1980:B-21). Although there were several other battles during the 1520s and extending up to 1564, the pattern of warfare became more sporadic, and the later attacks consisted primarily of raids launched from other islands. By the 1520s the Spanish presence on the island had solidified (Anderson Cordova 1980:B-22).

Although the Spanish were successful in securing Puerto Rico early in the sixteenth century, the position of Puerto Rico in the Spanish New World was relatively minor. The gold and silver resources of the island were already being depleted by the 1520s, and the Spanish population growth was stagnant during the first half of the century. Discoveries of gold and silver elsewhere in the New World made it difficult to attract permanent settlers to Puerto Rico, and the wish of many Spaniards in Puerto Rico was "*Dios me lleve a Perú*" (May God bring me to Peru) (Dietz 1986:6-7). The Spanish continued to cling to Puerto Rico, primarily because of the importance of the port of San Juan, which served as a critical link in the annual journey of the treasure fleet. San Juan became heavily fortified, and served as the population center, while much of the remainder of the island was uninhabited or sparsely inhabited. A second urban center was established in 1540 at San German, located along the southwest coast of the island, yet the government was unwilling to provide San German with the finances and fortifications lavished on San Juan, and the city was successively burned by pirates until finally retreating from its coastal settings and reestablishing itself in the hills in the interior southwest of the island in 1571 (Anderson Cordova 1980:B-25/27; Morales Carrión 1983:10-11).

The Spanish crown attempted to replace gold and silver with sugar in Puerto Rico, and at an early date offered incentives for this production. A Royal Decree of 1519 stated:

> It is the Catholic Queen's, my mother's and my will that the island of San Juan [Puerto Rico] be populated and planted like all the other farming lands belonging to this kingdom, and I urge you to encourage the people living there and have the room, to erect sugar mills, and for those who do not have a place to do so, give your help by lending them land from our hacienda estate to help them erect the mentioned sugar mills and also giving them freedom to enjoy the sharing of the land's bounty (Translation by Ana Burgamy from Brau 1969, cited in Anderson Cordova 1980:B-26).

While sugar was cultivated in relatively large quantities in Puerto Rico during the sixteenth century, sugar agriculture did not become the economic cure which the Spanish crown had hoped. Production in 1535 reached 10,000 pounds, increased to 450,000 pounds in 1582, but declined to 25,000 pounds by 1600 (Steward 1956, as cited in Anderson Cordova 1980:B-26). As Mintz (1986) observes, the failure of Spain to capitalize on sugar agriculture is surprising, but grounded in Spain's conception of the New World. Spanish settlement sought metallic riches through the short term exploitation of mines by native labor. The settlement plan was never for permanent occupation and an agrarian society. The capital available in the Spanish New World existed almost entirely of funds provided by the crown, and there was no mercantile class with money for investment which would have

been necessary for full scale sugar production. Trade relations established by Spain were extremely restrictive and authoritarian, and did not offer the sort of "free market" environment conducive to the growth of new enterprises. Finally, the majority of Spaniards in the New World were *conquistadores,* soldiers in search of fortune, and it would not be until the sixteenth century that the Spanish settlements took on a more stable nature. The fifteenth century was an era of quick riches taken by force, and fortified cities to support this effort (Mintz 1986:34-36). The fluorescence of sugar agriculture in the Caribbean would occur under Dutch and English colonization, and would be led by merchants, not soldiers (Mintz 1986:36; Dunn 1972). The Royal Decree of 1519 is thus of interest, since the implication, that Puerto Rico should become a settlement similar to Spain herself, was not supported by the reality.

Colonization and Stabilization (1600 - 1815.) The seventeenth and eighteenth centuries witnessed a steady increase in the population of Puerto Rico. From a meager 650 individuals in 1549, the island's inhabitants had increased five scale by 1646, and numbered 3,500 by this date (Anderson Cordova 1980:B-27). From the mid-seventeenth century onward this escalation continued. In 1700 the population reached 5,000; it then increased to 28,000 by 1759; to 44,883 in 1765; to 70,210 in 1770; and to 103,051 in 1787. By the end of the century the Puerto Rican population numbered 153,232 inhabitants (Anderson Cordova 1980:B-29; González Vales 1983a:45; Santana 1983:51). This population explosion in a sense qualifies as the true colonization of the island, and was the product of a number of factors.

By the mid-seventeenth century the Puerto Rican population was characterized as consisting of six groups. At the top of the hierarchy, but fewest in number, were the limited cattle herders and sugar planters of the island. Next in the social stratification, and far more numerous, were the official representatives of Spain in the New World. These included the royal Governor and other civil servants, but the bulk of this group was comprised of soldiers sent to man the fortifications of San Juan. Below this group came the isolated subsistence farmers, and the artisans and craftsmen of the island. The subsistence farmer most likely comprised the second largest segment of the island's population. After these were landless laborers, and finally, at the base of the economic scale, the slaves (Anderson Cordova 1980:B-28). Although Puerto Rico offered agricultural potential, especially for cash crop production, the majority of the islanders relied on subsistence farming and on the abundant natural resources of the land. Crops produced included plantains, bananas, rice, cotton, cassava, and maize, as well as small amounts of sugar cane grown by most farmers for their own use (Anderson Cordova 1980: B-27; Caro Costas 1983:35).

By the close of the seventeenth century the economic development of Puerto Rico continued to be stifled. Much of the arable land was employed as pasture, and

cattle owners who received royal grants to the use of this land were the most economically sufficient. Because of the restrictive trade policies imposed by Spain, there was a considerable amount of smuggling and illegal trade on the island, and most of the inhabitants were capable of supplying all of their needs through either self production or contraband (González Vales 1983a:42-43).

Much of the population increase of the mid- to late-eighteenth century can be understood through Spain's threatened position in the New World. Improvements on the fortifications of El Morro and San Cristabol in San Juan received 100,000 pesos yearly during the period between 1766 and 1771, with this amount increasing to 225,000 pesos after 1771 (González Vales 1983a:48). Thus large segments of the population consisted of stonemasons and laborers imported to work on these fortifications, as well as ever increasing numbers of soldiers. Other population increases came through deserters from the Mexican treasure fleet when it stopped in San Juan, and from fugitive slaves from various islands of the Caribbean (Santana 1983:51). Spain also appears to have recognized the value of true colonization of her New World acquisitions, and made such colonization more attractive by offering incentives. A reform of 1778 allowed foreign immigrants to settle in Puerto Rico, in return for their allegiance to Spain (Santana 1983:51). Trade restrictions were also relaxed, in an attempt to undercut the contraband trading, and a 1765 *cédula* opened seven additional ports to trade with the Spanish Caribbean (Santana 1983:52). Both of these actions made the Spanish Caribbean, and Puerto Rico, more attractive places to settle.

Perhaps the most significant factors toward producing economic change in Puerto Rico were the actions of other Spanish colonies in the New World. For example, Cuba, Venezuela, and Argentina were all demonstrating the economic potential of staple crop agriculture and pastoralism. Cuba's main crop was sugar, while Venezuela was dependent on cocoa, and Argentina found a lucrative market in the trade of hides and salted meat. Of the three, however, it was sugar in Cuba that drew the most attention. Production there increased dramatically, from 5,000 tons in 1760 to 8,160 tons in 1777, and to 15,423 tons in 1790. The Haitian Revolution and the collapse of the Saint Dominique sugar production of 80,000 tons a year skyrocketed prices and made the Cuban achievement so much more impressive (Santana 1983:56-57).

Yet Puerto Rico did not follow the example of Cuba, Venezuela or Argentina. Commenting on the situation in the late 1770s, Fray Abbad y Lasierra wrote:

> The farming of sugar cane is very common throughout the island: there is scarcely a farmer who does not have some portion of his land dedicated to this product, very few, however, make it their principal crop. The larger number of slaves needed and the great costs entailed in the establishment of a sugar mill, with the necessary

machinery, prevents the development of this crop (as cited in Santana 1983:56).

The actions of the remainder of the Spanish colonies were significant to the economic development of Puerto Rico in yet another way. Here the inaction of Puerto Rico in failing to emulate her neighbors worked to her advantage, and not against it. Beginning in 1810, a series of revolutions rocked the Spanish empire's continental colonies. Revolution was discussed in Puerto Rico as well, but never attempted. As a reward for loyalty, and a hedge against further rebellion, King Ferdinand II issued the *Real Cédula de Gracias* on August 10, 1815. The *cédula* contained sweeping reformations. There was a fifteen year permit to trade openly and directly with any port in which a Spanish consul existed, so long as the trade was carried by Spanish vessels. Perhaps most importantly, however, were the land reforms contained in the *cédula*. New immigrants were now to each be granted 170 acres free, and an additional 85 acres for each slave they brought to Puerto Rico. Land ownership and the redistribution of land which the *cédula* sparked was responsible for considerable economic activity in the following years (González Vales 1983b:93-95; Anderson Cordova 1980:B-30).

Toward an Agrarian Economy and Nationalism (1815 to 1897). One of the most immediate impacts of the *Cédula de Gracias* was the development of sugar plantations (*haciendas*) within the coastal plain of Puerto Rico. This land was underdeveloped in the early nineteenth century, with only 5.8% in cultivation in 1820. While the total amount of the littoral in cultivation increased only marginally during the century, reaching 14.3% in 1897, the amount of land devoted to sugar cultivation increased threefold during that period, while the increase in the total production of sugar was greater yet, expanding from 17,000 tons in 1820 to 62,000 tons in 1896 (González Vales 1983b:102-103). Technology played an important role in this increase during the later years of the nineteenth century, as sugar production became more and more consolidated, and sugar *centrales*, were found in greater frequency along the coast. Other crops remained important cash crop additions to the output of many subsistence crop farms, including coffee, cotton and tobacco. Of these, coffee was easily the most important, having been introduced to the island in 1736 and having increased in production since then. By 1818 Puerto Rico produced 70 millions pounds of coffee, while this number had increased to 120 millions pounds by 1830 (González Vales 1983b:103-106; Anderson Cordova 1980:B-31).

The development of the sugar industry in Puerto Rico was hindered by a number of factors. These included: (1) the lack of a financial base to provide the capital necessary to procure and support the technological apparatus of sugar processing; (2) the shortage of labor for the sugar fields; (3) high taxes imposed by the Spanish government; and (4) unfavorable commercial conditions as a Spanish colony (González Vales 1983b:104). These economic restrictions favored

the consolidation of larger and larger estates, as those *haciendas* of the period which were in operation made considerable profits, which could then be invested in further growth. This situation also favored the creation of the *centrales*, where the cane from small producers could be brought for processing and marketing. As time passed, land came to be held in fewer and fewer hands, and many of the inhabitants found themselves displaced. The early nineteenth century thus saw an increase in the population of the interior of the island, as displaced inhabitants from the coast moved inland and squatted on previously unoccupied lands (González Vales 1983b:105).

The sugar revolution saw an increase in the slave population of Puerto Rico, as labor was perhaps the most critical variable for successful sugar production. However, just as the lack of capital hindered the development of the technological elements of sugar production, lack of capital led to the purchase of fewer slaves in Puerto Rico than elsewhere in the Caribbean. In fact, at its peak in 1846, the slave population of Puerto Rico numbered only 51,000 individuals, and accounted for only 14% of the total population at that time. The abolition of the British slave trade made new slaves difficult to purchase at the same time the sugar *haciendas* were increasing in wealth. Sugar producers thus turned to free labor, and encountered difficulty coercing workers from this pool as well. Since both land and food were plentiful, and the interior of the island relatively isolated, most of Puerto Rico's landless preferred to live off the land of the interior rather than labor in the sugar cane fields. Perhaps as much as money, the lack of labor limited the growth of sugar plantations in the nineteenth century (González Vales 1983b:106).

With the shift in focus from subsistence to cash crop agriculture, the perception of the Puerto Rican landless changed. These individuals were now seen as resources who were evading their proper utilization. Since these people did not appear willing to volunteer for employment in the sugar fields, attempts were made to legally mandate this employment. In 1831 Governor Miguel López de Baños issued the *Bando de Polícia y Buen Gobierno* (Edict of Police and Good Government) which compelled all landless citizens to work on the *haciendas*. The *Bando* was not easily enforced, however, and failed to have much impact. More successful was the *libreta* (passbook) system established by Governor Juan de la Pezuela in 1849. This system required all landless laborers to carry passbooks in which their employer and the amount of time worked for that employer were recorded. Heavy fines and imprisonment were the punishments for failing to carry a registered passbook. This system was successful to a degree in forcing the landless to work on the *haciendas*, although as Bergad has noted it also led to an increase in the price of land and to increased purchases of small plots of land in the interior (González Vales 1983b:105-106; Bergad 1980:627-628).

Immigration, the growth of the sugar *haciendas*, the loosening of trade

restrictions, and the settlement of the interior, all made major transformations in the Puerto Rican way of life by the middle of the nineteenth century. The number of towns increased dramatically during this period, especially in the interior. San Sebastian was founded in 1820, Lares in 1828, and Gurabo in 1821. The inhabitants of these towns were different from the inhabitants of seventeenth-century Puerto Rico. Conspicuous among the town folk were merchants, often immigrants, who were frequently connected with large stores and shippers of the coastal cities. These merchants traded goods from the ports of the exterior, in exchange for coffee, cotton, sugar, and tobacco produced on the small farms of the interior. Other residents of the towns would have included government administrators, credit agents, artisans, service personnel, and laborers. The rural population was composed primarily of large land owners, their workers, and medium and small scale farmers. In general the population was wealthier than before, and more involved and effected by events outside Puerto Rico. The nineteenth century has been described as the period of the birth of Puerto Rico nationalism (Steward 1956:60; in Anderson Cordova 1980:B-33). It might also be described as the first century when Puerto Ricans recognized internationalism.

While the activities within Puerto Rico signalled a growing awareness of Puerto Rican culture and nationality, events occurring beyond the island served as the catalyst for reform in Puerto Rico. On February 24, 1895, Cuba revolted. The Cuban revolution threatened to spill over into Puerto Rico, and as a hedge against losing the island completely, the Spanish government granted Puerto Rico limited autonomy in 1897. However, United States sympathy for the Cuban Revolution, meshed with the desire to remove Spanish influence from the Western Hemisphere, and triggered by the sinking of the *U. S. S. Maine* in Havana harbor, brought the United States to war with Spain. Thus, only eight days after the autonomous Puerto Rican government took office, United States warships bombed San Juan (González Vales 1983c:120-125).

The nineteenth century is a critical century in Puerto Rican history. It witnessed the growth of Puerto Rican nationalism, the development of a true middle class, the rise of agrarian capitalism, the settlement of the interior, and significant changes in the population matrix. Yet for all the cultural transformations and historical events, it was also a century in which social and political changes were truncated by events.

The Second Colonization (1898 - present). Puerto Rico's entrance into the Spanish American War was quite rapid. On May 12, 1898, a fleet of seven warships under the command of Rear Admiral William T. Sampson opened fire on San Juan. Sampson hoped to surprise the Spanish fleet that had been sent to defend Puerto Rico, and believed he would catch them off guard in San Juan harbor. His barrage was unauthorized, but Sampson was eager to secure a military coup. Unfortunately the Spanish fleet had not reached Puerto Rico, and the American

bombs landed on the innocent and unsuspecting civilian inhabitants of the city. Chagrined, Sampson retreated. It was an inauspicious beginning (Morales Carrión 1983:129).

Despite the failure in San Juan, the United States was committed to removing the Spanish from Puerto Rico, and returned on July 3, 1898, landing 3,415 troops at Guánica. The American military were generally welcomed on their landing in Puerto Rico, and especially so along the southern coast. Resistance by the Spanish was limited and ineffective, and the Americans secured Puerto Rico well before the end of the war. Although not an issue at the onset, the U. S. policy during the peace negotiations called for the removal of the Spanish from the Western Hemisphere, and the cession of both Puerto Rico and Cuba to the U.S. The Treaty of Paris, signed on December 10, 1898, formally ceded Puerto Rico to the United States (Morales Carrión 1983:130-136).

Puerto Rico at the turn of the century was unfamiliar territory for the United States. One of the few Americans who knew the island, Robert T. Hill, wrote that Americans knew less of Puerto Rico than they did of Japan or Madagascar (Morales Carrión 1983:131). In 1898 the population numbered some 953,243, with a density equivalent to industrial New Jersey. Of this population, 61.8% was classified as white and 38.2% as black. There was some variation in place of residence by race. Whites made up 66.3% of the population in the mountains, whereas they only constituted 58.8% of the coastal population, an apparent outgrowth of the sugar plantation economy of the lowlands. Most of these inhabitants were small farmers, and most (93%) owned their farms (*fincas*). There were estimated to be 60,953 *fincas*, at the turn of the century, covering two million *cuerdas* (each *cuerda* being the equivalent of .97 acres). White owned farms averaged seven *cuerdas* in size, while farms owned by blacks were only three *cuerdas* on an average. Coffee had become the leading crop, with 122,358 acres producing 51,000,000 pounds worth 12 million pesos. Sugar followed, with 61,953 acres producing 126,000,000 pounds worth 4 million pesos (Morales Carrión 1983:137).

Coffee had become the leading cash crop of Puerto Rico in the closing decades of the nineteenth century. Most of the Puerto Rican coffee was sold in Europe. The American occupation thus did not bode well for coffee producers. Coffee was not produced in the United States, hence no protective tariffs were in place for this crop. As American dependents, the Puerto Rican coffee producers gained no advantage for the sale of their coffee in the U. S., and lost their favored status with regards to Spain. Puerto Rican sugar, on the other hand, had traditionally found its market in the United States (in 1897 61% of the sugar crop was exported to the United States; Anderson Cordova 1980:B-31) and sugar, as a product of the American gulf coast, received a favored status in the United States.

While the United States policy toward Puerto Rico was not well formulated prior to the invasion, two trends emerged following the Treaty of Paris. The first of these was the development of a paternalistic attitude by the Americans toward Puerto Rico. Puerto Ricans were viewed as not yet advanced enough in civilization and culture to fend for themselves. As Brigadier General Guy V. Henry wrote:

> I am getting in touch with the people, and trying to educate them to the idea that they must help govern themselves, giving them kindergarten instruction in controlling themselves without allowing them too much liberty (in Morales Carrión 1983:149).

The second trend, however, may have shaped the perceptions of the first. Once acquired, Puerto Rico was perceived as being the key to the continued U. S. military dominance of the Caribbean. Captain Alfred T. Mahan wrote of the island:

> Puerto Rico considered militarily, is to Cuba, to the future isthmian canal, and to our Pacific coast, what Malta is, or may be, to Egypt and the beyond; and there is for us the like necessity to hold and strengthen the one, in its entirety and in its immediate surroundings, that there is for Great Britain to hold the other for the security of her position in Egypt, for her use of the Suez Canal, and for the control of the route to India. It would be extremely difficult for a European state to sustain operation in the eastern Mediterranean with a British fleet at Malta. Similarly, it would be very difficult for a transatlantic state to maintain operation in the Western Caribbean with a United States fleet based upon Puerto Rico (in Morales Carrión 1983:135).

In this context the subsequent actions of the United States can be better understood. Puerto Rico under the U. S. was first administered by a military government. In 1900 the Foraker Law (also known as the First Organic Act) established a government for Puerto Rico comprised of a Governor and Executive Council appointed by the President, and a popularly elected House of Delegates (Anderson Cordova 1980:B-35). With this act paternalism prevailed, and provided the base for a United States military presence in Puerto Rico. Neither independent nor totally subservient, Puerto Rico was to be given an education in self government under U. S. tutelage.

Initially, the education seemed to be well taken. While coffee production suffered from the effects of the invasion and the San Ciriaco hurricane, sugar once again prospered. Coffee field workers in the early twentieth century were paid only 30¢ per day, and tobacco workers only 35¢, but the wages on the sugar plantations had increased dramatically, to 55¢ per day. Many of these plantations had in fact

evolved into sugar corporations, registered in the United States, such as the South Porto Rico Sugar Company of New Jersey, the Fajardo Sugar Company of New York, and the Central Aguirre Sugar Company of Massachusetts. Sugar prices increased during the first two decades of the twentieth century, reaching their peak between 1916 and 1919, and the economic success of the sugar industry spurred a general improvement in the island's economy. The population of the island also increased, from 1,118,102 in 1910 to 1,299,809 in 1920. Schools were rapidly expanded, and double sessions held in order to accommodate Puerto Rico's vast and youthful population (Morrales Carrión 1983:173-174). The statistics suggested boom time.

The economic increases of the early twentieth century did not favor all Puerto Ricans. While the corporatization of the sugar industry brought about higher wages, much of the profit garnered by these new firms went outside the island. Additionally, land came to be consolidated in fewer and fewer hands. By 1917, 477 corporations or individuals owned 26 percent of all rural lands, including the best crop lands. Their devotion to "King Sugar" came at the expense of traditional subsistence crops, and by 1945 Puerto Rico would import approximately 50 percent of all food stuffs. The corporatization of the sugar industry also saw the erosion of traditional relations between the *haciendado* and the sugar cane worker. Paternalism, which characterized earlier sugar production, gave way to a more strictly capitalist relationship. The sugar corporation dominated the civic and social life of the workers, yet provided no benefits or support during the off season. Coupled with the land consolidation, the sugar cane worker became tied to the cane fields on a year round basis, while only employed seasonally (Morrales Carrión 1983:217; Anderson Cordova 1980:B-37/38; Mintz 1974).

The Jones Act of 1917 granted Puerto Ricans United States citizenship, and also created a legislative body for Puerto Rico composed of an elected House of Representatives and Senate. The Governor and other key members of the government, including the Attorney General, the Auditor, and the Justices of the Supreme Court, were still appointed by the U. S. President. While these revisions provided a greater degree of self government to Puerto Rico, they were not sufficient to stem growing dissatisfaction with the American Government. A nationalist movement began during the 1920s, and its continued growth during the 1930s led to several episodes of violence, including the Rio Piedras Massacre of October 24, 1935, the assassination of Colonel Riggs of the insular police, and the retaliatory murders of several nationalists. However, the more popular political movement of the period was the *Partido Popular Democratico* (Popular Democratic Party) led by Luis Muñoz Marín. Backed by the rural farmers, and supporting a series of land reforms, the P.P.D. swept into power in the 1944 elections. The P. P. D. placed restrictions on the size of landholdings, purchasing property from tracts in excess of 500 acres; distributed some of these lands to the

landless inhabitants; and established government operated sugar mills which paid the highest wages on the island (Morrales Carrión 1983:251-261; Anderson Cordova 1980:B-39).

The P.P.D. balanced land reform with a move away from a strictly agrarian economy. "Operation Bootstrap" was unveiled in 1946, and sought to improve the welfare of the island through the process of industrialization. Industrialization occurred at a rapid rate in the following decades. In 1940 manufacturing had generated an income of $27 million; by 1969 the income from manufacturing was $908 million. The number of industrial facilities increased from 798 in 1940 to 2,367 in 1967. The income generated from industry surpassed that of agriculture for the first time in 1955, and has remained greater since (Morrales Carrión 1983:269-270; Píco 1974:300-301).

The post World War II era in Puerto Rico has brought considerable changes to the island. The migration of large segments of the population is perhaps the most important. During the twentieth century over two million Puerto Ricans have left the island in favor of residence in the United States. The population remaining on the island has largely transitioned from a rural to an urban style of life. In 1899 only 138,707 people, accounting for 14.6 percent of the population, lived in urban portions of Puerto Rico. By 1970 the urban population had reached 1,492,713 and accounted for 55.5 percent of the island's population. In terms of the island as a whole, the population has shifted from the west, and particularly northwest, sector of the island to the northeast. The most densely populated portion of the island is now the area surrounding San Juan, which includes sections, such as Santurce, with a population density of 75,000 per square mile (Píco 1974:229-233).

The twentieth century has witnessed major transformations in Puerto Rican society. Of these, perhaps the most significant was the segregation of Puerto Ricans. Several oppositions were created, or enhanced, by the events of the century. Rural vs. Urban, Interior vs. Coastal, Agricultural vs. Industrial; these are the key dichotomies which have shaped Puerto Rican life in the twentieth century.

HISTORICAL OVERVIEW OF THE PROJECT AREA

Both Area 1 and Area 2 were part of the municipality of Río Piedras until annexation within greater metropolitan San Juan in 1951. Río Piedras was one of the most important municipalities in the region, with a distinctive economy based on agriculture, with an emphasis on sugar cane production. River Río Piedras played an important role in this economy, being the main water supply to local *haciendas* and for human consumption.

There are few references to the Río Piedras area before the mid-eighteenth century. However, there are a few documents existing which do tell us something of the river, the people, and the Catholic Church which existed in the area at least by the mid-seventeenth century. In a description of the island of Puerto Rico by Don Diego de Torres Vargas in the year 1647, a river named Río Piedras flowing into San Juan Bay was noted as having excellent waters (BHPR, Vol. 4). During the same year, the church and the river of Río Piedras were mentioned in Constituciones Sinodales, written by Bishop Damián López de Haro. The Bishop decreed that the parishioners from Cangrejos Arriba and Cangrejos Abajo could attend mass at the church of Río Piedras, along with those from Quebrada, Sabana Llana, San Antón, Guadalcanal, Doña Aldonza and all the people living along the river banks from the estancia de Lorenzo Morcelo to the mouth of the river (López de Haro 1920:30-31).

The municipality of Río Piedras was founded in 1714. Apparently the town developed around an earlier small village, El Roble, in private ownership, before this date. The new municipality was built under the advocation of Our Lady of El Pilar (Junta de Planificación 1952:8).

Few documents were found relating to the first half century of the town's existence. In 1757, the government ordered the discontinuation of the *hatos*, large expanses of land used as a common cattle pasture by the local inhabitants of Río Piedras and several other towns in Puerto Rico. The *hatos* were broken up to allow the land to be divided into *estancias,* farms planted with several kinds of crops, and *haciendas* which specialized in the production of a single cash crop (Actas del Cabildo de San Juan, 1751-1760:169). In 1765, the municipality of Río Piedras, combined with the nearby municipality of Cangrejos, had a production of 63 horses, 33 swine, 27 goats, one mule, 132 cows and two donkeys (Actas del Cabildo de San Juan, 1751-1760:169).

By 1778, Río Piedras was described as a town with a Parish church and three houses on a plain beneath a small river. The majority of the 1369 inhabitants were scattered on farms in the surrounding country side. According to Agustín Iñigo, the town was located half a league (approximately 1.5 miles) from Martín Peña bridge. There were a number of sugar cane *haciendas* in the vicinity of Río Piedras by 1778, as well as 137 *estancias* and two *hatos*. Besides sugar cane, other crops grown in the area included cotton, coffee, and several kinds of tropical fruits, such as plantain and pineapple. There were 270 *cuerdas* planted in sugar cane, producing 4112 *arrobas* of sugar and 14,652 barrels of molasses. (A *cuerda* is approximately .97 acre, while an *arrobas* is equal to 25 pounds). There were 12,301 coffee trees and 965 cotton trees producing 3150 *arrobas* of coffee and 68 *arrobas* of cotton. Five hundred arrobas of rice, 614 of corn and 36 of tobacco were also produced. Still, the majority of land was used as pasture to raise beef

shipped to San Juan. Poultry was also important for local trade in the eighteenth century, as were fish collected from the river. Although the municipality had good soils and a steady supply of water, sugar production was only able to support a few small sugar mills, due in part to the scarcity of slave labor and lack of investable capital by the landowners (Abad y Lasierra 1866:119-121, 156).

Río Piedras witnessed a drastic period of population growth beginning in the early nineteenth century. Many immigrants arrived from Europe to settle in Puerto Rico, especially after the *Cédula de Gracias* of 1815. Among these new arrivals were Irishmen like Juan Nagle who established himself as a farmer in Río Piedras (Morales Carrión 1978:30). As early as 1803, several citizen of French origin, among them Francisco Senac, Carlos Monier and Juan Schaber had successfully established coffee plantations in the area (Actas del Cabildo de San Juan, 1798-1803:406). By 1812, population of the town reached 2,335 inhabitants (Colón Peña 1981:21).

Much of the agricultural success of Río Piedras in the early nineteenth century was dependent on slave labor. Two major slave revolts occurred in the area during this period. The first was in 1812, when slaves from the haciendas of Río Piedras mistakenly believed that freedom had been conceded by the Spanish Courts. The problem arose when Doña Josefa Giralt de Power, mother of the first *Diputado* at the Spanish Courts in Cadiz, received a letter from her son recounting growing sentiment towards emancipation. Power asked his mother to be the first to free her slaves in case the freedom act was approved. Slaves on the *haciendas*, believing freedom had been approved and was being denied to them, began a revolt under the leadership of the slave Antonio de Castro (Morales Carrión 1978:46). In 1821, a second slave rebellion, headed by Marcos Xiorro, began in Bayamón, but soon spread to Río Piedras, Guaynabo and other municipalities. The government of Puerto Rico blamed the Haitian government for these rebellions. Beginning with the Haitian revolution of 1804, Haiti was seen as a focus for slave rebellion throughout the Caribbean.

Like many other municipalities of the time, Río Piedras did not develop an urban zone until the nineteenth century. A few houses were centered around the parish church, while most of the inhabitants lived on farms in the surrounding country side. In 1825, Don Fernando Arús sold 10 *cuerdas* from his *hacienda* El Roble to the municipality of Río Piedras which would latter develop into the urban center of the town. The Catholic Church, which had fallen into ruins by this time, was reconstructed. A plan for the town was designed and lots distributed among the citizens (BHPR, Vol 12:183-189).

In 1831, Pedro Tomás de Córboda (1968:50) describes Río Piedras as covering 6 square leagues, bounded on the north by Cangrejos, on the south by Caguas, on the east by Trujillo and on the west by Guaynabo. Population of the municipality

had reached 3032 inhabitants.

A description of the river Río Piedras is also provided by Córboda (1968:50). He tells us that the river begins in the mountain named Morcelo and flows north into San Juan Bay in the area known as Puerto Nuevo. Usually the river was only two feet deep, but rose as high as 16 feet in times of flood. Córboda (1968:51) recounts how in the past the old wooden bridge near the urban area of Río Piedras was often flooded. In 1831, a masonry bridge was constructed across the Río Piedras by the government of Miguel de La Torre (Colón Peña 1981: 23). The new bridge is described as having three beautiful arches. This bridge is still standing and is located at the eastern edge of Area 2.

Commercial enterprise in the early nineteenth century continued to be dominated by agriculture. Important products included sugar cane, coffee, plantains, corn, sweet potatoes, rice, avocados, oranges and coconuts. In the third decade of the nineteenth century, there were 420 *cuerdas* planted in sugar cane, with 30 wooden sugar mills and 20 iron sugar mill in the municipality, producing some 8400 *quintals* of sugar, 18,000 quarts of molasses and 70 large barrels of rum. There were 200 *caballerias* dedicated to forestry and 60 to pasture.

The most important road in the area during the first half of the nineteenth century ran south from Martín Peña Bridge to the town of Río Piedras. Another important road, constructed in 1812, ran through Guaraguao Hills and Morcelo mountain to the municipality of Caguas. Yet another connected Río Piedras with Bayamón to the west (Córboda1968:51, 53-55).

Several important economic and technological changes occurred in the study area in the second half of the nineteenth century. The construction of the Carretera Central (Central Road) connected San Juan with Ponce, going through Río Piedras and several other municipalities. This road, following the general route of present day Highway 1, was a major step in the development of agriculture and commercial trade for the region (Castro Arroyo n.d.).

The municipality of San Mateo de Cangrejos, which bordered Río Piedras on the north, ceased to be an independent municipality in 1862. The lands were distributed among San Juan, Carolina and Río Piedras. Río Piedras received barrio Hato del Rey, one of the richest barrios in the region. Documents from the 1820s recount the importance of Hato del Rey as a agrarian center and major sugar producing area (Aponte Torres, page 22; Archivo General de Puerto Rico, Fonda Gobernadores Españoles, box 429).

In 1878, Don Juan Manuel Ubeda y Delgado describes Río Piedras as a municipality bounded on the northwest by San Juan, Carolina on the east, Trujillo Alto on the southeast, and Bayamón on the west. There were 9,612

inhabitants with seven public schools. The urban zone consisted of seven streets and a public plaza. Within the municipality, Ubeda mentions two sugar cane *haciendas* with steam mills and another with a mill driven by oxen (Ubeda y Delgado 1878:147-149). By 1894, Río Piedras had a population of 11,042. There were three sugar cane *haciendas* and 263 *estancias* in the municipality.

Drastic changes occurred in the agrarian foundations of Río Piedras in the twentieth century. The agricultural base of the economy changed as more of the municipality became more commercially oriented. By the middle of this century, the urbanized zone of Río Piedras covered 58% of the total municipal territory. The hydrology and topography of the area was severely altered by channelization, the diversion of rivers, road construction, and the filling of marsh lands for industrial development (USACOE 1980:16). On June 4, 1951, a referendum was enacted for the consolidation of Río Piedras into greater San Juan. It was felt at the time that consolidation would contribute to the development of both communities and ease administrative costs (Colon Peña 1981:36-37). By 1976, there were 128 industries in Río Piedras, producing such goods as windows, aluminum products, paints, photographic film, lamps and other electric equipment, pasteurized milk, butter and cheese, clothing, fiber glass, industrial machinery, and others.

Two nineteenth century developments in Río Piedras are of particular interest to the present cultural resource survey. These are the Hacienda San José, and the Río Piedras aqueduct. Standing structures in the southern portion of Area 2 are thought to relate to these properties. A brief summary of the history of each is provided below. Architectural descriptions of the structures are presented in Chapter IV.

Hacienda San José

Hacienda San José was one of the most important sugar cane plantations in the municipality of Río Piedras. The information presented below was assembled via an examination of available documentation, primarily Ferreras Pagán (1902:7-8) and Colón Peña (1981:31-33,78), and from the oral histories of local residents, conducted during the field phase of the investigations.

Hacienda San José is described as having been located south of Carretera Central, five minutes from the urban zone of Río Piedras. River Río Piedras passed from north to south next to the structures of the *hacienda*, and provided the waters needed for consumption, irrigation and sugar processing.

The *hacienda* was founded sometime in the 1830s by Don Alonso Andrade. The original sugar mill was powered by oxen. Some years latter, the *hacienda* was

acquired by Don José Solis. He, and latter his son Don Joaquín Solis, began to buy equipment in order to modernize the operation of the sugar mill. The new machinery was purchased from Don Ceferino Nevarez, and shipped from his Hacienda Media Luna in the municipality of Toa Baja. Other equipment was acquired from Hacienda Monserrate in the municipality of Dorado. This equipment included a Buchmans machinery system with cylinders measuring 5 x 26 feet, a multitubular caldron of 14 feet diameter, two clarifying pans, and a multitubular heater. The equipment also included a Jamaican train system of sugar processing and an Egroot still system.

The *hacienda* covered approximately 1,100 cuerdas, 500 of which were appropriated for growing sugar cane. Several structures were located on the hacienda, including a wood building used as a domicile, and a masonry building used as the mill.

Sugar production continued at the *hacienda* into the twentieth century. In 1902, approximately 200 *cuerdas* were planted in sugar cane, producing 300 large barrels of raw sugar. Seventy laborers were employed for the various activities of operating sugar processing equipment and farming (Ferreras Pagán 1902:7-8).

A new sugar mill was built on the Hacienda San José in 1912. It was located north of other principal *hacienda*s structures near the present day intersection of PR 1 and PR 176, in the area of the San José shopping center. The new sugar mill was originally named Central Vamina. The name was changed some years later to Central San José, in recognition of the original name of the *hacienda.*

Table 1 shows the sugar production of Central San José between 1913 - 1931 and 1945-1946. Like many other sugar producers in Puerto Rico, Central San José fell on hard times during World War I due to transitory sugar prices (Morales Carrión 1983:173). Prices again rose during the sugar bonanza between 1916 and 1919, but by 1922 prices again to drop.

By the mid 1940s, Central San José was in critical economic position, and placed under a trustee. The mill finally closed in 1946. In that year the Farmers Home Administration began promoting land sales of the old *hacienda* to small farmers. With the closing of San José, sugar cane cultivation gradually declined and ultimately disappeared from Río Piedras.

Many of the sugar cane fields of Hacienda San José were incorporated into the Estación Experimental Agrícola (Experimental Agriculture Station). The Station was established in Río Piedras in 1910 to promote investigations of tropical agriculture (Colón Peña 1981:78). The northern portion of study Area 2, north of PR 1, falls within these old fields. The latter sugar mill, Central San José, located

in the middle portion of Area 2 between PR 1 and the river, was demolished sometime after 1946. The area was ultimately landscaped and leveled with industrial fill.

Table 1. Sugar Production (tons) of Central San José, 1913-1931, 1945-46 (from Colón Peña 1981:31-33).

1913	12,006.88	1924	7,283.68
1914	7,224.25	1925	12,005.00
1915	5,224.25	1926	11,449.43
1916	10,464.75	1927	11,170.00
1917	10,543.00	1928	10,188.00
1918	12,135.25	1929	9,731.12
1919	11,733.25	1930	14,544.00
1920	12,921.50	1931	11,370.00
1921	11,762.38	1945	15,741.00
1922	9,161.50	1946	12,181.00
1923	5,944.50		

Architectural features on buildings present in the southern portion of Area 2 suggest at least two structures remain of the old, nineteenth century Hacienda San José. These include an octagonal chimney made of brick connected to a masonry building of brick and stone. This masonry building, and another of similar design present within the complex, are well preserved examples of the Neoclassical architectural style adopted as the official style for public and other important buildings in Puerto Rico during the nineteenth century. The architectural style and materials used in the construction of these buildings are typical of the middle of the nineteenth century.

Other structures in the complex show architectural styles popular in the late nineteenth and early twentieth centuries. Of particular interest are the water reservoir and standing structures thought to be related to a water system constructed in the last decade of the nineteenth century. A brief history of the architectural and constructional features present in the southern portion of Area 2 is presented below.

The Río Piedras Aqueduct

Ever since the beginnings of Spanish colonization on the north shore of Puerto Rico in the sixteenth century, waters from the Río Piedras were considered excellent for human consumption. Old San Juan, located next to the sea, has always suffered from the lack of fresh drinking water. In the early periods of Spanish occupation, water from the Río Piedras was collected in containers and shipped to Old San Juan.

As early as the mid-1800s, construction of an aqueduct in Río Piedras to bring fresh water directly to old San Juan was considered. Plans for the aqueduct were drawn up by engineers Juan Manuel Lombrera and Carlos Blume. The aqueduct was to function by gravity and have a capacity of 4,000,000 quarts daily, serving some 40,000 people in the municipalities of Río Piedras, Cangrejos and San Juan. Economic problems delayed the construction of this early aqueduct. The original plans were revised by Timoteo Lubelza in 1874. Again construction was delayed. Finally, in 1896, water reservoirs were constructed along the river in Río Piedras. Pipe lines leading north into San Juan were installed between 1897 and 1898 (Hostos 1983:497-482).

PREVIOUS RESEARCH

A review of the Puerto Rican site files show no known or reported prehistoric sites in the project area. Relatively few archaeological investigations have been conducted in the vicinity of the project area. Archaeological research in Old San Juan is reported in Solis Megana (1984) and Pantel et al. (1986 B-1, 11). While there has been recent systematic data recovery of prehistoric and historical materials from sites along the shoreline in Old San Juan (Garrow & Associates 1987) and in Condado, the results of these investigations have not yet been reported.

Perhaps the most substantial archaeological work yet reported in the San Juan area of Puerto Rico is the survey by Carbone and Nielsen (1976) and subsequent excavations by Pantel (1979) at Fort Buchanan. These investigations resulted in the recovery of prehistoric materials from sites located in relatively inaccessible areas undisturbed by subsequent urban development, including rock shelters, crevasses and caves.

It has been suggested that the valley surrounding Fort Buchanan was better suited for prehistoric occupations partially dependent of manioc cultivation than the Río Puerto Nuevo/Río Piedras area (USACOE 1980:14). This interpretation is based on soil characteristics of both areas. Soils in the Fort Buchanan area are derived from local limestone formations, and are richer and more easily cultivated, given their natural friability. Soils in the present project area, including the Toa series, are probably totally derived from volcanic material and are less well suited to aboriginal farming techniques. These considerations led the authors of the reconnaissance survey of the Río Puerto Nuevo project area to conclude the present "project area is one of low potential for prehistoric resources" (USACOE 1980:15).

The reconnaissance level survey of the Río Puerto Nuevo Flood Control Project Area, conducted and reported by the Mobile District, Corps of Engineers (1980:6), concentrated efforts in three major areas of investigations; (1) land north and south of the Río Piedras then being developed as Las Americas Park (including what is now our Area 1); (2) the area comprising the Agricultural Experimental Station and Botanical Gardens (our Area 2); and (3) the northern part of the project area encompassing the land north of Margarita Canal and the diverted Rio Puerto Nuevo.

After a boat trip down the northern sector of the project area confirmed that Area 3 had been disturbed by recent land fill and manmade landscapes, further terrestrial survey was deemed unnecessary in that section. In the first section (our Area 1), the reconnaissance survey covered areas south of the Río Piedras on lands being developed as Las Americas Park. Most of this area had been disturbed by grading and landscaping. A pedestrian survey was conducted, during which time deep profiles exposed by pipeline trenches were examined. No cultural resources were recovered. The area north of the Río Piedras in Las Americas Park was not covered during the reconnaissance survey. The reconnaissance survey in the southern section of the project area (our Area 2) consisted of a title search of property encompassed within the Agricultural Experimental Station, and oral interviews relating to the standing structures present within this area. Pedestrian survey of the project area was thwarted by heavy vegetation (USACOE 1980:22-23).

Recommendations presented by the original reconnaissance survey included the following:

> (1) Future cultural resource survey should include only those areas of, and contiguous to, Toa soils. Two such areas existed. The first is located south of the Hiram Bithorn Stadium. The second includes the large field east of the University of Puerto Rico Agricultural Experiment Station;
>
> (2) Additional historical and archival research was recommended to clarify historic land use within the project area;
>
> (3) Further work was recommended in order to mitigate potential impact on a nineteenth century bridge and dam, present in the southern portion of the project area (the bridge was subsequently excluded from the present project area); and
>
> (4) It was recommended that construction activities avoid standing structures associated with the old "power plant", which was considered eligible for inclusion in the National Register of Historic Places (USACOE 1980:24-25).

III. RESEARCH DESIGN AND METHODOLOGY

RESEARCH DESIGN

This project was conducted under a general research design that was prepared for Puerto Rico and the Virgin Islands and detailed in Garrow & Associates' technical proposal for the Jacksonville District open-end contract (Garrow & Associates, Inc. 1988A:12-15). Four general research areas were delineated in that proposal that could be applied to reconnaissance, survey, and data recovery level investigations. Those research areas are briefly discussed below.

Settlement Studies

The major use of reconnaissance and survey data is to determine the distribution of archaeological resources across the landscape. Such data can be utilized for a synchronic, spatial analysis to examine how groups of a single phase adapt to a range of natural settings. The results can also be used to address diachronic change in settlement to determine how cultures of a specific setting evolved in response to changes in the natural environment and cultural atmosphere. The basic underlying premise of such research is that settlement location will be predicated by the pattern of natural resources, the organization of culture, and the subsistence focus. The distribution of smaller, non-village sites is poorly documented in Puerto Rico and the Virgin Islands, and a significant portion of the settlement pattern is not well understood. Before archaeology can move toward explaining major cultural change (e.g. the development of hierarchal chiefdoms and concomitant ritual public works), it is necessary to document the full settlement sphere.

Major areas of diachronic change in settlement are expected when manioc cultivation becomes a major subsistence strategy, when complex societies arise, when European intrusion causes dispersal and refugee strategies, when the conquering of the Indians opens the backcountry for European settlement, when major sugar plantations cluster the population in rural centers, when family coffee production becomes economically important, and when industrialization draws populations to focal cities. In addition, settlement patterns probably were altered in response to extra-insular influences. Synchronic variation in settlement should be related to environmental potential of various island zones, although the organization of the various island cultures would also have had an impact.

Settlement patterning can also be understood at the site level, by examining the relations of individual structures and features to one another. Such analyses

provide useful information for the interpretation of past cultural systems. The relation of refuse dumps to living areas; of ceremonial structures to residences; of elite occupations to the workers; and of technical to domestic spheres, all provide insights to the cognitive aspects of extant cultural systems.

Stylistic/Ethnic Variation, Borders, and Mixing

The culture history of Puerto Rico and the Virgin Islands has been interpreted as a mosaic of diverse cultural influences entering the island from different sources and with different results. As such, the prehistory and history of the islands provide an excellent context for the study of culture contacts and dynamics. While an elementary culture history has been generated which covers portions of the islands, it is important to fill in the gaps in the record and document the manifestations of the border areas. Ethnographers have recognized that the character of cultural mixing (as demonstrated in material culture and, therefore, the archaeological record) is dependent on a number of factors including the social organization of both cultures, the subsistence base of both cultures and their efficiency in the areas in question, and the population of both groups. Additionally, major factors involved in the European-Indian contact were weaponry, mobility, and resistance to non-native diseases.

The results from reconnaissances, surveys, and mitigations in different areas of the islands can provide pieces of the puzzle for recognizing cultural boundaries. Furthermore, if the analysis of materials is conducted with an emphasis on cultural markers (e.g. surface motifs and ceramic paste characteristics), surveys and reconnaissances can address culture contact in specific areas. Explicit awareness of this research avenue is necessary if these proposed projects are to fill their archaeological potential.

Vernacular Architecture and Disappearing Structures

A research sphere that is often downplayed in the preliminary stages of cultural resource management is the documentation of vernacular architecture. Recent surveys and reconnaissances on the islands have often ignored standing structures or ruins unless they are part of large, well-documented *haciendas* or plantations. The possibility is strong that significant examples of isolated vernacular structures have been sacrificed to development because they were not carefully documented by archaeologists. Historic structures are cultural resources and must be carefully documented.

The architecture of the islands reflects their diverse culture histories. Spanish, Danish, native American, and African traditions, among others, are all anticipated to have influenced the vernacular architecture of Puerto Rico and the Virgin Islands. Additionally, minor American input was realized after the turn of the century. The buildings cover a range of functional types including single

family homes, *hacienda* complexes, sugar industry complexes, coffee plantations, and fortifications and military structures. The surviving buildings represent functional adaptations to unique island needs, expressed in a mixed cultural/vernacular tradition. As with the documentation of artifact style distributions, the recording of the spatial and temporal variation in house types will allow for questions of cultural interaction to be addressed.

Site Formation and Preservation Factors

While it is important to utilize archaeological data to address cultural processes, mitigation, survey and reconnaissance results can also be utilized to generate a detailed interpretation of the natural and cultural factors responsible for differential site preservation on the islands. It is important that each project critically evaluate the factors which may have served to prevent or promote site preservation in that particular area. The eventual outcome of such studies will be a management tool of high utility, which will also allow planners to predict areas in which well preserved sites are most likely present.

An awareness of site formation processes will also prevent misinterpretation of survey results, such as occurred at El Bronce in Puerto Rico. At that site, factors such as colluvial movement of soils, heavy historic plow disturbance, and sheet midden development patterns were not adequately addressed at the survey level. As a result, project planners were forced to modify their scope when unexpectedly rich deposits were discovered. As a growing corpus of site formation data is built through surveys and reconnaissances across the islands, it will be possible to critically evaluate the discovery methods currently in use. The ultimate goal of this research -- beyond generally characterizing the site formation processes in various environmental settings -- is to provide a means for the more efficient discovery, evaluation, and protection of the islands' cultural resources.

METHODS

As outlined in the proposal by Garrow & Associates, Inc. (1988b) to perform a Cultural Resource Survey within the Río Puerto Nuevo Flood Control project area, the work conducted as part of these investigations was completed in two phases. The initial phase of the investigations consisted of a literature and records search for previously recorded sites in the vicinity of the project area. The methods employed in the literature and records search followed procedures detailed in Garrow & Associates, Inc.'s proposal for the open end contract (Garrow & Associates, Inc. 1988a:20). The purpose of the literature and records search at the reconnaissance level of investigation is to provide a general indication of what resources may be present in the study area, as well as to document previously recorded archaeological sites. The Puerto Rican archaeological site files at the

State Historic Preservation Office in San Juan were examined for the study area, as well as previous investigations in the area. Environmental materials, including vegetation maps and soil surveys, were examined. Historical documentation at the Archivo General de Puerto Rico was also consulted. In addition, informal interviews with local residents of the study area were pursued during the investigations in order to gather information on the general history, land use, known sites and natural conditions of the project area.

No previously recorded archaeological sites were present in the project area. Site specific information was collected on properties in the southern portion of Area 2 when it became apparent that the project area encompassed standing structures potentially eligible for nomination to the National Register of Historic Places.

The archaeological fieldwork consisted of a Cultural Resource Survey, the goals of which are defined (USCOE 1980:2) as:

> An intensive, on-the-ground survey and testing of an area sufficient to determine the number and extent of the resources present, their cultural and scientific importance, and to estimate the time and cost necessary for preserving, recovering, or otherwise mitigating adverse effects on them.

The Scope of Work has modified this definition, and the Cultural Resources Survey is expected to "evaluate identified sites for nomination to the NRHP." The "survey" level of effort is normally employed after a cultural resource is identified, and combines most elements in what is generally referred to as "archaeological testing". Because no known archaeological sites were present in the present in the project area, a strategy of both site identification and assessment was employed.

Because vegetative cover on each area largely precluded the use of surface survey techniques, shovel tests were used to identify the distribution of subsurface archaeological resources. Two shovel test intervals were proposed. Shovel tests used for site identification were excavated on 30 meter intervals in areas which lacked parking lots, roads, or structures. Once a site had been identified, shovel testing at 10 meter intervals in order to identify site boundaries, and one or more 2x2 meter units within each site were proposed. However, this latter strategy was not used, as no subsurface archaeological sites were identified.

Shovel tests, excavated using a shovel or post-hole digger, measured at least 25 x 25 cm square. Tests were located by paced distances at 30 meter intervals along pedestrian transects when surface terrain and vegetation allowed. Fill was screened through .25 inch wire mesh, and dug to sterile subsoil or 0.5 meters. Artifacts were bagged by depth below surface and soil zones within each

individual shovel test. A running log was compiled, recording observations on slope, visibility, vegetation, land use, soils, and other transect conditions. Soil descriptions were made of each test using a Munsell color chart. The location of each shovel test was mapped in relation to other features in each of the project subareas.

Documentation of standing structures over 50 years of age included taking 35 mm black and white photographs and color slides of general structure layout, unique construction details and engineering aspects, as well as structure interiors. A sketch map showing the relative relation of each structure was also made. Because the structures in question were presently occupied, no subsurface archaeological excavations were conducted immediately adjacent to structure foundations.

The results of these investigations are presented in Chapter IV. Specific recommendations for each observed cultural resource are presented in Chapter V.

IV. RESULTS OF INVESTIGATIONS;

AREA 1

Area 1, the northernmost section of the project area, consists of approximately 28,284 square meters (2.8 hectares or seven acres) situated on the east bank of the Río Piedras at its confluence with Quebrada Dona Ana (Figure 5). This area is located immediately south of the parking lot of the Coliseo Municipal Roberto Clemente and the Estadio Municipal Hiram Bithorn, just west of *barrio* Puerto Nuevo. Elevations range from approximately 7.5 feet AMSL in the northwestern corner of the project area, to approximately 4.9 feet AMSL over the majority of the project area. Elevation on the Río Piedras is approximately one foot AMSL. Topographic maps indicate a relict river channel of the Río Piedras surrounding the study tract. This, and the linear course of the present river course, indicate the Río Piedras and Quebrada Dona Ana have been previously channelized at this location. Area 1 is presently being developed as part of the Parque de Las Américas (Las Americas Park). Work conducted at this location included a surface inspection, several shovel tests excavated in order to confirm the presence of land fill in disturbed areas, and two shovel tests an area not covered by land fill.

The reconnaissance level investigation of the Río Puerto Nuevo Flood Control Project, conducted in 1980 by the U.S. Army Corps of Engineers, Mobile District, describes conditions and work conducted in what is now considered Area 1:

> In the middle sector a good picture of the nature of the soils and potential for cultural resources were provided by the ongoing construction activities associated with the development of the Las Americas Park. Most of the area south of the Rio Piedras was totally disturbed by grading and landscaping activities and a number of deep profiles were exposed by pipeline trenches. No cultural material was found any where on the site and the heavy nature of these clayey Bajura soils (Table 4) was confirmed. The area north of the Rio Piedras was not surveyed. This area contains a small tongue of a soil unit mapped as part of the Toa series. If any channelization work is contemplated for this segment of the project area, this area should be subject to shovel test pitting to determine the presence or absence of cultural materials (USACOE 1980:21).

In the eight years following the initial survey, the area north of the Río Piedras as also been developed as part of Las Americas Park. The majority of the area

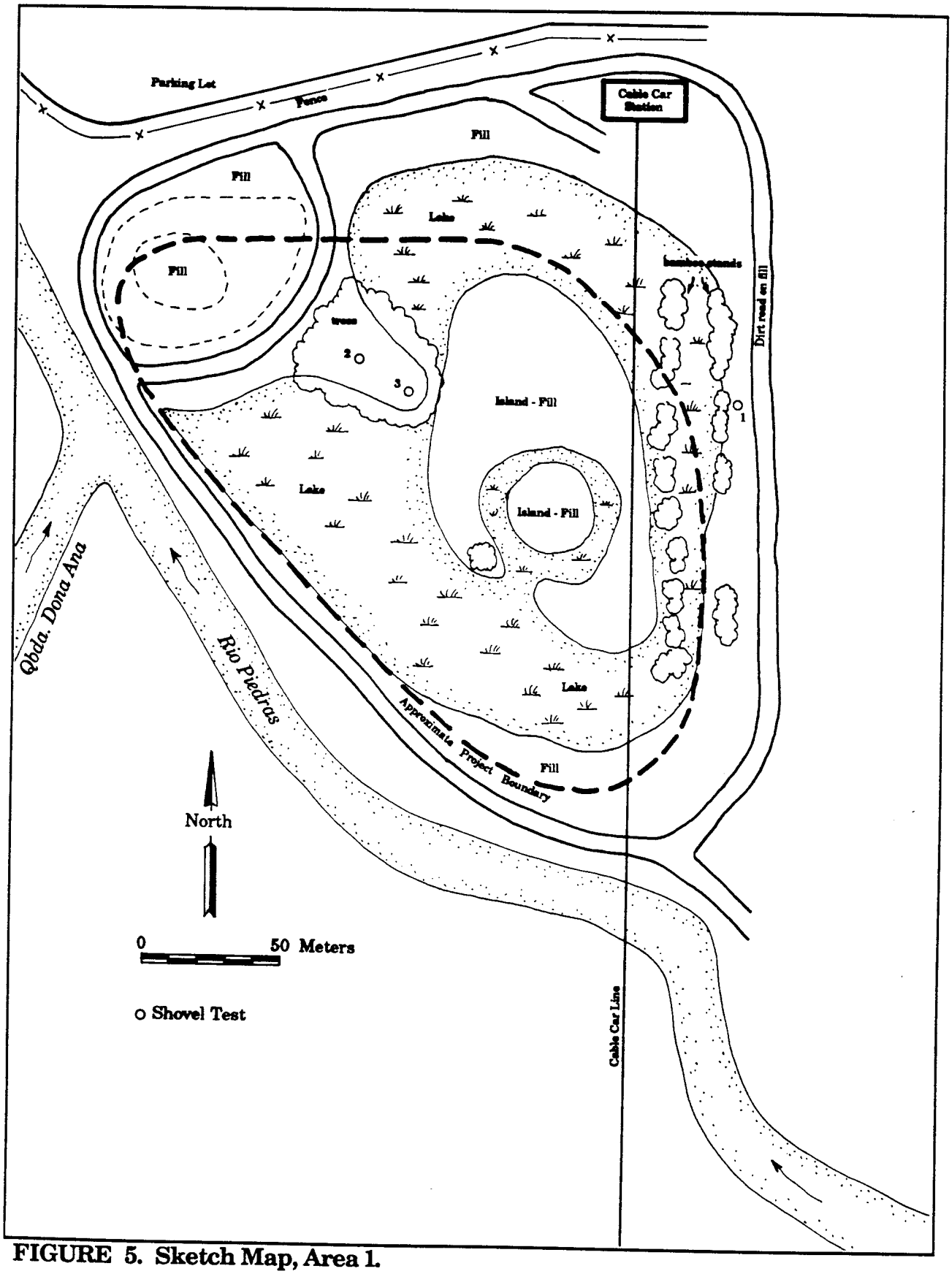

FIGURE 5. Sketch Map, Area 1.

(incorporating the relict river channels) has been turned into a a circular lake which supports attractive aquatic vegetation (Figure 6). A cable car terminal has been constructed at the northeastern corner of the project area which connects with the main terminal south of the river. Photographs of the project area taken from the cable car show how landscaping and filling have created an island within an island in the center of the lake (Figure 7). Observations from the air and on the opposite bank indicate the islands consist of fill dirt. This area will presumably be planted with scenic vegetation.

The soil survey indicates a small area of Toa series soils along the north bank of the Río Piedras. Unfortunately, the entire peripheral area surrounding the lake has also been covered with fill dirt (Figure 8). The fill was used to construct a dirt road along the right bank of the river, continuing around the edges of the lake. This area offered good surface visibility. Surface inspection and shovel tests indicated only twentieth century materials in the fill.

In the northern portion of Area 1 a small tongue of land, measuring approximately 50 x 25 m projected towards the southeast into the lake. This area is heavily wooded with bamboo, hardwoods and a dense understory vegetation. Two shovel tests 30 meters apart at the northwest and southeast end of the land form were excavated. The stratigraphic profile of Shovel Test 2 indicated 0-22 cm compact dark brown (10YR3/3) clay with platey structure and some charcoal mix. A modern glass marble was recovered approximately 10 cm below surface. This stratum, representing a horizontal continuation of modern land fill concentrated to the west, overlies a friable, subangular blocky brown to dark brown (10YR4/3) clay with common very dark grayish brown (10YR3/2) clay mottles to a depth of 50 cm below surface. Shovel Test 3 was also excavated to 50 cm below surface. The same friable dark brown clay with very dark grayish brown clay mottles revealed in Shovel Test 2 was present the entire profile of Shovel Test 3. No artifacts were recovered from Shovel Test 3.

It is difficult to measure the depth of land filling that has taken place at this location. Judging from the differences in elevations shown on aerial photographs provided by the COE, obvious fill deposits in the northwestern portion of the project area are approximately 2.5 feet higher than the adjacent finger of uncovered soils investigated by Shovel Tests 2 and 3. These photographs are outdated, however. Field inspection suggests the depth of fill is closer to 2 meters. Much of this fill could have originated from river dredging.

In any case, it appears highly unlikely significant cultural resources exist in Area 1, given its natural low lying terrain, previous channelization and recent construction, land filling and landscaping.

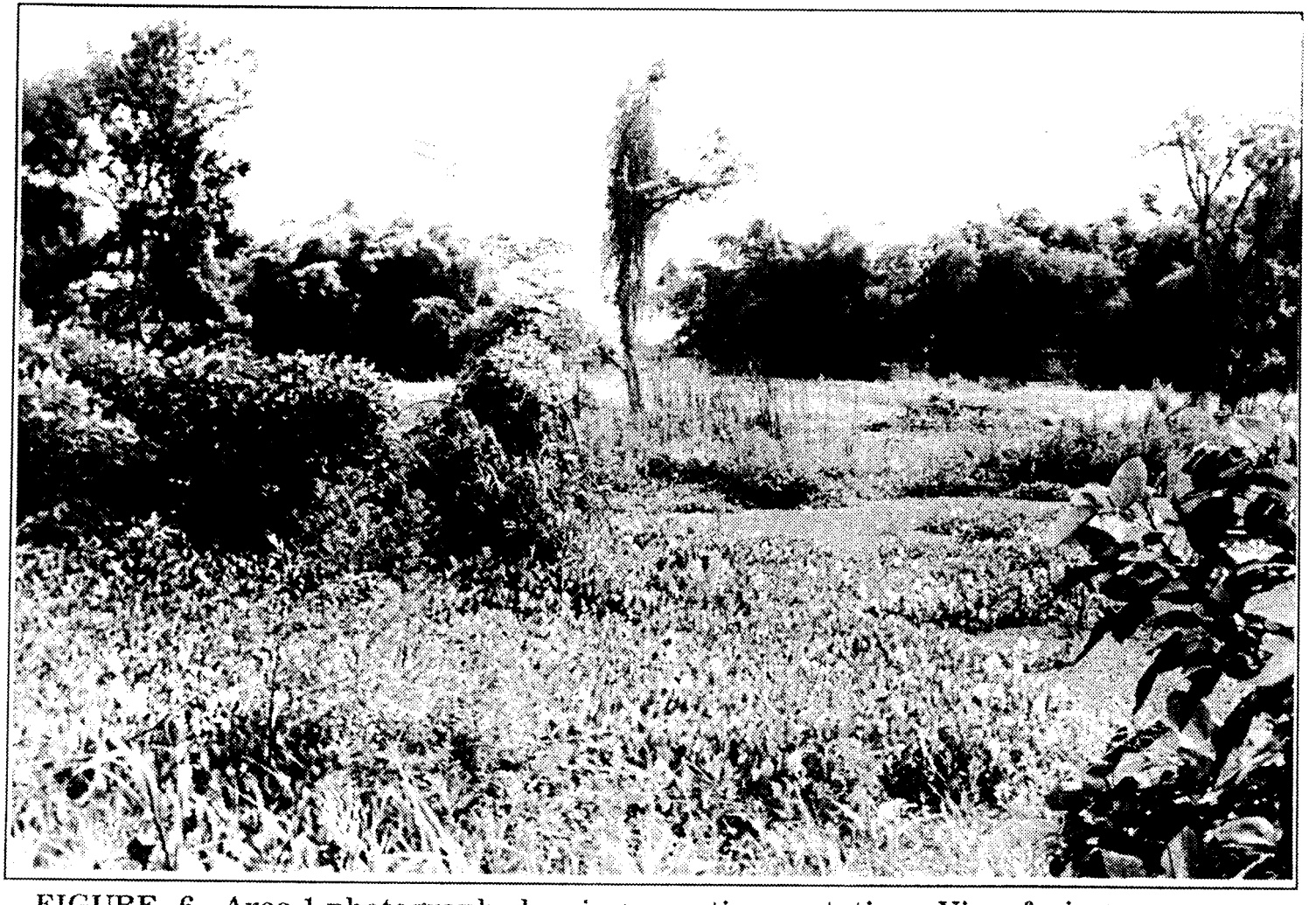

FIGURE 6. Area 1 photograph showing aquatic vegetation. View facing northwest.

FIGURE 8. Area 1 photograph, showing Río Piedras and western portion of the project area. View towards the northwest.

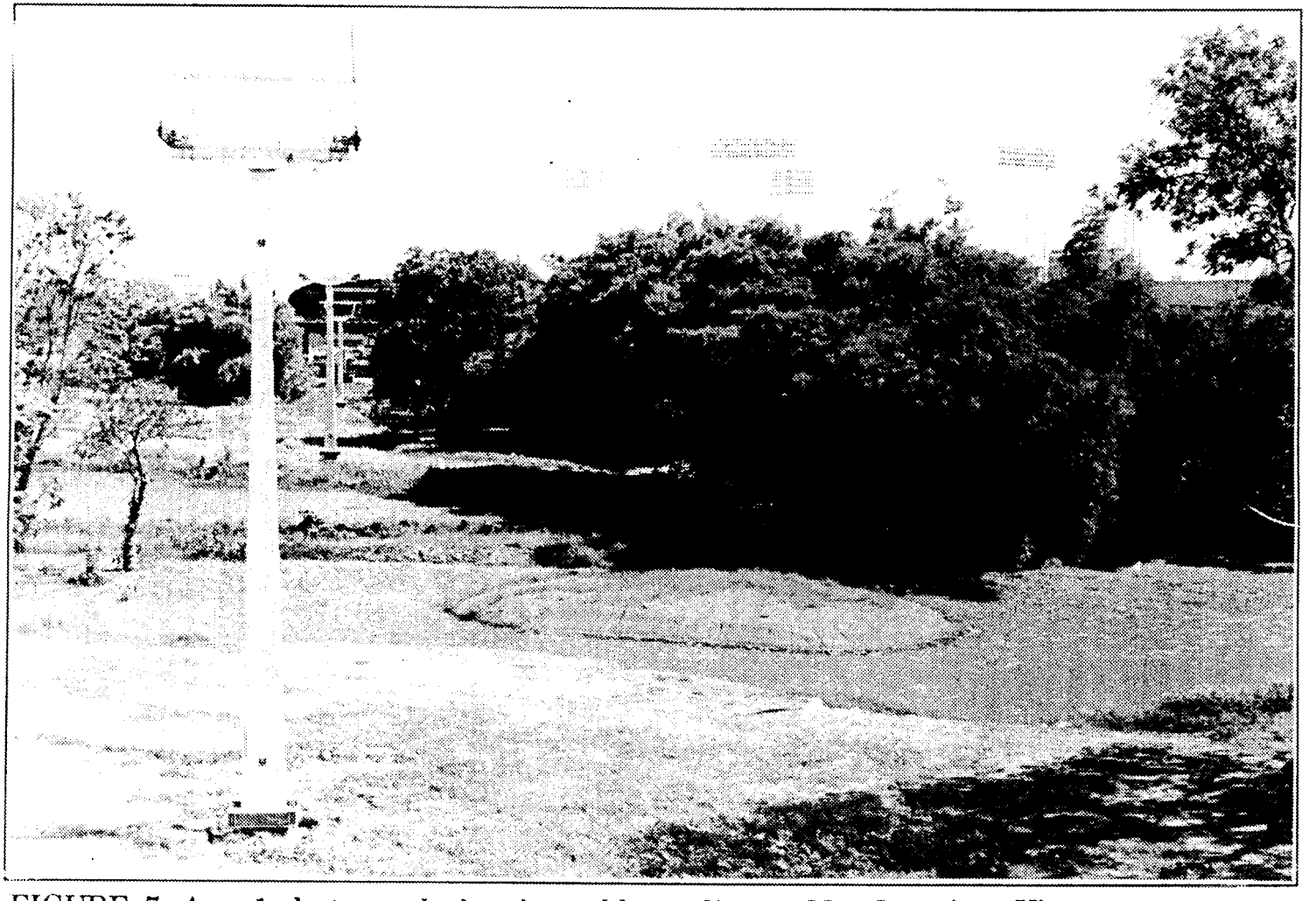

FIGURE 7. Area 1 photograph showing cable car line and landscaping. View towards the north.

AREA 2

Area 2 is located approximately 2.5 kilometers upstream from Area 1. Area 2 extends over approximately 249,690 square meters (25 hectares or 61.7 acres) and is located on both sides of River Río Piedras in the municipal district of Río Piedras, barrio El Cinco. The project area extends approximately 1.3 kilometers north to south, and includes approximately 2 k of river bank. Width of the project area varies from approximately 280 m in the southern portion to approximately 70 m where the proposed channel crosses Highway PR 1 (Figures 9 and 10).

Because of the size and the environmental variability present within this portion of the project area, the following discussion of investigations conducted in Area 2 is divided into three sections. Artifacts recovered from Area 2 are summarized in Table 2.

Table 2. Artifacts recovered from Area 2.

Shovel Test	Description	Count
11	lead glazed redware	1
15	brick fragment	1
27	clear glazed porcelain	1
29	ironstone	1
	white glass	1
	brick fragments	2
45	ironstone	2
61	clear bottle glass	1
	brown bottle glass	1
	porcelain	1
	limestone gravel	1
	unident. iron fragments	20+
	coal	1
	brick fragments	2
62	brick fragment	1
65	clear window glass	11
69	brick fragments	5
71	clear window glass	1
	brick fragment	1
79	unident. bone fragment	1
	lead bullet	1
90	clear bottle glass	1
	wire nail	1

Southern Portion, Area 2

The southern portion of Area 2 encompasses the area on the east bank of a bend of the Río Piedras (Figure 9). The majority of the southern portion of Area 2, including eight standing structures presently serving as the offices of the Puerto Rican Aqueduct and Sewage Authority (PRASA). A small parcel of land within the Estacíon Experimental Agrícola (Jardin Botanico), located north of these structures, was also considered as part of the southern portion of Area 2.

The river is naturally entrenched at this location, with vertical banks approximately 3 to 5 meters in height. A spillway dam across the river is present at the extreme southeast corner of the project area (Figure 11).

North of the spillway, a cut bank has been made into a natural hillock perpendicular to the river. Elevation at the top of the bank is approximately 30 feet AMSL. To the west of this artificial bluff, the land has been graded and terraced for the construction of an asphalt road and parking lot. Vegetation on the slopes and along the crest of the bluff consists of small hardwood trees and grasses. The grasses were extremely dense, reaching heights well over two meters. A dense matting of dead grasses, approximately a meter deep, obscured all surface visibility.

West of the bluff and road are eight standing structures constructed on terraced land. These buildings currently serve as office space and machine shops for PRASA. The most striking feature present among these structures is an octagonal brick chimney. The chimney is attached to the rear (east) of a small, brick structure (Structure 1 on Figure 9) with a two-pitched roof (Figure 12). A veneer of flat stone and white plaster covers most of the brick surface of this structure, which is connected to a larger, rectangular building, Structure 2 showing similar architectural features to the north (Figures 13 and 14). The latter structure is presently being used as a machine shop. A brick gate of the same mortared stone veneer flanks the road east of the chimney (Figure 15).

During the reconnaissance survey (USACOE 1980:20), personnel at the PRASA offices directed Mobile District researchers to Engineer Antonio Rodriquez Bianchi, who was apparently compiling a report on the filtration plant present in Area 2. It was Señor Rodriquez's opinion that the chimney and associated structures were constructed as the original "power plant" for the Río Piedras filtration plant around 1898. Señor Rodriquez has since retired, and was not available for an interview during the present investigations, and his report on the filtration plant was apparently not completed. However, architectural features present on the facade of several of the buildings in Area 2 suggest they were built decades earlier than the suggested 1898 date. It is the opinion of the present researchers that the chimney and two other masonry buildings date from the

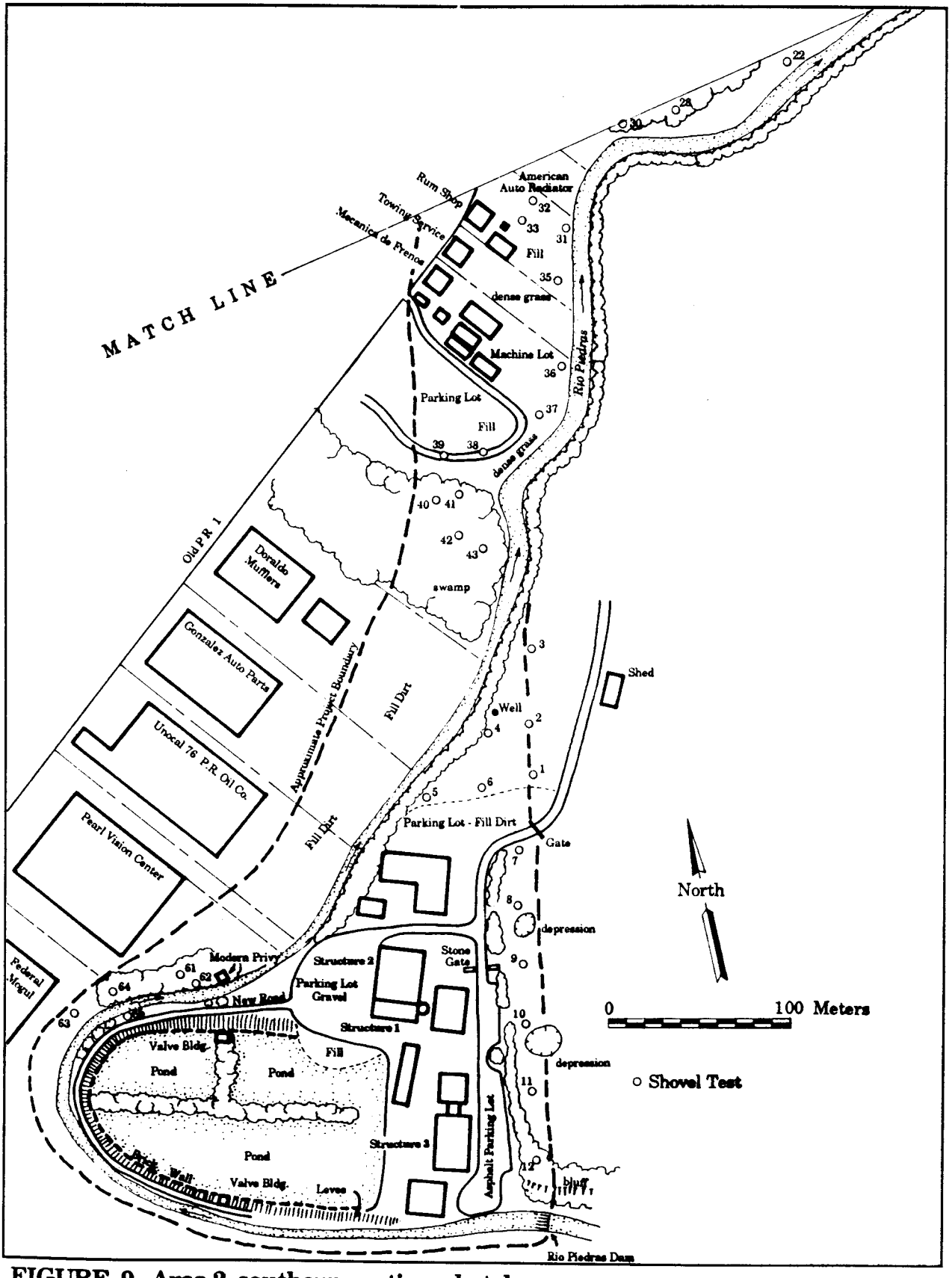

FIGURE 9. Area 2, southern portion, sketch map.

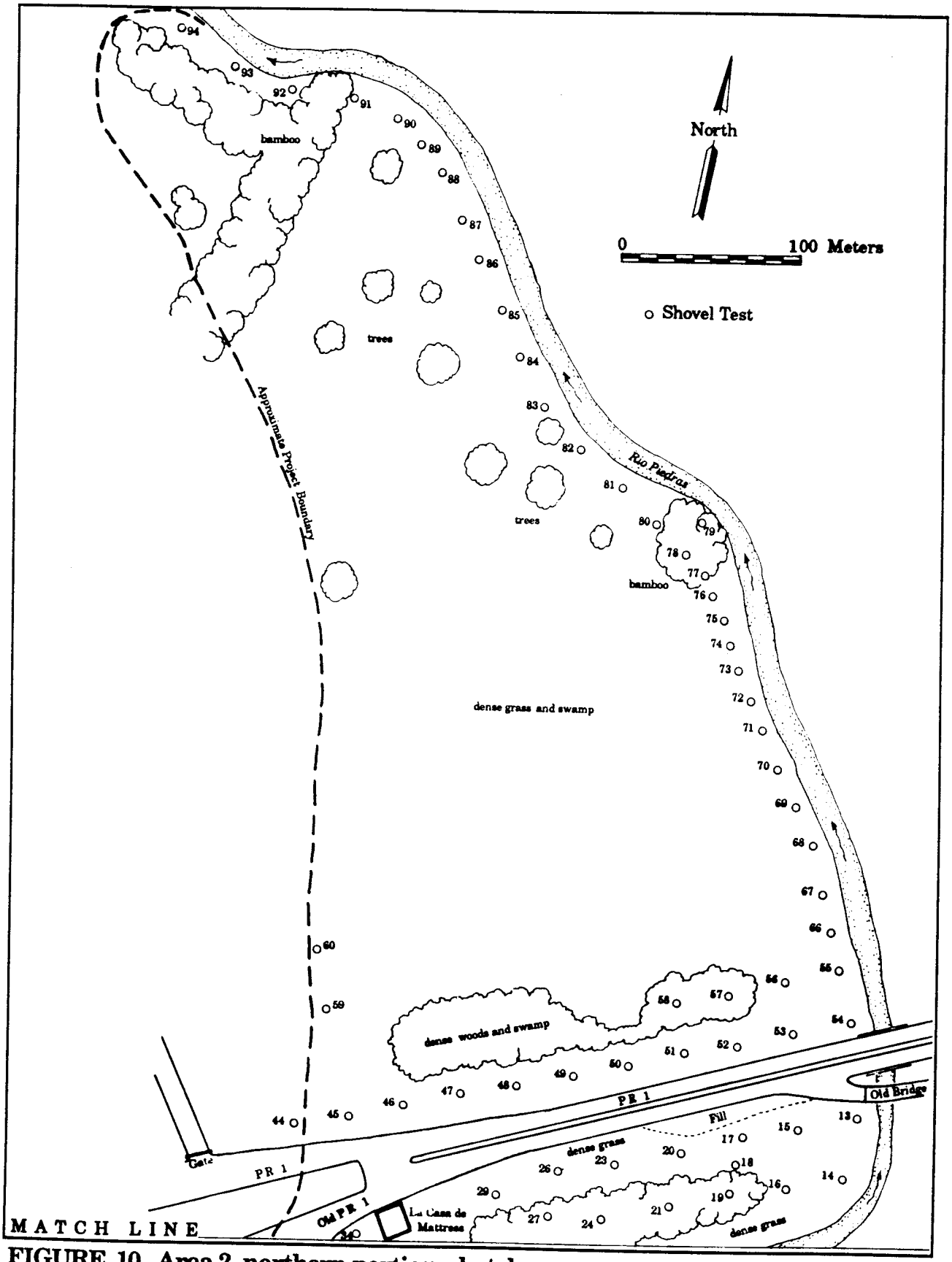

FIGURE 10. Area 2, northern portion, sketch map.

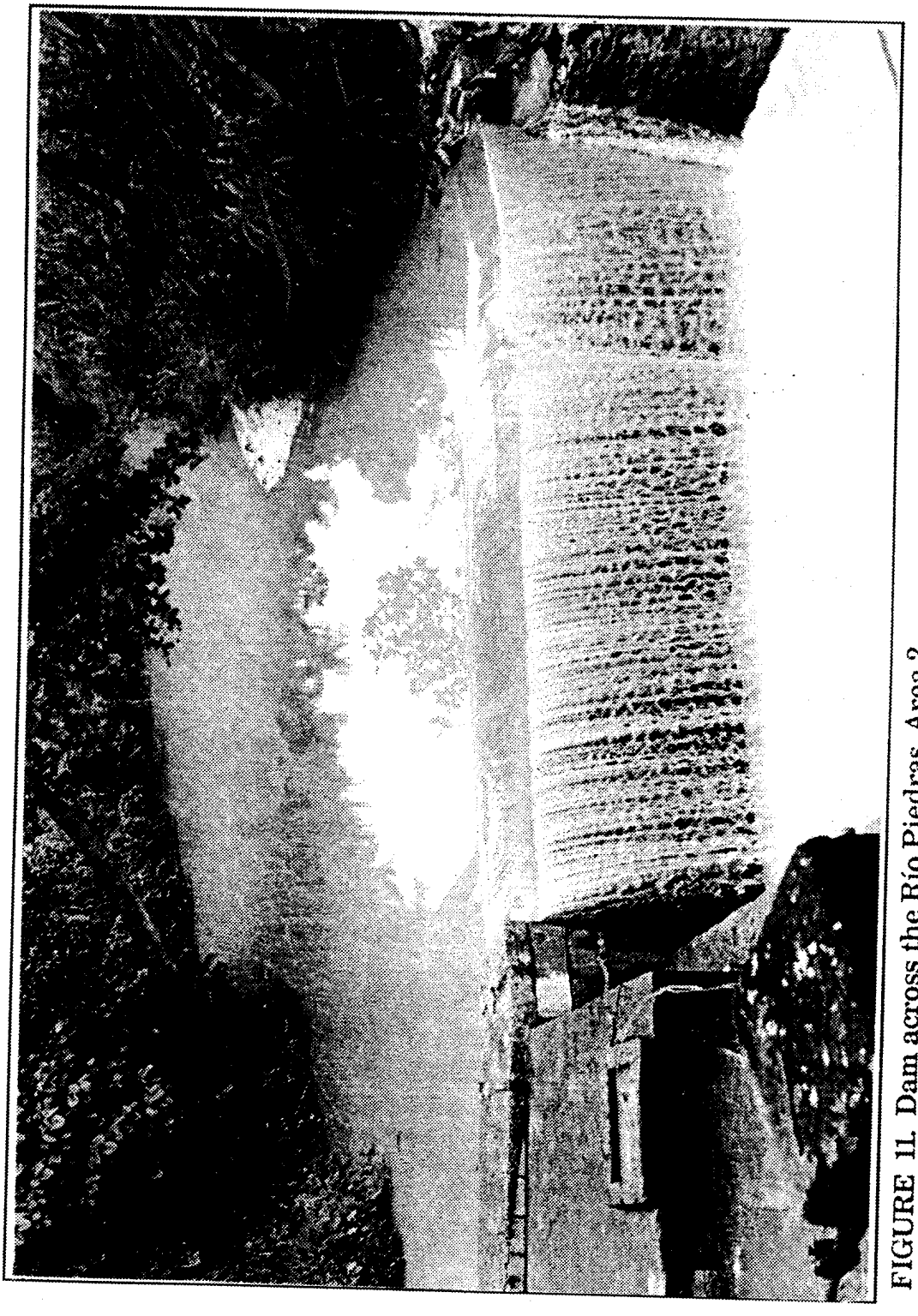

FIGURE 11. Dam across the Río Piedras, Area 2.

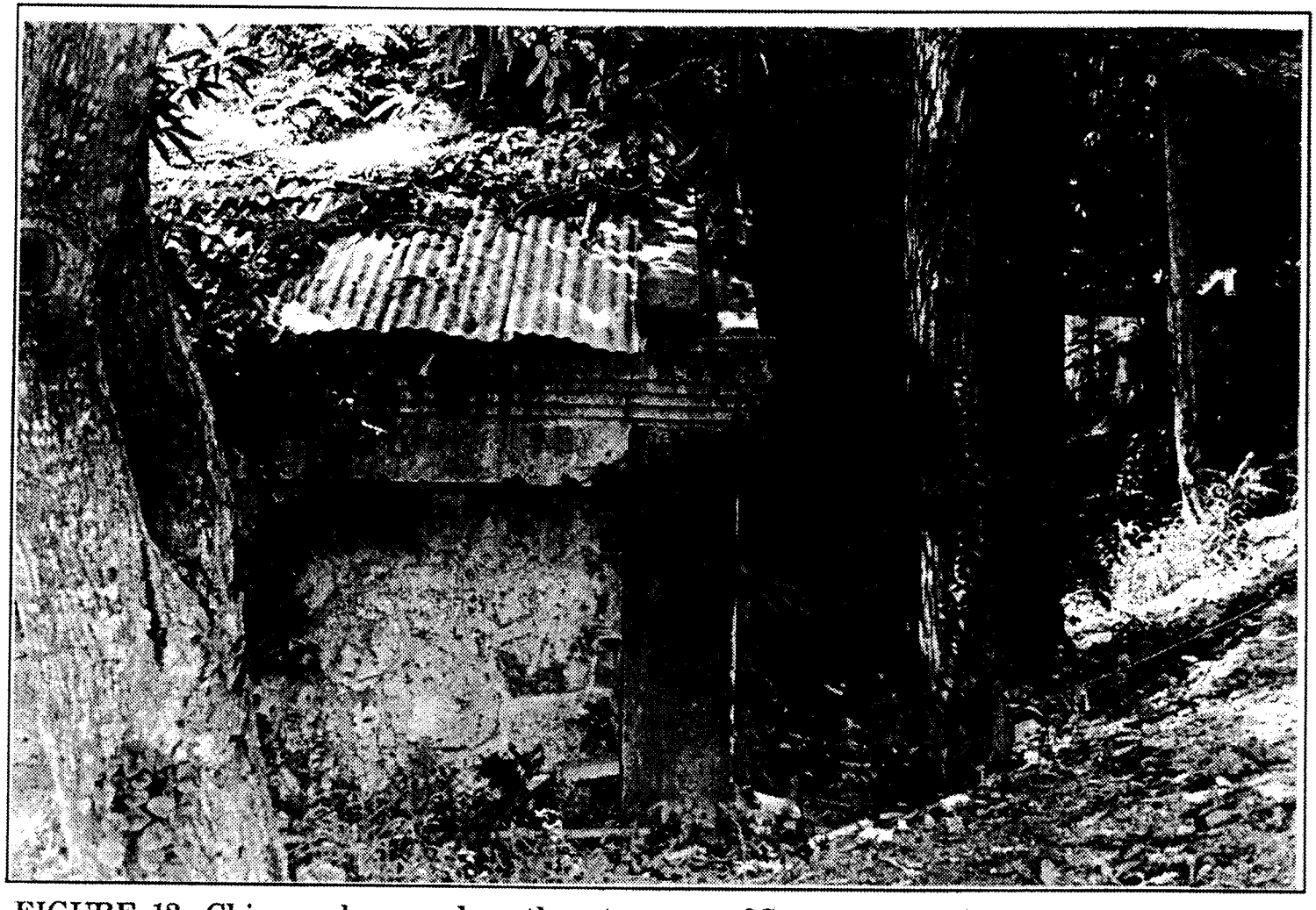

FIGURE 12. Chimney base and southeast corner of Structure 1. Note stone veneer and column details. View toward the north.

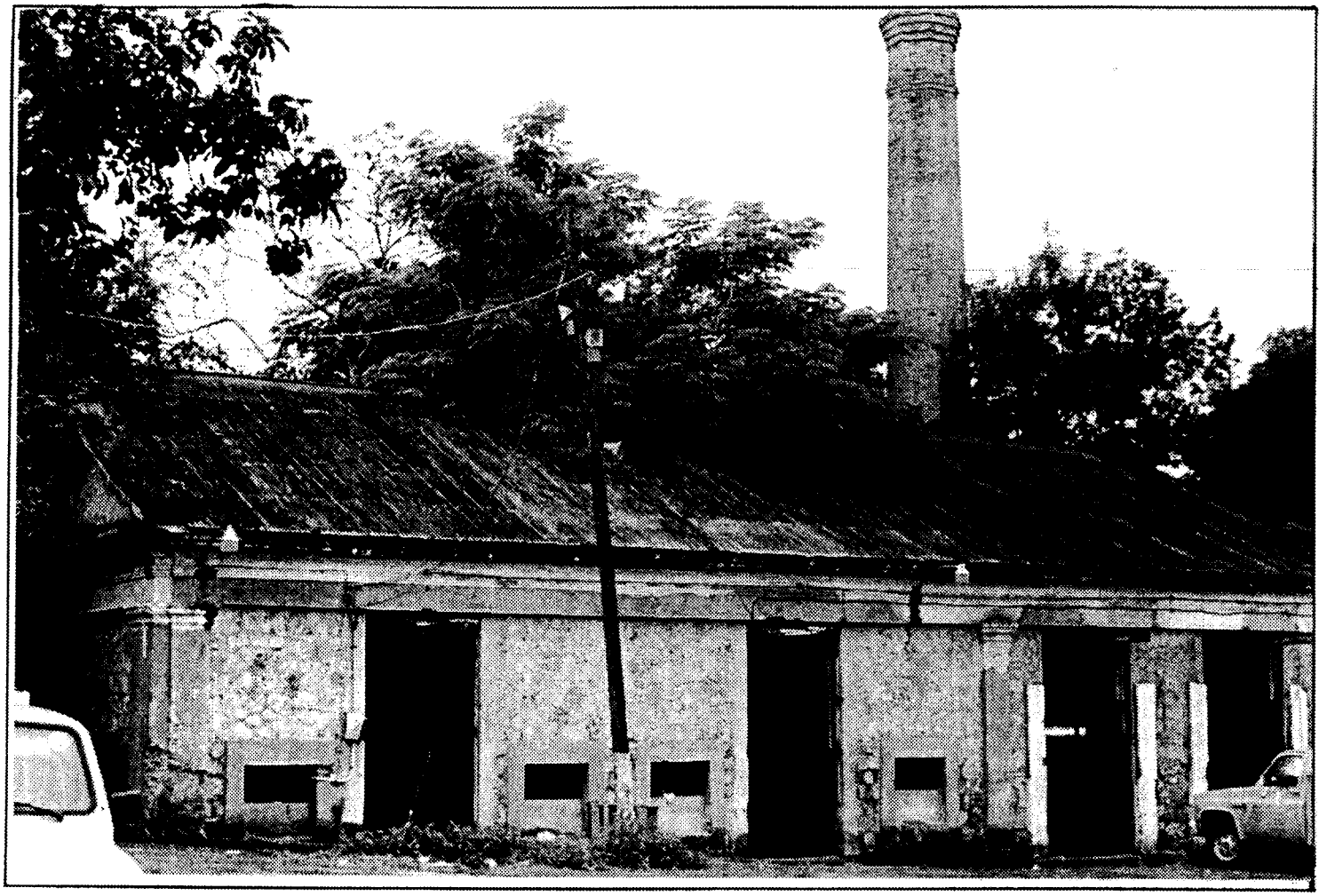

FIGURE 13. Brick chimney and PRASA machine shop, Area 2. View toward the east.

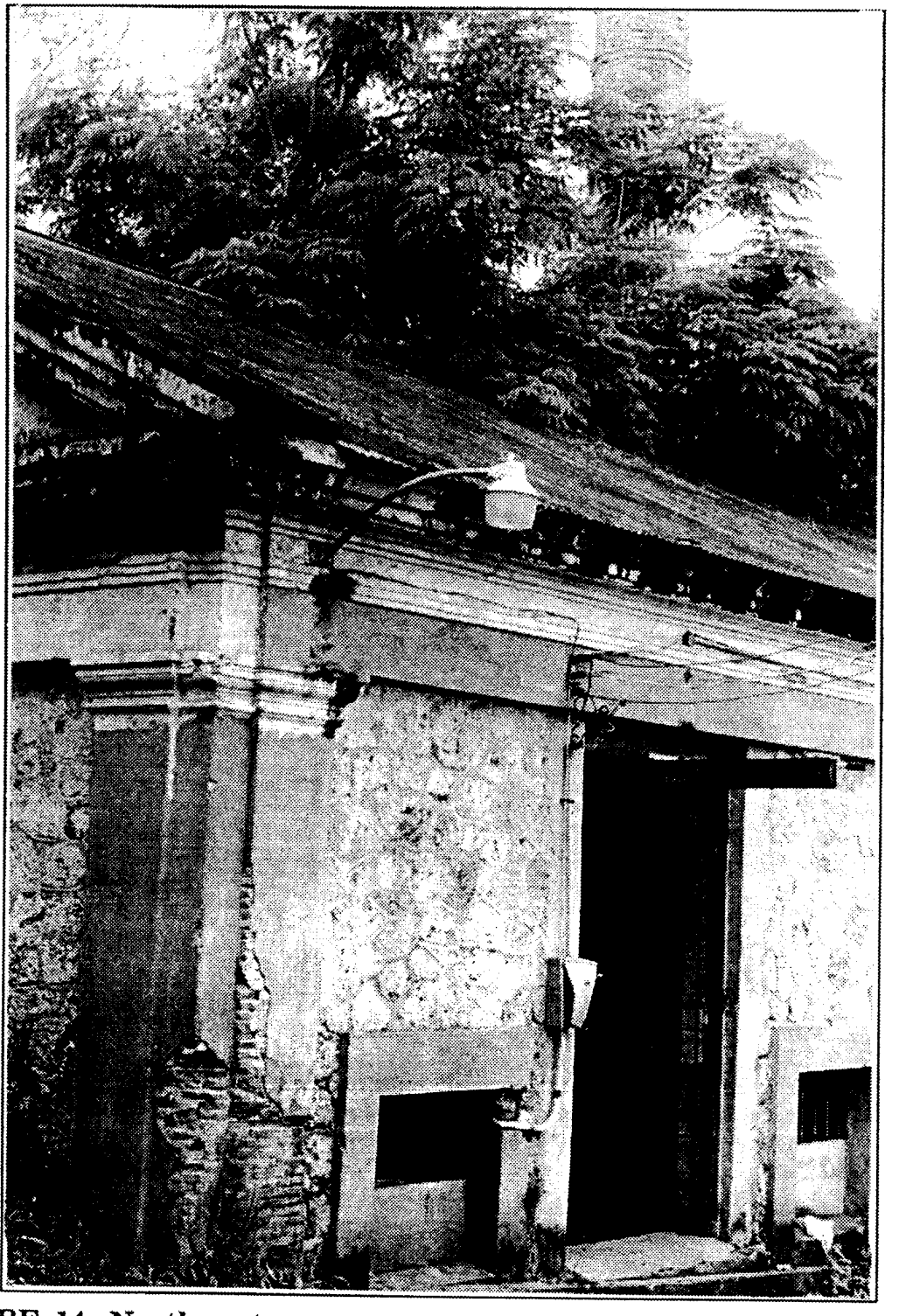

FIGURE 14. Northwest corner of PRASA machine shop. View towards the southeast.

FIGURE 15. Stone and brick gate, Area 2. View towards the north.

early to mid-nineteenth century, and are the remains of structures associated with the first mechanized sugar mill of old Hacienda San José.

Figure 16 shows some of the architectural details of the frontispiece on the two structures mentioned above. Note that the upper portion and capital of the pilaster on the door to the machine shop (left side of photograph) has been removed in order to enlarge the entrance way. Similar renovations were made to the entrance way of the building shown on the right side of the photograph. The pediment over the southern building, as well as the pilasters and capital motifs on both buildings are typical of neoclassical architectural in Puerto Rico in the mid-nineteenth century.

Southeast of the chimney is a building (Structure 3 on Figure 9) with one exposed wall showing similar brick and stone masonry as the two buildings described above. The facade, however, has architectural lines characteristic of the late nineteenth century (Figure 17). Windows and entranceways at the front of the building are arched in a fashion characteristic of Spanish buildings constructed at the turn of the century. The walls of the building are two feet thick. To the north of Structure 3 is a addition housing a complex of cast iron pipes and machinery obviously associated with the water works and filtration system. All of the other buildings in the complex exhibit this same late nineteenth-early twentieth century architectural style.

At least three of the buildings previously part of the Hacienda San José sugar processing plant were apparently incorporated into the water works complex. It is possible that more of the buildings were constructed at an earlier date, but were renovated in the late nineteenth century style. As mentioned above, the construction of the water works is reported to have been underway in 1898 (USACOE 1980:20). This date is consistent with the buildings architecture. This date is also consistent with the 1896-1898 construction of the first Río Piedras aqueduct and water filtration plant (Hostos 1983:497-482). Sugar processing at Hacienda San José was moved from the original location to the new mill, Central Vamina, located across the river to the north and west of the present project area. This new facility began operation in 1912. Whether another sugar mill was operating in the intervening period between 1898 and 1912 is not known.

West of these structures to the river, a partially filled and overgrown network of concrete dikes and wooden pens delineate an area which formerly served as a water reservoir (Figure 18-21). An earthen levee, 2 to 3 m in height, surrounds the periphery of the reservoir lagoons. At the time of the survey, construction of a road was underway along the top of this levee. A surface survey was conducted along the roadbed, where surface visibility was excellent. Cuts made into the levee by road construction were also examined. A soil profile of the levee exposed

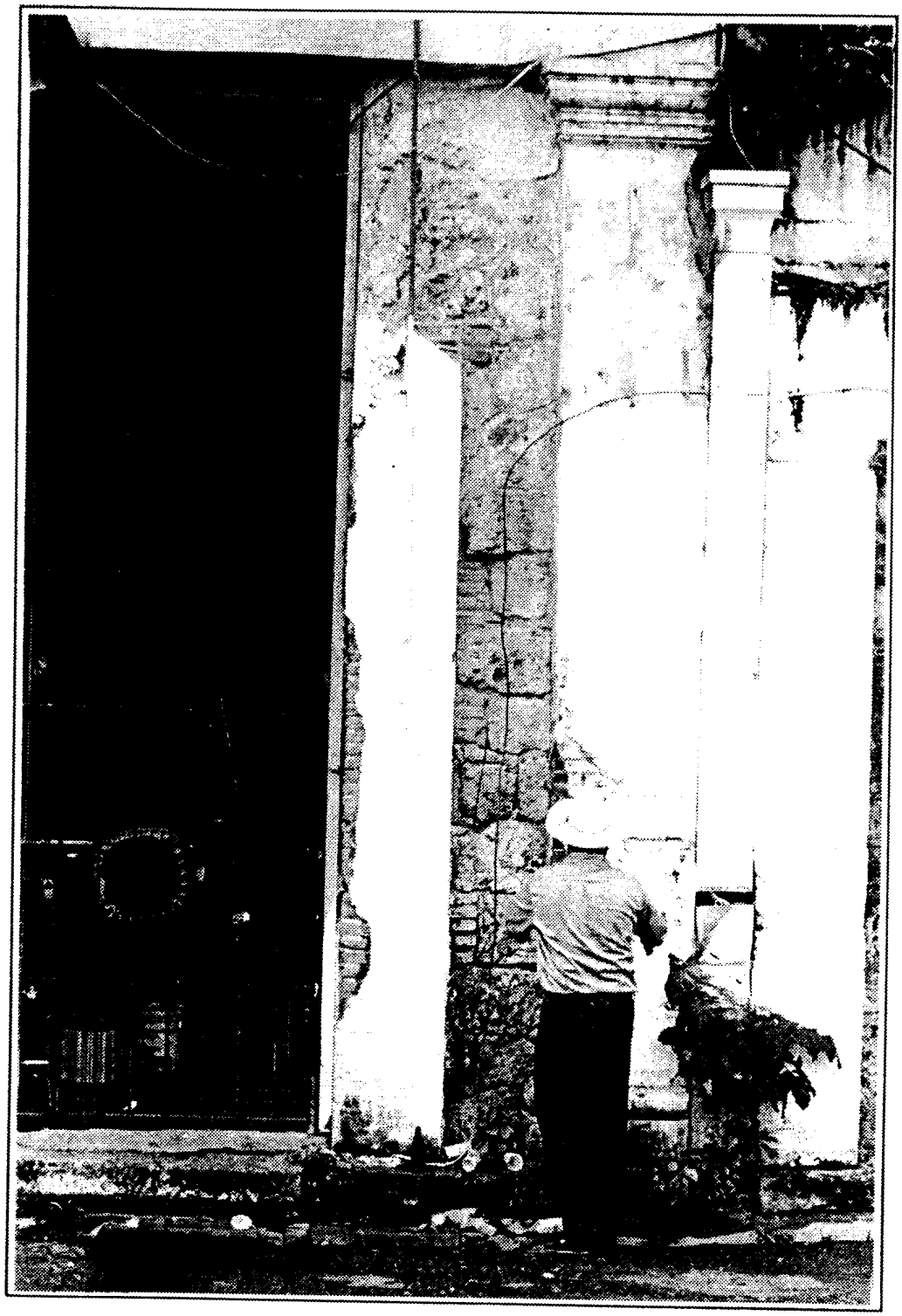

FIGURE 16. Architectural details of Structures 1 and 2, Area 2. View towards the east.

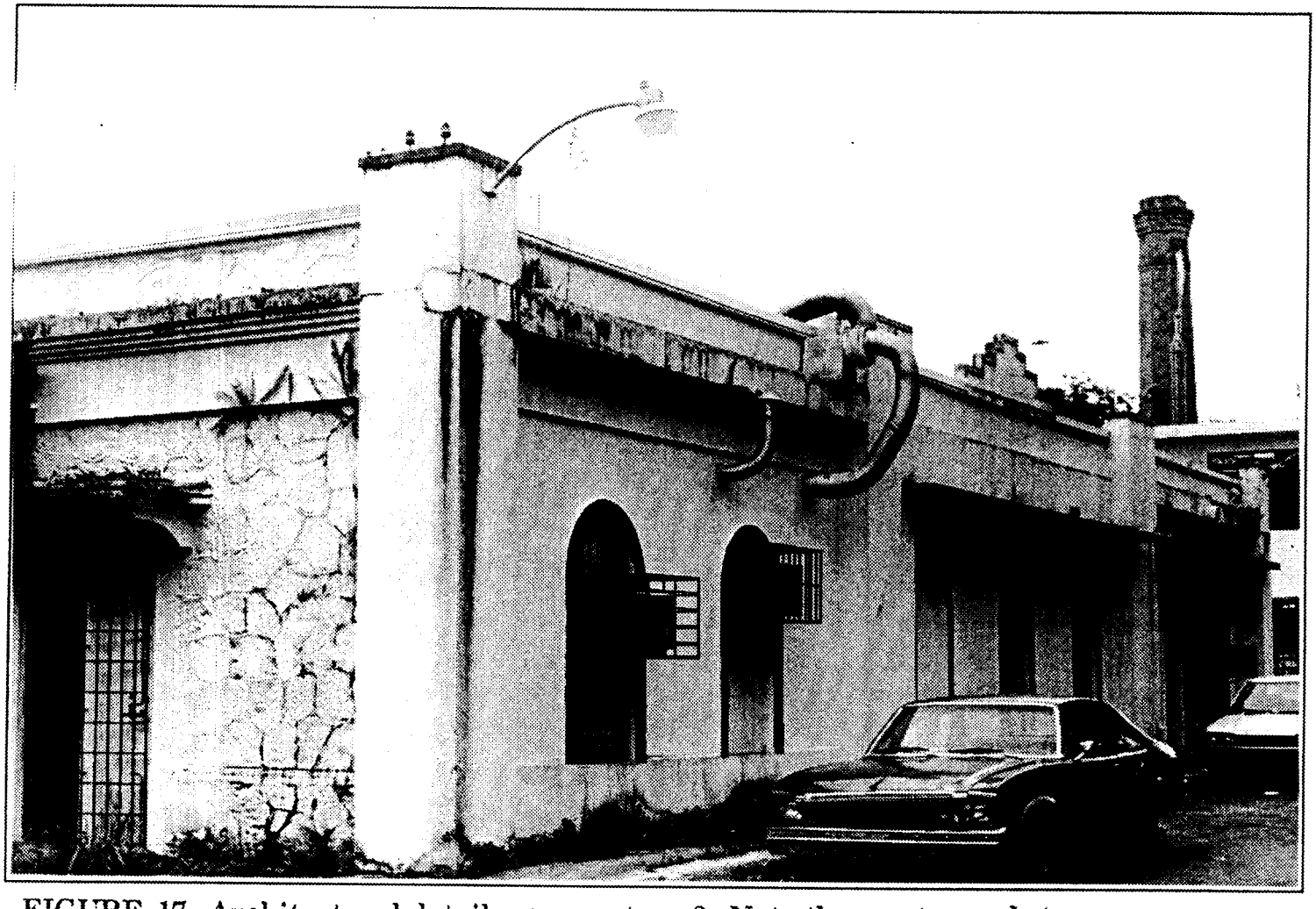

FIGURE 17. Architectural details of Structure 3. Note the mortar and stone construction of the side wall and later facade. View towards the northwest.

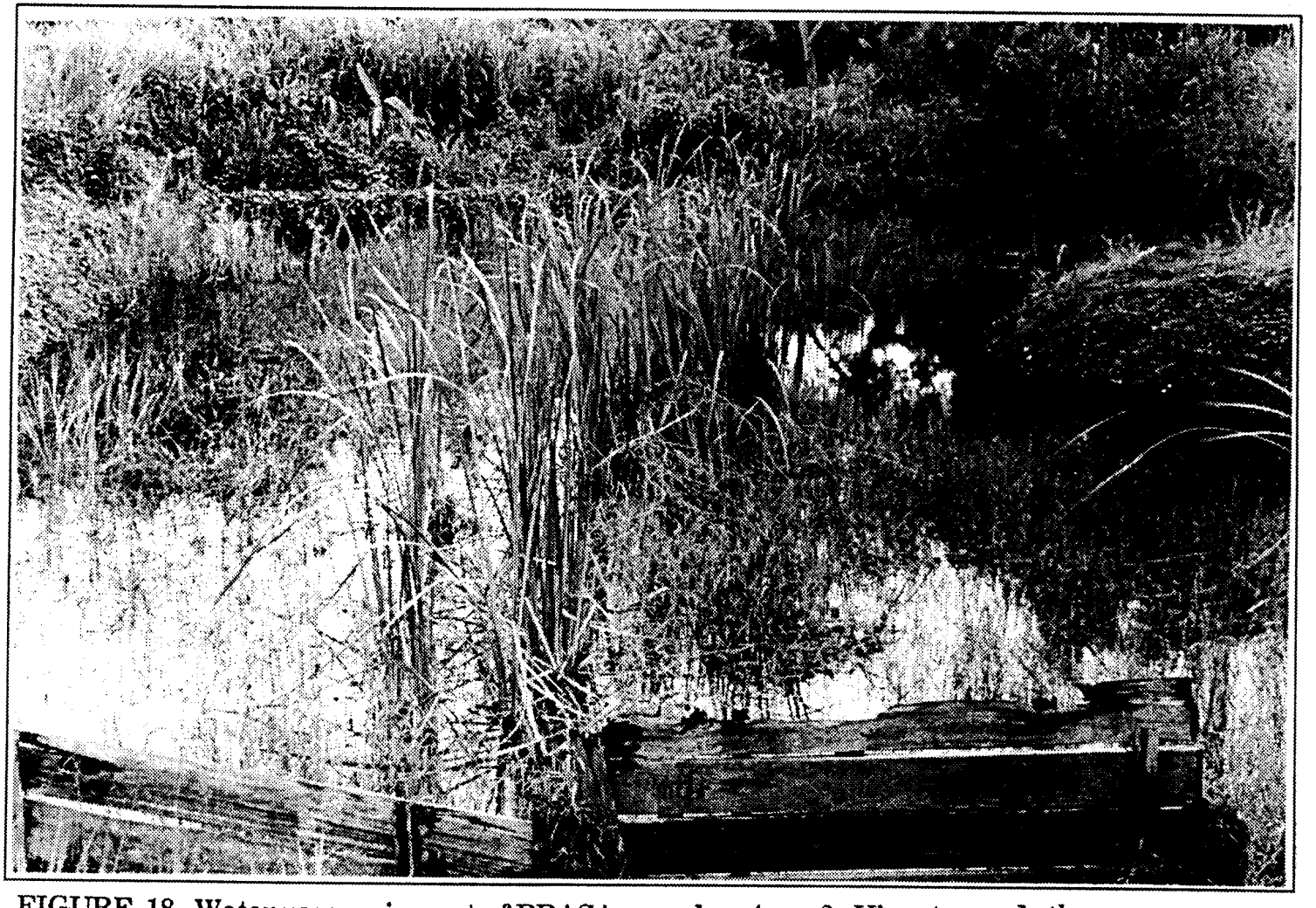

FIGURE 18. Water reservoir west of PRASA complex, Area 2. View towards the west.

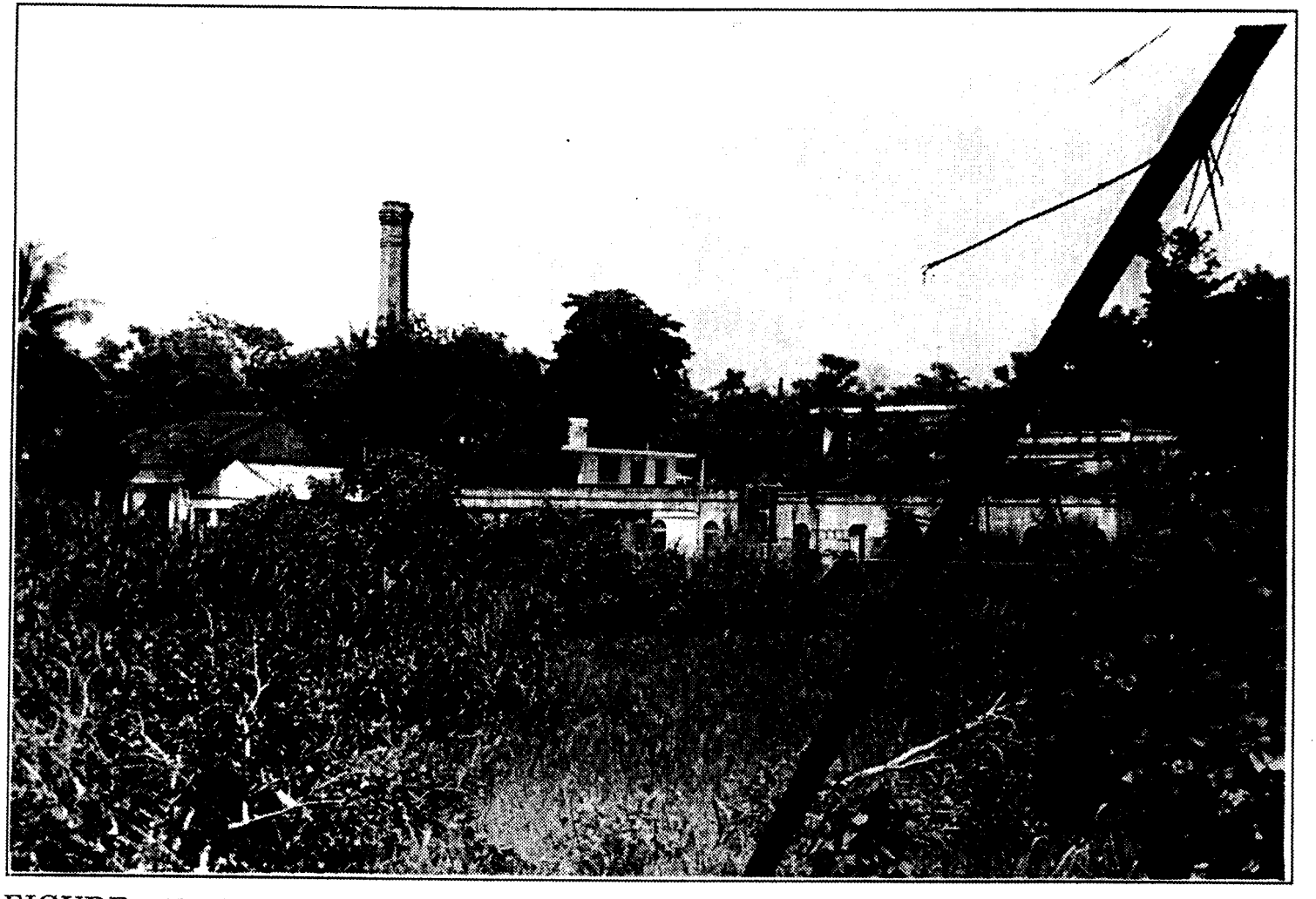

FIGURE 19.View of the PRASA water works complex from the levee surrounding the water reservoir. View towards the northeast.

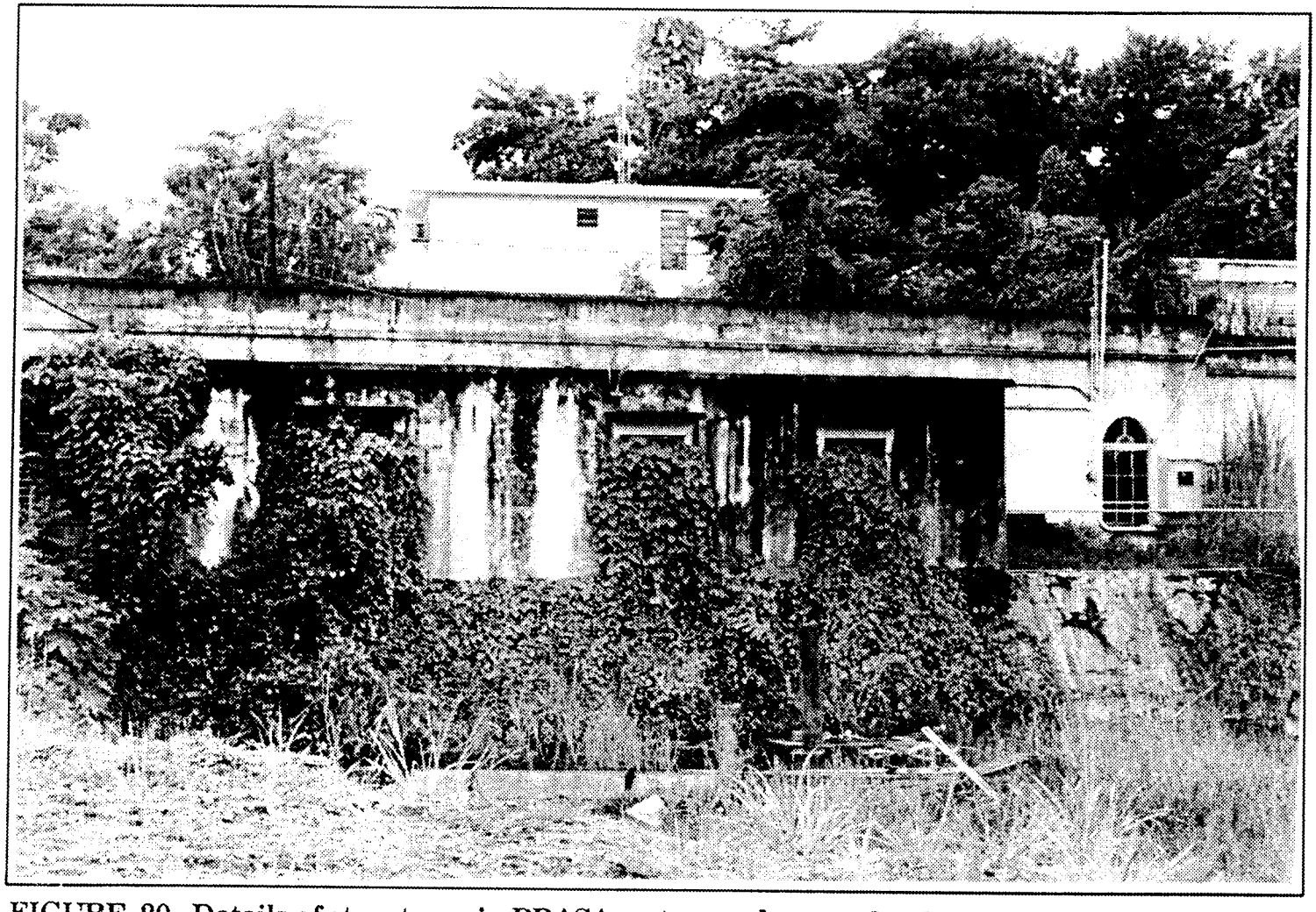

FIGURE 20. Details of structures in PRASA water works complex from edge of water reservoir. View towards the east.

FIGURE 21. Details of structures in PRASA water works complex from edge of water reservoir. View towards the southeast.

in the road cut at the northern side of the water reservoir revealed the following profile:

0-57 cm Friable dark brown (10YR3/3) silty loam with sand lens.

57-67 cm Very dark grayish brown (10YR3/2) sandy loam, representing the original land surface.

67-120 cm Dark yellowish brown (10YR3/2) silty sand with strong brown (7.5YR5/8) clay mottling.

Shovel Test 65, located north of and outside the levee next to the river was excavated to a depth 60 cm below surface. The resulting profile showed a continuous deposit of brown to dark brown (10YR4/4) coarse sand.

A very light scatter of cultural materials was evident in the road cut along the levee, including late nineteenth to early twentieth century ironstone ceramics and modern debris.

At the inside base of the levee, a masonry wall, approximately .5 to 1.0 meter high, forms the periphery of the water reservoir. The wall is constructed of brick, with curved brick caps, and is covered with concrete plaster. Road construction and filling in the parking lot behind Structures 1 and 2 have covered portions of this wall.

In the southern edge of the parking lot west of Structures 1 and 2, land fill is currently extending in to the reservoir. The fill contains innumerable spheres of white chalky limestone or marble. The spheres are of two sizes: 3 cm (1 3/16 in) and 8 cm (3 1/8 in) diameter. According to local PRASA engineers, the stone spheres were once part of a filtration process in which silts were removed from the water by trapping the sediments in the spaces between the stones. It is not known whether the fill containing these curious stone spheres are the result of water purification processes undertaken at this site, or whether they were transported to the site from some other location.

Systematic shovel testing was conducted at 30 m intervals along the top of the bluff east of the building complex. We began by cutting a path with machete through the tall grass along the edge of the bluff, but this approach was abandoned when two large depressions in the sandy bedrock were encountered on the transect. Vegetation obscured the actual size, shape and depth of these depressions. Our attempts at clearing away the grass matting from the edges of the depression were discontinued for safety reasons when it was discovered that the edges of the features were irregular and unstable. At present, it is not known whether these

depressions are natural sinkholes, or representative of past cultural features.

Six shovel tests (7 through 12) were conducted along the crest of the bluff. Distances between shovel tests were determined by pacing along the road and climbing the slope to the top of the bluff. At the northern end of the bluff, shovel tests 7 and 8 revealed a soil profile consisting of 30-15 cm strong brown (7.5YR4/6) sandy loam A horizon with sandstone fragments, stratigraphically above a strong brown (7.5YR5/8) clay subsoil. Further south at Shovel Test 9, located next to a stone gate, the A horizon changes to approximately 35 cm of dark brown (10YR3/3) sandy clay overlying the brown clay subsoil. Shovel Test 10 was located adjacent north of one of the two large depressions present on the transect. Deposits here consist of 30 cm of the same dark brown sandy clay with lens of clayey sand, over a very dark gray brown (10YR3/2) sandy clay with some organic material. Towards the southern end of the bluff, the dark brown sandy clay A horizon begins to thin out, and the subsoil becomes much more rocky, changing to a red (2.5YR4/8) clay with brown (7.5YR5.4) clay mottling. Shovel Test 12 revealed 15 cm of dark yellowish brown (10YR4/6) sandy clay over sandstone.

One artifact was recovered from the upper 5 cm of Shovel Test 11. It is a small (1.3 cm diameter), thin (0.6 cm) sherd of redware with clear, lead glaze on the interior. Unfortunately, the sherd is too small for positive identification.

Shovel testing was also conducted in the area north of the gate into the PRASA complex on lands incorporated within the Botanical Gardens (Figure 22). Shovel tests 1, 2 and 6 (see Figure 8) exhibited a soil development consisting of 20-25 cm dark brown (10YR3/3) clayey loam over a heavily mottled yellowish brown (10YR3/4), gray (10YR6/1) and red (2.5YR5/8) sandy clay. Closer to the river bank, Shovel Tests 3, 4, and 5 showed a continuous profile of homogeneous dark yellowish brown (10YR3/4) clayey sand. The undifferentiated nature of these sediments are indicative of relatively recent deposition. No artifacts were recovered from this area.

A rectangular area near Shovel Test 2, which measuring approximately 12.5 by 4 meters, was noted as being relatively bare of vegetation. Shovel probing revealed a foundation of concrete cinder blocks. The surface area within the foundation was covered with limestone gravel. Seven meters north of Shovel Test 2, a smaller (2.7 x 3.9) rectangular area of shortened vegetation was also noted. These remains were interpreted as being the foundation of a recent hot house or plant shed similar to the one standing just east of this location. West of Shovel Test 2 at the edge of the river is a steel capped well. Water could be seen approximately 20 feet from the surface after temporary removal of the lid.

FIGURE 22. Area north of PRASA complex, southern portion of Area 2. View towards the north.

Middle Portion, Area 2

The middle portion of Area 2 includes properties on the west bank of the Río Piedras south of old Highway PR 1 and north of the Río Piedras. Old PR 1 follows the route of the Carretera Central (Central Road) constructed between San Juan with Ponce in the second half of the nineteenth century. The western boundary of the project area crosses old PR 1 where it merges with the new highway. A remnant of the old highway is also present at the eastern boundary of the project area where the Norzagaray bridge crosses the Río Piedras This project area west of where old PR 1 and the new highway merge is commercialized. East of this merger, the area north of the river is an active flood plain. Ground cover at this locale consisted on dense grasses, bamboo, hardwoods and other understory vegetation. Elevation of this latter area is approximately 15 feet AMSL, and is approximately 3 m lower than the current road surface to the north. The commercialized area to the west is constructed on recent fill.

Systematic shovel testing was conducted in the flood plain area. These test show a pattern in soil development similar to the area within the Botanical Garden in the southern portion of Area 2. Shovel tests located 30 meters south of the road towards the river (tests 14, 16, 18, 19, 21, 22, 24, 25, 27, 28, and 30) show very little stratigraphic differentiation, indicating relatively recent alluvial deposits. A typical soil profile consists of 5 cm very dark gray (10YR3/1) sandy loam humus over a sterile dark yellowish brown (10YR4/4) sandy clay.

Shovel tests conducted along the base (tests 13, 15, 17, 20, 23, 26 and 29) of the road reflect ground disturbances from road construction and from modern refuse disposal. Shovel Test 13, located on the south side of the Norzagaray bridge, revealed 40 cm of (10YR3/2) sandy loam. Concrete mortar, probably associated with bridge construction, was encountered at the base of this deposit. Modern glass, plastics and other debris littered the ground around the bridge and road.

Shovel tests 15, 17, 20, 23, 26 and 29 revealed varying depths (from 5 to 60 cm) very dark gray to dark brown (10YR3/1-3/3) sandy clay fill washing onto the low area from the road over a dark yellowish brown (10YR4/4) sandy clay subsoil. An occasional modern artifact was recovered from the upper deposit (see Table 2), but there were no indications of intact nineteenth century deposits in this area. West of Shovel Test 29, the land becomes swampy and densely overgrown.

Random shovel tests were also conducted behind the commercial establishments along the west bank of the river in areas not covered with buildings or parking lots. These tests confirm local reports of recent land filling in the low swampy area which once bordered the river in this location. Señor Juan Varquez Galán, the owner of Garage Rafael and resident of the area for over 37 years, informed us

that the landfill was brought to this location 15 to 20 years ago from a construction site around the plaza of the town of Río Piedras. The landfill characteristically consists of large blocks of concrete, plastics, wood, brick and other building debris in a matrix of dark brown (10YR3/3) sandy clay with yellowish red to red (5YR5/8 - 2.5YR5/8) clay.

The survey did locate a small wooded area on the banks of the river behind the Pearl Vision Center and Federal Mogul which appeared to be original land surface. The area, approximately 5x5x9 m in size, was surrounded by landfill 1.5 meter deep. Shovel tests 61 and 62 were excavated here. Sediments from these tests include 0-15 cm dark brown (10YR3/3) sandy clay; 15-30 cm dark yellowish brown (10YR4/4) sandy clay with dark brown (10YR3/3) and light yellowish brown (10YR6/4) clay mottling and artifacts; 30-80 cm dark yellowish brown (10YR4/4) sandy clay with yellowish brown (10YR5/8) clay mottling. Artifacts recovered from the tests dated to the twentieth century and appeared to represent an earlier fill episode.

Northern Portion, Area 2

The northern section of Area 2, located west of the Río Piedras and north of Highway PR 1, includes a large section of bottom lands administered by the Agricultural Experimental Station. The area within the project boundaries are old sugar fields, once belonging to Hacienda San José. Several tracts were donated to the Agricultural Experiment Station in 1910 by the Sugar Cane Grower's Association (Asociación de Productocs de Azucar). Other tracts were transferred to the Station in the 1940s and 1950s (Colón Peña 1981:78; USACOE 1980:20).

The area is fairly level, with a slight slope south to north. Elevations at PR 1 are 15 feet AMSL, while elevations at the opposite end of the project area approximately 700 meters to the northwest, are 11 feet AMSL. The river at this location is entrenched with steep, heavily vegetated banks (Figure 23).

The reconnaissance survey report prepared by the Mobile District COE includes a partial title search for the area included within this portion of Area 2 (USACOE 1980:Appendix F). There is little evidence of historic development in the area. The title search does indicate tracts belonging to the Caguas Railway Company crossing the field. The remains of the railroad bed are still evident in a long trough, presently a small drainage overgrown in bamboo, crossing the northern portion of the tract (see Figure 10).

The Mobile District report describes the terrain as it existed in 1980, and the initial work conducted in the northern portion of Area 2:

> A large overgrown field behind the Agricultural Experiment Station was one of the few nonurbanized areas encountered during the reconnaissance. Relatively flat, the field was covered with tall grass reaching almost 2 meters in height. The ground surface was obscured by a vegetative mat approximately 0.3 meter thick. Numerous isolated stands as well as linear stands of bamboo were encountered in the field. Water level of the river was near 2 meters below the top of the bank (USACOE 1980:13).
>
> In the southern sector, which is comprised mainly of bottoms which are part of the Agriculture Experiment Station, the field was walked from the station building parking lot to the river's edge. However, the nature of the ground cover was such that there was absolutely no surface visibility. An attempt was made to evaluate the profile at the river bank but the luxuriant vegetation which seems to have been made doubly thick by the unusually heavy precipitation this year rendered this impossible. The bottomland at the Agricultural Station comprises the remainder of the project area which is mantled with Toa soils and should be incorporated in any future intensive survey efforts if impacts are projected for the area (USACOE 1980:22-23).

In the intervening years since the initial reconnaissance survey, the only change seems to be in the hight of the grass covering the entire project area. The road from the Experimental Station to the river bank has become grown over and impassable. Except for a 20 meter strip along the northern right-of way of PR 1, dense grasses cover the major part of this portion of the project area. Known locally as "elephant grass", the vegetation often exceeded three and even four meters in height. Work in area of such dense vegetation posed real risks to the safety of the field crew. Heat stroke caused by the high temperatures and extreme effort required to traverse the vegetated survey was an ever present possibility. Even more inhibiting was the thick mat of dead vegetation covering the ground surface beneath the grass. In places where the grasses were over three meters high, this mat reached a thickness over 1.5 meters deep. The matting obscured ditches and other holes, making for hazardous walking. We soon found that even the sharpest machete was useless in cutting through this deep, spongy matting.

Shovel testing in the northern portion of Area 2 began in the recently cleared area bordering the highway. Shovel tests 44 through 54 were excavated approximately 15 m from the fence bordering the highway, in an area we thought would be clear of road construction landfill. This area is characterized by 10 to 30 cm yellowish red (5YR5/8) and very dark gray (5YR3/1) clumps of sandy clay with modern refuse (land fill) superimposed over a second landfill of concrete, brick and other construction debris in a dark brown (10YR3/3) sandy clay matrix. High

concentrations of concrete in the bottom strata, at least 60 cm deep, made shovel testing difficult. Concrete slabs were recorded less 10 cm below surface at shovel tests 47 and 48, and may represent a building foundation. Cultural refuse recovered from the fill date to the mid- and late twentieth century. Next to the river in shovel tests 53 and 54, the landfill is covered by 15-30 cm dark yellowish brown (10YR3/4) clayey sand, representing recent overbank sedimentation.

A second transect 30 m back from the first began at the river bank and proceeded west (Shovel Tests 55 - 58). The area is slightly lower than the transect to the south. The resulting profiles reveal 10 to 30 cm of recent overbank sedimentation over the same land fill noted in the first transect. At Shovel Test 57, a concrete foundation with an asphalt slab was encountered 10 cm below surface, indicating some sort of structure was present in the area in the recent past.

West of Shovel Test 58, the survey encountered low, swampy terrain and dense vegetation which could not be cleared with machete. An attempt was made to complete the transect by walking in from the west off the asphalt road leading to the Experiment Station. Again we were turned back by wetlands and dense grasses. Two shovel tests, 59 and 60, were excavated at the western edge of the projected project boundary. These tests revealed 30 to 50 cm brown (10YR5/3) waterlogged sandy clay over yellowish brown (10YR5/6) sandy clay with red (2.5YR5/8) clay mottling.

A third attempt at gaining access to the interior of the northern portion of Area 2 was made by walking a kilometer from the Experimental Station to the river along a cleared path following the back lots of residential units at the northern edge of the field. At an electrical substation located at the rivers edge, we turned south following the rivers edge to the northern boundary of the project area. Although extremely difficult to transverse, the walk along the river bank was made easier by following the relatively cleared path of a transmission line (grasses were less than 3 meters high) and by taking advantage of the bamboo stands which shade out most of the understory vegetation. Reaching the northern portion of the project area, we attempted to survey the linear depression between the river and the Experiment Station, thought to represent the rail road bed of the Caguas Railway Company. We progressed approximately 75 meters before being turned back by a virtual wall of fallen bamboo. No indication of railroad tracks or other structures was evident.

Our fourth attempt at access into the overgrown fields in this section of the project area was more successful. A narrow survey line, periodically marked by blue pin flags, was discovered at the southern end of the field. The path following the west bank of the river to the transmission line. It was possible to reopen the path using machetes, as the grasses were only one to two meters high, and the matting no more than .5 meter deep (Figure 24). Being located so near the river, the transect

FIGURE 24. Shovel test transect along river bank, northern portion Area 2. View towards the south.

followed the natural levee formation. To the west of the transect, the land is somewhat lower in elevation as in a natural backswamp situation. Several attempts at clearing paths perpendicular to the river were thwarted by the dense vegetation.

Stratigraphic development revealed in the southernmost shovel tests (66-72) indicate recent overbank siltation. A characteristic profile in this area consists of 70 cm dark brown (10YR3/3) sandy loam. An occasional modern artifact was encountered in this deposit, but no intact cultural deposit or archaeological features were found. North of Shovel Test 71, sediments become lighter in color and more loam in texture. A typical profile encountered in tests 71-86 consists of 60-70 cm dark yellowish (10YR4/4) loam. Beginning at Shovel Test 87 and continuing north, sediments encountered reflect construction disturbances associated with the construction of the power line. Evidently, this area was covered by extraneous landfill. Deposits consist of 0-30 cm of dark brown (10YR3/3) loam over a friable dark brown (10YR3/3) loam heavily mottled with brownish yellow (10YR6/8) clay and light gray (10YR7/1) clay. The lower deposit contained locally heavy concentrations of concrete, brick and other modern artifacts.

At Shovel Tests 77-79, we stumbled on to a squatters camp in a clump of bamboo along the river. The make-shift camp was currently being occupied, but the resident was away at the time. Several concrete posts were evident in the bamboo thick, suggesting the possibility of a structure in the vicinity. Three shovel tests were placed here. No archaeological deposits were recovered, although we did find bone fragments and a .32 caliber bullet at the surface of Shovel Test 79, located next to the camp fire ring used by the occupants.

V. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Archaeological investigations revealed no significant archaeological, historical or architectural resources in the northern portion of the project area, designated Area 1. It appears highly unlikely that the area was ever occupied, given the fact of its location in a low lying, swampy environment. Previous disturbances in the area, including channelization of the Río Piedras, and construction activities associated with the development of Las Americas Park, largely preclude the presence of any existing intact cultural resources in the area.

Archaeological investigations in the northern and middle portions of Area 2 were inhibited by dense vegetation and industrial land fill. The survey did indicate that much, if not most of the survey area north of highway PR 1 is low lying, back swamps, generally unsuitable for long term settlement. The area bordering the river in this location, on what is interpreted as a natural levee deposit, has a higher potential for archaeological deposits. Shovel tests along this levee did not reveal significant archaeological deposits. However, the possibility of deeply buried archaeological deposits, covered by recent overbank sedimentation, can not be ruled out. Similarly, archaeological techniques employed during the present investigations, including surface inspection and shovel testing, were not appropriate in uncovering deeply buried archaeological and structural remains possibly present under industrial land fills and commercial buildings present south of highway PR 1. However, the location of these areas in low lying terrain bordering the river, and recent disturbances associated with urbanization would largely preclude any possibility for intact archaeological resources existing in this portion of the project area.

The survey did add new information on the structures present in the southern portion of Area 2. Buildings previously thought to have been constructed ca. 1898 as part of a water filtration plant are now considered to be associated with Hacienda San José, an early to mid-nineteenth century sugar processing plant, and the water filtration works are believed to be part of a late nineteenth century aqueduct system.

Evaluations of the National Register significance of standing architecture should be dependent on one or more of the following factors: (1) association with important individuals in Puerto Rican history; (2) representation of significant styles, trends, or construction techniques for Puerto Rican architecture; (3)

association with significant events in Puerto Rican history; or (4) potential contributions to scientific and/or historical knowledge. In addition to these factors, preservation and uniqueness will be considered as determinants of National register significance. It is the feeling of the present researchers that the cultural properties in the southern portion of Area 2 meet criteria (2) and (4). Architectural features noted above do indeed represent significant styles and construction techniques. The structures also have the potential for contributing to our knowledge of nineteenth sugar processing and water treatment techniques. Archaeological excavations in the yards and against structural foundations can contribute to site specific questions relating to site age, function and technological processes, while adding to our understanding of Spanish colonial culture in Puerto Rico.

In addition, there is the possibility these structures could be used as a interpretive facility to the general public. According to Señor Carlos Mantaras, there are tentative plans to establish a sugar museum as part of the *Jardin Botanico* (Botanical Garden) and the Agricultural Experiment Station. The public facility would include on-site exhibits of various varieties of sugar cane and sugar processing techniques. Señor Mantaras expressed the opinion that the structures present in Area 2 are appropriate for this purpose.

RECOMMENDATIONS

No additional archaeological research is recommended for Area 1. Archaeological investigations conducted in this portion of the project area did not reveal archaeological resources meeting the criteria for nomination to the National Register of Historic Places.

Archaeological and archival research in the northern and middle portions of Area 2, the southern tract of the project area, revealed no significant cultural resources. These subareas have been disturbed by previous construction and land filling. Areas not disturbed by urbanization are old sugar cane fields, and are low lying swampy areas not likely to have supported long term habitation sites. No further work is recommended in these areas.

Standing structures associated with Hacienda San José, an early to mid-nineteenth century sugar processing plant, and the old water filtration works, believed to be part of a late nineteenth century aqueduct system, are present in the southern section of Area 2. These structures have sufficient architectural integrity and research potential to be considered significant cultural resources and should be considered potentially eligible for nomination to the National Register of Historic Places.

Aerial photographs supplied by the COE indicate the proposed new channel of the Río Piedras will extend across the bend in the river at the location of the water reservoir. Because the reservoir is an integral part of the water filtration system, mitigation of adverse impact in this area must be considered. In addition, road construction presently taking place along the levee surrounding the water reservoir is within the COE right-of-way. The impact of this road construction on potentially significant cultural resources must be considered.

Although the exact nature of proposed adverse impact on potentially significant cultural resources at the PRASA complex is not known at this time, and is open to change, a tentative management plan is provided.

Mitigation of adverse impact should proceed in two phases. During the initial phase, an intensive archival search should be conducted, detailing land use patterns, previous building episodes, and chain-of-title. Mitigation of adverse impacts to significant architecture, following HAER or HABS standards should also be completed during this phase. The second phase of mitigation, to be performed subsequent to the first, should include archaeological data recovery.

Mitigation of adverse impacts to significant architecture should be conducted in conjunction with HAER/HABS standards for architectural documentation. The selection of HABS versus HAER recording will be the decision of the COE. In general, HABS documentation requires greater detail, in that scale drawings are required of all elevations. All photographs taken for HAER/HABS projects should be prepared with a 4" x 5" or larger format camera, and should be printed on archival quality paper. The HABS/HAER standards require the submission of two negatives and a single print, in an acid-free protective envelope, for each view. Information regarding the location of the view, date, photographer, etc. must be hand lettered in pencil on the exterior of the envelope. Accurately mapped site plans, constructed using either a transit or alidade, should be produced for the site. The site map should also include all relevant natural and man-made features, including representational depiction of site vegetation.

Archival research conducted for HABS/HAER projects should include documentation of the chain-of-title of the property, and additional historic research on significant individuals and events in the history of the site. Statistics on the production levels and methods of sugar production at Hacienda San José are needed, as well as information relating to the location of the house, earlier mills, slave barracks and other structures. Information gathered on the water filtration plant should include plans of the various facilities, methods of water purification, and the methods by which water was supplied to the different communities. If available, construction records, building permits, etc. should be investigated. Knowledgeable individuals should be consulted regarding the

history of each structure under study.

Land use history (chain-of-title) studies will reconstruct the sales and purchases of properties, and hence accurately identify the owner(s) of the site during the period of study. These studies are dependent on documentation at the municipal archives, as well as the Archivo General de Puerto Rico. It should be noted that the status and condition of the various municipal archives varies greatly, and hence it may not be possible to produce complete chain-of-title documentation for the property. Historic profiles may be developed through consultation of various documents relating to particular individuals. These include census and tax information, as well as wills and inventories. As with the chain-of-title materials, these documents are most frequently housed in the municipal archives, and are poorly indexed, and this research will be time consuming. Finally, considerable information relating to sugar *haciendas* can be recovered from the public works repository (*Fondo de Obras Publicas*) at the Archivo General. Requests for river channelization, irrigation, etc. often carried detailed descriptions of the output of *haciendas* and the wealth of *hacendados*. These materials should be consulted during the literature and records research of Hacienda San José.

Following the Phase I documentation described above, archaeological data recovery is recommended in the area immediately surrounding the structures. Field methods utilized during this phase of mitigation should be of sufficient scope to define and adequately sample all components and functional loci present at the site. Because the buildings were in use at the time of the cultural resources survey, no controlled excavations were conducted. It will be necessary to sample areas presently covered by gravel parking lots to locate possible activity loci, such as out buildings and refuse disposal sites. Previous experience has shown that the most cost effective way of locating buried archaeological features is through backhoe trenching, followed by hand excavation in areas of intact archeological deposits.

It is recommended that a minimum of six short backhoe trenches be excavated to either groundwater or bedrock in the area now covered by the gravel parking lot west of the PRASA machine shop. The trenches should be evenly spaced across the parking lot. The backhoe testing should be designed and implemented by a qualified professional archaeologist, and should be of sufficient scope to determine if significant cultural resources are present or absent. Each trench should be approximately 10 m long. Excavation of each trench should be monitored, and each observable stratum below the fill should be sampled through screening two wheel barrows full of sediment from each stratum. If cultural remains are encountered, backhoe excavation should cease in that area with hand excavated units the width of the backhoe trench manually excavated following acceptable, professional archaeological standards of excavation and recording. Excavation by

the backhoe should continue after manual excavations to determine if more deeply buried archaeological deposits are present, with the manual excavation procedure following each time the backhoe encounters a cultural deposit.

The water reservoir west of the PRASA complex should be drained of water and cleared of vegetation, after which a detailed map of the water reservoir should be completed,using either a transit or alidade. Any sediments present in the bottom of the reservoir should be examined through backhoe and manual excavation sufficient to determine if significant archaeological deposits are present. Sediments which have collected in the reservoir should be cleaned out in order to reveal any covered machinery or piping after backhoe and manual excavations

In addition, block excavations next to the structures should be located so as to intersect building trenches in order to recover chronologically sensitive artifacts which could help in dating construction episodes at the building complex. Other excavation units should be situated in areas where archival research indicates previous buildings or other activities associated with sugar processing or water filtration. An appropriate sample of the archaeological deposits and features encountered during these excavations should be excavated in a manner consistent with current archaeological methods.

Further work is also recommended at the top of the cut bank east of the structures in order to clarify the nature of the depressions located there, and their association, if any, with sugar processing activities conducted at Hacienda San José. This will involve hand clearing the vegetation from an area sufficient in size to recognize any structural remains that might be present. Given the results of shovel testing in this area, it seems highly unlikely that buried archaeological deposits are present, and no controlled excavations are recommended.

It is suggested that the recommended archival research and archaeological data recovery can be conducted with a five person archaeological crew and field director/principal investigator and one historian for a period of approximately five weeks, followed by proper data analyses and report preparation.

In addition to the mitigative activities recommended above, the Norzagaray bridge, spanning the Río Piedras at the eastern edge of study Area 2, is also considered significant and eligible for nomination to the National Register of Historic Places. Although outside the area of direct impact, and the scope of these investigations, special caution should be taken to protect this bridge from any indirect impact associated with the proposed construction activities

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APPENDIX 1: TIME TASK SUMMARY

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TASK 1: LITERATURE AND RECORDS SEARCH

A total of six person days was required to complete the literature and records search in San Juan, Puerto Rico, with one additional day spent in Atlanta. This includes five days spend by the historian in collecting primary documentation at the Archivo General de Puerto Rico and other local source, as well as one day spent by the field director at the State Historic Preservation Office in San Juan, examining previously recorded sites in the area, and a second day collecting previously collected literature and records on file with Garrow & Associates, Inc. in Atlanta. In addition, 0.5 day was spent by the Principal Investigator, 0.5 day by the Field Director, and 0.25 day by the Project Manager in preparation planning.

TASK 2: CULTURAL RESOURCE RECONNAISSANCE AND SURVEY

The cultural resource reconnaissance and survey required 21 person days for completion. The major difficulty encountered during the field investigations was that this project had to be conducted as a combined reconnaissance and survey. Data from the initial reconnaissance were insufficient to plan a true survey of the project area, as no indication of the number or types of sites, surface conditions or the presence/absence of fills present was given in that document. This meant that the current study had to essentially combine a reconnaissance that could be planned in advance with a survey that could not be preplanned. We recognize that this problem will likely recur on projects that have had extremely cursory reconnaissance investigations, but some consideration should be given to defining the combined reconnaissance/survey projects so that more effective prior planning can be possible. The amount of time planned for the field phase of this project proved to be adequate to perform a cultural resource survey of the study area, but given the nature of the project could have as easily proven to be either excessive or insufficient.

TASK 3: LABORATORY ANALYSIS AND REPORT PREPARATION

A total of 26 person days were allocated to the analysis and report phase of the project. Very few artifacts were collected during the survey, and the time

allocated for laboratory technicians was not needed.

APPENDIX II: RESUMES OF KEY PROJECT STAFF

Patrick H. Garrow
Garrow & Associates, Inc.

Education

A.A., Christopher Newport College of the College of William and Mary - 1963
B.A., Anthropology, University of Georgia - 1966
M.A., Anthropology, University of Georgia - 1968
Further graduate studies, University of Georgia - 1972 (summer)

Areas of Specialization

Ethnohistory, Prehistoric Archaeology of the Southeastern United States, Urban Archaeology, Plantation Archaeology, Afro-American Archaeology, Historical Archaeology, and Cultural Resource Management.

Professional Memberships, Offices, and Community Service

1977 - Present Member of the Society of Professional Archaeologists (SOPA), with certifications in Teaching, Fieldwork, and Historical Archaeology.
1978 President of the Society for Georgia Archaeology
1981 - 1982 Member of the North Carolina National Register Review Board.
1981 - 1984 Member of the Georgia National Register Review Board.
1983 - Present Member of the Georgia Archaeological Research Design Task Force.
1984 Delegate to the Southeast Cultural Resource Management Task Task Force, and Topic Spokesman at the 1984 Southeastern Archaeological Conference.
1984-1987 Member of the Board of Directors, Lullwater School, Decatur, Georgia.
1985 - 1986 Chairman of the Board of Trustees, Lullwater School, Decatur, Georgia.
1986- Present Editor, Society for Georgia Archaeology Newsletter

Professional Experience

1983 - Present Executive Vice President and Chief Corporate Archaeologist, Garrow & Associates, Inc.
1976 - 1983 Chief Corporate Archaeologist, Soil Systems, Inc.
1974 - 1976 Senior Archaeologist for the Archaeology Section, Division of Archives and History, Department of Cultural Resources, State of North Carolina. Duties included Specific Project Responsibility, Coordinator for Environmental Assessment Reviews, and Coordinator for Outside Operations. Served as Assistant Section Chief 1975-76.
1974 Field Director, King Site Project, David J. Hally, Principal Investigator, under grants from the National Geographic Society and the National

Endowment for the Humanities.
1971 - 1973 Director, King Site Project (part time, then full time Summer and Fall, 1973)
1972 Assistant Director, Carter's Dam Archaeological Project, Joseph Caldwell, Principal Investigator, A. R. Kelly, Director.
1970 - 1971 Director, Chieftains Excavation for the Junior Service League of Rome.
1970 - 1973 Instructor of Anthropology, Shorter College.
1968 - 1970 Instructor of Anthropology, Augusta College.
1969 Archaeological Consultant, Celanese Fibers Corporation, Rome, Georgia.
1968 Employee of Syms-Eaton Museum, Hampton, Virginia.
1968 Christopher Newport College, Instructor of Sociology (Summer Appointment)
1967 - 1968 Teaching Assistant, Department of Anthropology, University of Georgia. (not all in residence)
1967 Assistant Director, West Point Archaeological Project, H. A. Huscher, Director.
1966 Research Assistant, Labor Force Study, University of Georgia, Ethel Jones, Director.
1965 Assistant Supervisor, Bellfield Mound Excavation, A.R. Kelly, Director.

PROJECTS CONDUCTED

Selected Archaeological Survey Projects

Served as Project Manager, Principal Investigator or Senior Technical Consultant on more than 450 survey projects from 1969 to present. Those projects include:

1988 Archaeological Survey of The Proposed Champlain Pipeline Natural Gas Pipeline Corridor, Vermont, New Hampshire, and Massachusetts. Role: Senior Technical Advisor.

1988 Archaeological Reconnaissance of the Turpentine Run Flood Control Project, St. Thomas, U.S. Virgin Islands. Role: Principal Investigator and Report Author.

1987 Archaeological Survey of the Proposed Atlanta Gas Pipeline Corridor, Northwest Georgia. Role: Principal Investigator and Report Co-Author.

1984 Plant Vogtle Transmission Line Surveys, various locations in Georgia. Role: Principal Investigator, and Editor, Author, or Co-Author of a series of reports.

1983 The Bartlett's Ferry Project-Harris County, Georgia. Role: Principal Investigator and Contributing Author.

1981 The Wrightsboro Project, Wrightsboro, Georgia. Role: Principal

Investigator and Contributing Author.

1980 Colonial Pipeline Corridor Project-Howard and Anne Arundel Counties, Maryland. Role: Principal Investigator and Contributing Author.

1978 - 1979 The Rocky Mountain Pumped Storage Project-Rome, Georgia. Role: Principal Investigator and Contributing Author.

1978 The Mattamuskeet Wildlife Refuge Project-Hyde County, North Carolina. Role: Principal Investigator and Report Co-Author.

1977 The Edenton Courthouse and Jail Project-Edenton, North Carolina. Role: Principal Investigator and Report Author.

1976 The Bedford-Pine Urban Renewal Project-Atlanta. Role: Principal Investigator and Report Author.

1973 The Rocky Mountain Project, Rome, Georgia. Role: Principal Investigator and Report Author.

Selected Testing and Data Recovery Projects

Served as Project Manager, Principal Investigator or Senior Technical Consultant on more than 75 testing or data recovery projects from 1969 to the present. Those projects include:

1988 Archaeological Testing of Five Sites in the Proposed Ronald Reagan Expressway Corridor, Gwinnett County, Georgia. Role: Principal Investigator.

1987 Talbot County Cemetery Project, Talbot County, Georgia. Role: Principal Investigator and Report Co-Author.

1987 Archaeological Testing of the Ballája Site, Old San Juan, Puerto Rico. Role: Senior Technical Advisor.

1986 Archaeological Survey and Data Recovery on the Live Oak Landfill Site, DeKalb County, Georgia. Role: Principal Investigator.

1986 Archaeological Testing on the Georgetown Incinerator Property, Georgetown, District of Columbia. Role: Principal Investigator and Report Co-Author.

1985-86 Oxon Hill Manor Plantation, Prince Georges County, Maryland. Role: Principal Investigator, Report Co-Editor, and Report Contributor.

1985 The New Bern, Holiday Inn Testing Project, New Bern, North Carolina. Role: Principal Investigator and Report Co-Author.

1985 The Nancy Creek Primitive Baptist Church Cemetery Project, Atlanta, Georgia. Role: Principal Investigator and Report Co-Author.

1980 - 1983 Wilmington Boulevard Project, Wilmington, Delaware. Role: Project Manager, Report Editor and Contributing Author.

1982 The Phoenix Blocks 1 and 2 Project, Phoenix, Arizona. Role: Senior Technical Consultant and Report Contributor.

1982 The Ronson Ship Project, Manhattan, New York City. Role: Project Manager.

1981 - 1982 The 175 Water Street Project, Manhattan, New York City. Role: Project Manager.

1980 - 1982 Washington Civic Center Project, Washington, D. C. Role: Co-Principal Investigator, Principal Report Author.

1980 - 1982 Cooper River Rediversion Canal Historic Sites, Berkeley County, South Carolina. Role: Principal Investigator and Report Contributor.

1981 The Telco Block Excavation, Manhattan, New York City. Role: Project Manager.

1976 - 1979 Kerr Lake Reservoir Project, Virginia and North Carolina. Role: Principal Investigator and Report Contributor.

1978 Darien Water Supply Project, Darien, Georgia. Role: Principal Investigator.

1978 Edenton Courthouse and Jail Project, Edenton, North Carolina. Role: Principal Investigator and Report Editor.

1977 Wallace Dam Data Recovery Project, Central Georgia. Role: Project Manager for Planning and Management.

1974 - 1976 Various small excavation projects for the State of North Carolina.

1969 - 1971 Chieftains Project, Rome, Georgia. Role: Principal Investigator.

PUBLICATIONS

Books

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1973 With Marvin T. Smith, *The King Site (9Fl-5) Excavations April, 1971 and*

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1975 "The Woodland Period North of the Fall Line", *Early Georgia*, 3 (1), Athens.

1976 "The Mattamuskeet Indians", *New Leaves*, Volume 1, Number 1, North Carolina Department of Cultural Resources, Division of Archives and History, Raleigh.

1979 "The Historic Cabin Site: The Last Trace of the Cherokee Town of Coosawattee", *Early Georgia*, Volume 7, Number 1, Athens.

1979 "Contract Archaeology in the Business Arena", *Proceedings of the Compliance Workshop*, Publication No. 9, North Carolina Archaeological Council and the Archaeology Branch, Raleigh, North Carolina.

1980 With Jack E. Bernhardt, "Archaeology: Important New Aspect of Pipeline Route Selection", *Pipeline and Gas Journal*, April.

1980 "Private Sector Professional Services in Cultural Resource Management", *Edison Electric Institute Task Force on Cultural Resource Management.*

1981 "Archaeological Excavation of a Whiskey Still in Northwest Georgia", *Historical Archaeology Conference Journal*, Volume 15.

1982 Response to "The 'Small Business Act' and Archaeological Research", *Southeastern Archaeology*, Volume 1, Number 2.

1983 Review of: Sapelo Papers: Researches in the History and Prehistory of Sapelo Island, Georgia, Daniel P. Juengst, Editor, In *Historical Archaeology*, Volume 17, Number 2.

1984 "The Identification and Use of Context Types in Urban Archaeology". *Southeastern Archaeology*, Volume 3, Number 2.

1985 With Thomas R. Wheaton, "Archaeological Evidence of Acculturation in the

Carolina Low Country", In *Plantation Archaeology*, Edited by Teresa Singleton, Academic Press, New York.

1986 "The Mattamuskeet Indians", *High Tides*, Spring Volume, in Press.

1987 "The Use of Converging Lines for Determining Socio-Economic Status", in *Socio-Economic Status and Consumer Choices: Perspectives in Historical Archaeology* (Tentative Title), Edited by Suzanne Spencer-Wood, Plenum Press, in Press.

Papers Presented (Unpublished)

1972 "Historic Cherokee Pottery from Ridge's Ferry and Coosawattee, Georgia", presented before the Conference on Historic Site Archaeology, Morgantown, West Virginia.

1975 "The Mattamuskeet Documents: A Study in Social History", presented before the American Society for Ethnohistory, Gainesville, Florida.

1976 "Private Sector Involvement in Archaeology", presented before the Annual Meeting of the Society for Georgia Archaeology, Augusta, Georgia.

1978 "The New and The Old: The Bedford-Pine and Edenton Archaeological Investigations", presented before the Annual Meeting of the Society for American Archaeology, Urban Historical Archaeology Symposium, Tucson, Arizona.

1978 "The Edenton Historical Preservation Project",presented before the Annual Meeting of the Society for Historical Archaeology, Nashville, Tennessee.

1979 With Thomas R. Wheaton, "African Slave Archaeology: The Yaughan Plantation Example", presented before the Annual Meeting of the Historic Sites Conference, St. Augustine, Florida.

1980 "Investigations at Yaughan and Curriboo Plantations", Paper presented before the Annual Meeting of the Southeastern Archaeological Conference and the Society for Historical Archaeology, New Orleans, Louisiana.

1981 "Analysis of Ceramics from a Mid-Nineteenth Century Family Dump in Washington, D.C.", presented before the Annual Meeting of the Historic Sites Conference, Columbia, South Carolina.

1983 "Dating Nineteenth Century Ceramics", presented before the Annual Meeting of the Society for Historical Archaeology, Denver, Colorado.

1982 - 1983 Slide Presentation of The Ronson Ship Excavations, presented at various universities and agencies throughout the country.

1985 "Artifacts From the Nancy Creek Primitive Baptist Church Cemetery,

Chamblee, Georgia", presented before the Annual Meeting of the Society for Georgia Archaeology, Savannah, Georgia.

1986 "Oxon Hill Plantation 1710/11-1895", presented before the Annual Meeting of the Middle Atlantic Archaeological Conference, Rehobeth Beach, Delaware.

1986 "Excavations of an 18th Century Well at Oxon Hill Manor", presented before the 12th Annual Conference on South Carolina Archeology, Columbia, South Carolina.

1986 "An Approach to Urban Archaeology", presented before the Annual Meeting of the Georgia Academy of Sciences, Milledgeville, Georgia.

1987 "The Bottle Glass/Ceramic Comparison: A Potential Tool for Comparing Socioeconomic Status", presented before the Annual Meeting of the Society for Historical Archaeology, Savannah, Georgia.

GUY GORDON WEAVER
GARROW & ASSOCIATES, INC.

Education

Ph. D. program in Anthropology, Southern Illinois University at Carbondale, Illinois, August 1985 to present.
M.A. in Anthropology, Memphis State University, December 1978.
B. A. in Anthropology, Memphis State University, May 1975.

Areas of Specialization

Cultural Resource Management, Historical and Prehistoric Archaeology of the Southeastern United States and West Indies, Social Organization, Ethnicity, Folklore, Urban Archaeology, Historical Ethnology, Cartography, Museology.

Professional Membership

Society for American Archaeology (Member)
Southeastern Archaeological Conference (Member)
Society for Historical Archaeology (Member)
Archaeological Institute of America (Member)
Tennessee Anthropological Society (Member)
West Tennessee Historical Society (Member)
Memphis Anthropological Society (President 1977-78)
Mid-South Association for Professional Anthropologists (Charter Member)

Professional Experience

Academic Positions

Southern Illinois University, Carbondale, Department of Anthropology, Teaching and Research Assistant, 8/85-5/88.
Memphis State University, Memphis, Department of Anthropology, Adjunct Assistant Professor, 12/80-present; Instructor, 9/83-12/83.
Shelby State Community College, Memphis, Department of Sociology and Anthropology, Instructor, 1/80-5/80.
Rhodes College (Southwestern at Memphis), Department of Sociology and Anthropology, Co-instructor, 3/79-4/79, 4/80-5/80.

Non-Academic Positions

Garrow & Associates, Inc., Atlanta, Georgia. Senior Archaeologist, 10/88-present; Archaeologist II, 9/87-10/88.

Center for Archaeological Investigations, Southern Illinois University at Carbondale. Researcher II, 9/84-12/84.

Memphis State University Anthropological Research Center, Memphis. Co-principal Investigator, Field Director, Crewmember 1974-1985.

Tennessee Valley Authority, Cultural Resources Program. Principal Investigator under Personal Services Contract, 5/80-5/86.

Center for Southern Folklore, Memphis, Tennessee. Research Associate, 11/82-2/83.

Tennessee Division of Archaeology, Nashville. Archaeological Aid, 6/78-9/78, 5/80-8/80, Crewmember 5/76-8/76.

Field Experience

Participation in over fifty anthropological and archaeological field projects in Tennessee, Illinois, Arkansas, Alabama, Mississippi, Kentucky, New Hampshire, Vermont, Puerto Rico, as well as in Derbyshire, England and Barbados, West Indies.

Publications and Major Manuscripts

Weaver, Guy G.

1988a *Archaeological Testing at the Site of the Peabody Place Mall and Office Complex, Memphis, Tennessee: Phase II Construction.* Garrow & Associates, Inc. Report Submitted to Division of Housing and Community Development, Memphis, Tennessee.

1988b "Stone and Coral Tools." In *Archaeological Investigations on Rota, Mariana Islands, Micronesia*, edited by Brian Butler, pp. 255-278. Micronesian Archaeological Survey Report No. 23, Southern Illinois University at Carbondale, Center for Archaeological Investigations Occasional Paper No. 8. Southern Illinois University, Carbondale.

Weaver, Guy G. and Herminio R. Rorígguez Morales

1988 *A Cultural Resources Reconnaissance and Survey of the Río Puerto Nuevo Flood Control Project, San Juan, Puerto Rico.* Garrow & Associates, Inc. Report submitted to the U.S. Army Engineer District, Jacksonville Corps of Engineers.

Joseph, J.W., Guy G. Weaver and Mary Beth Reed

1988 *Nineteenth Century Agriculture in Pope County, Illinois: Shawnee*

National Forest Farmstead Thematic Study - Phase II Results. Garrow & Associates, Inc. Report submitted to the National Forest Service, Shawnee National Forest, Harrisburg, Illinois.

Coggeshall, John M. and Jo Anne Nast
1988 *Vernacular Architecture in Southern Illinois: The Ethnic Heritage.* Shawnee Series, Southern Illinois University Press. (Co-researcher, co-author and photographer.)

Weaver, Guy G.
1987 *The Presidents Island and Rivergate Proposed Development Tracts, Memphis, Tennessee.* Garrow & Associates, Inc. Report submitted to ERM-Southeast, Inc., Marrietta, Georgia.

Weaver, Guy G. and Jonathan Bloom
1987 Addendum to: *Archaeological Survey of the Proposed Northrop Substation and Transmission Line, Peach and Houston Counties, Georgia.* Garrow & Associates, Inc. Report submitted to Oglethorpe Power Company, Tucker, Georgia.

Weaver, Guy G.
1986a *An Archaeological Survey of the City of Salem Wastewater Treatment Facilities, Marion County, Illinois.* Center for Archaeological Investigations, SIU-C Manuscript on File No. 1986-7. Report submitted to Roland Associates, Des Plaines, Illinois.

1986b *An Archaeological Survey of the Proposed Albers Substation Site, Clinton County, Illinois.* Center for Archaeological Investigations, SIU-C Manuscript on File No. 1986-6. Report submitted to Clinton County Electric Cooperative, Inc., Breese, Illinois.

Weaver, Guy G. and John R. Stein
1986 *A Report of Archaeological Investigations in the Boxley Valley, Buffalo National River, Newton County Arkansas.* Tennessee Valley Authority. Report submitted to the National Park Service, Santa Fe, New Mexico.

Mark B. Sant and Guy G. Weaver
1986 *An Archaeological Survey and Assessment of the Proposed Wastewater Treatment Facilities, Steeleville, Randolph County, Illinois.* Center for Archaeological Investigations, SIU-C Manuscript on File No. 1986-5. Report submitted to E.M. Webb and Associates, Carbondale, Illinois.

McNutt, Charles H. and Guy G. Weaver
1985 *An Above-Pool Survey of Cultural Resources Within the Little Bear Creek Reservoir Area, Franklin County, Alabama.* The Tennessee Valley Authority Publications in Anthropology No. 45, and Memphis State

University Anthropological Research Center Occasional Papers No. 13.

Smith, Gerald P. and Guy G. Weaver
1985 *A Cultural Resources Survey of the Proposed One Riverside Drive Condominiums, Memphis, Tennessee.* Report submitted to the Pickering Firm, Memphis, Tennessee.

Weaver, Guy G.
1984a *An Archaeological Survey of the Proposed Devondale Apartment Complex, Metropolis, Massac County, Illinois.* Center for Archaeological Investigations, Southern Illinois University. Report submitted to Landmark, Louisville, Kentucky.

1984b *An Archaeological Survey for the KRPD Baldwin Industrial Port Site, Randolph County, Illinois.* Center for Archaeological Investigations, Southern Illinois University. Report submitted to Kaskaskia Regional Port District, Red Bud, Illinois.

Weaver, Guy G. and Patricia Ruppe
1984 *An Archaeological Survey of the Route 127 Development Corridor Utility System Improvements, Nashville, Washington County, Illinois.* Center for Archaeological Investigations, SIU-C Manuscript on File 1984-13. Submitted to the City of Nashville, Illinois.

Weaver, Guy G. and Gerald P. Smith
1984 *A Report of Archaeological Investigations at Reelfoot-Indian Creek Watershed Dam No. 1 and 18, and Adjacent Areas in Obion County, Tennessee.* Memphis State University Anthropological Research Center. Report submitted to Soil Conservation Service, Nashville, Tennessee.

Weaver, Guy G. and Mitch Childress
1984a *Archaeological Investigations at the Swan Bay Site (40HY66), Henry County, Tennessee.* Memphis State University Anthropological Research Center. Report submitted to the Tennessee Valley Authority, Norris, Tennessee.

1984b *An Archaeological Reconnaissance for the Proposed Bartlett Corporate Park, Bartlett, Shelby County, Tennessee.* Memphis State University Anthropological Research Center. Report submitted to the City of Bartlett.

Weaver, Guy G. and David Bowman
1984 *An Archaeological Survey of the Proposed Area for Land Application of Waste Water, 201 Facility Plan, EPA Project No. C470469-01-0, Oakland, Fayette County, Tennessee.* Report submitted to Gregory-Grace and Associates, Engineers, Bartlett, Tennessee.

Charles H. McNutt and Guy G. Weaver
1983 *The Duncan Tract Site (40TR27), Trousdale County, Tennessee.* The Tennessee Valley Authority Publications in Anthropology No. 33, Norris, Tennessee.

Charles H. McNutt, Guy G. Weaver, and Glenda Maness
1983a *An Archeological Overview and Management Plan for the Volunteer Army Ammunition Plant, Hamilton County, Tennessee.* Memphis State University Anthropological Center for Woodward-Clyde Consultants. Report submitted to National Park Service, Atlanta Georgia.

Charles H. McNutt, Guy G. Weaver, and Glenda Maness
1983b *An Archeological Overview and Management Plan for the Holston Army Ammunition Plant, Hawkins and Sullivan Counties, Tennessee.* Memphis State University Anthropological Center for Woodward-Clyde Consultants. Report submitted to National Park Service, Atlanta Georgia.

Gerald P. Smith and Guy G. Weaver
1983 *An Archeological Overview and Management Plan for Radford Army Ammunition Plant.* Memphis State University Anthropological Center for Woodward-Clyde Consultants. Report submitted to National Park Service, Atlanta Georgia.

Raichelson, Richard M.
1983 On the Road: An Ecological Interpretation of the Blues Pianist. *Journal of Regional Cultures* 3:1, pp. 41-64. (Cartographer).

Weaver, Guy G., David Bowman and Louella Weaver
1981 *A Cultural Resources Reconnaissance of the Proposed Humboldt and Bradford Drainage Programs, Gibson County, Tennessee.* Report submitted to U.S. Engineer District, Memphis Corps of Engineers.

Weaver, Guy G. and Charles H. McNutt
1981 *A Report of Intensive Testing for Cultural, Archeological and Architectural Resources at the Allen Duncan Tract, Off-Site Borrow Area No. 4, Hartsville Nuclear Plant, Hartsville, Tennessee, 1981.* Memphis State University Anthropological Research Center. Report submitted to the Tennessee Valley Authority, Norris, Tennessee.

Weaver, Guy G.
1979a *Report of Archaeological Excavations at the Denny Site, 40SM69.* Report submitted to the Tennessee Valley Authority, Norris, Tennessee.

1979b *Preliminary Survey of Archaeological and Architectural Resources at Point Pleasant Landing, Saltillo, Decatur County, Tennessee.* Report

submitted to the Tennessee Valley Authority, Norris Tennessee.

Weaver, Guy G. and Charles H. McNutt
1979 *Archaeological Survey of the Proposed Franklin-Hartsville Transmission Line.* Report submitted to the Tennessee Valley Authority, Norris, Tennessee.

McNutt, Charles H., and Guy G. Weaver
1977 *An Archaeological Survey of the Proposed Piney Campground Expansion, Land Between the Lakes, Steward County, Tennessee.* Report submitted to the Tennessee Valley Authority, Norris, Tennessee.

Broster, John, and Guy G. Weaver
1975 Middle Woodland Settlement Systems Along the South Fork of the Forked Deer River. In *The Pinson Mounds Archaeological Project: Excavations of 1974 and 1975*, edited by John B. Broster and Lee Schneider, pp. 90-98. Tennessee Division of Archaeology Research Series No. 1.

Professional Papers

1985 "The Tale of Two Wells: Historical Archaeology in Memphis." Paper presented at the April meeting, Archaeological Institute of America, Mid-South Chapter, Memphis Tennessee. With Louella Whitson Weaver.

1982 "Intra and Interskeletal Differences in Nitrogen Content of Prehistoric Human Bone." Paper presented at the Southern Anthropological Society, 17th Annual Meeting, Boone, North Carolina. With David R. Stevenson.

1982 "Chert Utilization Patterns in the Outer Nashville Basin." Paper presented at the Southeastern Archaeological Conference, 39th Annual Meeting, Memphis, Tennessee.

1981 "Excavations at the Duncan Tract Site, 40TR27, Hartsville, Tennessee." Southeastern Archaeological Conference, 38th Annual Meeting, Asheville, North Carolina.

CURRICULUM VITAE

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Education:

1987	Texas A & M Field School in Nautical Archaeology Port Royal Project
1985-1986	PhD Candidate (ABD) University of Valladolid Spain
1985	Master in Arts Puertorrican and Caribbean Studies Center for Advanced Studies of Puerto Rico and the Caribbean
1983	Bachelor in Arts International Institute of the Americas
1980	Studies in Land Surveying Politecnic University of Puerto Rico
1965-1969	Studies in Premedical Interamerican University of Puerto Rico

Licenses and Certifications:

1988	Licensed Instructor Trainer of Scuba Diving Professional Divers Instructors Corporation
1988	Licensed Instructor to Teach Scuba Diving Professional Divers Instructors Corporation
1988	Restricted Radiotelephone Operator Permit Federal Communications Commission
1988	Marine Radio Operator Permit Federal Communications Commission

1986 Advanced Openwater Diver
Professional Association of
Divers Instructors

1973 Scuba Diver
National Association of
Underwater Instructors

Work experience:

1986- Consultant in Archaeology
and Historical Research
Some researchs as follows:

Archaeological Assesment for
Center for Agricultural Distribution
Caguas, Puerto Rico

Archaeological Assesment for
Fill Placement in Wetlands
Adjacent to Espíritu Santo River
Río Grande, Puerto Rico

Cultural Resources Study for
Construction of Road PR-397
Las Marías, Puerto Rico

Archaeological Assesment for
Residencial Unifamiliar
Culebra, Puerto Rico

Archaeological Assesment for
Construction of an Acueduct in
Parcelas Nuevas Clark
Culebra, Puerto Rico

Archaeological Assesment for
Lot no. 4 in Dewey
Culebra, Puerto Rico

Archaeological Assesment for
Cabañas Vacacionales
Culebra, Puerto Rico

Archaeological Assesment for
Sanitary Sewer System in
Palmar Novoa Community
Aguada, Puerto Rico

Archaeological Assesment for
Wastewater Treatment Plant
Río Grande, Puerto Rico

Archaeological Assement for
Harborside Mansions
Santurce, Puerto Rico

Archaeological Assesment for
Construction of Arecibo Hotel
Convention Center
Hatillo, Puerto Rico

Archaeological Assesment for
Area Recreativa y Parador Vives
Guayama, Puerto Rico

Archaeological Assesment for
Finca La Hacienda, Parcela A
Guayama, Puerto Rico

Archaeological Assesment for
Construction of a sanitary
pipeline between the municipalities
of Coamo and Santa Isabel

Marine Phase of Archaeological
Assesment for Regional Wastewater
Treatment Plant Ocean Outfall
Fajardo, Puerto Rico

Marine Phase of Archaeological
Assesment for Regional Wastewater
Treatment Plant Ocean Outfall
Guayama, Puerto Rico

Archaeological Assesment for
Construction of a Parking Area
in Naguabo Beach
Naguabo, Puerto Rico

Co-author of
An Archaeological Reconnaisance
of Proposed Flood Control
Caguas and Gurabo, Puerto Rico
Garrow and Associates
Atlanta, Georgia

Historical Backgroung for
Cultural Resource Survey Within
the Río Puerto Nuevo Flood
Control Project
Garrow and Associates Inc
Atlanta, Georgia

	Archaeological Assesment for Complejo Deportivo Guayama, Puerto Rico
	Archaeological Assesment for Extension of Toa Baja Municipal Cemetery Toa Baja, Puerto Rico
1987	Coordinator for Cultural Activities Undergraduate Program Center for Advanced Studies of Puerto Rico and the Caribbean
1985-1987	Professor University of Puerto Rico Aguadilla Regional College
1984-1985	Historian comisioned by the Loíza Municipal Goverment to do a research and write the town history
1980-1984	Safety Consultant Caribbean Fire Safety Puerto Rico
1979-1980	District Chief II Executive of the Training Division Puerto Rico Fire Service
1977-1979	Director of Disaster Services American Red Cross Caribbean Area Division
1974-1977	Insurance Agent Lincoln National Insurance
1971-1974	Teacher Department of Public Instruction of Puerto Rico

Special Positions:

1986	Member of the Editorial Staff of the review "Método y Sentido" University of Puerto Rico Aguadilla Regional College
1986	Member of the Musseums Committee Regional Colleges Administration University of Puerto Rico

Research and Publications:

1987	"El canal de trasnportación de productos entre el río Loíza y la bahía de San Juan" (The Products Transportation Channel Between Loíza River and San Juan Bay)- presented at Seminario de Antiguas Obras Hidraúlicas de América in México sponsored by Ministerio de Obras Públicas of Spain and Universidad Autónoma de México.
1986	"Historia y Novela en la Muerte Anduvo por el Guasio", Método y Sentido, No. 5 January-June 1986, Aguadilla Regional College, University of Puerto Rico
1985	"San Lorenzo: Notas para su Historia" Historic Preservation State Office, La Fortaleza
1985	"The Urbanistic Development of Loíza During the Nineteenth Century" Master Degree Disertation
1984-1985	Archaelogical Excavation in the Saint Patrics and the Holy Spirit Parish in Loíza The first Catholic cemetery of the town was found during this excavation. Also was found an old atrium in "loza de patio"

Grants and Scholarships:

1987	Institute of Puertorrican Culture Summer Scholarship for Texas A & M Field School in Nautical Archaeology Port Royal Project
1986	Institute of Puertorrican Culture Summer Sholarchips for doctoral studies at the University of Valladolid
1986	Sea Grant Program "Seed Money" for "Estudio para la localización de los puertos marinos en la costa norte de Puerto Rico durante el siglo XIX"

Review:

1984	Tri Com News

Missionary Servants of the Holy Trinity
Silver Springs, Maryland, Dec. 1984
Vol. 8, No. 9
Priest Antonio Hernández
A review about the results of the archaelogical excavation in the Saint Patricks and the Holy Spirits Parish in Loíza

Memberships:

1988	Member of the Caribbean Studies Association
1986-	Regular member of the Institute of Nautical Archaeology