Archaeological and Historical Investigations of Site 41AS95, a Mid-Nineteenth-Century Salt Works on St. Charles Bay, Texas

by

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A Thesis

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ABSTRACT

Historical and archaeological investigations at site 41AS95, a mid-nineteenth century salt works on the Texas coast, have revealed previously-unknown information about a facility that likely provided salt to the local community of Lamar as well as to the network of towns and villages surrounding Copano Bay. Captain James W. Byrne, an Irish land speculator, helped to found the town of Lamar and built the salt works, which was in operation from sometime after 1851 to around 1862. Archaeological evidence suggests that the St. Charles Bay salt works may have consisted of a number of elements widely separated on the landscape, and estimates are provided for the amount of salt that could have been produced at the site. Byrne anticipated a need for local salt production that did not become truly manifest until the Civil War, when such facilities became relatively common and were among the high-priority targets of Union raids. Small-scale salt production sites of the type Byrne built are relatively unknown archaeologically or historically, so this research helps to illuminate a poorly-documented site as well as an obscure industrial process.

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CHAPTER I

INTRODUCTION

Site 41AS95 represents the remains of a mid-nineteenth-century salt-production facility on the Texas coast near the town of Lamar (Figures 1 and 2). Lamar, Texas was founded in 1838 by Captain James W. Byrne, George Armstrong, and George Robert Hull (Huson 1953). As a founder of Lamar, Byrne was an important member of the community and played a number of roles in the town, including developing the salt works that is the focus of this thesis.

The town lies at the southern tip of the Lamar Peninsula, bounded by Copano Bay on the west, Aransas Bay on the south, and St. Charles Bay on the east (Figure 2). Lamar became an important community in the developing network of towns and villages around Copano and Aransas Bays in the mid-nineteenth century. The settlements included Lamar as well as Copano, St. Mary's, Aransas City, Black Point, and Live Oak Point (Figure 3). The Copano Bay area was a center of cotton production, ranching, lumber, and shipping during this time. Efforts were made to bring the railroad to Lamar and to establish the town as the hub of a major road system (Huson 1953). These efforts ultimately failed because of financial limitations and the disruption caused by the Civil War.

Lamar was founded in 1838 (Huson 1953) and reflects the history of Texas through independence, early statehood, and the Civil War. Byrne's salt works was in operation from around 1851 to the early 1860s. Hobart Huson (1953), a prominent coastal historian in the early twentieth century, wrote that the salt works was shelled by

the Federal navy in December of 1862, but no primary sources have been found that confirm this statement. The official army records for the Confederacy and Union do not mention this attack, and, according to the head researcher at the Naval History Center, no official records from the U.S. Navy exist that mention this event. However, raids by small parties on relatively insignificant sites may have gone unrecorded, especially if they were unofficial actions (John Reilly, personal communication, January 2007). The Federal military was present in Aransas Bay throughout most of the Civil War, capturing merchant vessels and punishing blockade runners as well as generally harassing the citizens of the area (Wright 1965). The military forces near Lamar likely damaged the salt works, as salt works were common targets of Federal raids. Union forces attacked the town of Lamar in February of 1864, and the community never fully recovered (Wright 1965).

Figure 1: Lamar in the context of the Texas coast.

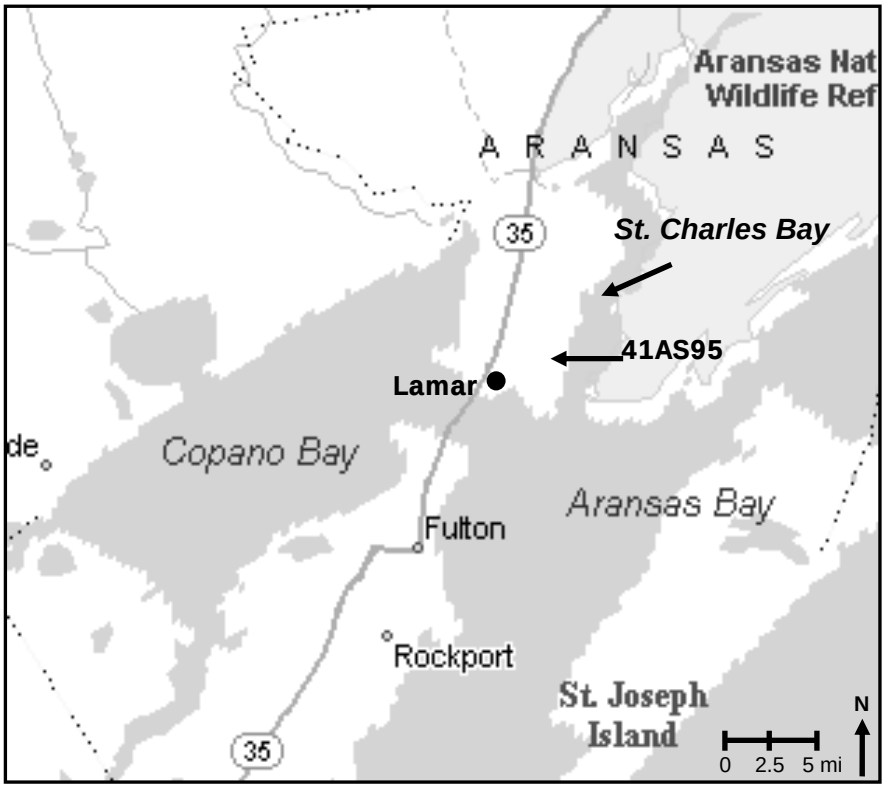

Figure 2: Site 41AS95 in relation to Lamar and Copano Bay.

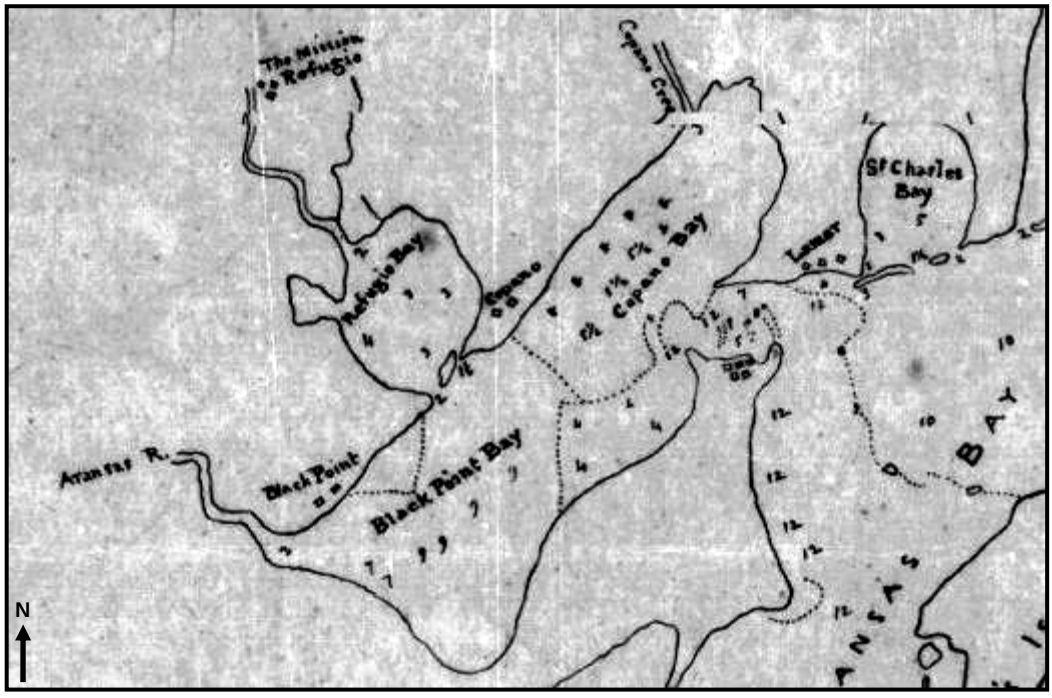

Figure 3: Detail of map of Texas coast dated 1845, showing towns around Copano Bay (courtesy Texas State Library and Archives [TSLA]).

In 2004, landowners on the Lamar peninsula discovered remains of shellcrete platforms on their property. Shellcrete was a common building material on the coast in the nineteenth century. Composed of a mixture of shell, lime, and sand, shellcrete is often referred to as "tabby," particularly in the southeastern United States (Singleton 1996:152) (Figure 4). The landowners, Al and Diane Johnson, were interested in local history and quickly surmised that the site represented the salt works on St. Charles Bay that was already vaguely known to have existed, although its location was unknown previous to the Johnsons' discovery. The Johnsons contacted the Texas Historical Commission (THC), and the Aransas County archaeological steward, Pat Braun, got involved. The site was registered and designated 41AS95. The THC conducted small-scale testing in 2004, and a magnetometer survey was produced for the immediate area of the salt works. Unfortunately, other than the magnetometer images, records of these investigations were unavailable at the time of this report. Following the THC investigations, Braun contacted archaeologists at Texas Tech University, initiating the archaeological investigations carried out in December 2005 and January and March 2006.

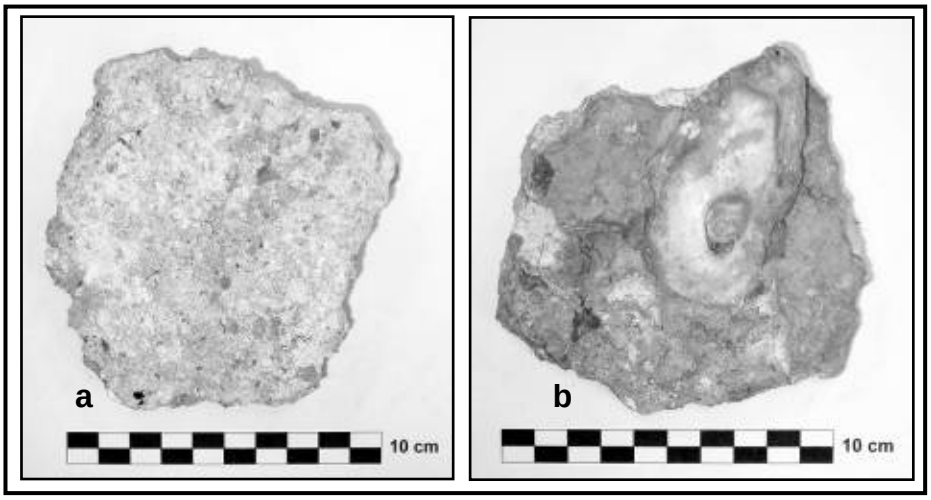

Figure 4: Example of shellcrete found at the St. Charles Bay salt works (a: upper surface; b: lower surface)

Shortly after the archaeological field work for this project was finished, ownership of a portion of the Johnsons' property, including Features 1 and 2, passed to U.S. Fish and Wildlife. The portions of the land below the high water line are now government property.

The primary purpose of this thesis research is to gather basic information about site 41AS95, a mid-nineteenth-century salt works on St. Charles Bay, and to document the site. Three primary questions are addressed:

1. How did the salt works operate?
2. What role did the salt works play in the community of Lamar?
3. What was the importance of the salt works in the overall network of commerce in the Copano Bay area?

This research is important for understanding the salt industry in Texas during the nineteenth century and, especially, during the Civil War. Salt was an extremely valuable commodity during this time period, and the production of salt by local individuals contributed significantly to the salt supply in regions of the South (Lonn 1965). Coastal salt works were uncommon in Texas compared to salt works based on brine springs or salt domes. Such small salt works were rarely well documented, and this thesis helps to illuminate salt-making procedures at coastal facilities. Since James Byrne requested that his personal papers be burned after his death, very few documents exist that mention the salt works at Lamar, so this project helps to fill a void in knowledge of a locally important site. Furthermore, this project seeks to clarify details about the presumed economic network that connected the Copano Bay communities to one another and to the

larger region, as well as to provide information on the economic and social situation in the Copano Bay area before and during the Civil War. According to Walter F. Bell (2005:219), "[t]here has been a growing interest by scholars in the study of localities" affected by the Civil War. Research at the St. Charles Bay salt works certainly fits this trend. In addition to exploring the history of the salt works, this project documents a site that is threatened by coastal erosion. The site lies in a wetland area and is vulnerable to destruction by storms and other natural processes. Therefore, it is crucial that the site be documented before it is damaged further or destroyed completely.

This thesis is organized into five chapters, including the introduction. In Chapter 2, the research plan and methods employed for both the historical and archaeological research are explained and described. Chapter 3 provides a background for the salt works on St. Charles Bay by presenting a brief explanation of salt making in the nineteenth century across the United States and, more specifically, in Texas. It also places the Copano Bay area, the location for the salt works, in an environmental and cultural context and provides the results of the historical research conducted for this thesis. Chapter 4 discusses the results of the archaeological research completed at the site. Finally, Chapter 5 provides an analysis of the historical and archaeological results as well as a discussion of the topic and the conclusions drawn from this research.

CHAPTER II

PROJECT DESIGN AND METHODS

Research Plan and Design

This project comprises two basic, and equally important, research approaches. First, historical research provides a context for understanding the salt works as a part of a larger historical scenario, and it supplements the archaeological field work to help answer the primary research questions. Second, archaeological fieldwork provides details about the salt works that are not present in the historical documents. Construction methods for the salt works and associated features were revealed archaeologically, as was the basic operating system.

The research plan, more specifically, involves both historical and archaeological investigations. Background research into the general historical context of the salt works provided a foundation for further work. Additional archival research, built upon this foundation, yielded a more specific impression of Byrne, Lamar, and the Copano Bay area.

Archaeological investigations included mapping, pedestrian survey, shovel testing, and limited hand excavations. The information thus gathered was then compared with existing data on other salt works that are known historically or archaeologically. Finally, a synthesis of all the information from these diverse sources provided the basis for a speculative reconstruction of the salt works.

The most important goal of this project is to document the site. The recent rash of intense hurricanes has brought attention to the need for coastal sites to be documented

before they are destroyed, and although the salt works is somewhat protected by the outlying St. Joseph's island, the site was designed to be submerged and is clearly susceptible to natural deterioration. Erosion of archaeological sites on Copano Bay is occurring at an alarming rate, due to natural processes that are exacerbated by human activities such as dredging (Barrera 2008).

Beyond documentation of the site, there are three primary research issues that are addressed through archival investigation and interpretation of the archaeology. First, the actual mechanism by which the salt works operated provides information useful to the understanding of the salt works as an industrial site. Presumably, evaporation of salt water was the basic principle behind its operation, but the archaeology of the salt works itself indicates a more complicated process. Since this salt works was so poorly documented, only the archaeology can illuminate what the site looked like and how it operated. These details are not addressed in the historical documents, as they were often taken for granted or considered unimportant by contemporary writers. As historical archaeologists in the United States have recently begun investigating such industrial sites, David R. Starbuck notes that:

> We historical archaeologists have a tremendous opportunity to rediscover the lost beliefs, values, and technologies of rural America by studying the many abandoned or soon-to-be-demolished industrial sites. Mills, furnaces, mines, craft shops, canals, fisheries, railroads, and many other industrial places have potential to provide technological knowledge that is no longer used in today's workplaces. Too often industrial processes are forgotten in the rush to innovate and modernize. *The remains and lessons we discover at industrial sites are helping to reconstruct a recent but poorly known past*. [Starbuck 2005:146-7] [Emphasis not in original]

Starbuck emphasizes the contributions that historical archaeology can make to the study of small, poorly-documented industrial sites. The St. Charles Bay salt works can clearly benefit from this perspective.

Second, it is important to examine how the salt works contributed economically to the town of Lamar. Aspects of this question that are addressed include the number of individuals employed by the salt works, how much salt was being produced, and by what processes and to what places the salt was distributed. Verifying stories of Union raiding of the salt works and the possible role of the salt works in the Civil War helps to illuminate the importance of the site in the local economy. Some historical sources claim that the salt works was raided shortly after the death of Captain Byrne, possibly in retaliation against Texans on the coast for blockade running (Huson 1953). If true, this story indicates that the salt works was an important part of the local economy and that it may have supplied salt to Confederate garrisons in the area. Such small supply centers are rarely mentioned in documentary records, but many existed across the South.

Finally, the synthesis of the archaeological and historical data helps to place the St. Charles Bay salt works in the larger context of the Copano Bay economic network of the mid-nineteenth century. Understanding how the salt works contributed to the local economy can provide insight into the commercial networks that linked the towns of the Copano Bay area to one another and to the rest of Texas and the Gulf coast. Because this portion of the coast was relatively isolated, many items were probably produced locally and distributed to towns in the Copano Bay area. While there may have been a number of small salt works on this portion of the coast, Byrne's is the only one that is known

from historical sources or from archaeology. Thus, the St. Charles Bay salt works was likely a primary provider of salt throughout the local community of towns and villages.

Archaeological investigations have revealed the basic structure of the site including the salt works and possible related structures, and these finds are compared to existing literature on archaeologically-known salt works throughout the southern United States and elsewhere. Information about the way the salt works was constructed was gathered during archaeological fieldwork and provides a framework for estimating salt yields and labor requirements at this facility. Historical sources that are incorporated include both published syntheses of Copano Bay and Civil War history as well as many primary documents. Archival materials including probate records, correspondence, maps, land documents, and census information are used whenever possible to provide first-hand information on many aspects of the salt works, Captain Byrne, the town of Lamar, and the Copano Bay area.

Methods

Historical Research

Research conducted at the archives at the Texas General Land Office (GLO), the Texas State Library and Archives (TSLA), the Catholic Archives of Texas, and the Center for American History (CAH) at The University of Texas at Austin (UT) yielded significant documentary information regarding the salt works, the town of Lamar, and other pertinent issues. The GLO provided plat maps and other land records as well as maps relating to the town of Lamar and the central Texas coast. Captain Byrne's military records and other documents relating to Byrne and the founding of Lamar, including

coasting manifests and shipping records, are held at the TSLA. While these records are helpful in illuminating certain aspects of life during the time period, none of them specifically mention Byrne's salt. The Catholic Archives of Texas yielded records relating peripherally to Captain James W. Byrne and his extended family, as well as to the town of Lamar during the mid-nineteenth century. The CAH was by far the most helpful repository for this research; a number of primary sources relating to many aspects of Byrne's life, the salt works, and the town of Lamar are held there.

Additional documents found at the courthouses in Rockport and Refugio include land ownership and probate records. A set of detailed county scrapbooks, compiled by Doris Ruttiger of Rockport and located at the Rockport public library, provided many interesting tidbits of local lore as well as some primary sources.

The Cincinnati, Ohio main city library yielded additional information on James Byrne and his wife and family, since Byrne had lived in Cincinnati before moving to Texas. The library provided access to census records and city directories, many of which have been compiled into books in the last thirty years.

The exhaustive search for primary sources has yielded a wealth of information on Byrne, Lamar, and the network of towns on Copano Bay. Although few documents mention the salt works itself, these resources provide insight into Byrne's life and ambitions, his family, and his business contacts and affairs. Correspondence and business records of Byrne's peers also contribute to an overall understanding of circumstances in the region at the time. Contemporary maps show towns and settlements that were considered important enough by the mapmakers to be included. When all the

information available from such primary sources is carefully considered, an image of life in the Copano Bay area in the mid-nineteenth century begins to appear.

Archaeology at the St. Charles Bay Salt Works

After a preliminary visit to the salt works site in June 2005, a plan for field work was developed. The research plan was designed to be flexible to adapt to unexpected discoveries. The fieldwork itself ran for a total of 19 days in December of 2005 and in January and March of 2006, during which time volunteers from Texas Tech University worked at the salt works site and in the surrounding area at the invitation of the land owners. Fieldwork sessions ran from December 14 through 21, 2005, and from January 4 through 8 and March 12 through 17, 2006. The crew for the December session included 13 Texas Tech University students, and the January and March crews had seven members each. A total of 15 students participated in the field project.

The fieldwork consisted of four primary components: survey, mapping, shovel testing, and excavation. Field methods were adapted from the following sources: Carmichael et al. (2003), Collins and Molyneaux (2003), Hester et al. (1997), and Stewart (2002). Prior to the crew's arrival, the landowner cleared vegetation from the main area around the visible features, and, as work progressed, he cleared additional areas to make them more accessible and features more visible. A detailed daily field journal was kept, in which notations were made about weather and environmental conditions, observations, and other pertinent issues. In addition, photographs were used to document features, excavation units, shovel tests, vegetation, topography, and unit profiles.

The crew surveyed over 42 acres of land in search of traces of human activity. The survey area included a portion of land between the shore and the tree line and about 100 meters north and 300 meters south of the exposed salt works features (Figure 5). Promising areas were marked, and records were made of the artifacts and features specific to each. Transects were set at 30-meter intervals, and two surveyors were assigned to each transect. The starting and ending points of each transect were recorded using a portable GPS unit. Transects ran perpendicular to both the shore and the tree line, or roughly east-to-west. Surface visibility was generally low (0 –10%) above the high-water mark, as natural vegetation obscured the ground surface.

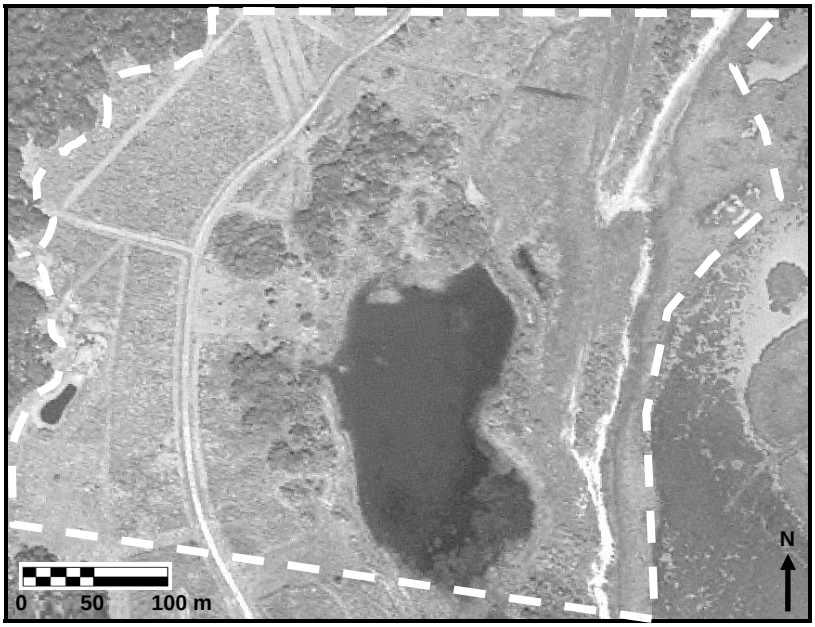

Figure 5: Aerial photograph of the salt works area, showing approximate extent of pedestrian survey (dashed white line) (base image courtesy Texas Natural Resource Information Service [TNRIS]).

To facilitate mapping, the crew established a 5-x-5-meter grid across the primary salt works area, incorporating both features that were originally recognized by the landowners (Features 1 and 2, designated Area A). These features include a small

rectangular shellcrete border, Feature 1, and a large rectangular shellcrete platform, Feature 2. A standard mechanical transit was used to lay out the grid lines. The grid covered an area of about 240 square meters, or 30 meters north to south and 80 meters east to west, and was oriented toward magnetic north. Each 5-x-5-meter block was marked by colored pin flags at the corners. The primary horizontal datum was arbitrarily set at N1000, E1000, elevation 10.0 meters, and marked the northwest corner of the grid. This datum was marked with a permanent aluminum cap set in concrete. As work progressed and excavations were opened, a second permanent datum was set at N900, E760, with an elevation of 12.57 meters (based on location relative to the primary datum). The second datum point created a reference for Feature 3, an alignment of shellcrete blocks, and Feature 4, marked by a pattern of eroding shell hash. This datum and the two associated features (Features 3 and 4, designated Area B) were tied into the original grid during the production of the master site map. A total data station (a Sokkia SET 5E) was used to record the exact locations of each shovel test and excavation unit, including surface elevations. The total station data allowed for accurate mapping of the site features and the incorporation of these features into a Geographic Information Systems (GIS) program, which was used to create a master site map (Figure 6). The locations of each datum cap and all shovel tests and excavation units were also recorded using a handheld Global Positioning Systems (GPS) unit.

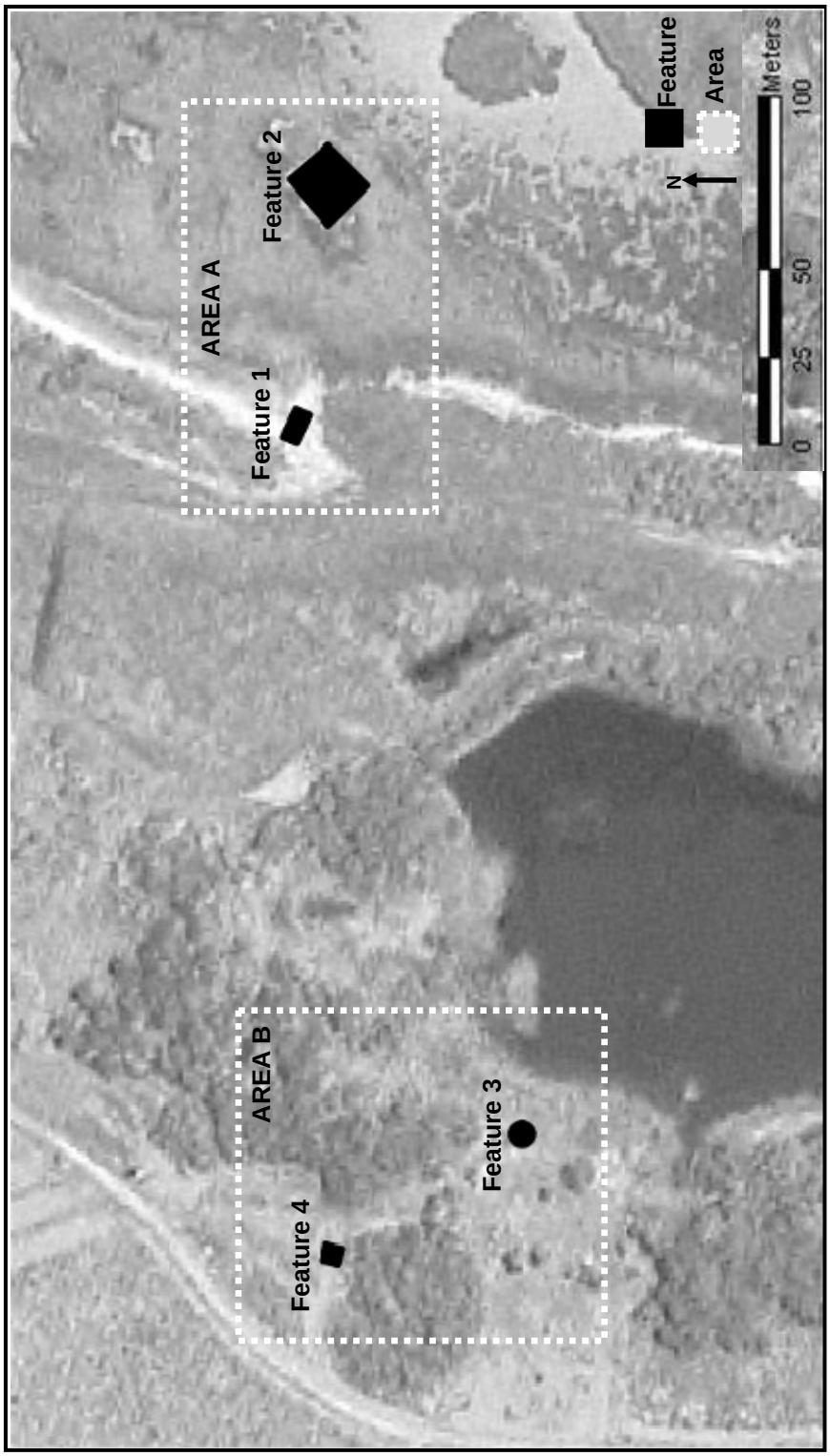

Figure 6: Master site map (base image courtesy Texas Natural Resource Information Service [TNIRS]).

Areas that appeared promising in terms of historical remains based on the pedestrian survey were further investigated through shovel testing, and shovel tests were also conducted in the vicinity of known features to determine the extent of each. Several sandy dunes were tested for evidence of human activity, and additional shovel test pits were randomly placed for more extensive sampling and to partially compensate for the limited surface visibility. In all, thirty-two shovel tests were completed, and all fill from each shovel test was screened through ¼-inch wire mesh. The location of each shovel test pit was either marked on the grid map for Features 1 and 2 (discussed below) or recorded using a portable GPS unit. These locations were later incorporated into the master site map (Figure 6). Shovel tests were at least 30 centimeters in diameter and were dug in approximately 20-centimeter levels to a depth of 1 meter or to the level of the water table. Artifacts exposed during these shovel tests were collected in bags marked with the shovel test number and location as well as the excavation level in which they were found.

Excavation units were first placed around Features 1 and 2 (Area A), and then units were added around the two newly-identified features discovered during survey, Features 3 and 4 (Area B). Units were placed in specific locations in order to reveal as much data on building methods and feature configuration as possible. Units were designated by year and a unit number corresponding to the order in which they were established, from 2005-1 to 2005-14 and 2006-1 to 2006-6. Excavation units were generally 1 x 1 meter in size, while some were later expanded to 1-x-2 meter or 2-x-2 meter units. Soil was removed from the units in arbitrary 10-centimeter levels, and all

soil was screened through ¼ -inch hardware cloth. Initially, the extent and function of the two features first identified during survey (Features 3 and 4, discussed below) was unknown. Therefore, vertical provenience for the first excavation units at each of the new features was established based on centimeters below surface elevation. As the excavations were expanded, vertical provenience was established using a transit and stadia rod based on the elevation of 12.57 meters set at the location of the datum cap for Area B. This elevation was based on relation to the primary datum (set at 10.0 meters).

Each level in every excavation unit was documented on a level form on which excavators recorded elevations, soil characteristics, artifacts recovered, and other pertinent information. Level forms also provided space for mapping *in situ* artifacts and features. Artifacts from each level were collected in level bags, as were samples of architectural materials. All level bags were marked with field provenience information, which was double-checked against the related field form at the end of each day for accuracy.

After the fieldwork was complete, the level bags were taken to the Texas Tech University archaeology laboratory for artifact processing. In the lab, each bag was assigned a lot number that correlates to a specific level in a specific excavation unit or to a shovel test. A total of 68 lot numbers was assigned, and the lot numbers were catalogued with their corresponding provenience information. In the lab, artifacts were weighed and counted. Metal artifacts were coated with oil to retard further corrosion, and all artifacts were placed in archival-quality bags for storage.

The archaeological field work for this project led to additional historical research and examination of comparable field projects. Historical data and the results of archaeological investigations of other salt works were necessary in order to help interpret the remains found at the St. Charles Bay salt works.

Although no single theoretical approach guided the interpretation of the data recovered during this project, several formal theories are reflected in various aspects of the syntheses and conclustions. Historical archaeology inherently involves the use of both historical documents and the archaeological record. How these two sets of data should be used and understood in relation to one another is an ongoing discussion among historical archaeologists. In this project, the historical documents that were available are understood as artifacts, as much products of the times and places of their creation as are the structures of the salt works themselves. Documents must be evaluated with an understanding of the objectives and biases of the people who created them (Hicks and Beaudry 2006). Additionally, in attempting to understand Byrne's motivations in building the salt works, the site's role in the larger world system must be taken into account (Wallerstein 1989). Interestingly, Byrne apparently was attempting to make Lamar less dependent on the external world than it had been by creating a local industry to create a product that otherwise had to be imported. Larger forces intruded upon the salt works during the period of the Civil War, when the conflict between the Union and the Confederacy was felt throughout the United States. Finally, the St. Charles Bay salt works cannot be evaluated adequately without examining its presence on the physical landscape (Palmer and Neaverson 1994). The landscape itself determined the form and

location of the salt works, as only on that piece of available land was there the correct combination of solid earth, briny marsh, wind and sun exposure, and nearby fuel needed for the operation of such an industry. Thus, this thesis reflects various theoretical approaches in the interpretation of documents, motivations, and the landscape.

CHAPTER III

ENVIRONMENTAL AND HISTORICAL BACKGROUND

Site Background

Setting

Environment

Site 41AS95 is located on St. Charles Bay, a narrow inlet that feeds into Aransas Bay on the eastern side of the Lamar Peninsula (known as Lookout Peninsula before the founding of Lamar). On the west side of the Lamar Peninsula is Copano Bay. The bay is fed by Copano Creek and by the Mission River, which empties into Mission Bay, a small bay on the northwest side of Copano Bay. Aransas Bay separates Copano and St. Charles Bays from the Gulf of Mexico (Figure 7).

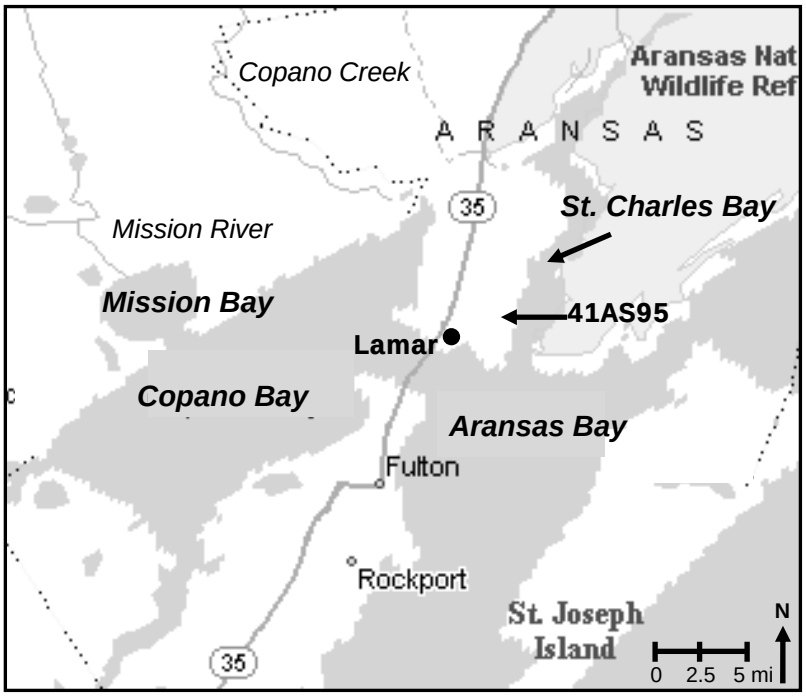

Figure 7: Site 41AS95 in relation to Lamar and Copano Bay.

This network of bays is located in the region of Texas known as the Gulf Coast Plain (Black 1989). Much of the Texas coastline is protected by barrier islands, which buffer the coast somewhat from storms but create treacherous conditions for boats. St. Joseph's Island separates Copano Bay from the Gulf of Mexico. Further southwest along the coast, the hypersaline bay known as the Laguna Madre provided a less habitable coastal environment than that of the central coast (Black 1989).

Salt marshes and lagoons are common between the barrier islands and the mainland, and the estuaries that make up much of the coast have provided rich resources for people from prehistoric times to the present (Black 1989). Shellfish such as oyster and lightning whelk abound in the estuaries and lagoons of the central Texas coast, and shell reefs are common in St. Charles, Copano, and Aransas Bays. Fish species found in these bays include red drum, black drum, sheepshead, southern flounder, and mullet (Ricklis 1996). Many of these fish species are still found in great abundance in this area during the winter to early spring.

The land on which the salt works was located includes both marshland and grassland. Features 1 and 2, two rectangular platforms, (Figure 6) are below the current high water line and are intermittently inundated. The vegetation in this area is composed largely of salt-tolerant plants (Figure 8). Features 3 and 4, a circular structure of shellcrete blocks and a possible architectural foundation, (Figure 6) are slightly more inland and located on land that currently is covered in grasses, prickly pear cactus, and mesquite (Figure 9). Further inland about 300 meters, the tree line is made up primarily of mesquite, but live oak is also common.

Figure 8: Salt-tolerant vegetation near Features 1 and 2 (photo by James Barrera).

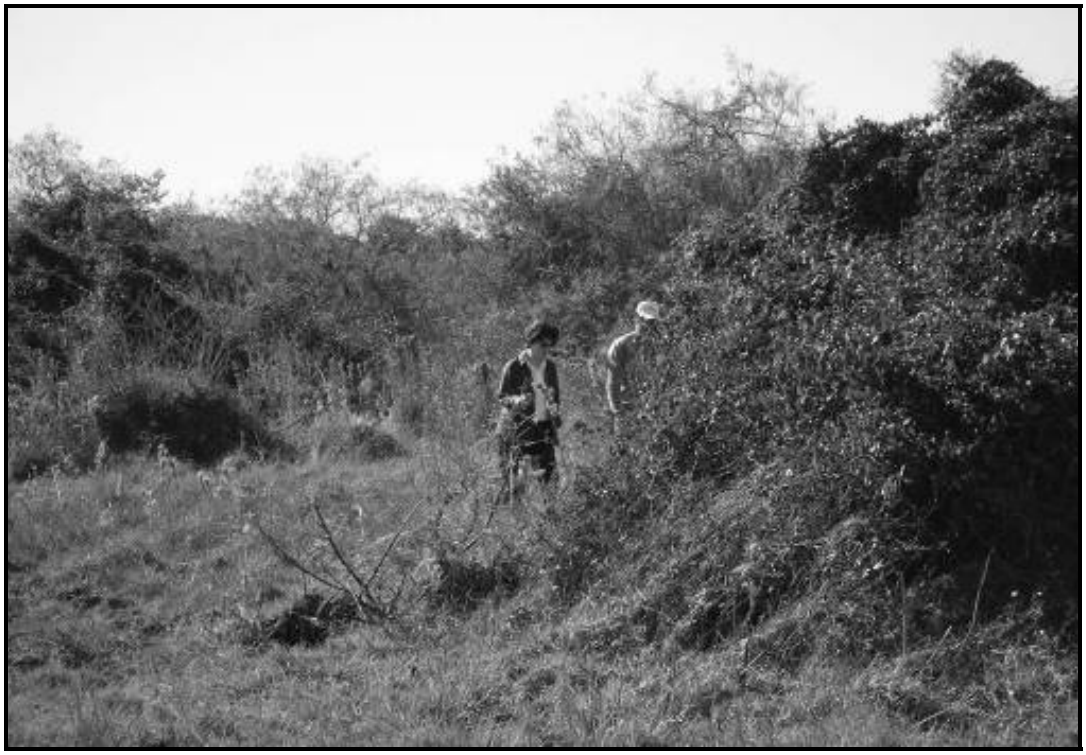

Figure 9: Brushy vegetation near Features 3 and 4 (photo by J. Barrera).

Soils

The St. Charles Bay salt works is located in part of the Galveston-Mustang-Dianola soil area, which is characterized by relatively level to undulating sandy soils that are rapidly permeable and nonsaline through extremely saline. Soils of this type are common in low coastal areas, such as that where St. Charles Bay is located (Guckian and Garcia 1979). Mustang fine sand, soils of the Galveston-Mustang association, and soils of the Barrada-Tatton association were all encountered during excavations of the salt works. Mustang fine sands are variably saline, depending on the length of time since they were last flooded by salt water, while the Galveston-Mustang association is characterized by deep, poorly drained, relatively level sandy soils (Guckian and Garcia 1979). The Barrada-Tatton association soils are highly-saline soils usually found along lagoons and bays and are composed of a combination of Barrada clay and Tatton fine sand. The water table is typically found at depths of 6 to 36 inches in this association, and soils are rarely dry more than 10 inches below the surface (Guckian and Garcia 1979).

Prehistory to Early History (ca. 2000 B.C. – A.D. 1830)

The Copano Bay area has been significant to the development of Texas throughout both prehistory and the historic period. While the historic period of Copano Bay is relatively well known, the prehistory of the area is not clearly understood. Several sites have been excavated in this area, but most of the work was done in the early part of the twentieth century, and the analysis has not been fully reported for most of these sites (See, for example: Campbell 1947, Campbell 1952, Campbell 1958, Martin n.d.). Still,

several prehistoric cultural manifestations that are represented archaeologically have been identified.

Archaic Period: Aransas Focus (ca. 2000 B.C. –A.D. 1200)

Prewitt and Paine (1987) estimate that Copano Bay was exposed to sea water around 7000 to 8000 B.C., but no stratified sites have been identified in this area that date to before ca. 2000 B.C., when Aransas focus occupations are first apparent. The Aransas focus was defined first by T.N. Campbell in 1947 in the *Bulletin of the Texas Archeological and Paleontological Society*. Campbell's article describes the Johnson site on Copano Bay and names it the type site for the Aransas focus, which is based not only on the Johnson site but also on the Kent-Crane and Live Oak Point sites. In 1989, Black reported that what he calls the "Aransas complex" first appeared during the Middle Archaic period, probably after 2000 B.C. However, Aransas complex materials as defined by Black (1989) become more distinctive and more common during the Late Archaic, beginning around 400 B.C. Black (1989) notes that the Aransas complex encompasses the area of the coast from south of San Antonio Bay to north of Baffin Bay and approximately 130 kilometers inland. Campbell's (1947:63) description of the Aransas focus is based on "the absence of pottery from the lower levels of some shell midden sites" and the presence of a particular complex of artifacts made of bone, stone, and shell. The absence of pottery in shell middens separates the Aransas complex from the Late Prehistoric Rockport phase which is characterized by sandy paste ceramics. Campbell (1947) describes Aransas complex people as coastal nomads who created large shell middens that demonstrated their reliance on marine mollusks as well as fish, turtles,

aquatic birds, and some terrestrial mammals. Bone artifacts associated with the Aransas complex include bird bone beads as well as awls and elongated pins of mammal bones that are occasionally decorated with incised and drilled designs. The Aransas complex is associated with large projectile points with plain or side-notched stems and short triangular points with alternately beveled lateral edges and include Bell, Matamoros, Catan, Abasolo, Gary, and Nolan point types (Campbell 1958; Prewitt and Paine 1987). Lithic knives, gravers, and scrapers are not found in great quantities but are associated with the Aransas complex as well. Ricklis (2004) dismisses the concept of the Aransas focus as obsolete and obscuring the variations across time and space seen in the coastal Archaic. The concept is still in use by many archaeologists, however.

Late Prehistoric to Historic Period: Rockport Phase (ca. A.D. 1200–1830)

The best known manifestation of Late Prehistoric occupation on the central Texas coast is the Rockport Phase, defined by Sayles in 1935. Ricklis (2004) considers the phase concept to be applicable in this situation, because there is clear definition of the artifact assemblage in both time and space. Black (1989) refers to the assemblage associated with this period as the "Rockport Complex," and suggests dates from circa A.D. 1200-1830. Rockport phase sites are defined primarily by the presence of Rockport ware pottery, which is found in a zone about 40 kilometers wide along the coast between Matagorda and Baffin Bays and has been correlated with the range of the historically known Karankawa Indians (Ricklis 2004). Two primary site types have been recognized for Rockport phase sites. The first group includes large, thick middens with abundant artifacts and a profusion of fish bones and mollusk shells, indicating intensive occupation

and fishing activity. Seasonality analyses indicate these types of sites were occupied primarily in the fall through early spring when fish are most abundant in these central coastal bays and terrestrial resources are relatively scarce. These sites likely represent seasonal aggregation of groups into large communities on the shoreline for fishing (Ricklis 2004). The second site type includes small, thin deposits on streams and near the heads of bays. Sites of this nature reflect a focus on hunting of large terrestrial game by small groups of people during the spring and summer months (Ricklis 2004).

The Rockport Phase artifact assemblage is very similar to that of the central Texas Toyah Phase except for the presence of Rockport ware pottery instead of the Leon Plain pottery found at Toyah sites. Rockport Phase artifacts include arrow points, mostly Perdiz points, as well as small unifacial end scrapers, and flaked drills or perforators. This phase is also characterized by the reappearance of prismatic blade-core technology, not seen since the Paleoindian period (Ricklis 2004). Rockport ware pottery has a sandy paste, is sometimes bone tempered, and is often coated or decorated with asphaltum, which naturally washes up on the shores of the central Texas coast. Bone and shell tools and simple ornaments, as well as ceramic smoking pipes, are also often found in Rockport Phase contexts (Ricklis 2004).

Like the Toyah phase, the Rockport phase has been associated with an increased reliance on bison hunting. In fact, Ricklis (1992) suggests that the appearance of what is recognized as the Rockport phase represents the adoption of a central Texas bison hunting and processing toolkit by preexisting groups on the central Texas coast. The fact that the Rockport people did not adopt the characteristic Leon Plain pottery of the Toyah

phase may indicate an indigenous pottery style was already in use on the coast before the adoption of the Toyah phase toolkit by coastal dwellers (Ricklis 1992). The existence of arrow point forms such as Scallorn may also indicate an earlier Late Prehistoric manifestation than the classic Rockport phase (Ricklis 2004). The increase of bison availability on the coast did not result in a complete abandonment of seasonal coastal migration, but it did provide an economic opportunity that indigenous coastal people exploited.

Associated with the Rockport phase, the Karankawa Indians were living on this central portion of the coast when the first Europeans arrived. European writings about the Karankawa often describe a tall, aggressive population that practiced cannibalism (Ricklis 1996). Conflict between European settlers and the native people of the coast began with LaSalle's colony (discussed below) and continued well into the nineteenth century, although the native groups in question varied.

Early History (1519 – 1864)

Although the Spanish were well established in Mexico by the middle of the sixteenth century, they had little interest in the lands now known as Texas until word spread that the Frenchman, La Salle, had founded a colony at Matagorda Bay in 1685 (Bruseth and Turner 2005; Mathes 2005). A few Spanish expeditions are worth mentioning, however.

In 1519, Alonso Álvarez de Pineda was commissioned to search for a passage that was thought to separate Florida from the mainland of the New World. The explorer started his journey in Jamaica, rounded the end of Florida, and followed the Gulf coast

until he came to Veracruz. There is no evidence that he disembarked at any point, but he created the earliest known map of the Texas coast (Kelsey 1998; Mathes 2005).

The famous journey of Alvar Núñez Cabeza de Vaca and his companions between 1528 and 1536 from Florida to the Pacific coast of New Spain took the four survivors of the expedition across the Texas coast (Kelsey 1998). Correlations to any specific locations on the coast with the writings from this expedition, however, are difficult to make. Several other Spanish expeditions passed through the region, but overall this northern frontier was neglected by Europeans until the late seventeenth century.

In 1685, Robert Cavelier, Sieur de La Salle, landed on the Texas coast and founded the ill-fated settlement of Fort Saint Louis on Matagorda Bay (Bruseth and Turner 2005). Word spread about the Frenchman's activities, and the Spanish began to pay attention to what they claimed as their lands on the Texas coast. In 1686, Alonzo de León began a search for La Salle's colony (Mathes 2005). His journeys along the Rio Grande were unsuccessful. The same year another Spanish expedition, led by Martín de Rivas and Pedro de Iriarte, discovered La Salle's abandoned ship *La Belle* but also failed to locate the French colony (Mathes 2005). In April 1689, Alonzo de León finally succeeded in locating the site of Fort Saint Louis, where he discovered the French settlers had been massacred by Karankawa Indians (Foster 1995; Mathes 2005). The following year de León returned to Matagorda Bay by roughly the same overland route he had used in 1689, and then his expedition continued inland and to the north (Foster 1995).

In 1722, the Spanish built their own presidio, Nuestra Señora de Loreto en La Bahía del Espíritu Santo, known as La Bahía, over the remains of the French Fort Saint Louis at Matagorda Bay (Bruseth et al. 2004a; Bruseth et al. 2004b). The founding of this presidio was part of a concentrated effort by the Spanish to increase their presence in east Texas, in hopes of deterring further French settlement (Bruseth et al. 2004a, Bruseth et al. 2004b). Following this activity, Spanish occupation in Texas began to increase.

According to Huson (1953), a fort called Aranzazu was built by the Spanish at Live Oak Point (near present-day Fulton) in the middle of the eighteenth century, and another fortification was built on St. Joseph's Island near Aransas Pass at the same time. The town of Goliad was created with the relocation of the mission and presidio of La Bahia in 1749 (Huson 1953). Mission Refugio was founded in 1790 and formed the core of the settlement of Refugio, which became one of the major towns in this region of Texas for the next 150 years (Huson 1953). During the last half of the eighteenth century, Spanish ranchos were established in this region, and by the time Mexico gained its independence from Spain in 1821, much of the land was used for ranching.

During the Mexican period (between 1821 and 1836), a number of immigrants, especially Irish, were granted land in Texas as empresarios. The Mexican government granted these lands in an effort to discourage intrusion by American settlers; the Irish were considered less threatening than Americans because of their Catholicism (Huson 1953). Empresarios entered into contracts with the Mexican government. In return for land, the empresario agreed to settle a certain number of families on the land within a specific time frame (Oberste 1953). Many of these land grant contracts were never truly

fulfilled, and when Texas fought for independence from Mexico, many empresarios who had not complied with their promises fought for independence.

Salt Works Background

Salt Making in the Nineteenth Century

The earliest commercial salt works operated on the principle of procuring salt through the evaporation of brine. In the United States even rock salt was accessed, prior to the development of efficient mining techniques, by pumping water into underground rock salt deposits to dissolve the salt into a brine which was then pumped out of the ground and boiled to evaporate off the water. Other sources of brine for salt making included brine springs and seawater. Brine evaporation was accomplished through three primary methods: solar evaporation, boiling, or using what is known as a "thorn house" or "graduation chamber," in which salt water is poured over piles of thorny branches or straw, respectively. In this third method, the salt water is thus distributed over a large surface area, speeding the evaporation of the water (Fielding and Fielding 2006, Multhauf 1978).

In the United States, one of the major centers for commercial salt production since the nineteenth century has been the Kanawha Valley in West Virginia (Updike 2001). Brine springs and seeps attracted salt makers, who gathered salt water and boiled it in large kettles, a process that gradually increased in capacity and complexity. A typical early furnace in the valley consisted of two parallel walls that formed a flue above which kettles would be placed. A firebox at one end of the flue provided heat that traveled along the length of the flue, under the kettles, and out a chimney at the other end (Updike

2001). As Updike (2001:42) explains, "The process of making salt with this type of furnace went as follows: The central feature was the furnace that evaporated salt from the brine pumped from nearby wells. An elevated storage cistern fed the brine by gravity through pipe logs to the kettles. Wooden stopcocks on each kettle controlled the flow of water." The first furnaces were built in the Kanawha Valley in the late eighteenth century by families and, later, entrepreneurs who often rented their furnaces to others. The valley experienced an industrial boom during the War of 1812, when large government orders for salt encouraged expansion and the British blockade of the coast limited imports to the Gulf coast and eastern states (Updike 2001). When the war ended, salt prices dropped, endangering the industry of the Kanawha Valley. In 1817, to stabilize prices, salt makers formed the Kanawha Salt Company, "the first industrial cartel in American history" (Updike 2001:40). Most of the salt produced in this region was transported to meat-processing centers in Cincinnati and Louisville via the Ohio River. During the Civil War, the Kanawha Valley was an object of conflict, as both sides in the war valued the salt and other resources produced in this area.

Archaeological remains associated with the Kanawha Valley salt works consist primarily of furnaces. Archaeologically, these furnaces appear as piles of burned earth and rocks with associated concentrations of cinders and coal (Updike 2001). The remains of one of two furnaces found in 1999 suggested a more complex system of salt production than simple evaporation by boiling. However, the other furnace appeared to have operated on the basic principle described above, with a large trench over which kettles or pans were placed as heat circulated below (Updike 2001).

At Boone's Lick in Howard County, Missouri, several salt works were operated between 1805 and 1833 (Bray 1987). These operations included six furnaces fed by two brine springs. At this site, limited archaeological testing revealed wooden elements in a remarkable state of preservation. Archaeologists discovered remains of a "brine-elevating delivery system" and two structures that sheltered the mechanisms (Bray 1987:1). A wooden drive shaft for a treadwheel pump was found, and preserved sections of wood provided evidence for a wooden aqueduct measuring an estimated 168 meters in length. The aqueduct comprised a wooden trough that carried salt water from the treadwheel pump, which pumped brine from underground, to several boiling furnaces (Bray 1987). The well-preserved remains at Boone's Lick emphasize the poor preservation at other sites and the types of structures that were likely present at other salt works.

Salt Making in Texas

Salt making at historic inland sites in Texas is reasonably well known. A number of locales supplied with salt lakes or salt springs have been archaeologically investigated, and more are known from historic records (Baker 1986; Skinner 1971). Among the known nineteenth-century Texas saltworks were Bonner's Saltworks in Anderson County, Fort Worth Salt Company Saltworks and Lone Star Saltworks in Mitchell County, Grand Saline Saltworks in Van Zandt County, Jordan and McGee Saltworks in Kaufman County, and Steen Saltworks in Smith County (Baker 1986).

At the Neches Saline in Smith County, Texas, archaeologist S. Alan Skinner (1971) investigated the commercial salt production conducted at that site between 1820

and 1870. Ten furnaces and eight furnace locations were identified during the archaeological survey. At the Neches Saline in the nineteenth century, families could buy salt from a salt maker or could rent kettles for making their own salt. According to Skinner (1971:15), "[w]ater was collected in wells located on the prairie and piped to the furnaces through a cedar trough pipeline….The water was poured into the kettles at the furnace and was evaporated to yield the salt….Kettles were moved on and off the furnace with the help of an A-frame." These historic salt works, like some others based on brine springs, conformed to a basic construction system, described by Skinner (1971:15-16) and shown in Figure 10:

> The furnace was a long trench lined with stone on both sides, and consisted of three contiguous parts. These three sections are the firebed, the flue or cooking area, and the chimney, in that order. A draft ran from the firebed at one end of the trench through the cooking area and up the chimney at the opposite end of the trench. An iron sheet covered the fire and cooking areas, and heat was funneled under the sheet to the chimney where it escaped….Heavy iron grates spanned the width of the trench in the fire area and logs were laid on the grates. The grates were set above the trench floor about 1.5 feet, so that ashes could fall and be removed easily. The trench was 4 feet wide in the cooking area, and the cast-iron sheet which covered the trench had holes into which the kettles were placed.

Skinner (1971) also mentions that a walkway adjacent to the flue/cooking area was necessary so workers could tend the kettles. This arrangement of kettles over a flue was also typical of sugar-refining operations, which essentially used the same methods for making sugar from sugar cane juice that was used for making salt from brine (Fox 1983). At the Sutherland Plantation in Jackson County, a circular firebox with an iron grate was found. Beneath the grate was a pit into which ashes would fall from the burning wood above (Fox 1983).

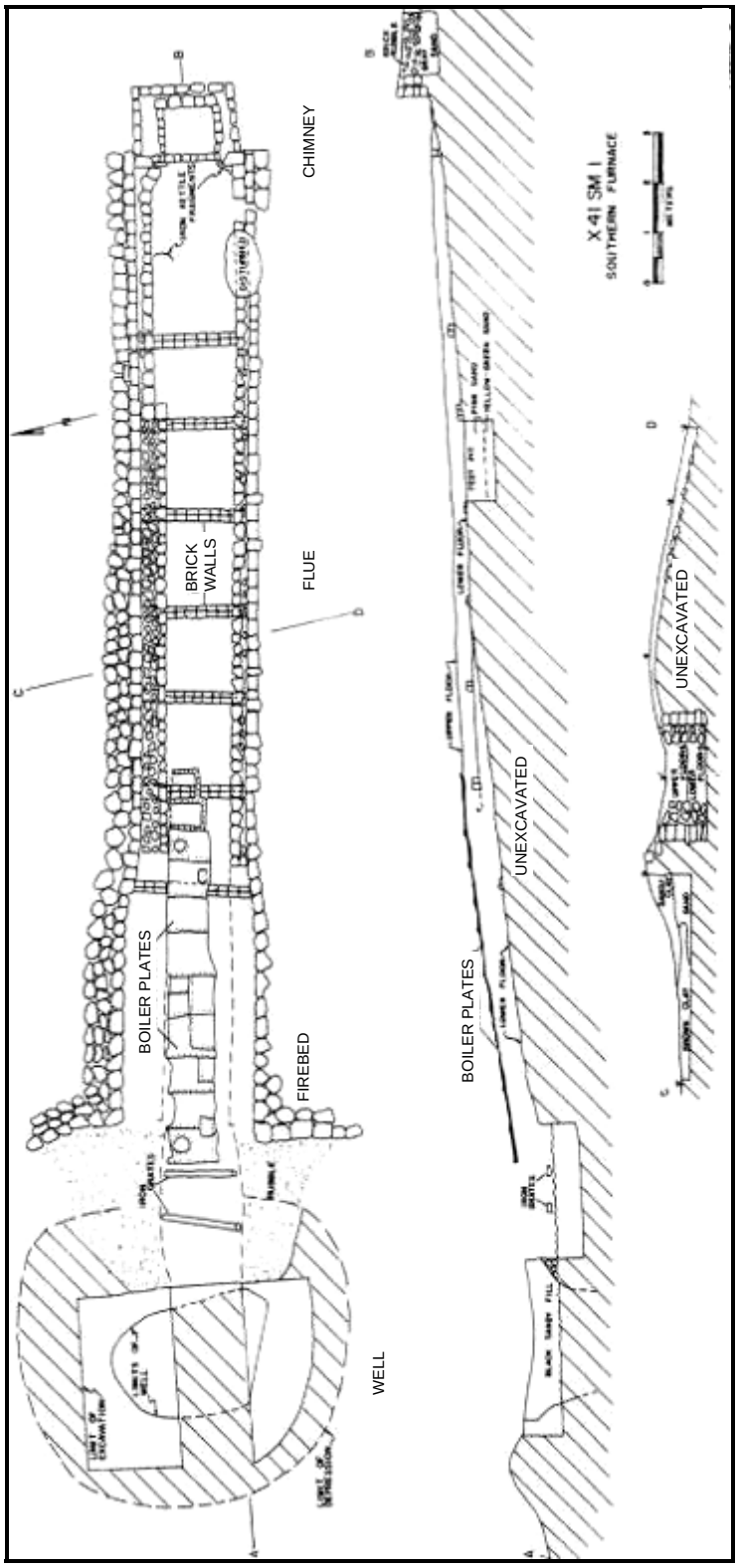

Figure 10: Plan map of one furnace investigated by Skinner (image from Skinner 1971:27, some labels have been retyped for clarity).

Unfortunately, documentary information on historic coastal salt works in Texas is limited. At the town of Velasco (only a small settlement at the time), at the mouth of the Brazos River and northeast of Lamar, Asa Mitchell had a salt works as early as 1825 (Earls et al. 1996). Mitchell wrote to Stephen F. Austin in 1826 of his journey to New Orleans to purchase a set of salt kettles (Earls et al. 1996). Although he apparently did not find the kettles he needed, this letter lends support to the idea that the central Gulf coast of Texas was not conducive to efficiently gathering salt through solar evaporation alone. Moreover, Mitchell's need for kettles at Velasco to at least expedite salt making supports the hypothesis that Byrne's salt works also used kettles for boiling the brine (discussed in Chapter 5). After the Battle of Velasco in 1832, which essentially destroyed the town that had existed up to that point, Velasco was rebuilt (Earls et al. 1996). The town association stipulated that salt wells or salt furnaces could not be built in the town, possibly to protect the interests of Mitchell, whose salt works lay just outside the town limits (Earls et al. 1996). Unfortunately, excavations at Velasco have not located remains of this salt works.

Salt and the Civil War

The Union Blockade of the Coast

In April of 1861, President Lincoln instituted a blockade of the southern states of Texas, South Carolina, Alabama, Florida, Mississippi, and Louisiana; North Carolina was added shortly thereafter (Thornton and Ekelund 2004). Lincoln hoped to end the war quickly by placing a cordon of ships along the coastline of the South to cut off supplies coming into the South and stop exports that provided income to the Confederate States.

By the end of 1861, the blockade was noticeably affecting supplies and prices. The South depended heavily on cotton exports for income, and, after the first year of the war, cotton exports had declined by 99 percent (Thornton and Ekelund 2004). The effect on imports was no less extreme. The southern states imported wool, coffee, tea, medicines, textiles, shoes, iron, and salt. All of these items became increasingly scarce in the South as the blockade continued (Thornton and Ekelund 2004). Across the South, efforts were made to develop local production of these commodities. In an attempt to make Texas self sufficient, the military board encouraged the development of natural resources such as salt and iron (Jewett 2002).

The South, despite having some natural salt deposits, imported almost all of its salt from abroad. England and the West Indies were the principal suppliers of salt to the United States in the years before the war, and, according to Lonn (1965), a fourth of all salt shipped from England was brought to the port of New Orleans. Most of the salt imported to Texas came through New Orleans. The blockade of the coast severely affected the availability of salt, forcing the development of local production (Lonn 1965).

For the approximately nine million people in the Confederacy, the adjutant general of Alabama estimated a requirement of three hundred million pounds of salt a year, which was somewhat less than the pre-war consumption of 50 pounds of salt per capita per year (Lonn 1965). Butter was heavily salted, eggs were commonly packed in salt, cattle and horse feed had to be supplemented with salt, and salt was also necessary for preserving hides until they could be tanned (Lonn 1965). The largest need for salt, however, was for meat preservation. The only available methods for preserving meat at

the time were salting and smoking, and great quantities of salt were required for the former. Experts recommended the use of two bushels of salt (about 100 pounds) per 1,000 pounds of pork, or one and one quarter bushels (about 70 pounds) of salt for 500 pounds of beef (Lonn 1965). In J. De Cordova's (1969:30) book on Texas (originally published in 1858), the author includes a section "On Salting Meat," which provides insight into contemporary thought on the issue:

> From necessity, much the larger portion of animal food consumed in Texas is salted meat; and as it is important that, under these circumstances, it should be properly prepared, and as so few people understand the art, we give the following process, being fully satisfied that those who will take the trouble will be amply repaid by the superior flavor and nutriment that meat salted on this plan possesses over that which is cured by the common manner.

Starvation was widespread in the South during the Civil War, in part because of the lack of salt for preserving meat. Herds of livestock were available for sale, but many people went without meat because it could not be preserved. Livestock in areas without natural salt deposits sickened and died from lack of salt in their diets (Lonn 1965). People resorted to extreme measures to procure salt, as Lonn (1965:51–52) explains:

> All the brine in the troughs and barrels where pork or beef had been salted was carefully dipped up, boiled down, and again converted to salt…the salty earth under the old smokehouses, impregnated with the drippings of years, was dug up and placed in hoppers…with a trough underneath to catch the seeping water as it percolated through the hopper. The resulting brine was boiled down to the proper point, poured into vessels, and set in the sun in order to complete the rude process by evaporation. The residuum was unsightly in color, but it answered the purpose, especially for the stock, and was accepted without complaint, if not always gratefully.

The desperate need for salt across the South fueled the development of local production, although many small-scale operations apparently were never documented.

During the Civil War, the Florida coast became a major salt-production area for the South. As a result, it also became a target of Union raiding and attacks. Several large commercial salt works are known historically and archaeologically, especially near St. Andrews Bay, where as many as 5,000 people were engaged in salt making at various facilities during the Civil War (Wayne and Ashton 1997). The Federal navy repeatedly attacked the various salt works on St. Andrews Bay, but the destroyed operations were quickly replaced with new ones (Wayne and Ashton 1997). While these large operations have similarities to the small salt works at Lamar, their scale is entirely different. More comparable, however, is a small nineteenth-century salt works at Salt Island, Florida that was investigated through pedestrian survey in 1977 by M. F. Dickinson and G. W. Edwardson (1984). The investigators noted that the salt works at this site comprised two identified furnaces, represented today only by large piles of rock. Portions of cast iron kettles, glass, and fragments of a clay pipe were scattered nearby (Dickinson and Edwardson 1984). The archaeologists searched for evidence of a camp or domestic area for salt makers, but no such occupation area was found.

Results of Archival Research

Captain James W. Byrne and His Family

Although his name is not recognized like that of Sam Houston, Stephen F. Austin, or William Barrett Travis, James W. Byrne was intimately involved in the development of Texas. Byrne was a cotton farmer, a cattle rancher, an entrepreneur, a land speculator, a soldier, and one of the founders of the town of Lamar. He also built the small salt works that forms the basis of this thesis. Byrne's life prior to 1812 is difficult to trace.

Hobart Huson, a coastal historian of the first half of the twentieth century, reported that Byrne was born in County Wicklow, Ireland around 1787 (Huson 1953). The year Byrne and his siblings immigrated to the United States is unknown, but by 1812 he was living in Kentucky or Ohio.

Byrne is listed in the War of 1812 service records as a member of Lieutenant Colonel Ball's Squadron Light Dragoons, U.S. Volunteers. Byrne's military record indicates that he entered the squadron as a private and was discharged as a corporal (NARA Index to the Compiled Military Service records for the volunteer soldiers who served during the War of 1812, Roll Box 31, Roll Exct: 602). A statement written by his granddaughter, Anna Byrne, explains that Byrne fought at Sandusky, Fort Meigs, and Fort William Henry in the War of 1812 (Statement of Federal Damages, Lamar Town Tract).

Byrne married Harriett Oden on September 19, 1814, in Franklin County, Kentucky (Franklin County, KY Marriage Records, 1790-1815, v.1). In 1817, William Oden Byrne, the only child of James and Harriett Byrne, was born (U.S. and International Marriage Records 1560-1900 [Ancestry.com]).

The 1817 Cincinnati, Ohio census lists a James W. Byrne, with no enumeration (Dickoré 1960), and Preble County, Ohio deed records indicate that James W. Byrne was living in Hamilton County, Ohio in 1818 and in Cincinnati, Ohio (in Hamilton County) in 1819 (Short and Bowers 1978). The Cincinnati City Directory for 1825 lists one James Byrne, a brewer, as an occupant of Cincinnati. Whether this is the James W. Byrne in question is unclear, in part because James W. and Harriet (sic) Byrne are listed as

residents of Louisville, Kentucky in 1824 Preble County deed records (Gilbert and Short 1987; Hall 1988).

In the 1830 U.S. Federal Census, a James W. Byrne is listed as living in the upper suburbs of New Orleans, Louisiana, in a household consisting of one male, age 20–30 and one female, age 30–40, plus three female slaves (1830 New Orleans Census). Whether or not this is the same James W. Byrne is unclear, but it is known that Captain Byrne of Refugio County, Texas had a brother, Charles, who lived in New Orleans. It seems likely that the James W. in New Orleans in 1830 is the same James W. who ends up in Refugio County, Texas. Also in the 1830 U.S. Federal Census, there is a James Byrne listed as living in the east ward of Cincinnati, Ohio in a household of one male 20–30, and three females between the ages of 15 and 60 (Hamilton County, Ohio, City of Cincinnati, East Ward Census Schedule 1830).

According to Hobart Huson (1953), Byrne was a member of Fraser's Refugio Militia in the Battle of Coleto on March 20, 1836. Fraser's company was one of the military units that fought with Fannin at Coleto and were captured and massacred at Goliad on March 27. Huson (1953) claims that Byrne was one of several men of Fraser's company saved from the massacre by Captain Carlos de la Garza.

In 1838, Byrne, George Armstrong, and George Hull bought one league of land issued to Isaac E. Robertson previously that same year. In the document of sale, Robertson mentions that, "… James W. Byrne and George Armstrong not having resided in the Republic of Texas a sufficient length of time to entitle them to the right of citizenship…" (Robertson to Byrne, Hull, and Armstrong, TSLA). This indicates that

Byrne had been a resident of Texas for less than six months, which seems inconsistent with his fighting in the Texas Revolution. According to Texas law at the time, a person had to be a resident of Texas for at least six months before he or she could be considered a citizen.

By 1839, Byrne appears on shipping accounts in the district of Aransas (Accounts, Returns, Abstracts, Jan–Sept 1839, District of Aransas, TSA). One source, based on the recollections of a man who had, as a child, known Byrne, explained that he "…owned extensive wharves and commodious warehouses, and owned and operated a large saltworks. The wharves, warehouses, and saltworks were destroyed by the Federal Navy during the Civil War" (Huson 1994).

Byrne is also listed as an occupant of Refugio County, Texas in the 1846 tax list (Texas Tax List Index 1840-1849), and he appears on the 1850 Refugio County census record, although his wife is called Jane rather than Harriett on the census. Many nineteenth-century census records contain inconsistencies and errors in spelling and other details.

William Oden Byrne, Byrne's son, may be the same William Byrne mentioned several times in letters in the Mirabeau B. Lamar papers. A William Byrne was commissioned by M. B. Lamar as notary public of Refugio County on May 29, 1839 (Gulick et al. 1968:III:5), and took the oath of office on May 7, 1840 (Gulick et al. 1968:III:391). He resigned the post in October 1840 (Gulick et al. 1968:III:463). In February of 1840, some businessmen from Lamar endorsed William Byrne for the position of secretary to the legation of France, claiming that this Byrne was educated in

France and was thus fluent in the French language (Gulick et al. 1968:III:342; Gulick et al. 1968:V:411). Whether this William Byrne is the son of James W. Byrne is difficult to determine, but no records for Refugio County mention another William Byrne living in Lamar.

William Oden Byrne married Anne E. Hatch, possibly in Colorado County, Texas, in 1844. The couple had one child, Anna William (Willie) Oden Byrne, who was born in 1846 (Texas Marriage Collection 1814-1909, 1900 U.S. Federal Census). Anna apparently lived with James and Harriett Byrne for a time after her father's death of unknown causes in 1849 or 1850 and was raised and educated by her grandparents ("Statement of Federal Damage," TSLA, ca. 1902). According to a later document written by Anna Byrne, Harriett Byrne died in 1858. In the 1860 census for Lamar Precinct, Refugio County, Texas, Anna was listed as living with her cousin, Jane P. O'Connor, in Lamar. In the same census, J.W. Byrne is listed as a retired male, 68 years of age. Byrne signed his last will and testament on August 16, 1862. In the will he names his niece Jane P. O'Connor of Lamar and his daughter-in-law Mrs. Ann E. Byrne of Ingleside as his executors (Last Will and Testament of James W. Byrne). Byrne died in September 1862.

Byrne's granddaughter and primary beneficiary (through her mother Ann E. Byrne), Anna Willie Byrne, married Samuel C. Vineyard sometime between 1862 and 1870, and they had a three-year-old son as well as a baby listed on the 1870 census for Refugio County. By 1880 they were both school teachers living in Austin, Texas with their three children (1880 United States Federal Census).

In 1902, Anna Byrne Vineyard wrote two documents in support of a petition for restitution from the U.S. government. Vineyard testifies that her inheritance from her grandfather included certain town improvements that were destroyed by Federal forces during the Civil War. She argues that Byrne was a non-combatant in the war, and that as his heir she should be repaid for the damages to her inheritance caused by the military. As an attachment to that letter, Vineyard includes a document she titles "Why Captain James W. Byrne Destroyed His Papers," in which she explains her lack of documentation for any of her claims. According to her writing, Byrne requested of his executors that all his personal papers be burned after his death:

> Then a wild delirium of fever set in and his whole thought centered on burning all his papers and letters to blot out the wretched memory of the fruitless labor of years; and also to save them from the raids of the Federal Marines at Aransas Pass! So under his instructions some ten or twelve barrels of business papers, patents, field notes, contracts and letters were burned by two unreasoning women who did not reflect what serious loss their folly entailed! [Why Capt. James W. Byrne destroyed his papers, TSLA, ca. 1902]

Vineyard was a teenager at the time of the Civil War and her grandfather's death, and her comments in the documents provide interesting information about Byrne's business dealings and property. Some of her information is inaccurate, however. Specifically, Vineyard states that Byrne owned no slaves, but other documentation demonstrates that he owned at least two in both 1850 and 1860 (Refugio County Slave Schedules).

Lamar, Texas and Refugio County

Refugio County, until 1871, included all of Copano Bay as well as surrounding lands (Huson 1953). The county seat was based at the town of Refugio, which grew up around the mission established there by the Spanish in 1789 (Tennis 2002). The land was

seen early on as being fertile, and Refugio County was advertised as a good place to grow crops and raise livestock. In an 1841 publication, William Kennedy (1925:164) wrote:

> The whole of the back country affords a magnificent range for cattle. The land upon Aransaso [sic] Bay and its tributaries is equal to any in the country for the production of cotton and sugar….Aransas Bay abounds in turtle and every variety of fish found in the Gulf of Mexico; the islands of the bay and the neighboring prairies are the winter resorts of multitudes of wild fowl. Droves of wild horses and herds of deer browze [sic] upon the prairies, and the forests are stocked with the wild turkey and a species of grouse.

In September 1838, Isaac E. Robertson sold to Byrne, Hull and Armstrong all his land holdings on the Lamar Peninsula for the sum of approximately $15,000 payable over three years (Robertson to Byrne, Hull, and Armstrong All His Land on Look Out Point and within Ten Miles of Look Out Point, GLO, Austin). It was on a portion of this land that Lamar was founded.

The Copano Bay, Refugio County area was on the frontier of the new Republic of Texas. Letters from Refugio County residents to Mirabeau B. Lamar, at the time Vice-President of Texas, indicate a constant threat from Indians, Mexicans, and bandits. Live Oak Point, across Copano Bay from Lamar and now the site of part of the town of Fulton, was a small town in 1838. In March, a W. Roberts wrote to General Mirabeau Lamar and reported that:

> …a party of robers [sic] of some description have visited the Copano house in which was stored a large quantity of tobacco & have carried off nearly all of it, & wantonly wasted & scattered the balance, riping [sic] open the bales & strowing the tobacco all around the house as if with design to waste & spoil…Copano house stands alone on the opposite side of the bay 7 or 8 miles n.w. of Live oak point & no person lives in the neighborhood of it. It is the point of landing upon the man [sic] land from the peninsula & where all persons going from this place into the adjacent country must necessarily pass unless they should prefer three days ride around by the isthmus This part of the country is in a defenceless & very exposed condition… [Gulick et al. 1968:II:42]

In July, Roberts wrote to General Lamar again, describing the pleasantness of the place and the abundance of fish, turtle, and oysters. He tells of the arrival of ships carrying people and building materials. Roberts does mention however, that "…the only annoyance we have is the dread of an incursion of Mexicans or Camanche [sic] Indians" (Gulick et al. 1968:II:183).

In May of 1839, Samuel Hewes wrote to General Lamar from the City of Aransas about an attack on Mexican travelers by a band of "Lapan [sic] Indians" (Gulick et al. 1968:II:585). He urges Lamar to send troops, stating, "[m]any families are desirous to leave the Rio Grande and settle in this western Country, but are prevented through fear of Indian hostilities" (Gulick et al. 1968:II:585).

The town of Lamar became a rival of the City of Aransas, when the custom house was moved from Aransas City to Lamar. Hewes, who was appointed customs collector for the area, wrote again to General Lamar from the City of Aransas on May 1, 1839, recommending the removal of the custom house to Lamar (Gulick et al. 1968:II:555). Hewes states that, "…from its Geographical position I am fully satisfied that the upper Country as well as the Rio Grande trade must centre at that point.---the proprietors Messers Byrne, Hull, and Armstrong are liberal, enterprising, Gentlemanly and men of sterling worth…" (Gulick et al. 1968:II:555). He also mentions that there were only 12 houses and 30 inhabitants in Aransas, while there were 20 houses under construction and more than 60 inhabitants in Lamar (Gulick et al. 1968:II:555). James W. Byrne delivered this letter to General Lamar in Houston. On June 15, 1839, the citizens of Aransas City, including the empresario Colonel James Power, wrote a letter to General Lamar

expressing their desire for the custom house to be returned to Aransas. The citizens argued that the town of Lamar did not provide sufficient protection to vessels during bad weather and that the waters around Lamar were too shallow for boats drawing seven feet of water (Gulick et al. 1968:III:21-23). Furthermore, the Aransas City citizens stated that their town seemed to be "…destined by a natural train of events up to this time to become at no distant period the great commercial Emporium of western Texas…" and that Lamar "…was never intended by Nature nor can it be made by art without the Expenditure of millions of dollars a town of any importance" (Gulick et al. 1968:III:23).

The City of Aransas was gratified by the return of the custom house to that town. In January 1840, Hewes again writes to General Lamar, complaining that as custom collector at Lamar he did not earn enough money to support himself and that, as the custom house would be permanently moved to Aransas, he would not be able to travel to the custom house every day; he thus requests reassignment elsewhere (Gulick et al. 1968:V:398).

Other writers mention Aransas in complimentary tones as well. In an 1840 text, Francis Moore, Jr. (1965:108) remarks on the town of Aransas, which he says, "…promises to become the site of a new city, which will rival the first cities of the republic in commercial resources. The harbour at this place is excellent. Vessels drawing eight feet water may approach within sixty yards of the shore at all seasons". In 1841, William Kennedy (1925:787) wrote of Aransas City, "[t]he town is already one of much note, and has received a large share of public attention. It is very eligibly located,

and has much trade with Mexico." Of Lamar, Kennedy (1925) wrote only that it was a new town on Aransas Bay.

Another town of some importance by 1840 was Copano, on the north-east side of Copano Bay. One writer in 1840 mentioned that, "…Copano is located on the east bank of Aransaso [sic] Bay, and being conveniently situated for the prosecution of a lucrative trade with the interior of Mexico, is rapidity [sic] increasing in population and wealth" (Stiff 1968).

In February 1851 Byrne, Pryor Lea, William G. Hale, and others formed the Treport City Company, officially changing the name of Lamar to Treport for a short time. Byrne was unanimously elected President of the Treport City Company and was given the authority to negotiate the purchase of additional land to add to that already laid out for the town ("Treport City Company," WGH Papers: Letters and Legal Papers 1851-1857, CAH, UTA). The Company created provisions wherein the town would be laid out and organized, and infrastructure including a warehouse, a wharf, and a pier would be supplied. The costs of all these improvements were to be divided equally among the members of the Treport City Company.

In May and June 1851, Andrew Morse, apparently an agent for Allen and Hale who operated out of Galveston, wrote to his employers from Treport with news of the business of the Treport City Company. In these letters, Morse indicates that Pryor Lea and Byrne were at odds over building plans for the wharf and other infrastructure, and that Lea was deeply in debt to Byrne and others. In the June letter, Byrne and his wife

sent their suspicions of Lea to Allen and Hale via Morse, who was a guest in the Byrne home (WGH Papers: Letters and Legal Papers 1851–1852, CAH, UTA).

In February 1852, Byrne and a number of other investors created the Aransas Road Company. The company was to build a road from Aransas Bay to the town of Goliad, with branches "in such directions and to such distances as the company may think proper," and with the provision that portions of railroad could be built to supplement sections of the road (Gammell's Laws [GL]: Chapter 171). That same month, Byrne and others created the Texas Western Railroad Company, which was to construct a railroad from Aransas or Corpus Christi Bay to the Rio Grande (GL:192). In general, Byrne and his peers were busy trying to build Lamar and the Aransas Bay area as a center of transportation and shipping.

According to J. De Cordova (1969), as of January 25, 1858, Refugio County had post offices in Lamar, Copano, Aransas, Crescent Village, and St. Mary's. The town of Refugio was even host to a Masonic Lodge. At the time, steamships ran regularly from New Orleans to Galveston and Indianola (De Cordova 1969).

Sometime between 1850 and 1860, a number of Byrne's relatives moved to Refugio County from Cincinnati. The 1850 Cincinnati, Ohio Federal Census lists Sarah Gregory (Byrne's sister), her husband Henry, and their children Henry, Eliza, Martha, Jane, Henrietta, and Sarah. In 1860, the Refugio County, Lamar Precinct census lists S.E. Gregory (Sarah, age 55) and her daughters Henrietta (age 19) and Caroline (age 17). Caroline of the 1860 census is listed as Sarah in 1850, but her full name was Sarah Caroline. The ages of many of the family members are inconsistent between the two

censuses, likely due to imprecise record-keeping. Byrne's niece Jane O'Connor (age 22) is listed as a teacher, living with her son John H. (age 6) and her cousin Ann Willie Byrne (age 15). O'Connor was Sarah Gregory's daughter, and she must have married and moved to Texas sometime between 1850 and 1854. O'Connor's husband, Patrick T. O'Connor, was born January 1, 1822, and died August 10, 1854. Patrick O'Connor is the only member of Byrne's close family who is buried in a marked grave in the Lamar, Texas cemetery (Figure 11).

The total population of Refugio County increased dramatically between 1850 and 1880 (the time frame during which the first three U.S. Censuses were taken in Texas). In 1850, the total recorded population of Refugio County was 288, in 1860 it was 1600, and in 1870 it was 2324 (U.S. Census, Refugio County, Texas, 1850, 1860, 1870).

Figure 11: Tombstone for Patrick O'Conner (sic) in the Lamar cemetery.

The Salt Works on St. Charles Bay

Very few documents were found that relate directly to Byrne's salt works. Many of the papers were probably burned with his other documents after Byrne's death. Most of the records about Byrne's life or the salt works are in the form of legal documents and letters written by Byrne to other people. The documents that exist reveal some information, however. The land on which the salt works site is located appears on a survey conducted for Byrne of 256 ½ acres in Refugio County, to which Byrne was entitled by headright certificate number 482 issued to W. G. Martin in October 1845. The headright certificate was issued for the standard 640 acres to Martin, but after buying it, Byrne split up the certificate into two parcels. In addition to the 256 ½ acres on St. Charles Bay, Byrne had a survey done for 383 ½ acres elsewhere on the Lamar Peninsula. This parcel is unrelated to the salt works and is only one among the numerous land holdings Byrne controlled. Byrne bought the headright certificate for $100 from Ebenezer Allen on September 25, 1850. Allen had bought the certificate from John H. Brown in July 1850, and John Brown had bought it from William G. Martin, to whom it was originally issued, in October 1845 (TGLO). In May 1851, James Byrne wrote a letter to his business associate William G. Hale in which he discusses the land that probably became the site of the salt works. In his letter, Byrne writes:

> I have ascertained, that in the survey made by Mr. Richardson of the Robertson League, there was left out—not included in the survey—two large salt flats, or tracts of marsh land, fronting on the St. Charles Bay, which would amount to some 700 or 800 acres; and although not valuable now, may in the course of time become of considerable importance. I therefore think it advisable to locate these forthwith, and for that purpose shall use a piece of scrip of 640 acres, handed me at Lavaca by Col. Allen, and which now remains in Surveyor's office… [WGH Papers: Letters and Legal Papers 1851-1857, CAH, UTA]

In 1861 Byrne and his associates Ebenezer Allen and William G. Hale sold to Samuel Colt of Hartford, Connecticut about 14,000 acres on the Lamar Peninsula; almost the entire peninsula was included except certain lots already sold to other individuals, "…and also reserving certain concrete vats heretofore made by said Byrne, for the purpose of making salt, and which are his private property" (WGH Papers: Letters and Legal Papers 1861-1885, CAH, UTA). Colt apparently defaulted on the purchase, and the lands returned to their previous owners, Byrne, Allen, and Hale. By this date Byrne had died, and the lands passed to his heirs ("Statement of Federal Damages, Lamar Town Tract" A.W.O. Byrne 1902, TSLA).

The final document found that mentions the salt works specifically is Byrne's will, in which he states:

> To Mrs. Jane P. O'Connor of Lamar, I bequeath all improvements, salt making apparatus and ten acres of land on which the said improvements and apparatus are situated, under the condition that the said Jane P. O'Connor will pay One Hundred ($100) Dollars to the Rev. J. Quirat to be applied according to the direction I have given him, said sum to be paid as soon as any of the salt will be sold. [Last Will and Testament of James W. Byrne]

No records indicating what Jane O'Connor did with the salt works or verifying that Rev. Quirat received his $100 were found during the course of this research. However in 1873, S.C. Vineyard, Ann Willie Vineyard's husband, made testimony about the piece of land on which the salt works was located (although he does not mention the salt works). Vineyard's statement indicates that his wife had inherited the land, but that on examination based on the field notes on file in the general land office he "found there was no space" (S.C. Vineyard, Oath in Relation to Certificate No. 482, Filed April 9, 1873, GLO, Austin). Apparently the marshy land that Byrne had seen as promising held

no value for his heirs, and at this point it was absorbed into the adjoining land holding, the William Lewis League. A 1929 court case reinforced this change. In the case, George E. Shelley of Travis County petitioned to "…purchase, if unsurveyed public domain, land covered by field notes of abandoned Wm. G. Martin survey in Aransas Co. No. 482 lying between Wm. Lewis League No. 254 and St. Charles Bay and containing approximately 250 acres of land" (Refugio County 2-27 file, GLO, Austin, District Court Minutes #1854). The court found that:

> …said premises are covered by the field notes and patent of the William Lewis survey No. 254,…or, if same were not covered by said field notes, then, at the time of the survey of said Lewis League, the area covered by said field notes…were covered by the waters of St. Charles Bay; and, if same is not the condition of said area at this time, then said area constitutes an accretion to the shoreline of said Wm. Lewis survey and has become a part thereof. [Refugio County 2-27 file, GLO, Austin, District Court Minutes #1854]

The Union Blockade, Lamar, and the Salt Works

The Texas coast was a primary focus of Lincoln's coastal blockade during the Civil War, and the portion of the coast near Lamar lost much of its shipping business during this time. The blockade was not completely successful in keeping shipments of cotton from leaving Texas or goods from being brought in, but it disrupted commerce and life in the region. Aransas Pass was closely guarded by Acting Lieutenant Kittredge on the bark *Arthur*, beginning in February 1862. According to a report by Major C. G. Forshey, a Confederate Army Engineer of Coast Defenses, the Union troops went ashore at Aransas in early February, 1862, and "assumed many liberties, took beef and mutton at their pleasure, burned several houses, shelled the neighboring islands and sand hills in the moorings… and made themselves at home there" (U.S. Government Printing Office

[USGPO] 1883:482). Another report, by Major Dan D. Shea, of the Confederate Army in February of 1862, mentions a meeting with a Union captain near Aransas. Major Shea reports that "[i]f this man is not stopped immediately, before he can capture the small boats now in the lower bays and salt-works, he will command the whole western coast" (USGPO 883:485–86). The Union forces in Aransas Bay were clearly disrupting life and commerce. On February 22, 1862, Capt. B.F. Neal at Camp Aransas wrote that "the enemy is becoming quite bold and daring, and will destroy the commerce of these bays unless checked in their buccaneering" (USGPO 1883:526). In July of 1862, Captain Kittredge commanded a heavily-armed schooner that captured a vessel loaded with cotton at Lamar (USGPO 1883:725). In August of 1862, Kittredge commanded the bombardment of Corpus Christi by the U.S.S. *Sachem*, *Reindeer*, *Belle Italia*, and the yacht *Corypheus*. On September 14, Kittredge was captured while ashore near Corpus Christi (USGPO 1883:624). A number of other small incidents are reported in letters appearing in the *War of the Rebellion* series, but none specifically mention the salt works on St. Charles Bay. Despite the absence of specific references, it may be inferred from the documentary evidence that, if the salt works was still in operation, it would have been an attractive target for Union attacks. There are abundant references to small excursions by Union troops into the areas between Corpus Christi and Indianola, and there are specific references to activities at Lamar by both Union troops and Confederate forces. On February 11, 1864, Captain Edward Upton of the Lamar Home Guard reported the landing of 75 Union troops. The troops destroyed a large warehouse and plundered the contents of it, then "[t]he men were turned loose, as it seems, for indiscriminate plunder.

They entered almost all of the houses and took whatever they desired, defenseless families suffering the most" (USGPO 1891:135–136). In 1902 Byrne's granddaughter (and heiress), Anna Vineyard, wrote to the Federal government asking for restitution for damages caused by troops during the Civil War to the property she inherited from Byrne. Vineyard claims that:

> Some two months after Capt. James W. Byrne's death, a company of Federal marines, of the Aransas Pass Blockade Squadron, and at one time under command of Capt. J. Kittredge, entered the small port of Lamar, that was not garrisoned, nor occupied, at any time, by any squad, or company of Confederate soldiers! The Federal marines, in their unrestricted raids, tore down all the newly built town improvements made by Capt. James W. Byrne… ["Statement of Federal Damages, Lamar Town Tract" by Anna Wm. Odin Vineyard, Texas State Archives, Austin, Texas]

Vineyard lists the destruction of a warehouse, a wharf, a large steam barge built to carry cattle, cattle pens, machine shops, pile drivers, elevators, and "many other articles of town property." Vineyard then asks for restitution in the amount of $250,000, as she says, "to cover principal, and interest, on the actual loss of $75,000 or $80,000." Although there are no specific references to this attack on Lamar in 1862 in the U.S. military records, the Federal government most certainly had a presence in the Aransas Bay area and may have invaded the town at this time. Alternately, Vineyard may be referring to the attack on Lamar in 1864. Since almost forty years had passed between the Civil War and the writing of the document, Vineyard may have mistaken the date. See the timeline (Table 1) for a summary of the historical background for this research.

Table 1: Timeline for the Life of James W. Byrne and the Town of Lamar, Texas, Based on Primary Sources

1787?----------James W. Byrne born in County Wicklow, Ireland

1812 ----------Fights in the War of 1812

1814 ----------(September 19) Marries Harriet Oden in Franklin County, Kentucky

1817-1819 ------Living in Cincinnati, Ohio

1817 ----------Son, William Oden Byrne, born

1824 ----------Living in Louisville, Kentucky

1830 ----------Living in New Orleans? or Cincinnati?

1836 ----------Fights in the Texas Revolution?

1838 ----------Byrne, Hull, and Armstrong buy land on which Lamar was established

1839 ----------Competition over location of customs house between Lamar and Aransas City; Aransas City prevails

1844 ----------William Oden Byrne marries Anne E. Hatch

1845 ----------Texas joins the United States of America

1846 ----------Anna Willie Oden Byrne born to William and Anne Byrne

1849/1850 ------William Byrne dies

1851 ----------James W. Byrne writes of salt flats

Byrne and others form Treport City Company (change name of Lamar to Treport; change doesn't last)

1852 ----------(February) Byrne and others create Aransas Road Company

(February) Byrne and others create Texas Western Railroad Company

1858 ----------Harriet Byrne dies

1862 ----------James W. Byrne dies

1864 ----------(February) Lamar destroyed by Union forces

1873 ----------Land on which salt works was located is legally absorbed by adjoining property

CHAPTER IV

RESULTS OF ARCHAEOLOGICAL RESEARCH

Description of Field Work

Field work accomplished in the course of this project included pedestrian survey, shovel testing, and excavation. The pedestrian survey completed in December 2005 covered an area of approximately 170,000 square meters. Pedestrian survey revealed two previously-unknown historic features, Feature 3 and Feature 4, which were later investigated through limited excavation. Shovel testing did not reveal any new features, but it helped to delineate site boundaries and provided a better understanding of the soils and terrain. Results of the shovel tests associated with each feature will be discussed with the results of excavations below. For a detailed overview of the shovel tests, see Appendix A.

Results of Excavation

Area A

Area A comprises two discrete features, Feature 1 and Feature 2, which appear to represent a small shellcrete foundation and a large shellcrete platform, respectively. This area was recognized by the landowners as archaeologically significant and provided the impetus for this investigation. Features 1 and 2 are separated by a swath of vegetation during the winter and by a marsh during the summer (Figure 12).

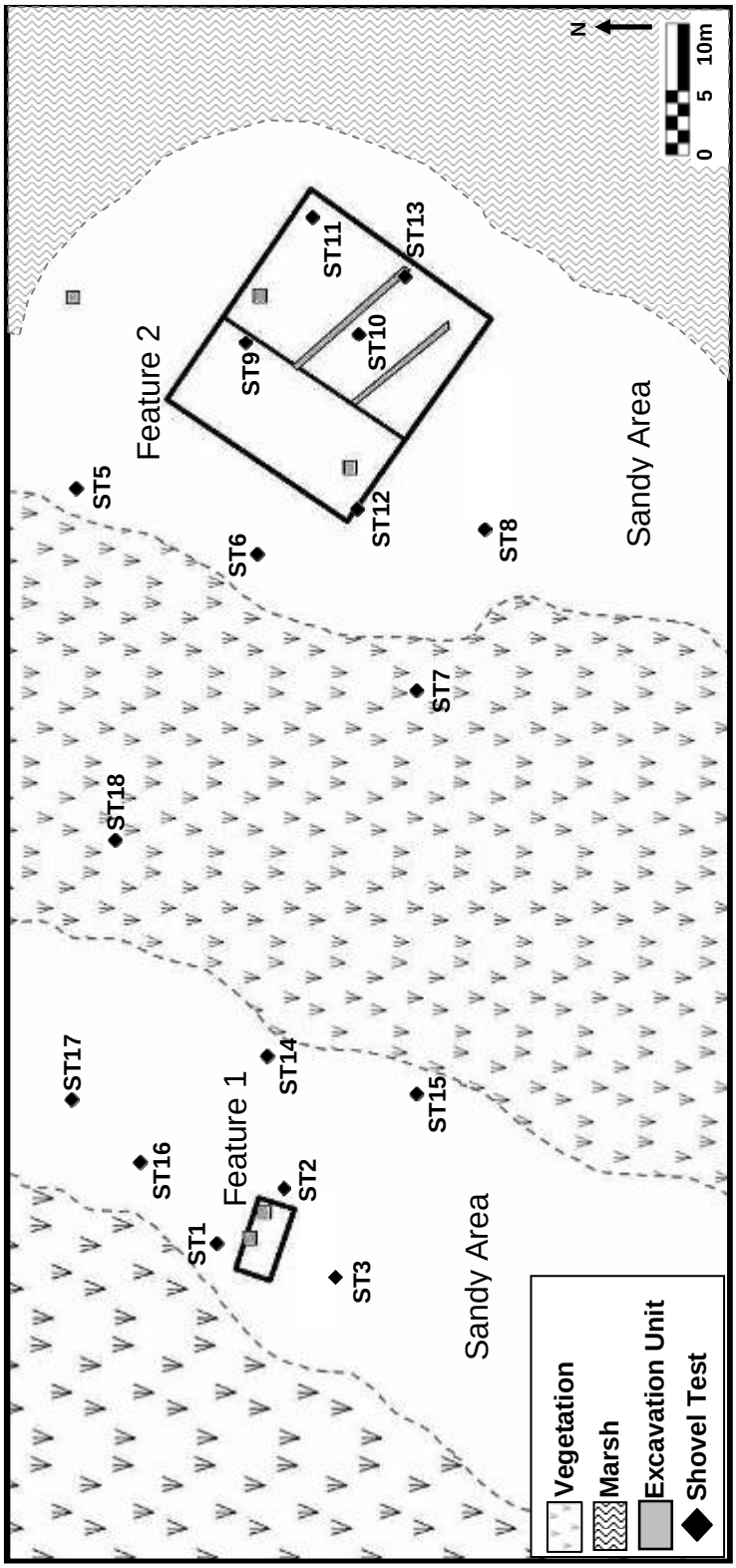

Figure 12: Plan map of Area A, showing Feature 1 and Feature 2. For more detailed maps of each Feature, see Figures 16 and 22.

Feature 1

The visible portion of Feature 1 is a border of shellcrete, roughly rectangular in shape, that measures approximately 5 by 2.5 meters (Figure 13). The long axis of the feature lies at an angle approximately 110 degrees east of north and runs toward St. Charles Bay, which is roughly 80 meters east of the feature at low tide (Figure 12). Two 1-x-1-meter excavation units (2005-1 and 2005-2) were placed on the edges of the shellcrete outline in an attempt to define the purpose and construction of the feature (Figure 14).

Figure 13: Feature 1 surface (photo by Daniel Rose).

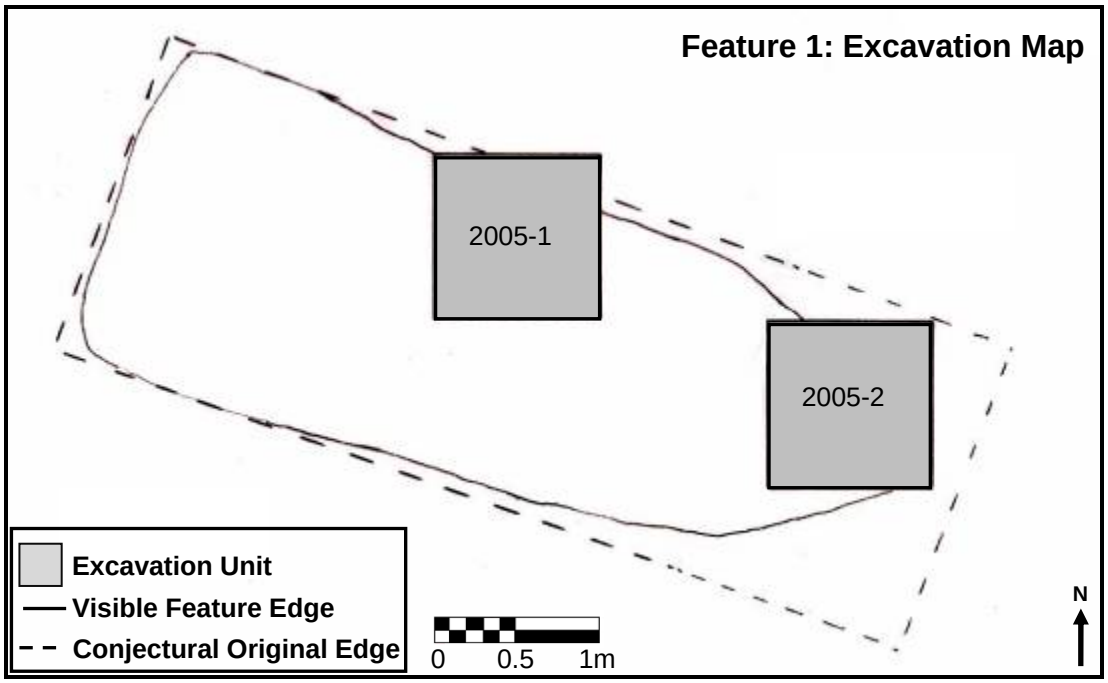

Figure 14: Feature 1 excavation map.

Unit 2005-1 was excavated to a depth of 40 centimeters below the surface (elevations from 9.68 to 9.28 meters). The water table was reached at approximately 35 centimeters below the surface, but excavations continued in to fully delineate the stratigraphy of the feature. This unit did not yield any artifacts.

Unit 2005-2 was excavated to thirty centimeters below the surface (elevations from 9.66 to 9.36 meters) to the level of the water table. One iron fastener covered in shellcrete and one lithic flake were recovered, both from the upper 10 centimeters of unit 2005-2 (Figure 15) (see Table 2, below).

One shovel test placed near Feature 1 (ST 2) yielded a single shell fragment that appears to be drilled with two holes of almost identical size (Figure 16). The fragment may be part of a pendant from a prehistoric occupation, or the holes may be the result of parasitic snail activity. No other artifacts were found in the shovel test.

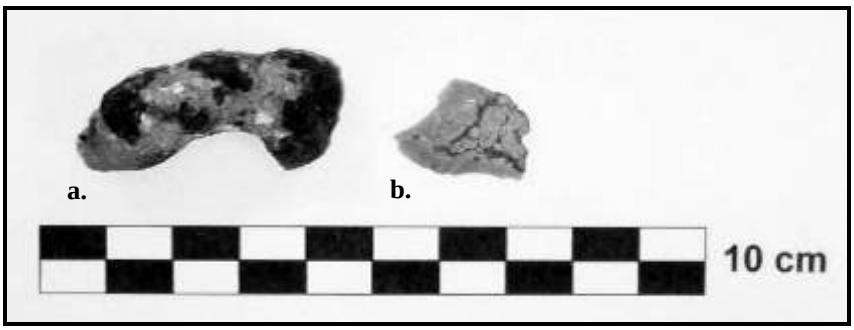

Figure 15: Artifacts recovered from Unit 2005-2 (a. iron fastener with adhered shellcrete; b. lithic flake).

Table 2: Unit 2005-2 Excavation Information by Level

Level	Elevation (m)	Description	Weight (g)	Comments
1	9.66–9.56	iron fastener with attached shellcrete	9.2	corroded
		lithic flake	1.2	
2	9.56–9.46	none		
3	9.46–9.36	none		

Figure 16: Possible shell pendant found in Shovel Test 1.

The overlying soil in the area of Feature 1 is a mixture of sand and dense, sandy clay and ranges in color from very dark gray to light brown. The stratigraphy of the feature was distinctive, as shown below in Figure 17. Six strata were identified (Figure

17). The top of the feature was covered with the dense sandy clay typical of the soil in that area. Below that lay a mixture of shellcrete and shellcrete components such as brick and shell. The next stratum was a thick deposit of lime or very degraded plaster and shell hash. Below that was a substantial lens of charcoal and burned wood. The surface below the burned lens was a hard clay overlying sand.

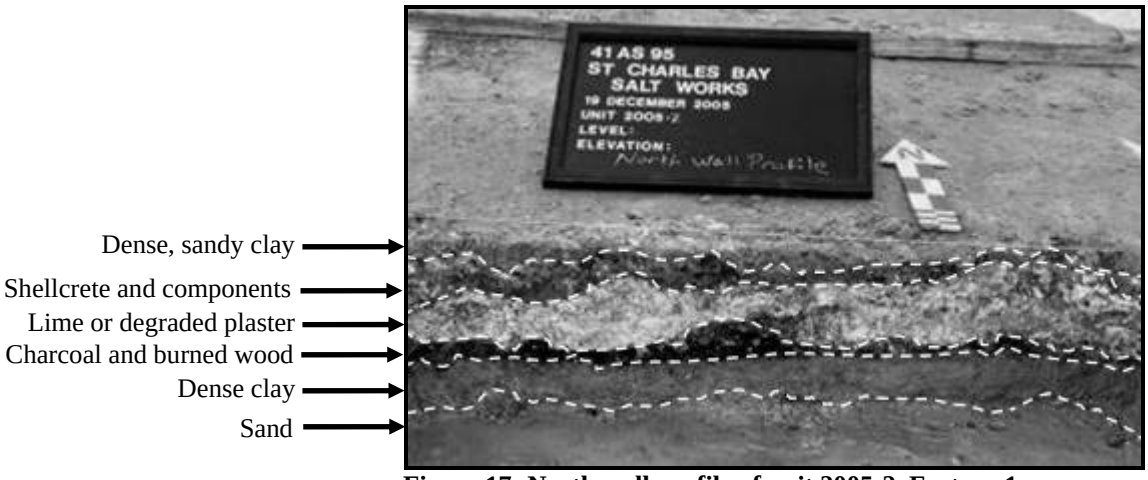

Figure 17: North wall profile of unit 2005-2, Feature 1, demonstrating stratigraphy; dashed lines represent stratigraphic divisions.

This small rectangular feature may represent the remains of a foundation for either a pump or an elevated cistern where salt water was held after it was pumped out of the Feature 2 platform (discussed below) and before it was piped elsewhere. The stratigraphy at Feature 1 may be the result of widespread vegetation burning immediately prior to the laying of the shell for the foundation. In this case, the burned vegetation under the foundation was preserved in place by the overlying shellcrete, while surrounding areas were eventually washed clean of the burned remains. Alternately, the

burned stratum may represent the remains of a wooden base or platform that burned at some time and was replaced by a platform of shellcrete.

Feature 2

Feature 2 lies approximately 30 meters to the east of Feature 1 (Figure 12). During the summer, when the average water level of St. Charles Bay is at its highest, Feature 2 is surrounded by marsh. In the cooler months, when the water level is lower, the edge of the marsh is approximately 10 meters to the east of the edge of Feature 2. The visible portion of the feature is a large rectangular surface that is only sparsely vegetated (Figure 18). A slightly raised border of shellcrete marks one edge of what at first glance appears to be the entire structure (Figure 19).

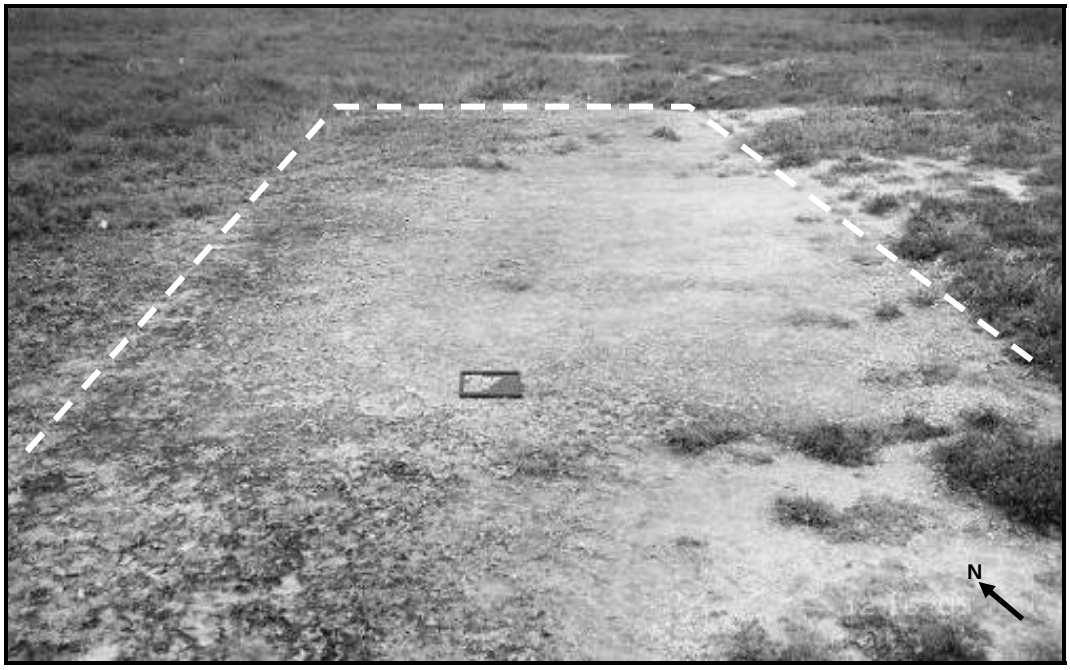

Figure 18: Feature 2 surface recognized by landowners; white dashed line indicates shellcrete borders (photo by D. Rose).

Figure 19: Visible shellcrete border between eastern and western platforms at Feature 2 (photo by D. Rose).

Investigations to the east side of this surface revealed a second platform that abuts the visible portion of the feature (Figure 20). The western platform measures approximately 17 meters long by 7 meters wide. The eastern platform is also approximately 17 meters long, with an width of approximately 10 meters. The elevations recorded for the two platforms indicate that the western platform surface is approximately 15 centimeters lower than the eastern platform. Several shovel tests and three 1-x-1-meter excavation units (2005-3, 2005-4, 2005-5) were used to delineate the extent of the platforms and investigate the platform construction. Two narrow trenches were also hand excavated roughly northwest-to-southeast across the surface of the eastern platform to expose surface features. These trenches were each approximately 30 centimeters wide and 5 to 10 centimeters deep (Figure 20). Because the surface of the platform was covered with a thin layer of overburden, only a few centimeters of soil had to be removed

in these trenches. Although the soil was screened through ¼ inch mesh, as was all the excavated soil, no artifacts were recovered from these trench excavations.

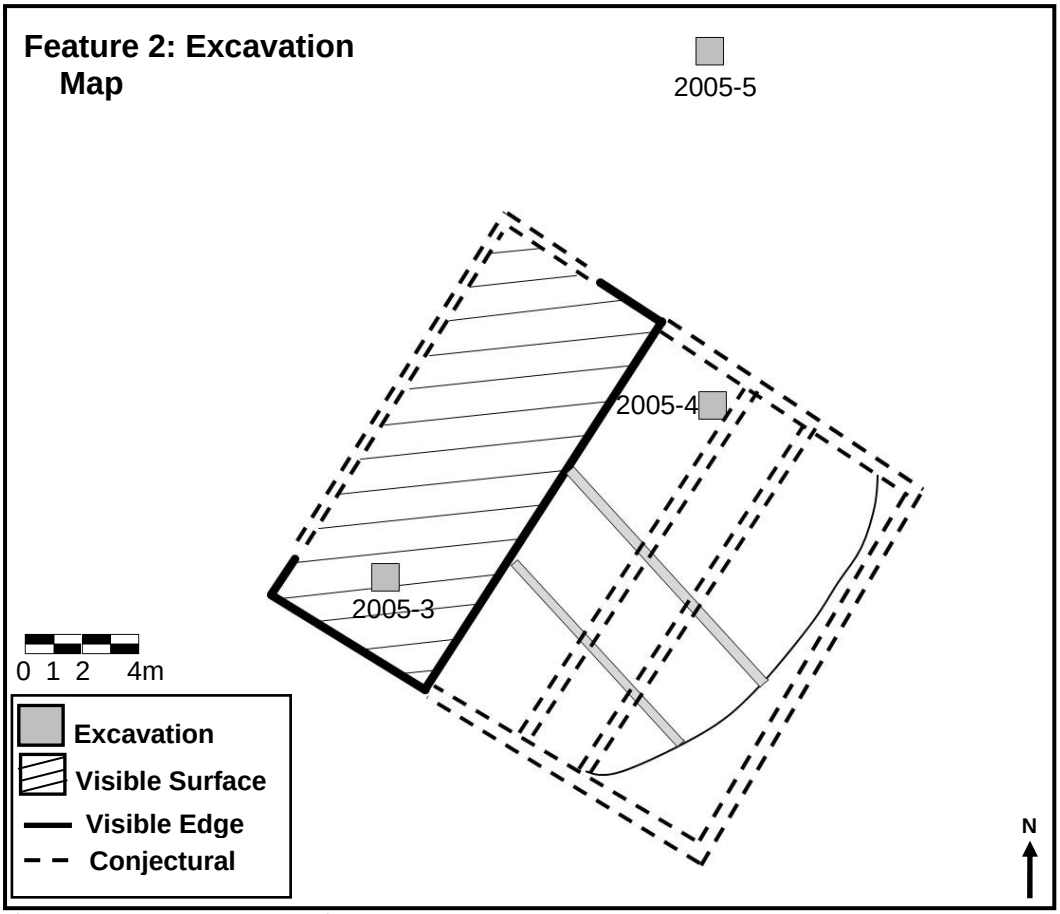

Figure 20: Feature 2 excavation map.

The surface of the platform seems to have been finely plastered with shellcrete, some of which has eroded, and at least two partitions apparently ran parallel to the raised shellcrete border dividing the two platforms, one to the east and one to the west (Figure 20). The footings of these partitions were revealed in the narrow trenches excavated across the platform surface. The dimensions of the two platforms combined is approximately 17 meters square (or almost 55 feet on each side). The edge of this eastern

platform nearest to the bay has eroded away leaving an irregular edge, and no evidence of a wall or enclosure on the bay side of the structure was found. Around the edges of the western platform, the remains of shellcrete wall footings, approximately 30 centimeters wide, were observed. These wall footings were distinguished by their rough surface and regular outline, and they indicate the presence of a wall or enclosure on the land side of the structure (Figure 21).

Figure 21: Remains of Feature 2 wall footing.

Three 1-x-1-meter units were excavated within Feature 2 (Units 2005-3, 2005-4, and 2005-5) (Figure 20). Unit 2005-3 was placed on the western platform and was excavated from 9.67 to 9.28 meters (Figure 20). The surface of the platform was reached at 9.45 meters. The northwest corner of the unit (25 x 25 centimeters) was further excavated through the shellcrete platform, which appears to be approximately 8 centimeters thick. No artifacts were recovered from this unit.

Unit 2005-4 was placed on the northern end of the eastern shellcrete platform and was excavated to 51 centimeters below the surface, from 9.81 to 9.30 meters (Figure 20).

Level 1 (9.81–9.70 m) from this unit yielded 20 small indeterminate iron fragments, while the underlying level contained no artifacts. Two nail fragments, one indeterminate iron object, and one small vertebra (from an unidentified small mammal) were found in Level 3 (9.60–9.50 m) of unit 2005-4 (Figure 22). Due to time constraints, only the southern half of this unit was excavated through Level 4 (9.50–9.40 m), and only the southwest corner of the unit was continued through Level 5 (9.40–9.30 m). These partial excavations provided a view of the stratigraphy of the unit, and no artifacts were found in these levels. See Table 3 for detailed excavation information.

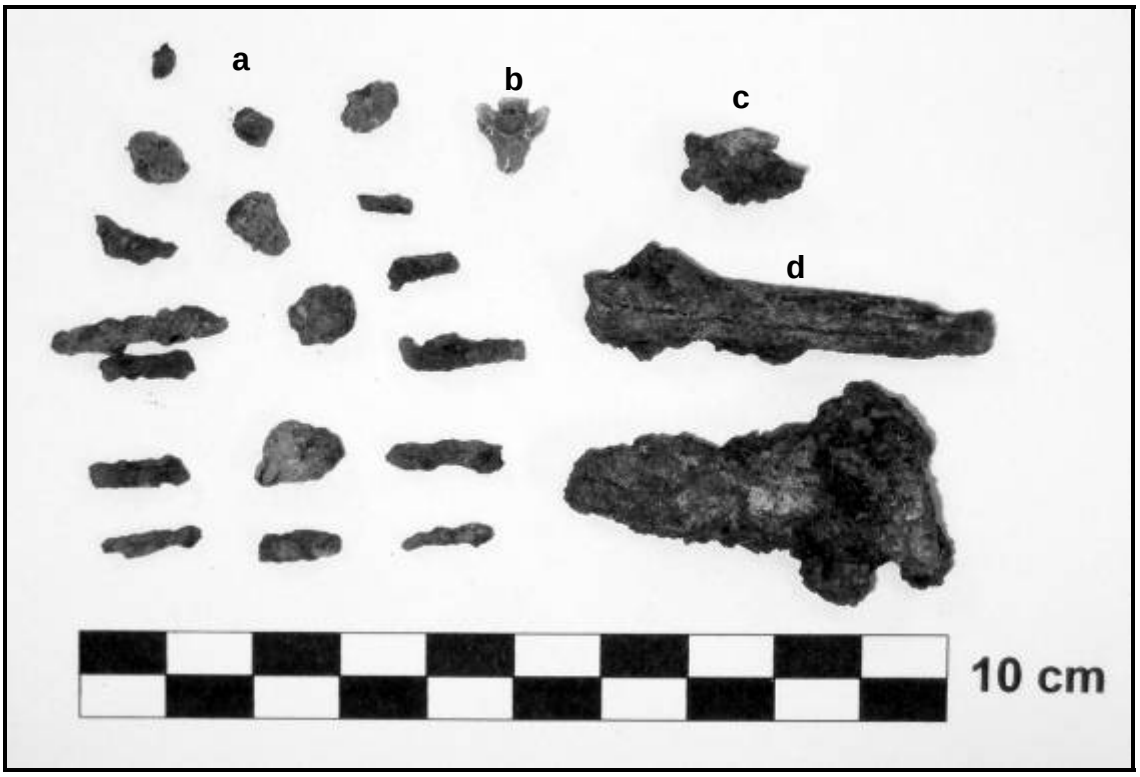

Figure 22: Unit 2005-4 artifacts (a: small indeterminate iron objects, Level 1; b: vertebra, Level 3; c: indeterminate iron object, Level 3; d: iron nail fragments).

Table 3: Unit 2005-4 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	9.81–9.70	iron fragments	20	3.1	
2	9.70–9.60	none			Sandy lens in west side of unit
3	9.60–9.50	square cut nail fragment, no head	1	5.3	46.7 mm long, 7.5x8.0 mm shank
		square cut nail fragment, with head	1	10.2	41.9 mm long, 10.5x17.9 mm head, 11.3x8.0 mm shank
		indeterminate iron object	1	1	
		small vertebra	1	0.1	
4	9.50–9.40	none			South half of unit only
5	9.40–9.30	none			SW corner of unit only

Unit 2005-5 was placed approximately 10 meters north of the northern edge of the eastern shellcrete platform (see Figure 20). This unit was excavated from 9.82 to 9.52 meters and yielded no artifacts. Due to time constraints, Levels 2 through 4 (9.77–9.52 meters) included only the southern half of the unit, which was characterized by moist sandy clay. The soil on and around the platforms is highly saline and not conducive to the preservation of perishable materials. Remains of lightweight materials were likely washed away by years of tides and storms. Thus, it is difficult to discern what structural elements other than the shellcrete platforms were originally present. These shellcrete platforms appear to have been solar evaporation vats, where salt water was exposed to sun and wind in order to concentrate the brine.

Area B

A marshy inlet and dense vegetation separate Area A from Area B. Area B covers a piece of land of approximately 70 x 50 meters and includes Features 3 and 4, which likely represent the remains of a circular boiling structure and a large shell hash

foundation. The two features are separated by a patch of moderately heavy vegetation consisting of shrubs and trees (Figure 23).

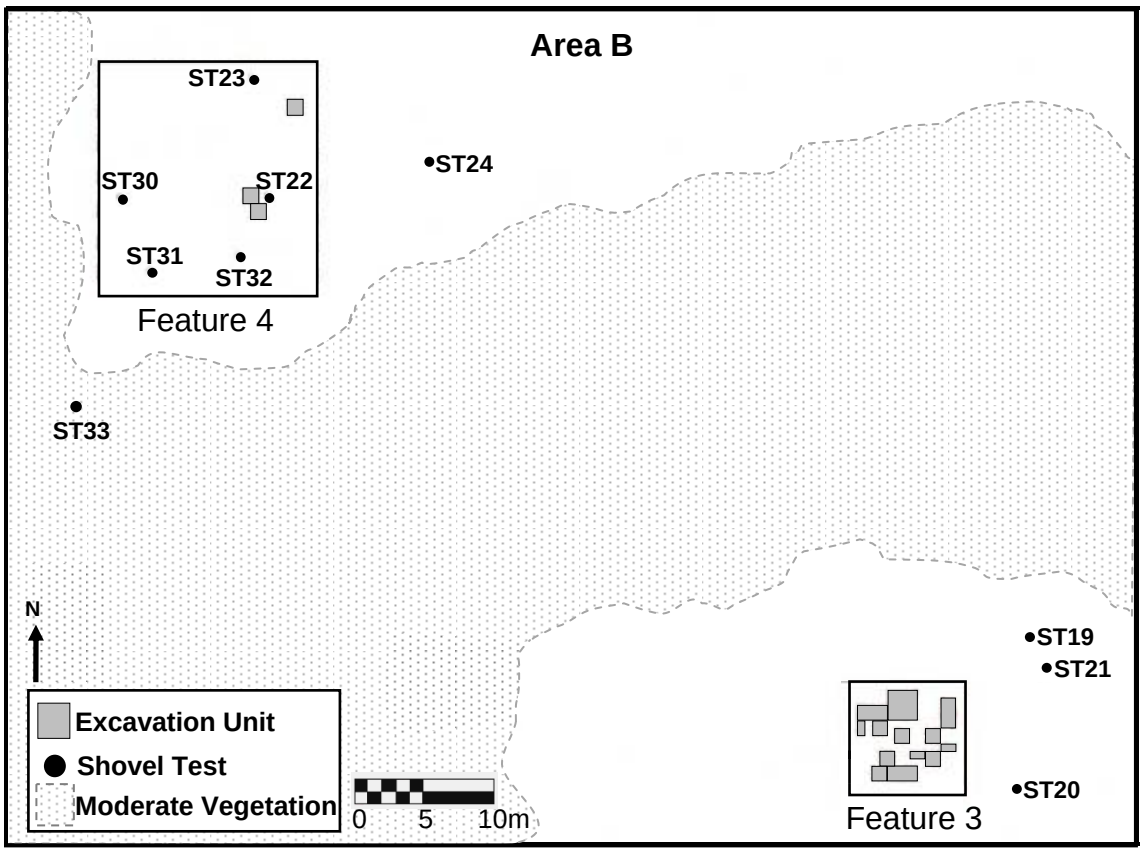

Figure 23: Plan map of Area B, showing Feature 3 and Feature 4. For detailed maps of each feature, see Figures 24 and 34.

Feature 3

Feature 3 is one of the two historic features discovered during site survey. The eastern portion of the feature was visible due to the activities of wild pigs in the area, which had disturbed the overlying soil. Excavations revealed additional minor disturbance. A total of 14 units was excavated within Feature 3, totaling 17.5 square meters of surface area (Figure 24).

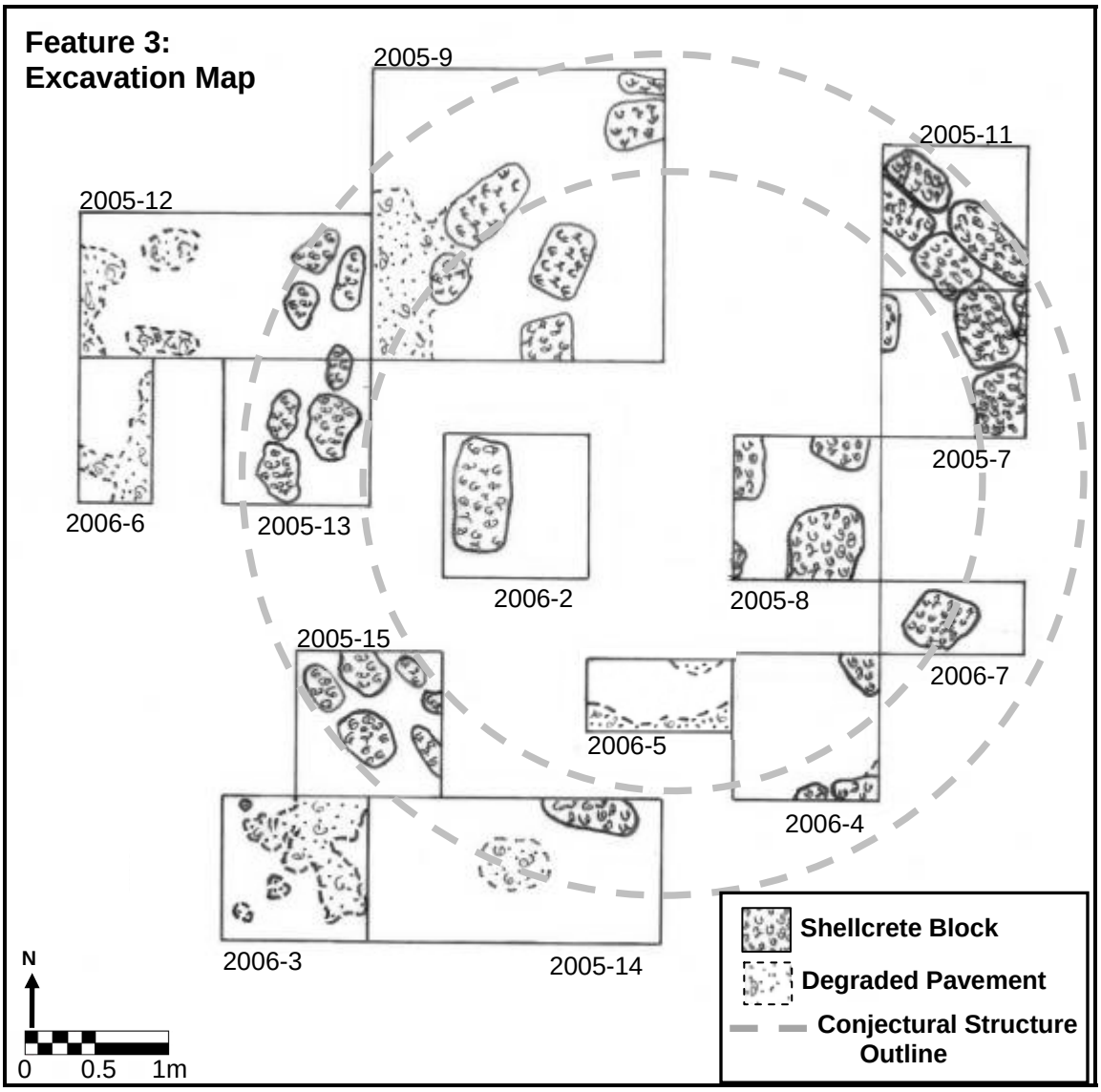

Figure 24: Feature 3 excavation map.

Although the entire feature was not excavated, an attempt was made to delineate the structure to determine its function and appearance. No artifacts associated with this feature were found *in situ*. This was due to the dark color of the metal artifacts, which made it difficult to distinguish them from the dark color of the surrounding soil (see Tables 4 through 17 for excavation information for each unit).

Feature 3 represents the remains of a circular structure approximately five meters in diameter. A double wall of shellcrete blocks defines this architectural element, with the most complete blocks measuring approximately 70 centimeters long, 30 centimeters wide, and 30 centimeters thick (Figure 25). Excavations in the interior of the structure revealed, in place, finely-plastered shellcrete blocks that appear to have been intentionally aligned (Figure 26). Found in association with the feature were many small, thin fragments of metal, averaging approximately 2.3 millimeters in thickness (Figure 27). These metal fragments may represent the remains of a kettle or pan used for boiling brine to yield salt. The metal fragments are relatively well preserved, since the soil around Feature 3 is not highly saline like that around Features 1 and 2. In and around the structure, fragments of a sandy plaster-like substance, smoothed on one side and covered with what appears to be a waterproofing material like pitch or tar, were found (Figures 28 and 29). The underside of some of this material retained traces of shellcrete, while remnants of shellcrete and shell hash were also visible on the ground surface. The sandy plaster-like material appears to have been intentionally spread over a thin layer of shell hash and then coated for waterproofing.

This circular alignment of shellcrete blocks is likely what remains of a furnace on which a metal kettle or pan of brine was boiled in order to cause the salt to crystallize out of the solution. Such boiling furnaces were common features at inland salt works from the same time period (Skinner 1971, Updike 2001). The flat metal fragments are likely remnants of the boiling vessel, and the plaster-like material probably formed a pavement around the structure.

Figure 25: Double row of shellcrete blocks defining eastern edge of Feature 3 structure (photo by J. Barrera).

Figure 26: Shellcrete block found in place in the interior of Feature 3 (photo by D. Rose).

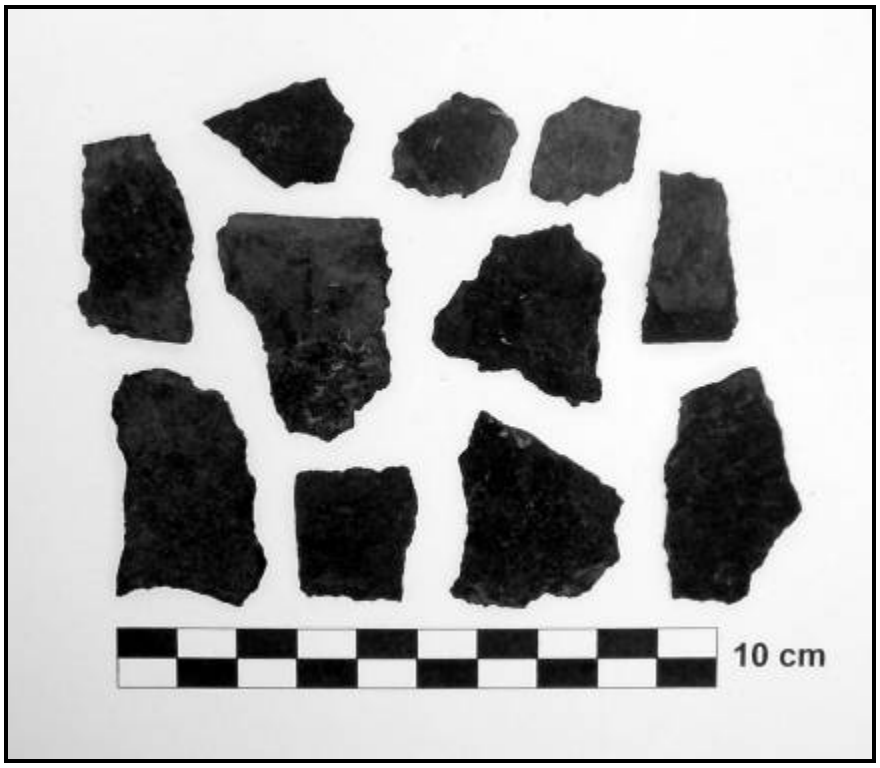

Figure 27: Examples of flat metal fragments found in association with Feature 3.

Figure 28: Examples of pavement fragments from Feature 3.

Figure 29: Reverse side of pavement fragments shown in Figure 28.

Other items found in association with Feature 3 included the tip of a broken biface (Figure 30), one indeterminate bone fragment, and one large tooth (probably from a cow) (Figure 31), all found in Unit 2005-9. A fragment of mandible from a large mammal (of unidentifiable species) was recovered from Shovel Test 19 (Figure 32). The relationships of these items to the historic-period feature are unknown.

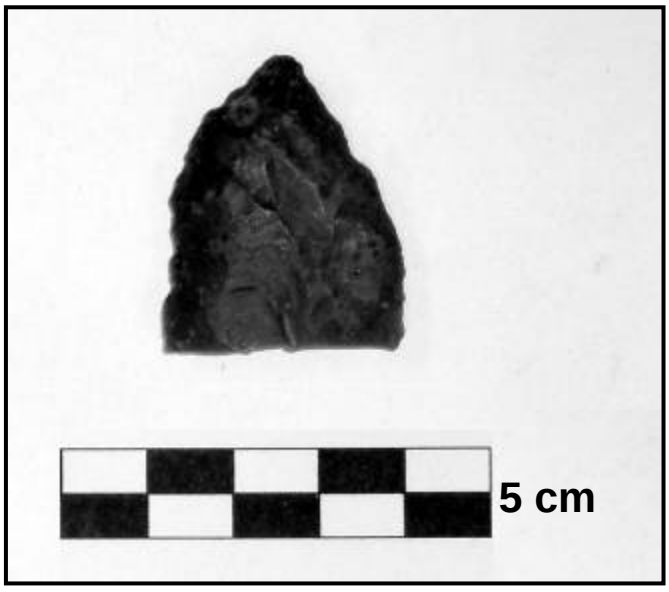

Figure 30: Biface fragment found in Feature 3.

Figure 31: Bone fragment and tooth found in Feature 3.

Figure 32: Mandible fragment found in Feature 3.

Table 4: Unit 2005-7 Excavation Information by Level

Level	Elevation (m)	Description	Count	Weight (g)	Comments
1	10.04–9.97	none			
2	9.97–9.87	flat iron fragments	64	93.4	
		pavement	10	25.1	
3	9.87–9.77	flat iron fragments	74	110.5	some with evidence of paint?
		probable square cut nail fragment	1	2.7	29.2 mm long, 4.7x5.7 mm shank
		pavement	29	56.6	
		charcoal	3	0.2	
Unit Notes:		1-x-1-meter unit; 5 shellcrete blocks visible in Level 1			

Table 5: Unit 2005-8 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	10.20–10.04	flat iron fragments	13	21.5	
		cylindrical iron object	1	3.5	fragment of wire?; 45.0 mm long; 4.0 mm diameter
		burned wood	4	0.5	mostly burned
2	10.04–9.94	flat iron fragments	7	8.9	
		iron/steel tack	1	2.3	heavily corroded
Unit Notes:		1-x-1-meter unit; 2 shellcrete blocks visible in Level 1			

Table 6: Unit 2005-9 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	10.28–10.17	flat iron fragments	18	25.4	
		charcoal	~20	3.5	
2	10.17–10.07	biface fragment	1	7.9	32.7 x 27.8 x 7.4 mm
		flat iron fragments	28	43.8	
		pavement	2	4.4	
		charcoal	16	4.6	1 large and ~15 small frags
3	10.07–9.97	flat iron fragments	153	203.4	
		indeterminate iron fragment	1	5.4	vaguely cylindrical; 29.8 mm long, 7.4x13.5 mm thick
		indeterminate iron fragment	1	4.5	
		indeterminate iron fragment	1	4.4	vaguely cylindrical; 25.6 mm long, 7.7x12.4 mm thick
		pavement	2	1.1	
		charcoal	20	93	3 large, 1 med., 16 small frags
		mandible/long bone fragment	1	14.5	79.5 x 26.8 x 16.5 mm
		large mammal tooth	1	26.3	60.3 x 26.6 x 15. 2 mm
		indeterminate bone fragment	1	<0.1	
Unit Notes:		2-x-2-meter unit; 4 shellcrete blocks visible in Level 3			

Table 7: Unit 2005-11 Excavation Information by Level				
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**
1	10.07–9.97	flat iron fragments	8	16
		pavement	1	0.7
2	9.97–9.87	flat iron fragments	30	24.3
		pavement	4	1.5
		charcoal	2	0.3
3	9.87–9.77	flat iron fragment	1	3.2
		pavement	3	20.5
Unit Notes:		1-x-1-meter unit; 4 shellcrete blocks visible in Level 1		

Table 8: Unit 2005-12 Excavation Information by Level				
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**
1	10.37–10.17	flat iron fragments	3	9.5
		pavement	16	36.5
		charcoal	10	1.8
2	10.17–10.07	pavement	104	393.9
Unit Notes:		1-x-2-meter unit		

Table 9: Unit 2005-13 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	10.36–10.17	pavement	3	8.6	
		charcoal	15	63.5	2 large, 1 large flat, ~12 small fragments
2	10.17–10.07	flat iron fragments	1	1.2	
		pavement	3	12.3	
		charcoal	1	0.2	
Unit Notes:		1-x-1-meter unit; 2 shellcrete blocks visible in Level 2			

Table 10: Unit 2005-14 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	10.22–10.08	flat iron fragments	1	1.7	
		pavement	7	12.6	
		charcoal	1	0.6	
2	10.08–9.98	square cut nail, with head	1	7.9	heavily corroded
		pavement	33	84.6	
		charcoal	1	0.3	
Unit Notes:		1-x-2-meter unit; 1 shellcrete block visible in Level 1			

Table 11: Unit 2005-15 Excavation Information by Level				
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**
1	10.24–10.08	pavement	21	48.9
Unit Notes:		1-x-1-meter unit; fragments of shellcrete blocks visible		

Table 12: Unit 2006-2 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	10.21–10.12	flat iron fragments	1	3.9	
2	10.12–10.02	flat iron fragments	6	8.1	
		charcoal	1	1.1	
3	10.02–9.92	flat iron fragments	15	14.8	
		pavement	6	10.2	
		charcoal	3	3.8	1 large and 2 small fragments
		vertebra	1	0.4	7.6 x 11.3 x 12.0 mm (in 2 pieces)
4	9.92–9.82	flat iron fragments	4	4.3	
		pavement	2	3.3	
		indeterminate bone	1	0.4	
Unit Notes:		1-x-1-meter unit; 1 shellcrete block visible in Level 1; edge of 2nd block visible in SE corner in Level 2; entire shellcrete block exposed in Level 4			

Table 13: Unit 2006-3 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (m)**	**Comments**
1	10.28–10.16	pavement	1	2.0	
		charcoal	4	1.1	
2	10.16–10.06	probable square cut nail fragment	1	1.0	13.3mm long x 4.7 mm diameter
		pavement	32	108.4	
		charcoal	27	14.7	2 large and ~25 small pieces
3	10.06–9.96	pavement	4	18.5	
Unit Notes:		1-x-1-meter unit			

Table 14: Unit 2006-4 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	10.17–10.02	flat iron fragments	3	2.5	
		iron fastener fragment	1	1.7	22.3 mm long x 7.5 mm diameter
2	10.02–9.92	flat iron fragments	18	10.1	
		cylindrical iron object	1	5.2	In 2 fragments; 69.6 mm long x 5.4 mm diameter
		charcoal	1	0.5	
3	9.92–9.82	flat iron fragments	115	59.7	
		iron fastener fragment	1	5.3	heavily corroded; 36.4 mm long x 6.8 mm diameter
		pavement	2	49.5	
		indeterminate bone	1	0.2	
Unit Notes:		1-x-1-meter unit; Fragments of shellcrete blocks visible in Level 2			

Table 15: Unit 2006-5 Excavation Information by Level				
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**
1	10.20–10.12	flat iron fragments	1	0.9
2	10.12–10.02	flat iron fragments	3	1.7
3	10.02–9.92	flat iron fragments	30	13.8
		pavement	3	8.8
		charcoal	1	<0.1
Unit Notes:		0.5-x-1-meter unit; Fine crushed shell throughout unit in Level 3		

Table 16: Unit 2006-6 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	10.33–10.25	none			
2	10.25–10.15	flat iron fragment	1	1.6	
		irregular iron lump	1	1.3	
		pavement	2	6.1	
		charcoal	1	0.3	
3	10.15–10.05	flat iron fragments	1	<0.1	
		cylindrical iron fragment	1	0.8	16.9 mm long x 4.4 mm diameter
		pavement	12	24.9	
		charcoal	1	0.2	
Unit Notes:		0.5-x-1-meter unit			

Table 17: Unit 2006-7 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	10.11–10.02	none			
2	10.02–9.92	flat iron fragments	12	8.3	
		cylindrical iron fragment	1	2.0	22.3 x 6.7 x 8.1 mm
		pavement	4	6.0	
		charcoal	7	0.8	
		burned wood	4	29.0	
3	9.92–9.82	flat iron fragments	3	1.4	
Unit Notes:		0.5-x-1-meter unit; 1 shellcrete block visible in Level 1, appears to be lying on its side			

Feature 4

Feature 4 is the second historic feature discovered during site survey. The survey crew noted shell hash eroding out of a sandy dune (Figure 33). Five shovel tests (ST 22,

23, 30, 31, and 32) and three 1-x-1-meter units (2005-6, 2005-10, and 2006-1) were excavated into this dune (Figure 34).

Figure 33: Feature 4 as seen on surface.

In two of the units (2005-6 and 2005-10), metal objects were recovered between the elevations 12.95 meters and 12.85 meters. Two shovel tests in this area each yielded one small flat fragment of iron, and one other shovel test yielded three square cut nail fragments. Unit 2005-6 yielded three square cut nail fragments, and unit 2005-10 yielded two large and fourteen small flat fragments of iron, and one small amorphous lump of metal (Figures 35 and 36). Both units were characterized by dense concentrations of broken shell (shell hash) between approximately 12.95 meters and 12.75 meters, overlain with loose concentrations of broken shell. The third unit, 2006-1, also yielded loose shell but appears to have been placed outside the main feature area (see Tables 18 through 20 for detailed excavation information).

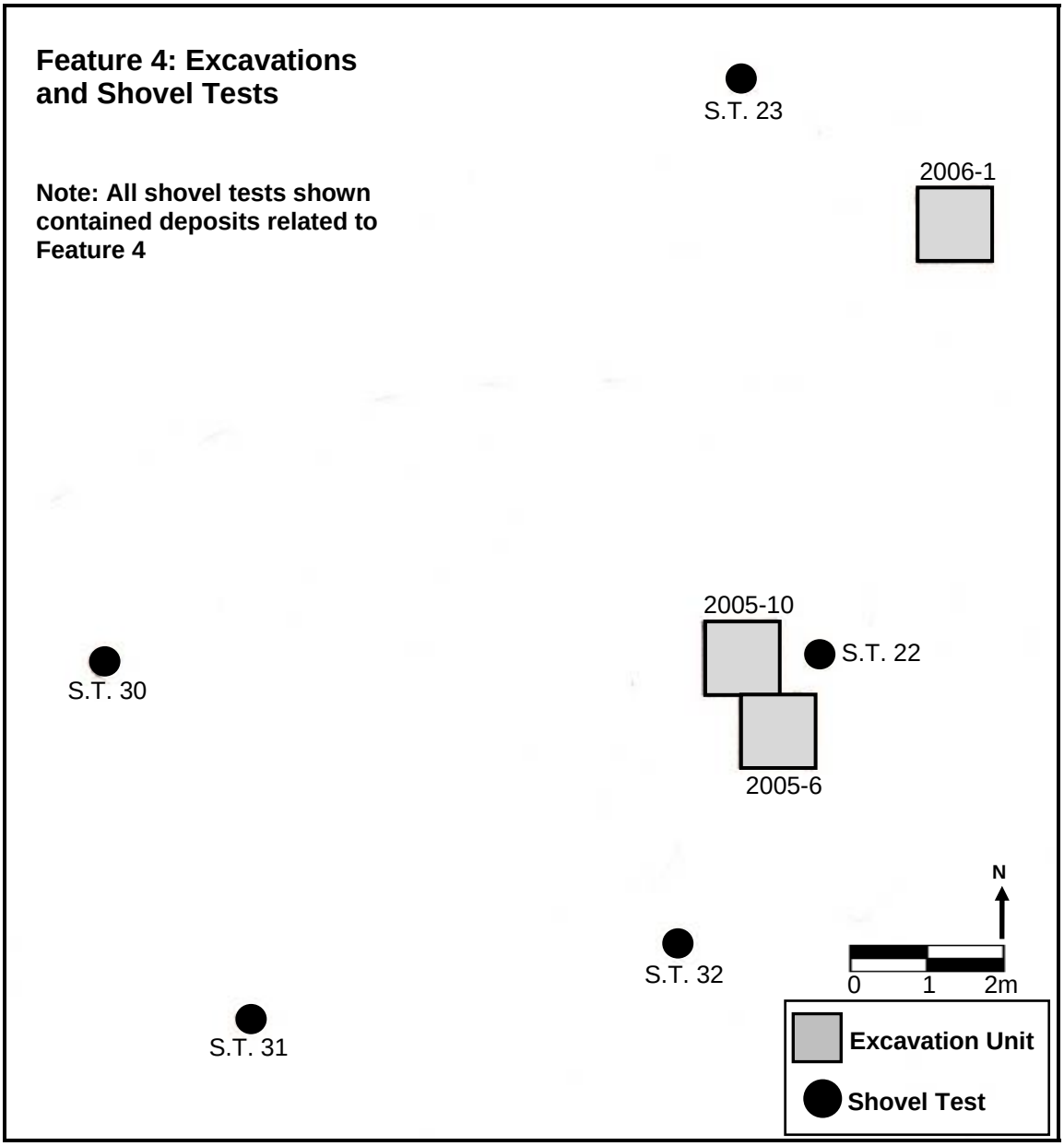

Figure 34: Feature 4 excavation map.

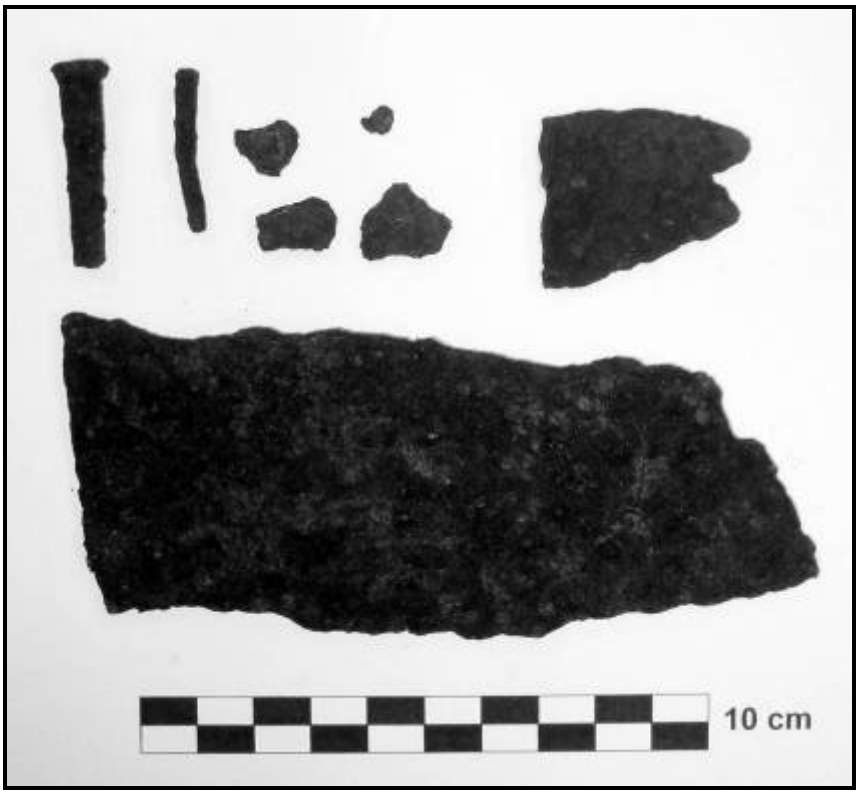

Figure 35: Metal objects found in Unit 2005-10.

Figure 36: Metal fastener fragments found in association with Feature 4.

Table 18: Unit 2005-6 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	13.33–13.25	none			
2	13.25–13.15	modified lithic flake	1	2.9	
3	13.15–13.05	none			
4	13.05–12.95	none			
5	12.95-12.85	square cut nail fragment, no head	1	3.9	50.6 x 4.9 x 4.2 mm
		square cut nail fragment, with head	1	1.1	27.7 mm long; head: 5.0 x 7.0 mm; shank: 2.5 x 2.5 mm
		square cut nail, with head	1	11.2	80.8 mm long; head: 7.9 x 9.1 mm; shank: 6.5 x 7.2 mm
6	12.85–12.75	none			
Unit Notes:		1-x-1-meter unit			

Table 19: Unit 2005-10 Excavation Information by Level					
Level	**Elevation (m)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	13.34–13.15	none			
2	13.15–13.05	fish (?) vertebra	1	1.1	14.5 x 12.0 x 21.1 mm
3	13.05-12.95	flat iron fragments	4	2.3	
		large flat iron fragment	1	10.1	34.8 x 29.0 x 4.2 mm (max)
		large flat iron fragment	1	91.8	123.0 x 51.5 x 4.8 mm (max)
		square cut nail fragment, no head	1	1.6	27.9 x 3.6 x 4.0 mm
		square cut nail fragment, with head	1	5.1	34.9 mm long; head: 9.2 x 8.0 mm; shank: 5.9 x 5.0 mm
4	12.95–12.85	lithic flake	1	0.3	
5	12.85–12.75	flat iron fragments	7	1.1	
6	12.75–12.65	globular metal fragment	1	0.8	
		flat iron fragment	1	0.1	
7	12.65–12.55	none			
Unit Notes:		1-x-1-meter unit			

Table 20: Unit 2006-1 Excavation Information by Level					
Level	**Elevation (meters)**	**Description**	**Count**	**Weight (g)**	**Comments**
1	12.44–12.33	pavement?	2	14.8	similar to pavement at Feature 3, but lacks black/brown coating
2	12.33–12.23	charcoal	2	0.3	
3	12.23–12.13	charcoal	8	0.6	
Unit Notes:		1-x-1-meter unit			

Feature 4 appears to be the remains of the foundation for a structure of unknown purpose. The archaeological remains provide little evidence for the feature's original purpose, but a functional relationship is likely between this feature and Feature 3, the circular shellcrete structure. The relatively large number of metal fasteners found in association with this feature (Figure 36) suggests that the foundation supported a wooden structure of some type. As the excavations at Boone's Lick emphasize, many of the components that made up a salt works were composed of wood (Bray 1987). The Feature 4 foundation might have supported a storage structure for drying and keeping salt or, more likely, a cistern where salt water was held before it was boiled at Feature 3.

Overall, Site 41AS95 yielded relatively few artifacts, and no artifacts of a personal nature, such as buttons, ceramics, or pipe fragments, were recovered. This lack of artifacts is likely the result of a combination of site scavenging and storm clearing. After the salt works was abandoned, local people probably removed any usable equipment and any other objects of value. The materials that were left in place probably were washed out into the bay over time by periodic storms and floods. The area in which the most artifacts were found, Feature 3, is relatively protected by its location, which likely accounts for the number of metal fragments recovered there.

CHAPTER V

INTERPRETATION AND CONCLUSIONS

Interpretation

Both historical information (Huson 1953; LeConte 1862; Lonn 1965) and archaeological data from other historic-period salt works (Bray 1987; Fielding 2005; Fox 1983; Skinner 1971; Updike 2001) were used to interpret the features and artifacts found at the St. Charles Bay salt works. No single site provides a perfect analogy that can explain all components of the Lamar site, but James W. Byrne's salt works contains features similar to those found at a number of different known salt works (Bray 1987, Fielding 2005, Fox 1983, Skinner 1971, Updike 2001). No historical documents were located that provide details or descriptions of the salt works at Lamar. However, a synthesis of the archaeological remains at the site, coupled with the few references to the St. Charles Bay salt works in historical documents and information from known salt works elsewhere, are used to speculatively reconstruct the site of 41AS95.

Based on the available historical and archaeological evidence, a reconstruction of how the St. Charles Bay salt works operated is proposed. Feature 2 probably represents a set of platforms for solar evaporation. Saline bay water would have been pumped into the easternmost chamber of the large, partitioned platform area (Feature 2). There, sediments began to settle out, and some of the water evaporated. After some time, the brine was allowed to pass into the second chamber, where further evaporation occurred. The movement of water between chambers was probably accomplished through the use of either small floodgates or pumps. The platform surfaces both slope slightly inland,

and the western platform drops approximately 15 centimeters from the eastern surface, which would have facilitated the movement of water. This process was repeated until the water was released onto the westernmost platform for further evaporation. The surface of this platform was likely divided into a number of smaller chambers with low retaining walls of shellcrete. This follows the pattern seen at many other historic salt works that operated based on solar evaporation (Figure 37). Due to time constraints, the surface of the platform was not investigated adequately to determine whether or not such walls were present. The large surface area of this platform allowed for maximum exposure of the water to the sun and wind, thus expediting the evaporation process. See Figure 38 for an artist's reconstruction of Area A, including Features 1 and 2.

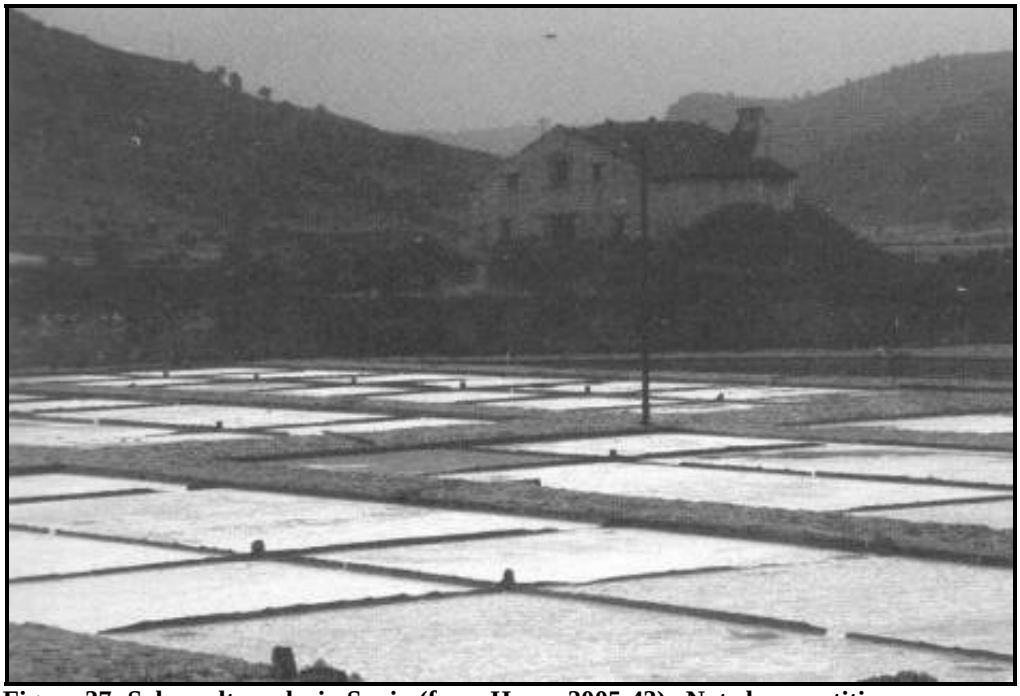

Figure 37: Solar salt works in Spain (from Hueso 2005:43). Note low partitions separating the pools of brine.

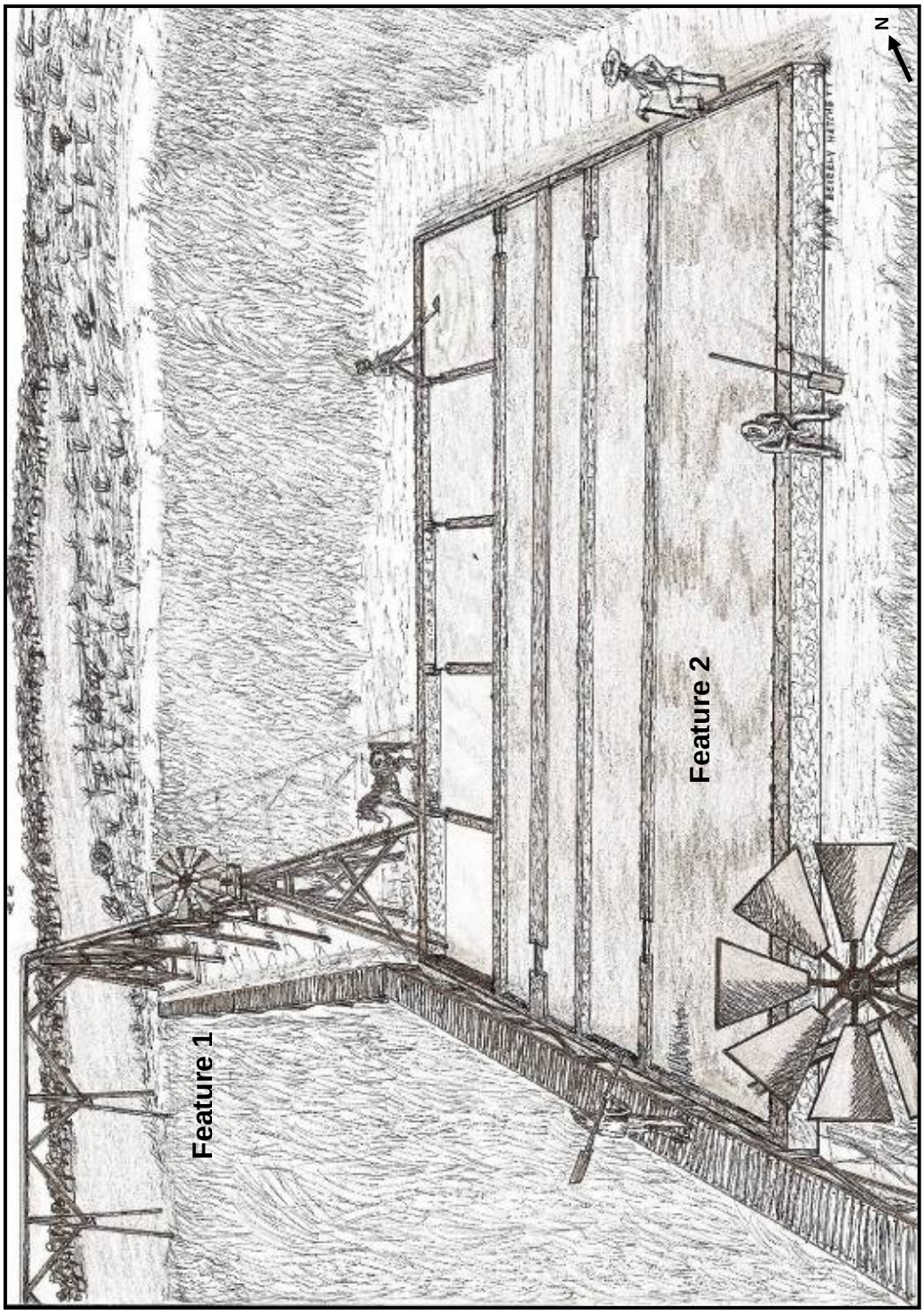

Figure 38: Artist's reconstruction of Area A as it may have appeared circa 1860. Feature 2 is in the foreground, while Feature 1 is behind it. (Image courtesy Beverly Hatchett).

Solar evaporation is the simplest method for producing salt from saline water. No fuel is needed, and labor requirements are minimal (Updike 2001). Salt production by solar evaporation involves the capturing of seawater on platforms or in shallow lagoons, and it is a method that has been in use for centuries and across the globe (Lonn 1965). As Fielding (2005:11) explains, "[a]s the seawater becomes more concentrated it is directed through a series of smaller solar evaporation basins only a few centimetres deep where at an appropriate stage, salt crystallises and is raked into heaps for drying while the bitter tasting salts drain off." This method of salt production is feasible in only certain climates, high in sunlight and low in humidity. While the Texas Gulf Coast has plenty of sunlight, it is too humid for solar evaporation alone to provide an efficient means of making salt. Documents from the historic salt works at Velasco emphasize this point, as Asa Mitchell needed kettles for boiling salt water (Earls et al. 1996). A combination of solar evaporation and boiling was common in many locations where the climate is not conducive to salt making by means of solar evaporation alone (Fielding 2005).

Pumps of some type were almost certainly used at the St. Charles Bay salt works. Pumps were in use since at least the mid-sixteenth century, when Agricola described a simple pump mechanism in his *De Re Metallica* (Bray 1987). There are few descriptions of the types of pumps that might be in use at salt works in historic documents, however. As Bray (1987:9) explains:

> Among the various descriptions of technology involved in the manufacture of salt in the early United States, there are frequent references to delivery of brine to evaporative units. Thus, we read that pumps were used to raise water from wells and into gutters, troughs, or leaders that carried brine by force of gravity to evaporation sites. But rarely is there any elaboration on what kind of pump was

> used nor just how broad one's interpretation justifiably might be in defining the word.

The types of pumps used at salt works and other industrial sites from the nineteenth century was often taken for granted in contemporary written sources, so discerning these details is difficult in present-day investigations. In conjunction with pipes, pumps may have delivered water from St. Charles Bay to the solar evaporation platforms and also from the platforms to other portions of the site. A wind-driven pump may have pumped water from the bay onto the platforms. Such wind pumps were common at salt works, as shown in Figures 39 and 40. Alternately, bay water could have washed onto the Feature 2 platform during high tide. This scenario is unlikely, however, because it would have limited control over the process of procuring salt water for evaporation. More likely, the entire platform area was enclosed in low shellcrete walls that prevented the marsh water from washing onto the platforms and diluting the increasingly-saline brine being processed. The remains of the footings for portions of these walls were found archaeologically. If walls were present on the side closest to the bay, however, they have since eroded away. Pumping water from some distance out in the bay would also help to reduce the amount of sediments introduced onto the platforms. Water procured from the marsh immediately next to the solar evaporation structure would contain a relatively large proportion of sediments in the forms of vegetation, soil, and other impurities. Byrne likely constructed a wooden walkway out into the bay to support a wind pump that could pull relatively clean water from further off shore. In fact, a deeper pool within the marsh Byrne owned might have provided the ideal source of relatively clean water (Figure 43).

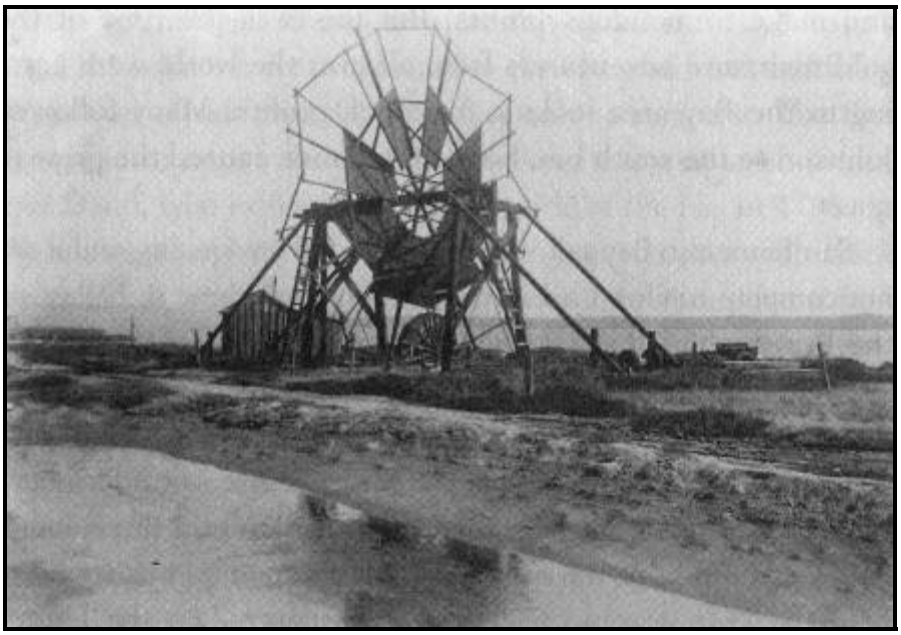

Figure 39: Windmill pumping brine into a salt works in California, nineteenth century (from Kurlansky 2002:284).

Figure 40: Windpump at Southwold, Suffolk, England, 1861 (from Fielding and Fielding 2006:17).

Once the salt water being processed at Feature 2 had reached the desired salinity, it was likely pumped through wooden pipes across the marsh to the circular structure (Feature 3), where the remaining water was boiled until the salt began to crystallize. The

salt resulting from this process could then be gathered from the kettle or pan and allowed to dry before being packaged. Networks of wooden pipes were frequently used at salt works (Bray 1987; Lander 2005; Updike 2002) (Figures 41 and 42). Wooden pipes were preferable to metal for the movement of brine, since iron is corroded by salt water while wood is not. Hollowed out half logs provided inexpensive piping, and the open top allowed for additional evaporation as the salt water moved slowly from one part of the site to another. Although wooden materials rarely survive at archaeological sites, the remains of such an aqueduct were found at Boone's Lick, Missouri (Bray 1987). These remains included "two 40- and 50-cm-long sections of half logs with squared ends. One side of each log had been hollowed out forming troughs 26 cm deep and 58 cm in diameter" (Bray 1987:32). Remains of a piping system have not been found at the St. Charles Bay salt works, but salt water was probably moved from one part of the site to another in this way.

Figure 41: Wooden channels for delivering brine, Salinas de Annana, Alava, Spain (from Lander 2005:51).

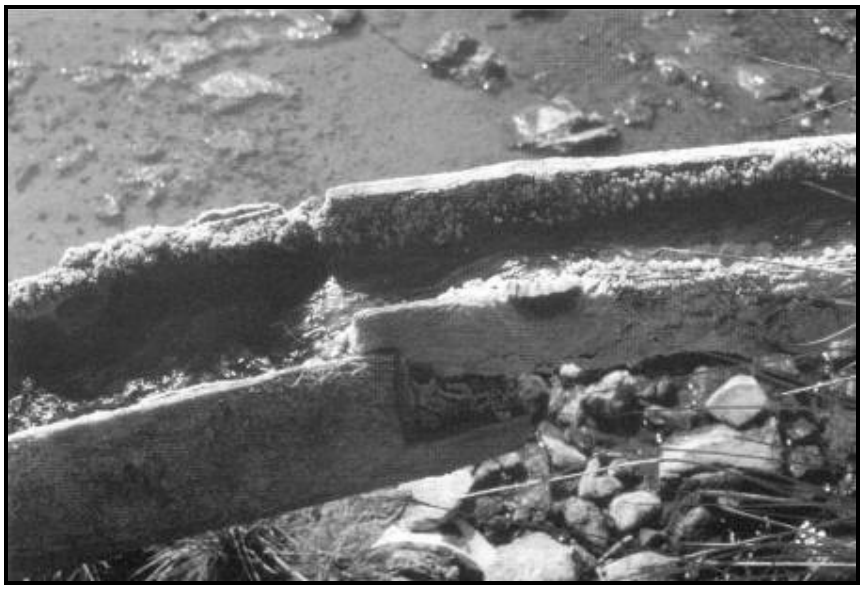

Figure 42: Joint in a wooden brine channel, Salinas de Annana, Alava, Spain (from Lander 2005:50).

Area A, dominated by the large evaporation platforms (Feature 2), and Area B, where the circular structure (Feature 3) is located, are approximately 250 meters apart. A carefully-planned system of pipes could have carried the saline water across this distance, and the exposure to sun and wind during the slow journey from one area to another provided additional opportunity for evaporation. Updike (2002) describes a pipeline in the Kanawha Valley that may have spanned hundreds of meters. The great distance between the two areas at the St. Charles Bay salt works may be explained by the configuration of land on which Byrne built the salt works. By overlaying the survey map Byrne had done for the property on an aerial photograph of the peninsula (Figure 43), it becomes clear that there was very little dry land on which Byrne could build anything. When comparing the modern aerial photograph to the survey map, it must be remembered that the coastline has shifted somewhat, and exactly matching the modern photograph to the nineteenth-century image is difficult.

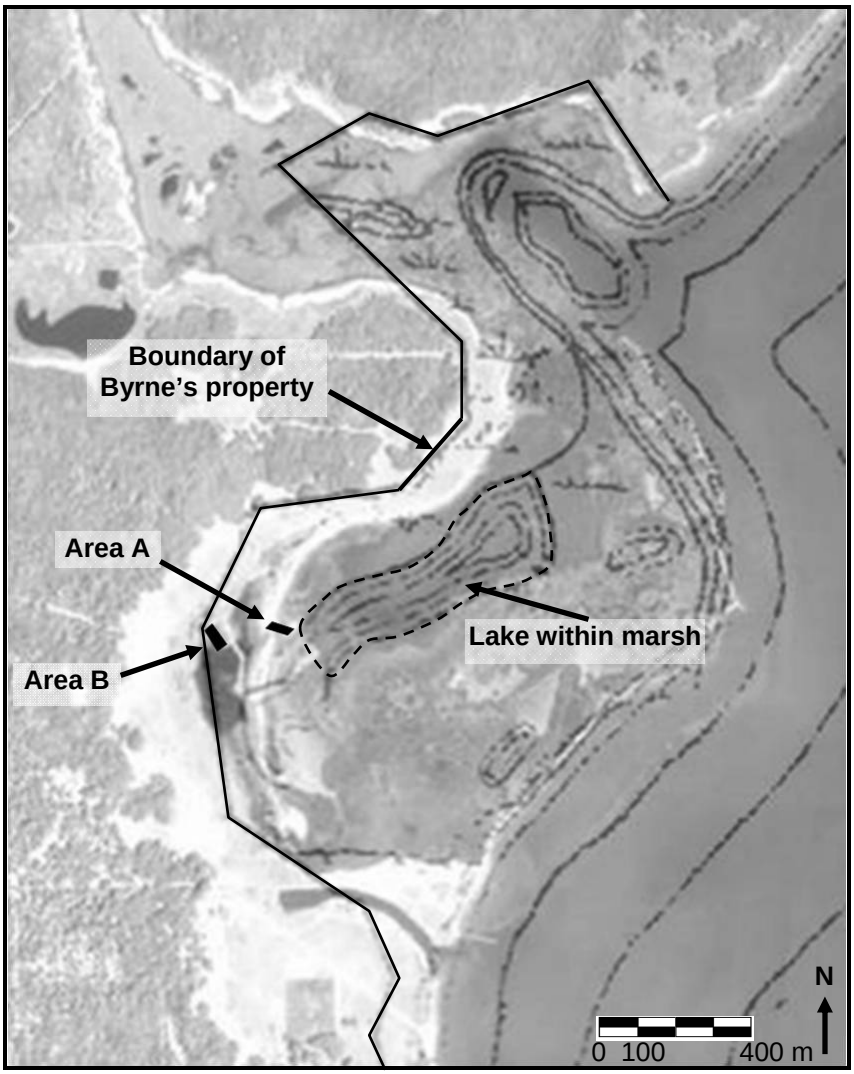

Figure 43: Image created by overlaying survey map of Byrne's property on aerial photograph of the peninsula (Photo from www.texmaps.com). Note that the aerial photograph was taken during a time when the water level was relatively high.

A network of wooden pipes, as may have been present at the St. Charles Bay salt works, would require a system of trestles to support the troughs at the correct elevations to maintain the flow of water (Bray 1987). Feature 1 may represent the remains of a foundation for a support of this type. A wooden trestle would leave behind few remains under any but the best preservation circumstances. Alternately, the small platform at

Feature 1 may represent a foundation for a pump or for a small reservoir. Most likely, however, the platform was related to the movement of water between the large evaporation platforms at Feature 2 and the rest of the site.

The shell hash foundation and associated metal fragments at Feature 4 may represent the remains of a cistern or tank for holding concentrated brine before it was moved to the boiling structure at Feature 3. A tank of this type could provide a means of regulating the flow of brine to the boiling feature. Alternatively, Feature 4 may be the foundation for a storage building or other support structure needed for the production of salt.

Feature 3, which appears to be the remains of a simple furnace for boiling salt water, does not conform to furnace designs used at other historic salt works (Bray 1987; Skinner 1971; Updike 2002), but it is similar enough to other furnaces that its function can be understood. This circular feature lies approximately 10 meters southeast of Feature 4, and the occupation levels at Feature 3 (9.90-10.20) are approximately 2.8 meters lower than those at Feature 4 (12.70-13.00), so there is a slight slope between the two features. This slope would have allowed gravity to feed water through pipes from Feature 4 to Feature 3. The boiling structure at Feature 3 was constructed of a circular arrangement of shellcrete blocks set on a foundation or pavement. The pavement extended past the circular structure, probably in order to provide dry stable footing for laborers and a place to pile salt as it was removed from the pan. Skinner (1971) mentions that a walkway for laborers would have been necessary at the Neches Saline as well. Additional shellcrete blocks inside the circular structure would have both supported the

evaporation kettle or pan and acted similarly to the tile pillars in a Roman hypocaust in which hot air circulated around and between the stacks of tiles (Figure 44).

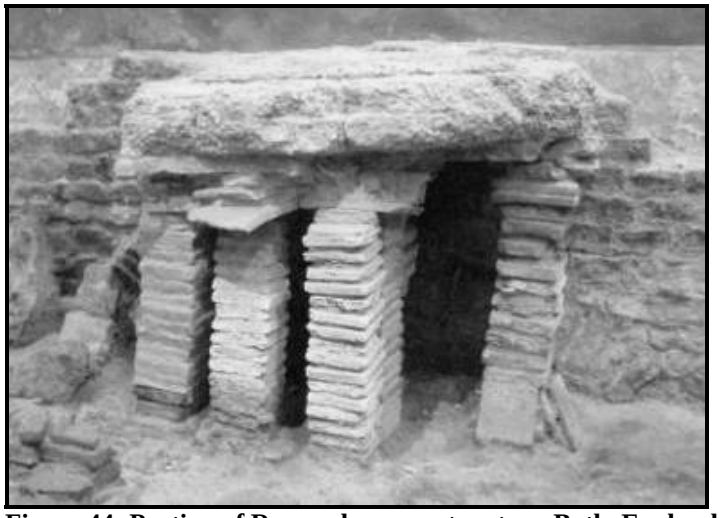

Figure 44: Portion of Roman hypocaust system, Bath, England.

If the Feature 3 structure represents the remains of a boiling area, a fire was probably maintained on the foundation of the structure, under the evaporation vessel. Several large fragments of charred wood were found during excavations and provide evidence for burning. Other burned remains have probably been washed away by the storms and tides of the intervening 140 years. Gaps between some shellcrete blocks in the circular alignment would allow access for laborers to build and maintain the fire and to remove ashes and charcoal periodically. An mid-nineteenth-century publication by John LeConte (1862:6) of South Carolina describes a salt works that operated on this principle: "The bottom of the pan is supported by small pillars of brick-work, built from the foundation of the furnace, so as to form, at the same time, flues for the distribution of the heat. These flues are calculated to disseminate the flame as uniformly as possible

over the bottom of the pan…" Salt works based on boiling could be of any size and were common throughout the United States and Western Europe (Figure 45).

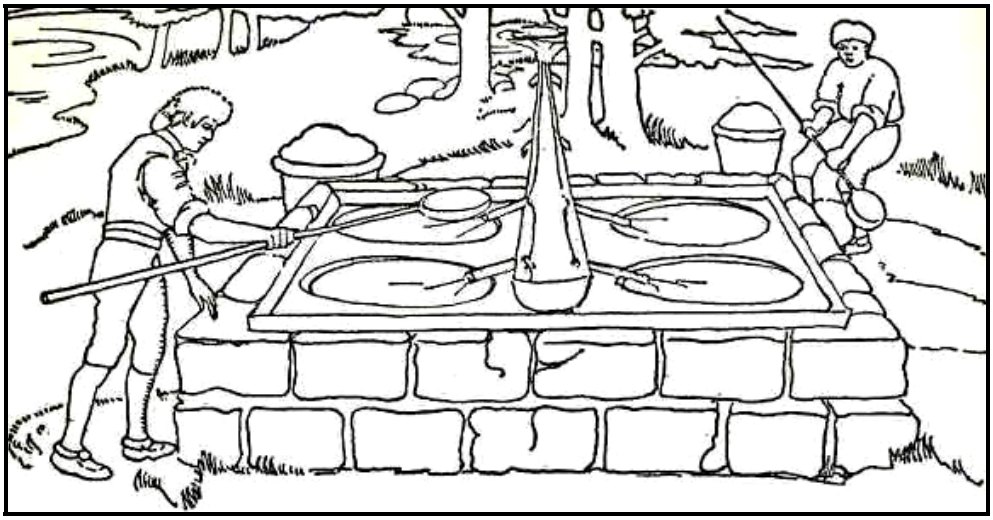

Figure 45: Artist's rendering of an early-nineteenth-century salt works near Salina, New York. Note wooden pipeline supplying water to the boiling kettles set into a stone framework. (Illustration by Mary Constance Enslow, from Eskew, 1948:50).

The nineteenth-century evaporation furnace at the Lion Salt Works in England demonstrates this method of salt making on a large scale. At this salt works, the furnace is a massive structure of brick with metal doors opening into the firebox. Firemen worked constantly, feeding the fires with coal to maintain the temperature of the brine in the huge evaporation pan above (Figures 46 and 47). Inside the firebox, pillars of bricks encouraged heat circulation under the evaporation pan (Fielding, personal communication, July 2007). At this site, heat was directed out of the firebox and into the drying rooms, eventually escaping through a brick chimney at the end of the complex (Figure 48).

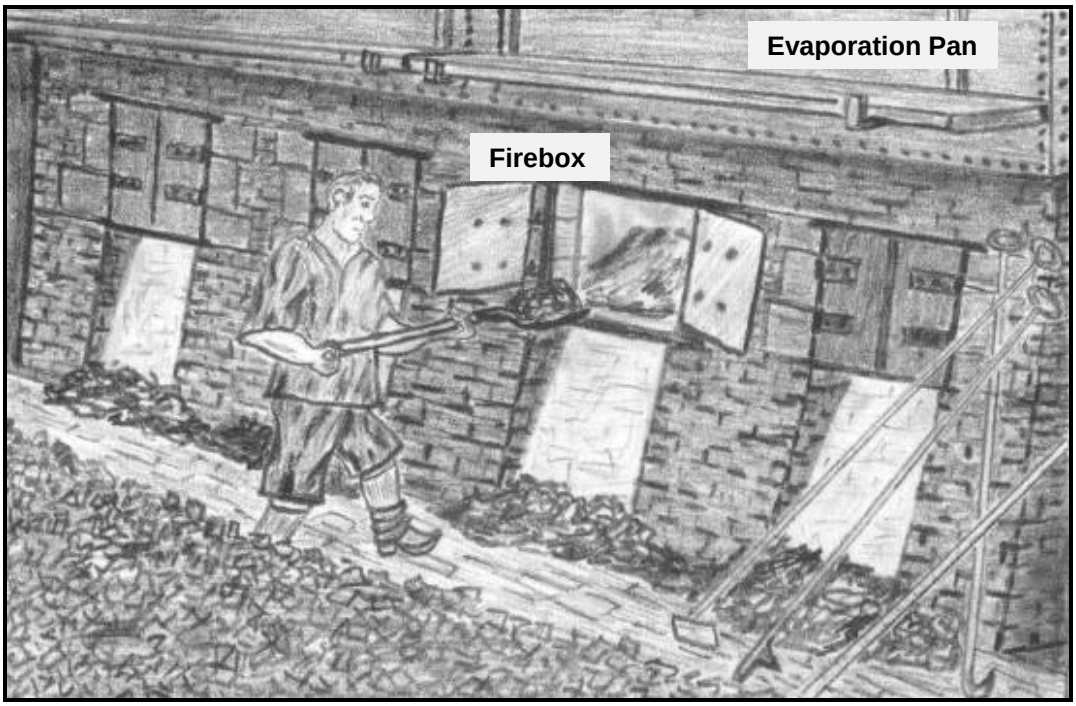

Figure 46: Drawing of a fireman feeding coal into the firebox at a large facility similar to the Lion Salt Works; the evaporation pan is above the firebox (image from Lightfoot 2000:25).

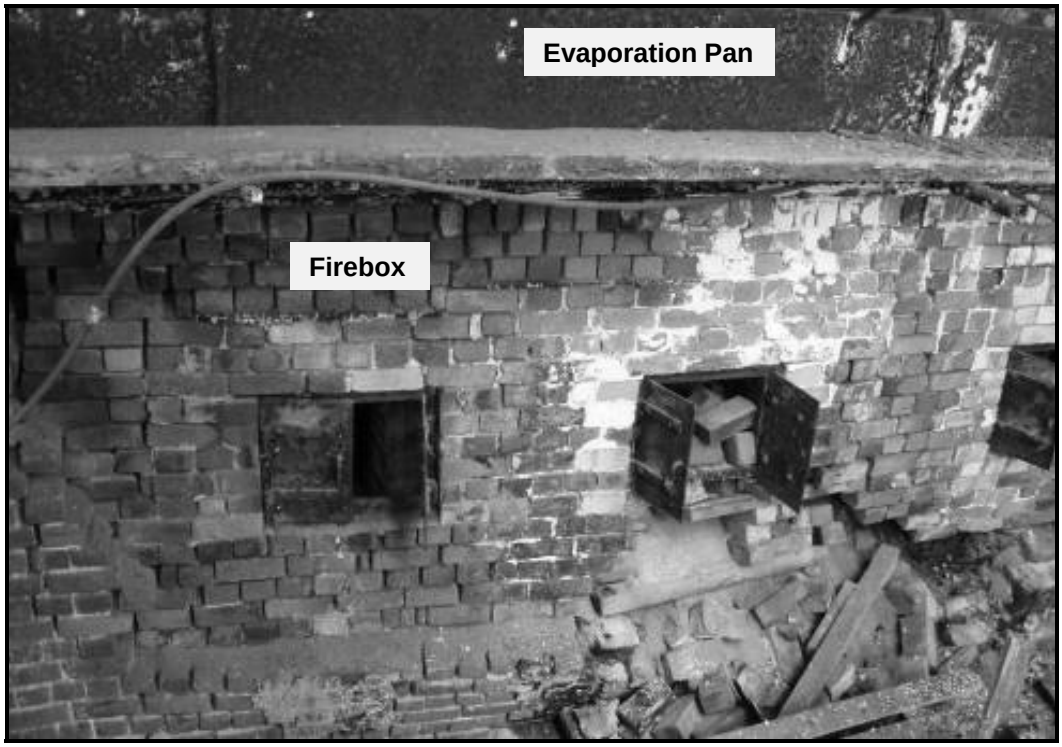

Figure 47: Remains of the firebox at the Lion Salt Works; the evaporation pan is above the firebox.

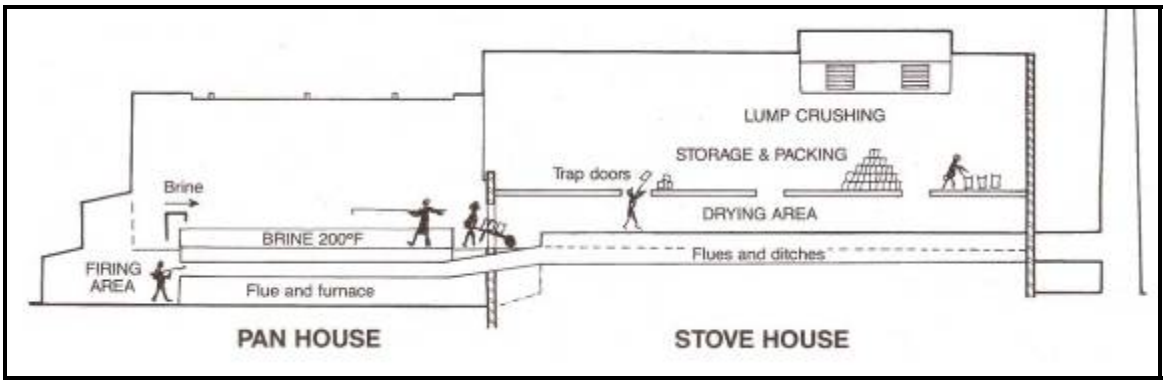

Figure 48: Simplified schematic showing the process of salt making at the Lion Salt Works (image from Lion Salt Works Trust 2000:18).

Based on the available archaeological evidence, no chimney or external firebox was present at Byrne's salt works, although these were common features at some other salt works such as at Neches Saline and in the Kanawha Valley (Skinner 1971; Updike 2001). At the St. Charles Bay salt works, heat probably escaped through gaps in the supporting structure. The circular shape of the boiling structure at 41AS95 implies the use of a circular evaporation pan or a very large salt kettle. Kettles were commonly used for boiling salt at salt works in the early part of the nineteenth century. These vessels were often recycled sugar or potash kettles, since containers produced specifically for salt making were uncommon (Updike 2001). See Figure 49. The later nineteenth-century practice of using relatively shallow iron pans allowed for greater relative surface area for evaporation and were lighter in weight per surface area than were kettles. LeConte (1862:6) describes a typical salt pan as a "…shallow four-sided vessel of sheet-iron, from nine to twelve inches deep, with flat bottom, somewhat deepened towards the middle…" Most of the documented salt pans were rectangular, but James Byrne may have had a circular one specially made or adapted some other similar round receptacle to use as an

evaporation pan. Byrne's brother, Charles, who lived in New Orleans, was a dealer in metal goods. In the 1861 New Orleans City Directory, Charles Byrne advertised himself as a:

> Manufacturer of Copper, Sheet Iron & Tinware and dealer in Stoves, Stove-Pipe, etc. Makes Copper Stills, complete to contain from 20 to 20,000 gallons, & any other description of heavy or light Copper Work. Black-smithing & general jobbing and repairing in the Metallic line, executed & attended to.

Byrne's brother in New Orleans may have supplied metal vessels to Byrne's specifications for salt making. Unfortunately, no records of transactions between Byrne and his brother were found during this research. A search for documents from Charles Byrne's store was also unsuccessful. See Figure 50 for an artist's reconstruction of Area B, including Features 3 and 4. Figure 51 illustrates the entire salt works area to demonstrate the relationship between areas and features.

Figure 49: Large salt kettle (photo courtesy Jeffrey Girard).

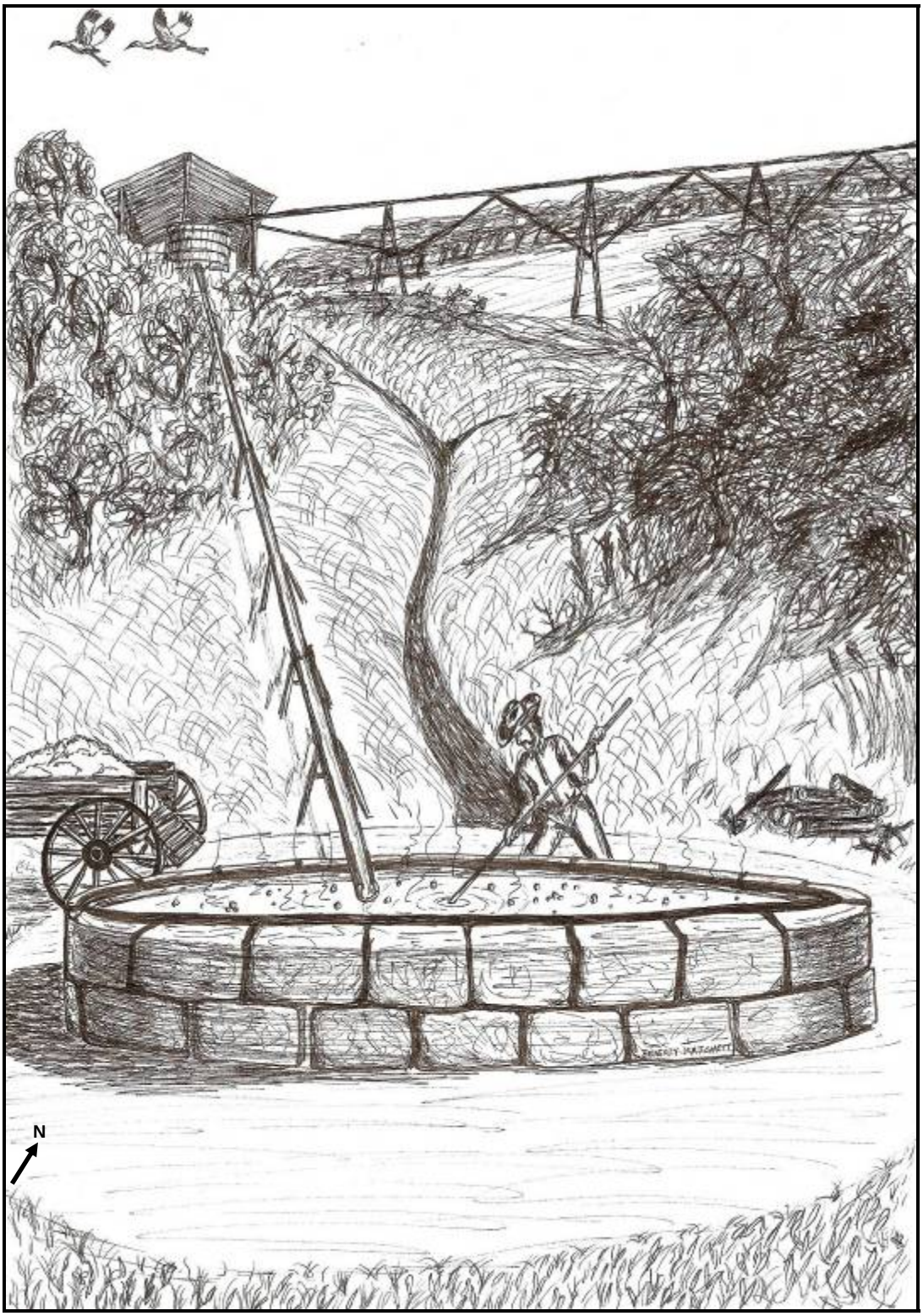

Figure 50: Artist's reconstruction of Area B as it might have looked circa 1860. Feature 3 is in the foreground, while Feature 4 is to the northwest. Slope is exaggerated to show distance (Image courtesy Beverly Hatchett).

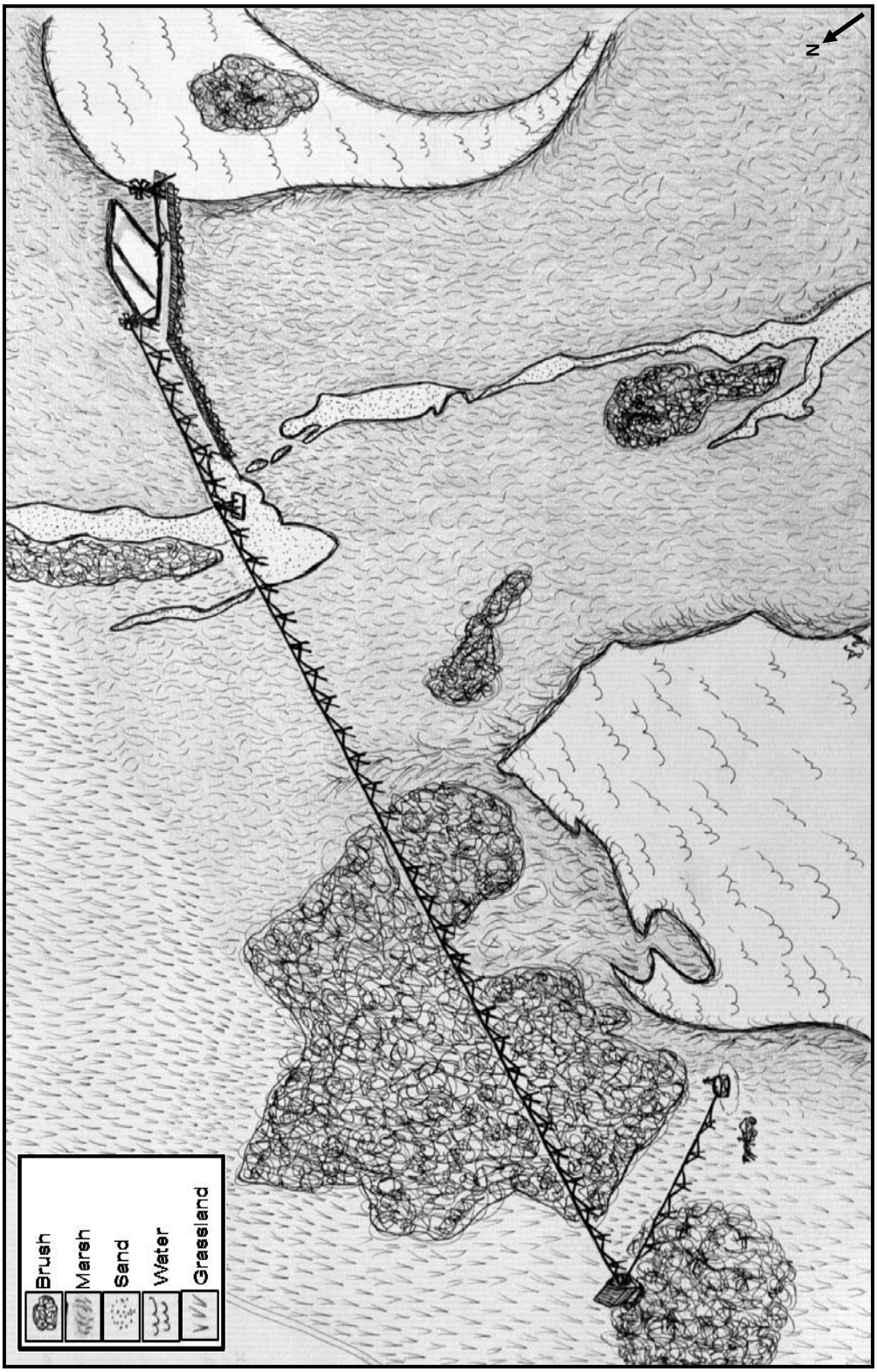

Figure 51: Artist's reconstruction of the St. Charles Bay salt works as it might have looked circa 1860 (Image courtesy Beverly Hatchett).

If Byrne's salt works operated as suggested in this speculative reconstruction, it was based on precedents well known to salt makers in the mid-nineteenth century. This reconstruction is based on both the archaeological remains of the site and a wide range of historical sources, and it fits into the patterns of salt making elsewhere during this time period. LeConte (1862) describes multiple variations on making salt from sea water. Specifically, LeConte describes a salt works based solely on solar evaporation, one at which solar evaporation was combined with boiling, another using a graduation chamber combined with boiling, a fourth combining leaching salt from beach sand and boiling, and a final example based only on boiling sea water. The second method, that of combining solar evaporation and artificial evaporation, is described in terms that parallel elements of Byrne's salt works on St. Charles Bay. In LeConte's description, sea water is concentrated in large basins before being boiled to yield salt. LeConte (1862) mentions that furnaces, evaporation pans, and a storage building must be available if salt water is to be boiled. Although LeConte's (1862) full description is more complex than the system suggested by the archaeology at the St. Charles Bay salt works, it is useful in interpreting the site remains.

Sometime after 1935, Hobart Huson interviewed a Lamar native, Peter A. Johnson, who recounted his memories of the Lamar area from the 1860s onward. These notes later formed the basis of a book that provides interesting clues about how Byrne's salt works may have operated and about other details of life in Lamar in the mid-nineteenth century (Huson 1994). Johnson was only a boy during the Civil War, but he reveals information about life in Lamar during the mid-nineteenth century. Much of

Johnson's narrative, especially of the earlier period in Lamar, was probably based on local stories rather than his own memories. Johnson recalls that one of his earliest memories was from 1867, so many of the details he gives from before that time may be inaccurate (Huson 1994). Johnson mentions that Byrne was a businessman who owned a salt works, but he provides no details. At another point in the narrative, Johnson discusses a large salt works on St. Charles Bay that he claims was built by the Confederate authorities and that was abandoned because of Federal gunboat activity in the bays (Huson 1994). According to Johnson, after the war Seth Ballou, a long-time Lamar resident, took over that salt works and produced both salt and molasses at the site. No archival records dealing with Ballou's interest in a salt works, or, indeed, dealing with any salt works on St. Charles Bay except that of Byrne, have been found. Johnson may be confusing the salt works he claims was built by the Confederacy with Byrne's, or there may have been another salt works in the area that is even more poorly documented than Byrne's. Johnson does give some description of this salt works, but it is difficult to determine how much of the detail is accurate and whether or not the salt works he discusses was originally Byrne's. According to Johnson:

> The saltworks was a considerable affair. There was a mill operated by wind power. The mill had "Johnny Armstrong arms" on the grinders. Salt was scooped from the evaporation pits and ground by the mill, either coarse or fine, as was desired. The saltworks was one place where employment could be had. I often worked there as a boy, scooping salt. Sometimes I had to take my pay in molasses. [Huson 1994:19]

Further research into the possibility of another salt works on St. Charles Bay could be helpful in filling out the picture of life in Lamar at this time. This example illustrates the difficulties inherent in attempting to reconstruct the history of a poorly-documented site.

Johnson also provides a few other interesting bits of information that may or may not be reliable, considering the time lapse between the events and the recording. Johnson claims that a man named Moses Simpson built a home at Copano sometime before 1856 and was shipping hides and tallow from there. Johnson also mentions another packing operation at Lamar, "…in the bend of St. Charles Bay, near the 'Big Tree.'…its operation was kind of a community affair. The meat was salted or pickled. The tallow was packed in barrels, and the hides tied in bundles" (Huson 1994:40). Neither of these claims has been verified through documents, although a search was made for such records. However, if anyone was engaged in packing meat, hides, or tallow commercially during this time period, there certainly would have been a demand for large quantities of salt. No archaeological remains of a packing operation have been reported in this location, although such remains may exist. Also notable is the fact that Byrne's salt works could be described as being "in the bend of St. Charles Bay, near the 'Big Tree,'" which is still a recognized landmark.

Byrne may have moved to Texas for the promise of a new life, as did many other immigrants. An 1840 publication sums up the attitude of promise in Texas:

> Young men of good moral character and handsome acquirements, may have a wide and uncultivated field in which to lay the foundation for future usefulness in Texas; such perhaps as cannot be elsewhere found, and these, if possessed of strong nerves, and qualified to perform the double duty of heroes and saints, may have a very bright prospect of becoming in time, not only rich but eminent and distinguished among men while living, and objects of veneration when dead. [Stiff 1968:190]

Byrne was not a young man when he moved to Texas, and he may have seen in Texas the opportunity to leave a lasting legacy. Documents indicate that he apparently had ongoing

financial difficulties. Virtually every documented business transaction in which Byrne participated underscores his position as a speculator without enough means. Byrne did leave a legacy, however; his name even appears on the "Local History" section of a menu at a diner located near where the town of Lamar once stood (Menu, Pop's Restaurant, Lamar). Byrne is remembered locally for founding the town of Lamar, for fighting in the Texas Revolution, and for building a salt works.

Conclusions

This thesis utilized a combination of historical research and archaeological investigation to explain the nineteenth-century salt works on St. Charles Bay, Texas. The salt works was excavated and recorded, fulfilling one of the major objectives of this study. Beyond the documentation of the site, this thesis addressed three major research questions: How did the salt works operate? What role did the salt works play in the town of Lamar? What was the importance of the salt works in the overall network of commerce in the Copano Bay area? Alone, neither the historical documents nor the archaeological record fully answer any of these questions, but a combination of all of the information collected provides considerable insight.

One of the primary research questions dealt with how the salt works operated. A conjectural reconstruction of the St. Charles Bay salt works unites the four features that were investigated archaeologically (Figure 51). The process of making salt at this site likely began at Feature 2, the evaporation vats (Figure 38), where bay water was gathered and concentrated. Feature 3, the circular boiling structure (Figure 50), probably represents the final stage of the process. The highly-concentrated brine was then boiled

to yield salt. Features 1 and 4 likely represent structures that contributed to the movement of water between Features 2 and 3. Feature 1 may be the remains of a platform for a support structure for the wooden pipelines that were probably used to transport brine from one part of the salt works to another. Feature 4 likely represents the remains of a similar structure, or it may be the foundation for a cistern or tank for holding salt water before it was transported to the boiling structure (Feature 3) for final processing.

The second research question addressed the role that the salt works played in the community of Lamar. Byrne clearly anticipated a need for local salt production far in advance of the difficulties caused by the Civil War, when many local salt works arose across the South. Throughout his life in Texas, Byrne was involved in investments and business speculation, and he was interested in nurturing the town of Lamar. Byrne probably built the salt works both in hopes of making a profit for himself and with the expectation that a local salt works would strengthen Lamar, since salt would not have to be imported from elsewhere. The cost of salt increased dramatically with distance from the source, so producing salt locally would provide a considerable advantage for the people of the area (Eskew 1948). While no business records have surfaced that provide figures for salt production or income for this site, the importance placed on the salt works in business transactions and in Byrne's will indicate that the operation was of some importance.

The production capacity of Byrne's salt works is difficult to estimate accurately, since such a figure is dependent on a number of factors. Included in this equation are the

salinity of the water, the rate of solar evaporation (based on ambient temperature, wind, and humidity), the number of solar evaporation areas and boiling areas, and the types of pumps used to transport the water. That being said, historical sources and the archaeological remains do provide some insight into the possible yield of Byrne's salt works.

The total surface area of the Feature 1 platforms (excluding the width of the three known partitions) is approximately 272 square meters, or almost 2,928 square feet. In his description of a model salt works, LeConte (1862) recommends a water depth of 10 to 16 inches. If the water in the platforms was, on average, 13 inches deep, the total volume of water on the platform area was approximately 23,727 gallons. The average salinity of sea water is approximately 3 percent. To begin to boil brine to yield salt efficiently, the salinity of the water should be between 20 and 25 percent (LeConte 1862; Andrew Fielding, personal communication, July 2007). Based on the size of the Feature 3 boiling structure, Byrne likely used a pan or kettle approximately 4.5 meters in diameter. Assuming the vessel was a flat-bottomed pan rather than a semi-spherical kettle, at five inches of water depth, the container would have held about 535 gallons. LeConte (1862) recommends a flat-bottomed pan 9 to 12 inches deep, filled just over halfway with brine. When the brine reached the correct salinity, salt crystals began to form on the surface. At this point, the brine in the pan was kept over high heat (but not boiling) as salt crystals grew and dropped to the bottom to be scooped out. LeConte (1862) claims that 260 bushels of salt could be produced from 10,000 gallons of brine at 20% salinity. Based on this estimate, from the 535 gallons of brine at 20% salinity as originally fed into the

boiling pan at the St. Charles Bay salt works, approximately 14 bushels of salt could be produced. The timeframe for this process is difficult to estimate, since the rate of solar evaporation varied, and the time required to heat the brine to boiling would depend on the heat of the fire. In LeConte's (1862) instructions, the process of boiling the brine to the point of crystallization could take from 20 to 24 hours. Following that period, it could take several days for the salt crystals to grow and sink to the bottom of the pan (LeConte 1862). Based on these estimations (LeConte 1862), Byrne's salt works could have produced as little as 14 bushels in 6 or 7 days of continuous work. If only 14 barrels of salt was produced per week, the rate of return on the amount of time and labor involved was relatively low.

However, if one or more factors were adjusted, the salt yield could increase considerably. For example, if the bay water was concentrated to 30% salinity before boiling, the yield increases to 21 bushels of salt per pan of water. The amount of salt produced is further increased if brine is continuously added to the pan as water evaporates, thus maintaining a constant depth of water in the pan. If this technique was used, the process of harvesting the salt crystals is continuous rather than cyclical. Based on this model, it would take several days to heat the brine to the point that salt begins to sink to the bottom. Once that process began, it could continue indefinitely, with yields as high as 21 bushels per day rather than per week, based on 30% brine salinity. The pan requires cooling periodically for the removal of the hard crust of minerals that forms on the bottom. This mineralization, called "blocking," was subsequently chipped away, because the blocking expanded and contracted at different rates than the iron pan and

could cause the pan to crack (Lonn 1965). Furthermore, a thick layer of blocking on the bottom insulated the pan from the heat of the fire and reduced the efficiency of the heating process (Lonn 1965). At the Lion Saltworks, the mineralization was removed once a week (Andrew Fielding, personal communication, July 2007).

Based on the model described above, continuously boiling brine at an original 30% salinity for 6 days at a time (with a day off for cleaning the pan), potentially yields as much as 105 bushels of salt a week. This estimate takes into account the 24 hours it sometimes takes to boil the brine to the point that salt crystals can be harvested. A bushel was approximately 50 pounds, so 105 bushels of salt would equal 5,250 pounds produced weekly. An average estimate for the price of salt in 1860 is $2.50 per bushel (Lonn 1965). Based on this price, Byrne's saltworks was capable of producing $262.50 worth of salt in a week.

Clearly, the boiling of brine to yield salt was a process that needs maintenance 24 hours a day. Every time the pan was allowed to cool, it took hours to reheat it to boiling temperature, so letting the pan cool between daytime shifts of laborers was inefficient.

The production of salt from bay water through the means used at Byrne's salt works would require a labor force of several individuals. Based on estimates of labor forces at a number of other salt works, Byrne needed at least three people to tend to the solar evaporation vats and at least two people to maintain the boiling of the brine. Between these two elements, four or five laborers were probably employed to maintain the pumps, repair pipelines, and ensure the process worked smoothly. Other laborers were necessary for packaging the salt produced and transporting the salt to its final

destinations. Based on this model, a minimum of 12 individuals were needed to operate the salt works. Thus, Byrne provided employment for a number of local laborers. In addition to providing jobs, the salt works undoubtedly helped to meet dire local, and possibly regional, need for salt that arose during the Civil War.

Finally, the role Byrne's salt works played in the regional economy is addressed. The St. Charles Bay salt works likely provided salt for the needs of both the town of Lamar as well as surrounding areas. The importance of the salt works overall may be indicated by its significance to the Union forces blockading the coast outside Lamar. Whether or not Byrne's salt works was attacked during the Civil War is unclear from the documentary record. However, assuming the salt works was in operation at that time, it undoubtedly attracted negative attention from the Union forces blockading that portion of the coastline. The Union had a well-established habit of destroying sites of local production of all sorts of products, especially salt. The Confederacy was so dependent on imported salt that the coastal blockade severely limited salt availability and fueled the development of local salt works. The Union began the blockade with the intention of preventing the South from exporting cotton (which potentially provided income for military activity) and importing necessary items (which would weaken popular resolve). This being said, it is likely that any known salt works were potential targets for Union attacks, and Byrne's operation was in easy range of the blockading forces. The likelihood of a Union attack on the salt works underscores the importance of the site to the people of Lamar and of the Copano Bay community.

Small-scale coastal salt works in the United States are relatively unknown archaeologically, and they tend to be poorly documented historically. Thus, the present study contributes to knowledge of what is, at this time, a poorly-understood but vital local industry from the nineteenth century. Through extensive archival research, investigation into the history and operation of salt works from across the world, and archaeological excavations at Byrne's salt works, this thesis contributes significant information to overall knowledge of salt production during the nineteenth century. Additionally, this thesis demonstrates the difficulties of researching a poorly-documented, small-scale industry. Also importantly, the research into Byrne's salt works provides insight into the personality of a pivotal figure in the history of the Copano Bay area.

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APPENDIX A

SHOVEL TESTS CONDUCTED AT 41AS95

Table 21: Shovel Tests Conducted at 41AS95

Shovel Test	Feature Association	Depth (cmbs)	Soil Color	Soil Texture	Artifacts Recovered	Comments
1	Feature 1	0–20		Sandy clay	None	
		20–40		Sandy clay	None	Terminated at 40 cmbs due to groundwater
2	Feature 1	0–23	light gray	Moist sand	Small concentration of burned shell	
		23–50	same	Sandy loam	Burned shell	Sterile at 45 cmbs
3	Feature 1	0–20		Moist sand	None	
		20–40		Sandy clay	None	
		40–60		Sandy clay-compact	None	
		60–80		same	None	
		80–100		same	None	
4	Feature 2	0–10	dark gray	Sandy clay loam, sticky	None	
		10–20	gray-blue	Sandy clay loam, less sticky	None	
		20–30	same	Sandy clay loam, saturated	None	Water seeping into test
		30–40	same	same	None	Terminated at 40 cmbs due to groundwater
5	Feature 2	0–20		Sandy clay, saturated	None	
		20–40		Clay, saturated	None	
		40–60		same	None	Terminated at 60cmbs due to water
6	Feature 2	0–20	dark gray	Clay	None	
		20–30	same	same	None	Terminated at 30 cmbs due to groundwater

Table 21: Shovel Tests Conducted at 41AS95 (continued)

Shovel Test	Feature Association	Depth (cmbs)	Soil Color	Soil Texture	Artifacts Recovered	Comments
7	Feature 2	0–10		Clay, mottled with sand	None	
		10–20		Clay	None	
		20–30		same	None	
		30–40		Clay, saturated	None	Terminated at 40 cmbs due to groundwater
8	Feature 2	0–10	gray	Sandy clay loam	None	
		10–20	same	same	None	At 12 cmbs hit compact shell lens approx. 3cm thick
		20–30	same	same	None	
		30–40	same	same	None	Terminated at 40 cmbs due to groundwater
9	Feature 2	0–15		Sandy loam	None	Hit plastered shellcrete surface at 15 cmbs
10	Feature 2	0–15		Sandy clay loam	None	Hit plastered shellcrete surface at 15 cmbs
11	Feature 2	0–20		Sandy clay to clay	Styrofoam bobber	Shellcrete wall in west 1/4 of unit, ends 11 cmbs
12	Feature 2	0–10		Sandy, silty loam		Exposed plaster slab and outer wall
13	Feature 2	0–10		Sandy clay to clay	None	Profile of shellcrete slab
14	Feature 1/2	1–10	Light gray/ brown	Sandy clay	None	Disturbed
15	Feature 1/2	0–20		Sandy clay	None	
		20–40		Clay	None	
		40–60		same	None	
		60–80		same	None	
		80–100		same	None	
16	Feature 1/2	0–30		Sand	None	
17	Feature 1/2	0–20		Sand	None	
		20–40		Sandy clay	None	
		40–60		Compact sandy clay	None	
		60–80		same	None	

Table 21: Shovel Tests Conducted at 41AS95 (continued)						
Shovel Test	**Feature Association**	**Depth (cmbs)**	**Soil Color**	**Soil Texture**	**Artifacts Recovered**	**Comments**
18	Feature 1/2	0–20		Sand, moist	None	
		20–40		same	None	
		40–60		Sandy clay, dry and compact	None	
		60–80		Sandy clay, very compact	None	
19	Feature 3	0–10		Sandy clay loam	None	Exposed top of shellcrete block
		10–20		same	None	
20	Feature 3	0–20	very dark gray	Sandy clay loam, loose	None	
		20–40	same	same	None	Hit water 30–40 cmbs
		40–60	same	same	None	Dry again 50–60 cmbs
		60–80	same	same	None	
21	Feature 3	0–20		Sandy loam	None	
		20–40		same	None	
		40–60		same	None	Terminated at 60 cmbs due to groundwater
22	Feature 4	0–20		Sand	None	
		20–40		Sand/shell	None	Shellcrete or shell hash; seems to run north to south
		40–60		Sand/shell	None	Same as above
		60–80		sand	None	Sterile sand
		80–100		same	None	Sterile sand
23	Feature 4	0–20		Sandy loam	1 UID metal fragment	
		20–50		same	None	
		50–70		same	1 fragment burned shell	
		70–100		same	None	
24	Feature 4	0–20	dark gray	Sandy loam, loose	None	
		20–40	same	same	None	
		40–60	same	same	One flake	
		60–80	same	same	None	
		80–100	same	same	None	Orange clay mottling

Table 21: Shovel Tests Conducted at 41AS95 (continued)						
Shovel Test	**Feature Association**	**Depth (cmbs)**	**Soil Color**	**Soil Texture**	**Artifacts Recovered**	**Comments**
25	Feature 4	0–20		Sandy loam	None	
		20–40		same	None	
		40–60		same	None	
		60–80		Sandy loam with some clay	None	
		80–100		Sandy clay loam	None	
26	Feature 4	0–20	brown	Loose sandy loam	None	
		20–40	same	same	1 flake	
		40–60	same	same	None	
		60–80	same	same	None	
		80–100	same	same	None	
27	Feature 4	0–20	brown	Sandy loam	None	
		20–40	same	same	None	
		40–60	same	same	None	
		60–80	same	same	None	
		80–100	same	same	None	
28	Feature 4	0–20	brown	Sandy loam	None	
		20–40	same	same	None	
		40–60	same	same	None	
29	Feature 4	0–20	brown	Loose sand	None	
		20–40	same	same	None	
		40–60	same	same	None	
		60–80	same	same	None	
		80–100	same	Loose sand/ Sandy clay loam	None	
30	Feature 4	0–20	brown	Loose, moist sandy loam	None	Roots
		20–40	same	same	None	
		40–60	same	same	None	Shell hash (eroded?)
		60–80	same	same	1 metal fragment	Shell hash (eroded?)
		80–100	same	same	2 shellcrete fragments	

Table 21: Shovel Tests Conducted at 41AS95 (continued)						
Shovel Test	**Feature Association**	**Depth (cmbs)**	**Soil Color**	**Soil Texture**	**Artifacts Recovered**	**Comments**
31	Feature 4	0–20	brown	Sandy loam	None	Scattered shell and shellcrete
		20–40	same	same	None	Scattered shell and shellcrete
		40–60	same	same	1 columella	Scattered shell and shellcrete
		60–80	same	same	None	Burrow
		80–100	same	same	None	Scattered shell and shellcrete
32	Feature 4	0–20	dark brown	Fine sand	bone fragment	
		20–40	same	same	None	
		40–60	same	same	None	
		60–80	same	Coarse sand	None	
		80–100	red-brown	same	shell, metal, bone	
33		0–20	brown	Fine sand	None	
		20–40	same	same	None	
		40–60	same	same	None	
		60–80	same	same	None	
		80–100	same	same	None	
34	Feature 3	0–20	black	Sandy loam	None	Humus layer with lots of roots
		20–40	same	same	None	
		40–60	same	same	None	
		60–80	black/gray	same	None	
		80–100	gray/ black	same	None	
35	Feature 3	0–20	black	Sandy loam	1 fragment "floor" material	Terminated, reached feature base level

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