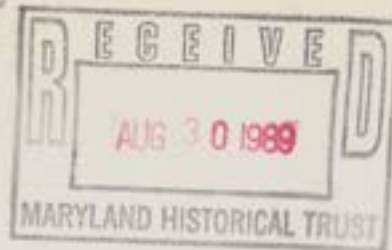


I
FR 43
Final



DOC 4385
August 10, 1989

**A PHASE I ARCHEOLOGICAL INVESTIGATION OF
CATOCTIN FURNACE (18 FR 29), CUNNINGHAM
FALLS STATE PARK, FREDERICK COUNTY,
MARYLAND**

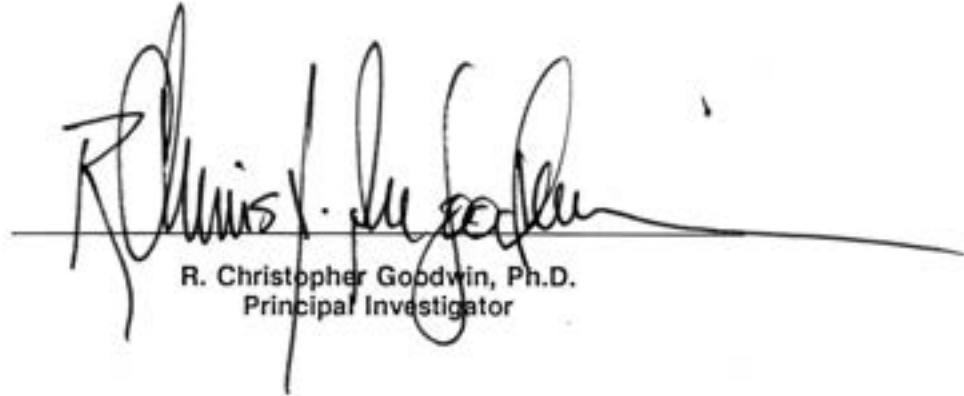
**R. Christopher Goodwin & Associates, Inc.
636A Solarex Court
Frederick, MD 21701**



PREPARED FOR:

**State of Maryland
Office of Engineering and Construction
Department of General Services
301 West Preston Street, Room 1405
Baltimore, MD 21201**

**A PHASE I INTENSIVE ARCHEOLOGICAL
INVESTIGATION OF CATOCTIN FURNACE (18 FR 29),
CUNNINGHAM FALLS STATE PARK,
FREDERICK COUNTY, MARYLAND**



R. Christopher Goodwin, Ph.D.
Principal Investigator

by

Thomas W. Neumann, Ph.D.

R. Christopher Goodwin & Associates, Inc.
636A Solarex Court
Frederick, MD 21701

August 10, 1989

For

State of Maryland
Office of Engineering and Construction
Department of General Services
301 West Preston Street, Room 1405
Baltimore, MD 21201

ABSTRACT

This report presents the results of an intensive Phase I archeological investigation at Catoclin Furnace (18 FR 29), an archeological site with above ground remains of a late eighteenth through early twentieth century iron smelting operation. Phase I testing was done in preparation for the stabilization of the retaining walls at the furnace complex. Testing consisted of 166 50 x 50 cm shovel tests, six 1.5 x 1.5 m test units, three 1.0 x 1.5 m test units, three 50 x 50 cm test units, one 50 x 100 cm test unit, one 75 x 200 cm test unit, and seven trenches with a combined area of 117.75 m². Five areas were tested: Area A, located within 7.6 m (25 ft) of the west side of the retaining wall system; Area B, a 30.5 x 91.4 m (100 x 300 ft) area located west of the retaining wall system; Area C, located at the south end of the retaining wall system; Area D, located within 4.6 m (15.0 ft) of the east side of the retaining wall system; and Area E, corresponding to a north-south line across the furnace yard where a sediment barrier will be located during construction.

Testing in Area A revealed that furnace-related fill extended to at least 2.15 m below the surface. No conclusive evidence was found of the frame stock house shown in various historic photographs. Testing in Area B revealed that most of the area was covered by at least 75 cm of furnace-related fill. No evidence of structures was found. Testing in Area C revealed extensive slag fill on the slope south of the retaining wall, and multiple fill events of building debris located at the base of that slope. Testing in Area D exposed possible structure remains. Testing in Area E exposed the floor of an undocumented structure that would have been immediately west of Stack No. 3 (Deborah).

No further archeological work was recommended for any of the five areas. Archeological monitoring was recommended in Areas A and C during construction.

TABLE OF CONTENTS

ABSTRACT	ii
LIST OF FIGURES	v
LIST OF TABLES	vi
I. INTRODUCTION AND RESEARCH DESIGN	1
Introduction	1
Location and Nature of Project	1
Summary of Project Impacts	4
Design and Impacts	4
Project Impacts on Cultural Resources	4
Research Objectives and Design	6
Organization of Report	7
II. ENVIRONMENTAL BACKGROUND	8
Physiography	8
Geology	8
Soils	9
Vegetation and Land Use	9
III. HISTORIC BACKGROUND	12
Previous Investigations	12
Summary of Catoclin Furnace History	20
Research Expectations and Hypotheses	22
Dominant Questions	22
The Anderson Hypotheses	30
Stack No. 1 (1787 Stack)	30
Charcoal House for Stack No. 1 (1787 Stack) and Stack No. 2 (Isabella)	31
Function of Structure on Top of Retaining Wall	31
Engine House and Blowing Machinery for Stack No. 3 (Deborah)	32
Location of Steam Boiler	32
Spillway and Stack No. 1 (1787 Stack)	33
Additional Hypotheses	33
IV. RESEARCH METHODS	35
Archival Investigations	35
Field Investigations	35
Area A	35
Area B	36
Area C	36
Area D	36
Area D1/D3	36
Area D2	36
Area D4	36
Area E	37
Laboratory Methods	37

V. ANALYSIS AND RESULTS	38
Site Description	38
Results of Investigations in Impact Areas	39
Area A	39
Area B	43
Area C	45
Area D	46
Area D1/D3	46
Area D4	50
Area E	52
Artifact Analysis	54
Testing of Hypotheses	56
Discussion	60
VI. SUMMARY OF RESULTS AND RECOMMENDATIONS	63
Summary of Results	63
Area A	63
Area B	63
Area C	63
Area D	64
Area D1/D3	64
Area D4	64
Area E	64
Recommendations	65
Area A	65
Area B	67
Area C	67
Area D	67
Area D1/D3	67
Area D2	68
Area D4	68
Area E	68
REFERENCES CITED	69
ACKNOWLEDGEMENTS	73
APPENDIX I: ARTIFACT PROVENIENCE TABLE	
APPENDIX II: SCOPE OF WORK	
APPENDIX III: CURRICULUM VITAE OF KEY PERSONNEL	

LIST OF FIGURES

Figure 1.	Location of Project Area	2
Figure 2.	Catoctin Furnace Retaining Wall and Stack Stabilization Project Area	3
Figure 3.	Location of Impact Areas at Catoctin Furnace	5
Figure 4.	Diameter Classes of Tree Species at Catoctin Furnace (18 FR 29)	10
Figure 5.	Location of Known Sites in the Catoctin Furnace Area	16
Figure 6.	Approximate Location of Historic Structures within the Catoctin Furnace Complex	17
Figure 7.	View of Catoctin Furnace from Southeast, ca. 1890 (photograph courtesy of Noel Anderson)	25
Figure 8.	View of Catoctin Furnace from Southeast, ca. 1903 -1906 (photograph courtesy of Noel Anderson)	26
Figure 9.	View of Catoctin Furnace from South, ca 1906 (from Singewald 1911:Plate VIII, Fig. 2; photograph courtesy of Noel Anderson)	27
Figure 10.	View of Catoctin Furnace from Northeast, ca. 1903-1906 (photograph courtesy of Noel Anderson)	29
Figure 11.	Site Plan of Catoctin Furnace (18 FR 29)	Attached
Figure 12.	West Wall Profile, Unit A-1	40
Figure 13.	East Wall Profile, Unit A-2	41
Figure 14.	Subsoil Fill Over Reddish Brown Sandy Silt: North End of Trench A4	44
Figure 15.	West Wall Profile, Unit C-1	47
Figure 16.	South Wall Profile, Unit D-1	48
Figure 17.	Plan View and Profile of Unit D-5 and Feature D-U5-1	49
Figure 18.	Plan View and Profiles of Features D-U3-1 and D-U3-2	51
Figure 19.	Mortared Stone and Brick Floor in Shovel Test E 11	53
Figure 20.	Areas To Be Avoided, Protected, or Monitored During Stabilization Activities	66

LIST OF TABLES

Table 1.	Sites in Vicinity of Catoctin Furnace	13
Table 2.	Distribution of Artifacts from Catoctin Furnace by Functional Category and Type	55

CHAPTER I INTRODUCTION AND RESEARCH DESIGN

Introduction

This study, undertaken to fulfill compliance with Maryland Historic Preservation Legislation, Article 83B, Sections 617-618, and pursuant to contract number P-016-741-401 for the State of Maryland, presents the results of Phase I intensive archeological investigation of Catoctin Furnace (18 FR 29), Cunningham Falls State Park, Frederick County, Maryland. The purpose of this study, conducted between February 16 and May 4, 1989, was to determine if stabilization of the Catoctin Furnace retaining wall would disturb significant archeological deposits. In addition, if Phase I investigations indicated the presence of significant deposits, then plans to mitigate the effects and/or to conduct additional archeological work were to be designed as part of this study.

Location and Nature of Project

Catoctin Furnace (18 FR 29) represents the stone masonry ruins of a late eighteenth through early twentieth century iron mining and smelting complex. It is located along the east side of U.S. Highway 15, approximately 22.5 km (14.0 mi) north of Frederick and 5.6 km (3.5 mi) south of Thurmont, in northern Frederick County, Maryland (Figure 1). Catoctin Furnace is within the Catoctin Furnace Historic District, which is listed on the National Register of Historic Places.

The ruins are dominated by a 5.5 - 6.1 m high (18.0 - 20.0 ft) four faced, three angled dry lain stone retaining wall set in the toe slope of Catoctin Mountain (Figure 2). This wall system is approximately 55.3 m (181.4 ft) long north to south; it has a southern north-south face that is 15.5 m (51.0 ft) long, and a central north-south face that is 41.5 m (136.2 ft) long. The land surface west and behind the retaining wall generally is even with the top of the wall. A series of depressions and 41 3.8 cm (1.5 in) diameter threaded tie irons representing the ruins of an engine house are located at the foot of the south wall face. Northeast of the retaining wall system is an isolated wall segment around 7.6 m (25.0 ft) long and 4.0 m (13.0 ft) high. Immediately east of this segment are the ruins of a furnace stack, known variously as Stack No. 2 and as the Isabella Furnace, which is 8.0 m (26.2 ft) wide at its base and approximately 9.4 m (30.8 ft) high. Adjoining the east side of the Isabella Furnace is a reconstruction of its casting shed.

The planned stabilization project calls for partial consolidation of the walls of the Isabella Furnace. Although the main retaining wall originally sloped in against the hill, both east facing segments now bow out. The south wall segment is held in place by six 20.3 cm (8.0 in) square timbers, all of which have rotted, that are set 3.5 m (10.0 ft) out from the wall base in the ruins of the engine house. This wall face leans out, and it has a 3.0 m (9.8 ft) long and, near the top, a 1.0 m (3.3 ft) wide crack at its upper north end.

The long central east-facing wall segment also bows out. It has not developed extensive cracks in the face. A single, 20.3 cm (8.0 in) square, rotted timber brace, similar to those along the south segment of the retaining wall, is positioned in the center of the bow.

The short isolated wall segment between the Isabella Furnace and the main retaining wall complex has started to collapse. Some stones have been lost from the top, but the most apparent damage is a 1.8 m (6.0 ft) high and 1.4 m (4.6 ft) wide cavity where the wall has collapsed. This is located in the base at the center of the wall.

The stabilization and consolidation plans call for repairing the deteriorating walls where needed. This would be done by replacing the fill behind the main retaining wall system with gravel-filled concrete cribbing, running tie rods from the wall into the concrete cribbing, and repairing the collapsed or cracked masonry. Accomplishing this stabilization will require setting temporary bracing both in front and in the excavated cavity behind the retaining wall system.

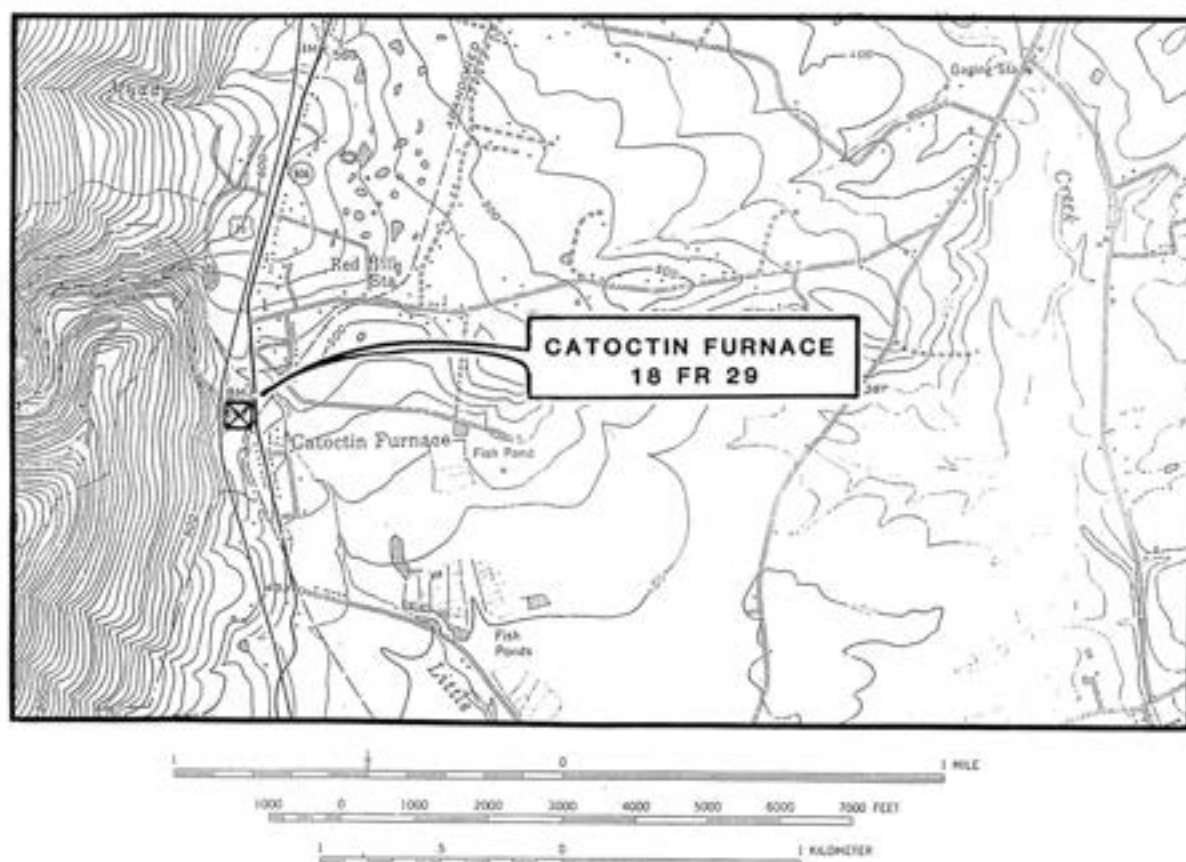
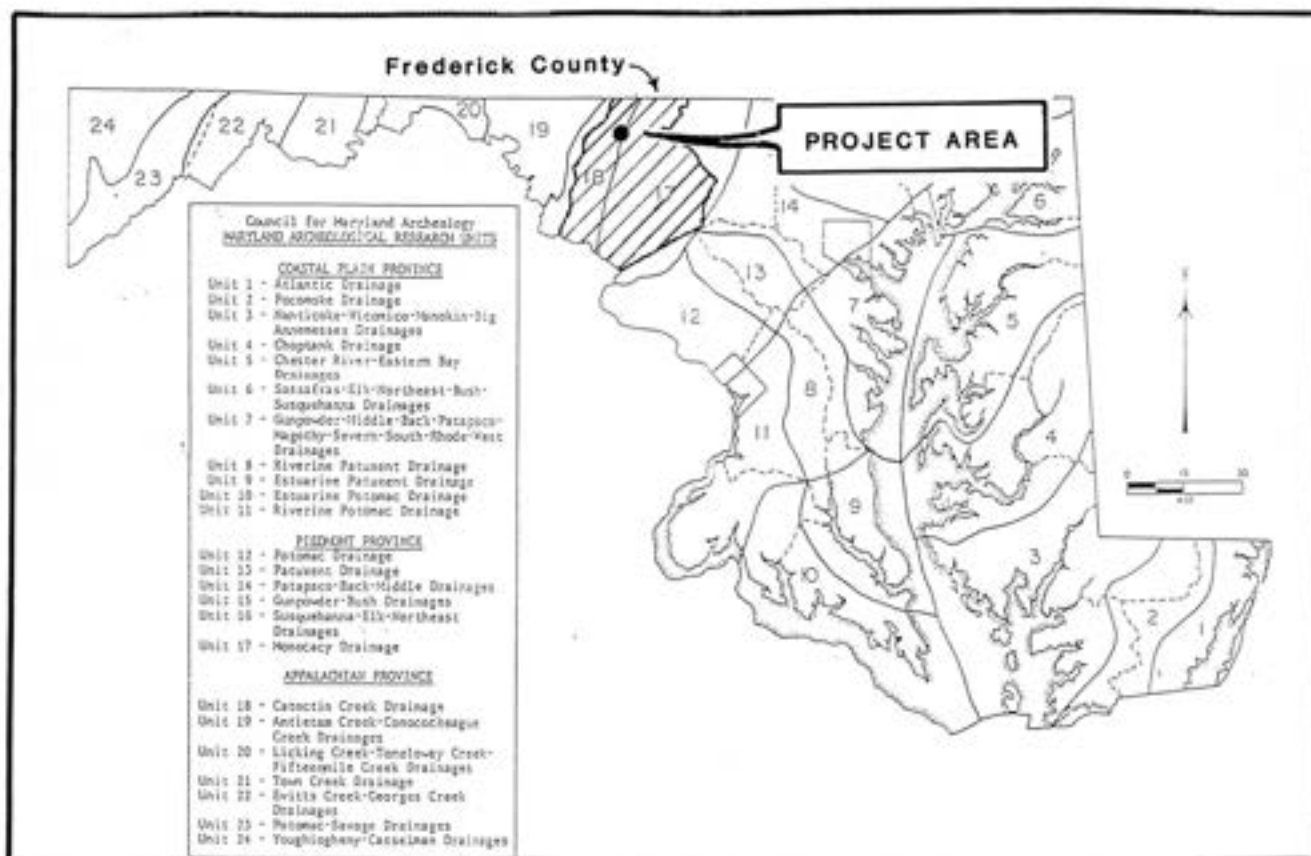


Figure 1. Location of Project Area.

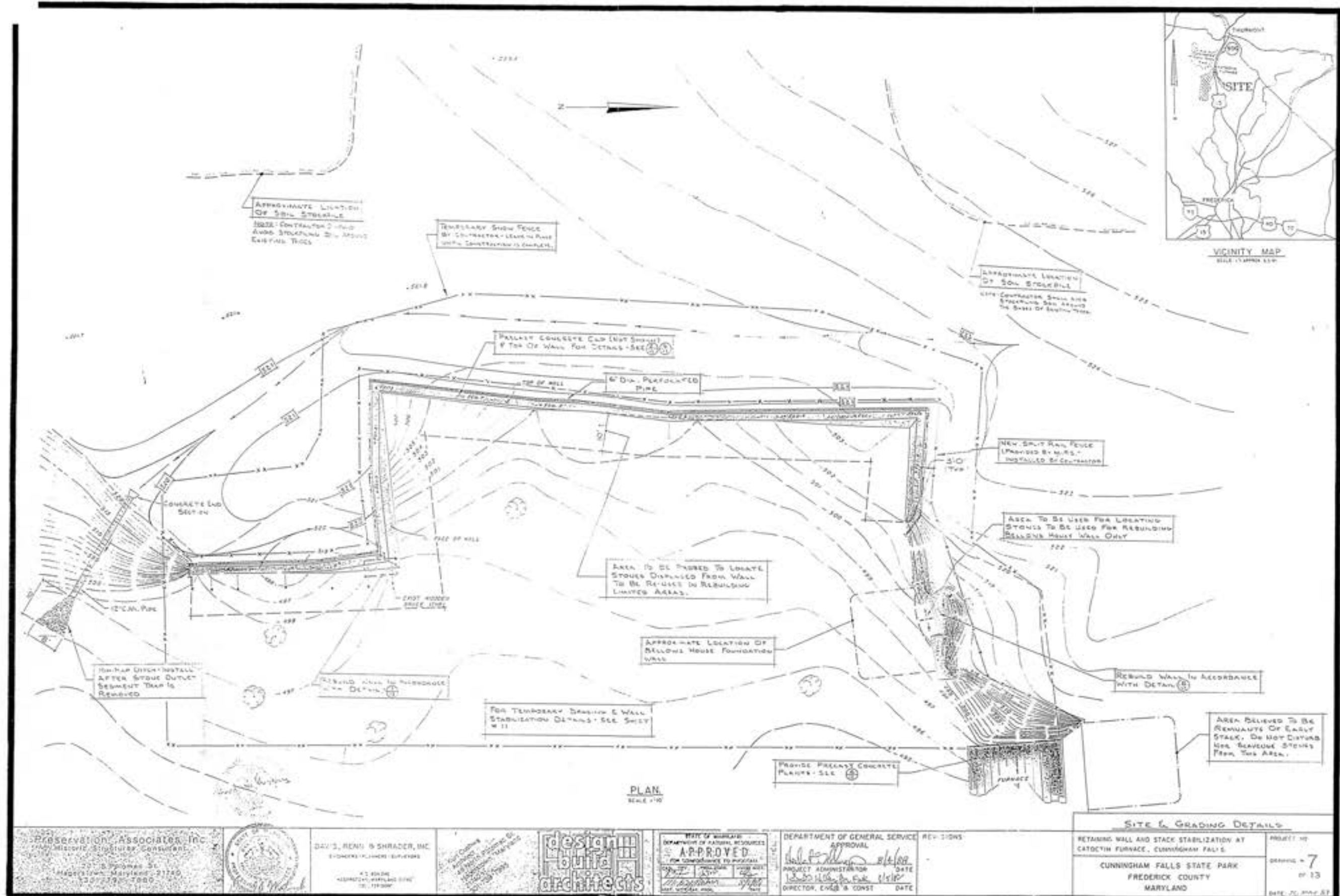


Figure 2. Catoctin Furnace Retaining Wall and Stack Stabilization Project Area.

Summary of Project Impacts

Design and Impacts

The stabilization and consolidation plans can be discussed most easily with reference to Figure 3. There are five general construction and/or impact areas, labeled A through E. Area A corresponds to an area 7.6 m (25.0 ft) behind the main retaining wall system. Fill will be removed from behind the retaining wall to a depth equal to the base of the wall, then the resultant cavity will be filled with gravel-filled concrete cribbing. To prevent the collapse of the wall during excavation, nearly vertical steel beams with angled steel bracing will be set along the exterior faces of the wall. This will be in Area D1, with the footings for the steel braces covering Area D4 (Figure 3). Temporary bracing, consisting of two courses of 25.4 cm (10.0 in) diameter steel pipes set against 10.2 cm (4.0 in) square timbers, will be placed behind the wall in the excavation hole. Connecting the exterior and interior bracing will be two courses of tie irons, which will hold steel plates against the interior and exterior faces of the wall. The exterior and interior bracing, as well as the tie bars and steel plates, will be temporary. These will be replaced by permanent tie bars, set into the wall and anchored into the concrete cribbing behind the wall.

Area D1 extends 3.5 m (10.0 ft) from the base of the wall, but not all of this area will be disturbed by the nearly vertical bracing (Figure 3). Instead, holes will be dug to receive the steel beams. Area D4 corresponds to the locations of compacted shale mounds located between 1.5 - 4.6 m (5.0 - 15.0 ft) from the base of the wall (Figure 3). These mounds will be set on the surface to serve as footings for the angled steel bracing.

Area D3 has the same boundaries as Area D1 (Figure 3). Area D3 may contain fallen building stone with which the damaged parts of the retaining wall can be repaired. Area D2, which field investigations showed to be a large mound of limestone, presumably served as flux for smelting operations. It also will serve as a source of building stones for the stabilization project (Figure 3).

Area B is a 30.5 x 91.4 m (100.0 x 300.0 ft) area above and west of the main retaining wall system (Figure 3). Heavy excavation machinery will be moving within this area. Although the original plans called for stockpiling fill in the southwest and northwest corners of Area B, the field investigations reported here discovered that the southwest corner corresponds to part of an early ore pit. Because it is unlikely that fill will be stockpiled in the old ore pit, subsurface impact over Area B will be limited to the near-surface disturbance created by the movement of machinery.

A drainage channel, drain piping, rip-rap, and a slope base sediment trap will be placed in Area C (Figure 3). Subsurface disturbance will range from 30 cm (1.0 ft) to a maximum of 152 cm (5.0 ft). The 30 cm (1.0 ft) diameter drain pipe will be permanent, and it will have a concrete apron at the northwest end of Area C.

Area E represents the course of a straw bale sediment trap (Figure 3). Subsurface disturbance will be approximately 30 cm (1.0 ft). The straw bales will be removed at the end of construction.

Project Impacts on Cultural Resources

The immediate purpose of Phase I intensive archeological investigations was to determine which, if any, archeological resources would be damaged or destroyed by the stabilization and consolidation project. Subsurface disturbance will occur in Areas A, C, D, and E. In Area A, historic records and photographs indicate that a frame stock house may have existed west and along the edge of the long central wall segment. In Area D, a portion of this structure, or a separate structure, may have existed east and against that same central wall segment.

Most of Area D against the long central wall segment contains mounds of limestone and iron slag. The original plans called for leveling and landscaping this area. The anticipated extent of subsurface

disturbance is not known, although this activity also may have an impact on the remains of any structure that once existed there.

An engine house was against the base of the southernmost retaining wall segment, also partly within Area D. Remnants of the engine house are visible on the surface. Part of the engine house will be covered by a compacted shale mound (Area D4), part of it will be excavated for the vertical wall braces (Area D1), and part of it will be trenched for the straw bale sediment trap (Area E).

Historic records suggest that either the original furnace stack or a bellows house existed at the isolated wall segment northwest of the main retaining wall system. This area will have exterior bracing only, the impacts being part of Area D1.

In Area C, the only possible known archeological resource would be part of the water race that is conjectured to have run north-south across the complex. This same water race also is crossed by Area E, the location of the straw bale sediment trap. Area E also crosses the possible locations of a fourth furnace stack just north of the engine house, as well as the possible location of the bellows house/the original furnace stake.

Research Objectives and Design

The primary objectives of the Phase I intensive archeological investigation were to identify and to assess any archeological resources located within the five construction areas. The Scope of Work outlined the original research strategy. In Area A, ten 1.5 x 1.5 m units were to be excavated, followed by two 3.0 x 7.6 m trenches with their lengths set perpendicular to the long, central retaining wall segment. In Area B, 130 50 x 50 cm shovel tests were to be excavated at 4.6 m intervals, followed by five 1.5 x 1.5 m test units. In Area C, 15 50 x 50 cm shovel tests were to be excavated at 3.5 m intervals, followed by a total of five 1.5 x 1.5 m test units. In Area D1, 20 1.5 x 1.5 m test units were to be excavated. In Area D2, one 3.0 x 3.0 m unit were to be excavated. In Area D4, 20 50 x 50 cm shovel tests were to be excavated at 3.5 m intervals. In Area E, 20 50 x 50 cm shovel tests were to be excavated at 3.5 m intervals. Screening was to be limited to a 25.0 per cent sample of the fill, and then only if diagnostic materials were likely to be present.

The purpose of the above work was to identify potentially significant archeological resources. It was not to carry out a detailed excavation and analysis. More extensive field work was to take place during Phase II investigations. Consequently, the Scope of Work specifically instructed that all architectural features were to be left in place.

As field work progressed, the research design was modified to reflect the field results. This is discussed in greater detail in Chapter IV, but can be summarized here. The restructured research design shifted field work away from the areas below the main retaining wall system to Area A. In Area A, two 1.5 x 1.5 m test units, three 50 x 50 cm test units, a 50 x 100 cm test unit, a 1.0 m x 7.5 m trench, a 3.0 x 7.6 m trench, a 3.0 x 19.6 m trench, and a 1.5 m x 13.6 m trench were excavated. Overburden in the last two trenches was removed using a backhoe. In Area B, 112 50 x 50 cm shovel tests, three 1.5 x 1.5 m test units, one 0.75 x 2.0 m test unit, one 0.50 x 1.5 m trench, one 1.0 x 3.0 m trench, and one 1.0 x 4.5 m trench were excavated. In Area C, ten 50 x 50 cm shovel tests were excavated above the retaining wall, two such shovel tests were excavated on the slope south of the wall, and seven such shovel tests along with one 1.5 x 1.5 m test unit were excavated below the slope south of the wall. In Area D1/D3, two 1.0 x 1.5 m test units were excavated at the base of the central retaining wall segment. No excavation was done in Area D2. In Area D4, 13 50 x 50 cm shovel tests were excavated. Only one shovel test was placed in the engine house area; none were placed below the isolated wall segment. One 1.0 x 1.5 m test unit was excavated 1.5 m east of Area D4. In Area E, 22 50 x 50 cm shovel tests were excavated.

The above work represented a shift in field efforts from below the retaining wall system to above it. This was prompted by two factors. The first was the possible evidence of the remains of the stock house in Area A. Since Area A would be destroyed completely, an attempt was made to delimit the structure known to have been there. The second was the presence of limestone and iron slag rubble mounds against

the base of the central wall segment. These mounds, which were between 1.0 - 3.2 m (3.3 -10.5 ft) high, were shovel tested. It was impractical to conduct further hand excavations in them. One 1.0 x 1.5 m unit was placed at the edge of one of the rubble mounds to determine their composition and what might be below the surface upon which they rested.

In addition to the excavation field work, the engine house area was raked clear of vegetation, photographed, and mapped. A detailed topographic map was prepared of the Catoctin Furnace complex. All excavation units, as well as all mapped features, were tied into a permanent, metal-capped concrete datum located against the southeast corner of the Isabella Furnace.

Organization of the Report

Chapter I describes the nature of the project and the purpose of the study. Chapter II gives a brief overview of the local environment as it pertains to the furnace complex. Chapter III reviews previous investigations, summarizes the history of Catoctin Furnace, and outlines the hypotheses derived from the previous investigations and history. Chapter IV discusses the archival, field, and laboratory methods. Chapter V presents the results of the field work. Chapter VI summarizes the results, providing recommendations and justifications for future work.

CHAPTER II ENVIRONMENTAL BACKGROUND

Physiography

Catoctin Furnace (18 FR 29) is located 5.6 km (3.5 mi) south of Thurmont against the colluvial toe slope of Catoctin Mountain (Figures 1 and 2). It is on the border between the Piedmont Physiographic Province to the east and the Appalachian Physiographic Province to the west, corresponding to Maryland Archeological Research Units 17 and 18, respectively. Little Hunting Creek flows east-southeast down Catoctin Mountain, passing 240.0 m (787.4 ft) north of the site, joining the Monocacy River around 8.0 km (5.0 mi) southeast of the furnace area.

The relief in the area is a product of almost a century and a half of iron mining and smelting. Originally, the land sloped evenly east-southeast from the mountain side to the Monocacy Valley. The activities associated with the extraction and processing of iron ore resulted in a series of ore pits, slag piles, railroad beds, and water races. These activities produced an irregular surface, ranging from steep sided 1.5 - 4.6 m (5 - 15 ft) deep and 30.5 m (100.0 ft) long ore pits, to 3.0 m (9.8 ft) high fill and slag piles. This is reflected in the elevations at Catoctin Furnace. The yard area east of the retaining wall system has elevations between 149.4 - 151.3 m (490.2 - 496.4 ft) amsl, ignoring the rubble mounds at the base of the wall system. The area above and west of the retaining wall has elevations between 158.9 - 160.3 m (521.3 - 525.9 ft) amsl. It is likely that most of the land behind the retaining wall system is fill. This will be considered in more detail in Chapter III.

The climate of the area is humid continental, with temperatures in the summer reaching highs of +40.0°C (104.0°F) and, in the winter, lows of -30.6°C (-23.0°F; Weeks 1941). The average January temperature is +0.1°C (32.2°F); the average July temperature is +24.0°C (75.2°F; Weeks 1941; Matthews 1960). Precipitation averages 1035 mm (40.7 in) per year. Precipitation varies from 117.3 mm (4.62 in) in August, to 69.6 mm (2.74 in) in November (Weeks 1941).

Geology

The geology of the area was summarized by Fauth (1982), from which the following description is drawn. Catoctin Furnace is located on the border between the Blue Ridge Geologic Province on the west and the Piedmont Geologic Province on the east, at the base of the eastern slope of Catoctin Mountain. Most of the mountain consists of Cambrian age quartzites and phyllites of the Waverton and Harpers formations, while the adjacent lowlands are underlain by Cambrian limestones and dolomites of the Frederick formation, and by Triassic mudstones and siltstones of the Newark formation.

Iron ore is located where the quartzites and carbonates are juxtaposed along the Harpers-Frederick Contact. These are termed "limestone contact deposits" (Singewald 1911:190). Iron that leached out of the overlying quartzites is precipitated out when the slightly acidic groundwater comes into contact with the limestones. Fauth (1982:49) stated that such deposits are common in the Blue Ridge province west of Catoctin Mountain, but that they are localized along the eastern slopes of the mountain. He continued by noting that the only significant iron ore deposit on the eastern side of Catoctin Mountain is the one associated with the various ore mining operations for Catoctin Furnace.

The ore consists of limonites and other hydrous oxides of iron that occur as nodules, seams, and irregular masses. The ore that was mined came from secondary deposits located in alluvial and colluvial materials at the base of Catoctin Mountain. Fauth (1982:52) also noted that:

The larger masses of ore occur mostly in plastic yellow clay, but smaller granules and nodules are dispersed throughout yellowish to purplish red clay, or are mixed with quartz grains, fragments of quartzite and phyllite, or subrounded quartzite boulders.

The importance of this will become apparent when the extensive "yellow clay" fill identified above and behind the retaining wall system is discussed.

Soils

The soils at Catoctin Furnace originally were mapped as part of the Penn loam series (Matthews 1960). The soil survey is being revised, and the new designations (if any) for the area are not yet known. For the area examined during field work, the lack of a clear soil ascription may not make any difference. Most of the area tested appears to be fill, or soil developing out of fill. A thin (0-10 cm) A horizon sod layer covers most of the furnace complex. In some areas, this is underlain by a channery silty clay that, on first examination, appears to be B horizon material. However, field work indicates some, if not all, of this B horizon material was deposited as fill. It may represent mining spoil, following from Fauth's (1982) observation that the larger iron ore masses in the Catoctin Furnace area occur in such a matrix.

Vegetation and Land Use

At the time that field work was conducted, most of the Catoctin Furnace complex was in cut European lawn/yard grasses. A low thicket of raspberry (*Rubus odoratus*), pasture rose (*Rosa carolina*), brambles (*Rubus* spp.), and 0-5 cm dbh black locust (*Robinia pseudoacacia*) had been allowed to emerge over the 12 m wide area east of the central retaining wall segment. This had been done to discourage visitors from getting too close to the wall.

Only a few large trees were present in the yard area of the furnace complex. These consisted of three 40-60 cm dbh sycamore (*Platanus occidentalis*), two 20-30 cm dbh black walnut (*Juglans nigra*), a 20-30 cm dbh black locust, and a 50-60 cm dbh ailanthus (*Ailanthus altissima*). The south central part of the yard area, corresponding to the former location of the Deborah Furnace casting house, was covered with brambles, as well as 0-10 cm dbh ailanthus and black locust.

The area above and behind the main retaining wall system was in European lawn/yard grasses for a distance between 4.6 - 18.4 m west of the wall edge. This narrow, park-like area contained 30-50 cm dbh black walnut and 40-50 cm dbh ailanthus. The edges of the retaining wall hosted numerous 0-10 cm dbh ailanthus. The area beyond this park-like setting was overgrown, with an understory of brambles, rose, and Virginia creeper (*Parthenocissus quinquefolia*), and a canopy of 70-80 cm dbh tuliptree (*Liriodendron tulipifera*), 20-50 cm dbh black cherry (*Prunus serotina*), 10-80 cm dbh black locust, and 50-80 cm dbh sycamore.

The sizes and types of tree species present document four land-use phases in the recent history of Catoctin Furnace (Figure 4). The oldest trees present are the 70-80 cm dbh black locust, which should have started growth during the early 1900s. These trees probably represent the initial forest colonization of the abandoned furnace complex.

The second phase began around 50-60 years ago, when conditions favored the emergence of elm (*Ulmus americana*), sweet birch (*Betula lenta*), ailanthus, and black walnut. All of these species first appear in the 50-60 cm dbh class (Figure 4). Conditions favorable for a multi-species community continued until perhaps 40-50 years ago, with hackberry (*Celtis occidentalis*) and black cherry joining the other trees. During this period, black locust was declining in frequency at the furnace complex. This community would have been present from the 1930s into the 1950s, which corresponds closely with the period during which the National Park Service controlled the property (1937-1954).

The third phase is represented by trees between 10-40 cm dbh, and by the 40-80 cm dbh tuliptrees and sycamores (Figure 4). These trees probably were established in the early 1950s through the late 1960s and early 1970s. During this period, it appears that smaller trees were thinned out, favoring an increase in the number of black locust and sycamore.

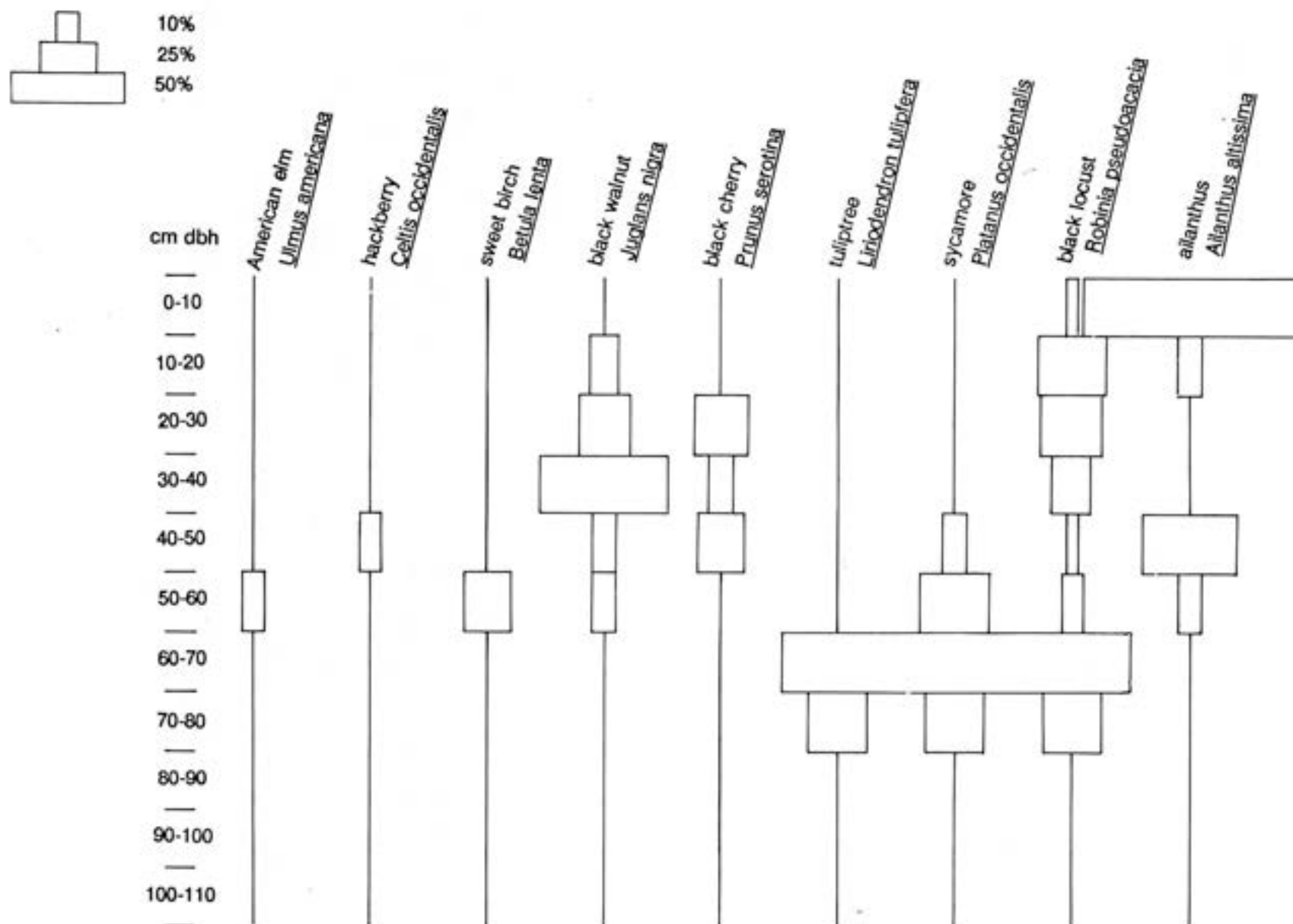


Figure 4. Diameter Classes of Tree Species at Catoctin Furnace (18FR29).

The fourth land-use phase is represented by the trees between 0-10 cm dbh, nearly all of which are ailanthus (Figure 4). These small trees are clustered over the former location of the Deborah casting house, on the northeast side of the reconstructed casting house, and along the top of the retaining wall system. Given the presence of larger ailanthus, seed sources have been present for some time, so the reason for the abrupt emergence of these small trees is not clear.

CHAPTER III HISTORIC BACKGROUND

Previous Investigations

Table 1 lists the sites recorded in the vicinity of Catoctin Furnace; their locations are shown on Figure 5. The first documented archeological field work done in the area was conducted at the Catoctin Furnace complex (18 FR 29) under the auspices of the Works Progress Administration (WPA) in 1936 (Mentzer 1972; Orr and Orr 1975:7-8). The field work involved excavation of a 4 ft wide trench 12 ft east of Stack No. 2 (Isabella) and parallel to its east face. The trench continued north to the north wall of the casting house.

Also during 1936, two historic background searches were conducted. The first was done by Porter (1936) in a detailed letter report. Porter, the assistant regional historian from Richmond, provided a history of the furnace complex, focusing on ownership changes and economic details. The second was done by Waesche (1936) as an undergraduate paper for an economics class at Johns Hopkins University.

Between 1936 and 1971, a number of short publications or manuscripts were produced that treated the furnace complex and the immediate area. The earliest of these was by Rice (n.d.). Evidence in the manuscript suggests that it was written after 1954, but before Eisenhower left office in 1961. Rice summarized the history of ownership and some of the associated events that made Catoctin Furnace important historically, although there were several historic errors. These seem to trace to folklore that had been established as early as 1925, since similar accounts appear in Lantz's (1925) newspaper article. In 1969, the National Park Service (1969) published a detailed account of the history of the furnace complex and surrounding area. It also contained historical errors, but it did provide an overall chronological framework for the site. Also in 1969, Wireman (1969) published a short history on Thurmont, in which mention was made of Catoctin Furnace.

The next field work began in 1971, in response to the dualization of U.S. Highway 15. The first project was conducted by Contract Archaeology (1971), which excavated seven backhoe trenches west and northwest of the retaining wall system at Catoctin Furnace (Figure 6; only five of these were located within the limits of the figure). This was done to locate evidence of the "charcoal house" structure shown on top of the retaining wall system in late nineteenth-early twentieth century photographs, the "Old Charcoal Road," and any other archeological features (Contract Archaeology 1971:54). Although they did not report their methods or results, the context of the discussion indicates that Contract Archaeology did not expose any archeological features suggestive of a roadbed or of structures. Contract Archaeology also conducted pedestrian survey of 12,000 ft of the proposed dualization corridor, noting foundations, quarry pits, races, and dams. Most of their effort, though, focused on developing a history of the furnace complex and its adjoining community.

In 1972, Mentzer (1972) serialized his history of Catoctin Furnace and the iron industry in central Maryland. This placed Catoctin Furnace in a broader historical context, and gave details about eighteenth and nineteenth century iron production and community structure. Also, in that year, Catoctin Furnace and the adjacent area were listed on the National Register of Historic Places as the Catoctin Furnace Historic District (Rivoire et al. 1972).

Also in 1972, Fauth (1972), a geologist at the State University of New York - Cortland, evaluated the large pits adjacent to and south of Catoctin Furnace. The purpose was to determine if they had served as sources of iron ore for the furnace, and if the limestone present was suitable for use as flux. Although Fauth found that some of the limestone would have been suitable, he suggested instead that "the limestone quarries at Cavetown, located on the Western Maryland Railroad, may have been the source of the limestone flux used at Catoctin Furnace" (1972:2).

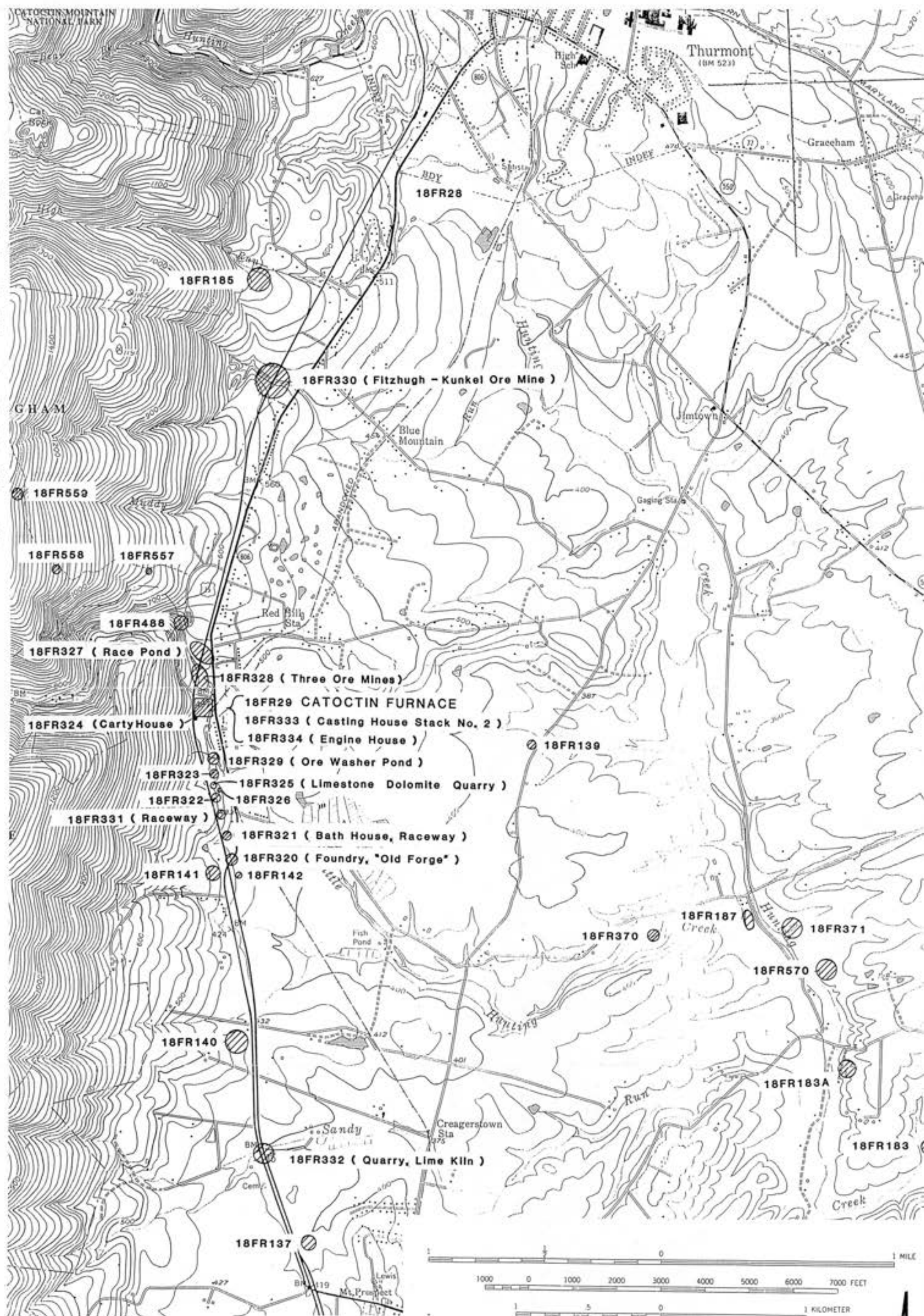
In 1973, Bastian (1973) prepared a background report treating the archeological significance of the Fitzhugh-Kunkel iron mine (listed later as historic site 18 FR 330), north of Catoctin Furnace. A proposal had

Table 1.

Sites in Vicinity of Catoctin Furnace				
Site Number & Name		Type of Site	Investigated	Reported
FR28	Mountindale	Early Archaic, Middle Woodland	-----	Kavanagh, 1982
FR29	Catoctin Furnace	Ruins	WPA 1936, Con Arch 1971 Orr 1975,1976	Orr & Orr 1975, 1976
FR137	Prospect Field	Unknown Lithic	Visited Md. Geo. Survey 1975	-----
FR138	Sandy Run	Unknown Lithic	Visited Peck, 1978 Visited Md. Geo. Survey, 1975	
FR139	Stull Farm #1	Prehistoric	Md. Geo. Survey, 1975 Md. Geo. Survey	Peck, 1979
FR140	Quarry Road	Late Archaic, Early Woodland	Peck, 1978	Peck, 1979
FR141	Furnace Road West	Late Archaic, Early Woodland	Peck, 1978 Md. Geo. Survey, 1975	Peck, 1979
FR142	Furnace Road East	Unknown Prehistoric	Peck, 1978 Md. Geo. Survey 1975	Peck, 1979 Conrad, 1975
FR183A	Hunting Creek I	Late Archaic, Late Woodland	Misluia, n.d. Peck, 1978	Peck, 1979
FR183B	Hunting Creek I	Late Archaic, Late Woodland	Peck, 1978	Peck, 1979
FR185	High Row	-----	Misulia n.d. Peck, 1978	Peck, 1979

Site Number & Name		Type of Site	Investigated	Reported
FR187	Hunting Creek II	Middle Woodland	Peck, 1978	Peck, 1979
FR320	Catoctin 18th Cent. Foundry	Dam, forge ruin	Milner Assoc. Md. Geo. Survey, 1975	Orr & Orr 1977; Milner Assoc. 1979, 1980, 1982 Conrad, 1975
FR321	Catoctin Bath House Spring	Raceway	Orr & Orr 1977	Orr & Orr 1977, 1979
FR322	Catoctin American Indian	Archae	Mid Atlantic 1980 Orr's, Orr 1977 Milner Assoc., 1979	Mid Atlantic 1980 Orr & Orr 1977
FR323	Catoctin/Renner Burial Ground	100-200 graves cemetery	Orr & Orr 1977 Thomas, 1979	Orr & Orr 1977
FR324	Catoctin/Carty House	Foundation	Orr & Orr 1977 Milner Assoc. 1979	Orr & Orr 1977
FR325	Catoctin Limestone Quarry	Quarry	Mid-Atlantic, 1980 Orr & Orr, 1977	Mid-Atlantic, 1980 Milner, Assoc.
FR326	Catoctin Exhumed Cemetery	Exhumed cemetery 1960	Orr & Orr 1977	Orr & Orr 1977, 1979
FR327	Catoctin Race Pond	-----	Orr & Orr 1977 1979	Orr & Orr 1977, 1979
FR328	Catoctin Three Ore Mines	Quarry	Orr & Orr 1977 1979	Orr & Orr 1977, 1979
FR329	Catoctin Ore Washer Pond Area	-----	Orr & Orr 1977	Orr & Orr 1977
FR330	Catoctin Runner Ore Mine RR Tracks	-----	Orr & Orr 1977 1979	Orr & Orr 1977, 1979

Site Number & Name		Type of Site	Investigated	Reported
FR331	Raceway	Raceway	Orr & Orr 1977 1979	Orr & Orr 1977, 1979
FR332	South Catoctin Limestone Quarry & Kiln	Quarry, Lime kiln	Orr & Orr 1977 1979	Orr & Orr 1977, 1979
FR333	Catoctin Stack II Casting Shed	Reconstructed Shed	WPA 1935 Orr & Orr 1975	Orr & Orr 1975
FR334	Catoctin Retaining Wall Shoring Cleats	-----	Orr & Orr 1976	Orr & Orr 1976
R370	Anderson I	Late Archaic	Md. Geo. Survey Kavanagh 1980	Kavanagh 1982
FR371	Anderson II	Late Archaic, Middle Woodland	Md. Geo. Survey Kavanagh, 1980	Kavanagh 1982
FR390	Gardiner	Dump, Prehistoric, Historic	Md. Geo. Survey 1980	Kavanagh 1982
FR411	M/DOT-950	Brick barn	Md. Hist. Trust 1980	M/DOT Survey Transect #140/17/062
FR488	Manor Area	Late Archaic, Late Woodland	Stewart 1981	Stewart 1987
FR557	Bobs Hill I	Prehistoric	Stewart 1981	Stewart 1987
FR558	Bobs Hill II	Historic, Prehistoric	Stewart 1981	Stewart 1987
FR559	Bobs Hill III	Prehistoric	Stewart 1981	Stewart 1987
FR570	Anderson	Historic, Prehistoric	Elizabeth Anderson 1981	-----



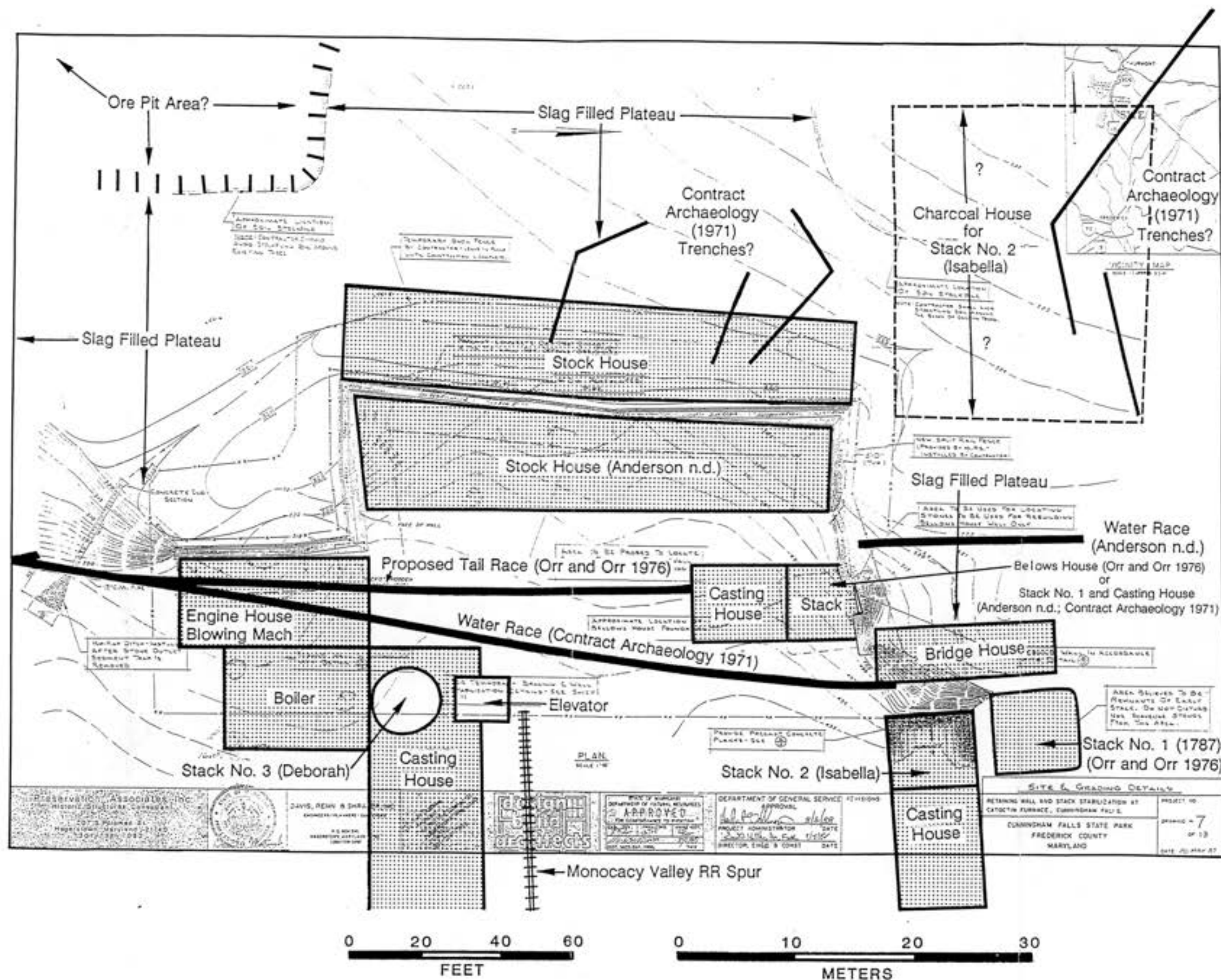


Figure 6. Approximate location of historic structures within the Catoclin Furnace Complex.

been made recommending use of the pit as a sanitary land fill. Bastian's research provided the first detailed historical documentation of the ore mining process in the context of furnace operations. The report also is notable for its presentation of all of the then-known historic sites associated with the furnace complex on a single, one page map.

In 1974, James (1974) presented a short manuscript detailing the history of ownership of Catoctin Furnace, which corrected some details in the Contract Archaeology (1971) report. Also in 1974, Balter (1974) recorded five test borings at the furnace complex. Four of these were behind the retaining wall system, and revealed slag and cinder fill to depths of 19-27 ft. The fifth boring, located east of the retaining wall in the furnace yard, showed fill to a depth of 4 ft.

In 1975, Orr and Orr (1975) conducted test excavations east of Stack No. 2 (Isabella), to document the remains of the associated casting house in preparation for its reconstruction. They documented multiple sand layers and the presences of a subfloor drainage system. The casting house area subsequently was listed as a separate historic site, 18 FR 333, within the Catoctin Furnace site.

Also in 1975, the National Heritage Corporation (1975:2) undertook "an intensive survey of all primary and secondary evidence relating to the socio-economic history" of Catoctin Furnace. During the same year, the Maryland Geological Survey conducted a reconnaissance survey along the proposed corridors for the dualization of U.S. Highway 15 (Conrad 1975). This survey identified six prehistoric sites (18 FR 137-142).

In 1976, Orr and Orr (1976) conducted test excavations around the base of the retaining wall system, preparatory to the installation of timber bracing. Their excavations revealed details of the engine house associated with Stack No. 3 (Deborah), as well as what they interpreted as the remains of the bellows house and water wheel pit associated with Stack No. 1 (1787 Stack). The engine house area subsequently was listed as a separate historic site, 18 FR 334, within the Catoctin Furnace site. The Orrs also examined the area immediately north of Stack No. 2 (Isabella), and suggested that this might represent the almost entirely buried remains of Stack No. 1 (1787 Stack).

In 1977, Orr and Orr (1977) conducted an intensive survey of one of the proposed corridors for the dualization of U.S. 15. Field work included pedestrian survey, limited mapping, and subsurface testing. The Orrs identified and tested 11 historic and one prehistoric sites (historic sites 18 FR 321, 18 FR 323 - 332, and prehistoric site 18 FR 322). The historic sites included four quarries or mines, one mill pond, one washer pond, two structures/foundations, one extant cemetery, one exhumed cemetery, and one race. All of these were associated in some way with the activities at Catoctin Furnace.

Part of the 1977 survey included the area around the furnace complex. Orr and Orr (1977:38, Figure 14) presented a map showing their interpretation of the Catoctin Furnace physical plant. The elements of this map are incorporated into Figure 6. The area behind the retaining wall system was designated a "slag-filled plateau." The locations of all three stacks were shown, with Stack No. 1 immediately north of Stack No. 2. Just as important to the study reported here, the large limestone talus located in the southwest corner of the retaining wall system was labeled as "limestone (flux) talus." This designation was based upon mineralogical assays of the limestone, which indicated the presence of three different kinds of limestone, none of which appeared to be of local origin. This conclusion regarding the source of flux agreed with Fauth's (1972:2) conjecture that the source for the limestone flux may have been outside of the Catoctin Furnace area.

In 1978, another archeological survey was undertaken by the Maryland Geological Survey (Peck 1979). In addition to visiting the sites identified by Conrad (1975), this survey located three more prehistoric sites (18 FR 183A, 18 FR 183B, and 18 FR 187).

During 1979, a three part archeological project was conducted at or near Catoctin Furnace (Orr and Orr 1982; John Milner Associates 1980; Mid-Atlantic Archaeological Research 1980). This work, once again prompted by the dualization of U.S. Highway 15, was coordinated by the Orrs and conducted on behalf of the Maryland Highway Administration.

In their part of the project and report, Orr and Orr (1982) returned to and tested eight historic sites (18 FR 321, 18 FR 325-329, 18 FR 331, 18 FR 332). These represented structural remains, mine pits/quarries, railroads, roadbeds, and raceways. The Orrs also included reports by a geologist (Fauth 1982) and a palynologist (Harrington 1982). Fauth's (1982) report discussed the geology of the Auburn Dam (included in 18 FR 320), a limestone quarry (18 FR 325), a race pond (18 FR 327), three iron mines (labeled together as 18 FR 328), and a raceway (18 FR 331). Fauth (1982) identified the limestone at 18 FR 325 as dolomite, the importance for Catoclin Furnace being that Kunkel is said to have developed and patented a method for extracting phosphorous from some iron ores that depended on the high magnesium content in dolomite (John Milner Associates 1981:30-31). The remainder of the report focused on the geology of the Catoclin Furnace area.

Harrington (1982) analyzed pollen and macrofossil remains from sediments at the Auburn Dam (included in 18 FR 320). There was no evidence for selective timber cutting, which would agree with the nineteenth century practice of clear-cutting wood every 25-35 years for charcoal.

John Milner Associates (1980) examined 18 FR 320, the conjectured location of an early forge. Excavations revealed a large number of foundation and retaining walls. The deposits reflected iron processing and casting, evidence of a small tailrace, and suggestions of a water-powered forge. John Milner Associates (1980:41) stated that "it is not thought likely that site 18 FR 320 contains remains of the original [1774] furnace."

Mid-Atlantic Archaeological Research, Inc. (1980) examined three historic and one prehistoric sites. The historic sites were a cemetery (18 FR 323), the Carty House (18 FR 324) located southwest of the main furnace complex, and the Fitzhugh-Kunkel ore mine (18 FR 330). The prehistoric site was 18 FR 322, a limited activity Archaic site.

In 1980, the Maryland Geological Survey conducted another survey in the vicinity of Catoclin Furnace, the results of which were incorporated into Kavanagh's (1982) report. Three prehistoric sites (18 FR 28, 18 FR 370, 18 FR 371) were visited, as was a mixed historic-prehistoric site (18 FR 390). The historic materials had no immediate bearing on the iron furnace complex.

Also in 1980, John Milner Associates (1981) conducted an archeological survey of the Catoclin Furnace area on behalf of the Maryland Department of Natural Resources. This project was conducted "to provide data useful for interpretation and stabilization, planning future research and park master planning and management" (1981:ii). Field work identified 124 features or groups of features, which then were presented in the context of the industrial infrastructure of which they had been a part. As part of the survey, John Milner Associates (1981:40-44) documented six charcoal hearths on the mountain slopes above Catoclin Furnace. This was the first time that this part of the charcoal production process had been identified in the area.

In 1981, John Milner Associates (1982) continued excavations at 18 FR 320. This work identified portions of a raceway, remains of a possible charcoal house, and deposits of ironworking waste. Although there was depositional evidence for the refining and casting of iron (John Milner Associates 1982:116), no remains of a forge or furnace structure were found. The presence of gate metal in the deposit provided circumstantial evidence that the 1774 stack may have been nearby (John Milner Associates 1982:123).

At the same time that historic research was being done in 1981, Stewart (1987) was continuing his research into prehistoric rhyolite quarries and associated sites. Four of these were located on the mountain slope northwest of Catoclin Furnace (18 FR 488, 18 FR 557-559).

The most recent historical research on Catoclin Furnace was conducted by Anderson (1982, 1984). In 1982, Anderson (1982) completed a paper, based on primary documentary sources, detailing the history of the furnace and surrounding community. This paper incorporated materials theretofore not discussed in the historical summaries of the furnace complex.

Summary of Catoctin Furnace History

There are several detailed histories of the Catoctin Furnace complex and the immediate area (Porter 1936; Contract Archaeology 1971; Mentzer 1972, 1974; James 1974; John Milner Associates 1980, 1981, 1982; Anderson 1982). The intention here is to present a brief synopsis of those histories as they bear upon the field work conducted at Catoctin Furnace.

Iron mining and smelting along the eastern foot of Catoctin Mountain began in 1760, when an unknown investor (probably John Vertrees) erected Maryland's first inland iron furnace along Tom's Creek about 1.5 miles west of Emmitsburg (Singewald 1911:132). Known as Hampton Furnace, the ore came from 10 miles to the south, around Catoctin Furnace (Mentzer 1972). In 1761, Antietam Furnace was built along the west slopes of Catoctin Mountain, about 10 miles due west (Mentzer 1972; Frye 1984).

In 1768, Thomas Johnson (later Governor), in partnership with Launcelot Jacques, received a land grant of a little more than 7,000 acres from Frederick Calvert, the sixth Lord Baltimore. The partnership was dissolved soon after, with Jacques retaining possession of lands west of Catoctin Mountain. In the late 1760s, Thomas Johnson joined with three of his brothers to form James Johnson and Company, the purpose of which was iron production at the foot of Catoctin Mountain. Thomas Johnson had purchased Vertree's "Mountain Tract," which included the Hampton Furnace, some time around 1767 - 1768. Mentzer (1972) suggests that James Johnson probably had the Hampton Furnace disassembled, and used the machinery to assist in setting up the new furnace near what is now Catoctin Furnace in 1774.

The location of this first furnace is a matter of controversy. The earliest locational reference is from Alexander (1840:78-79), who stated that:

Catoctin Furnace, situate about twelve miles northwest of Fredericktown, and within a mile of the present furnacestack, was built in the year 1774, by James Johnson and Company and was carried on successfully until the year 1787...[in which year the present furnace was erected] about three-fourths of a mile further up Little Hunting Creek, and near the ore banks [quoted in Porter 1936:1].

The "present furnacestack" referred to a second stack built in 1787. This passage also is cited by Swank (1884) and Singewald (1911).

Singewald (1911:201) wrote that "the bank back of Dr. McPherson's house was opened in 1774 by James Johnson and Company and the ore smelted in a furnace erected on the property." Based on this passage, Porter (1936:2) predicted that any remains of the 1774 furnace would be located in this area. Depositional evidence that may represent the nearby presence of a stack and an associated foundry was uncovered in that area during archeological excavations in 1980 and 1981 (John Milner Associates 1980, 1982) at 18 FR 320.

In all likelihood, the current furnace complex was established in 1787. From 1787 until 1793, the furnace was operated by James Johnson and Company. The Company was dissolved in 1793, with the holdings divided amongst the Johnsons. From 1793 until 1802, it was operated by Thomas and Baker Johnson. Baker Johnson became sole owner in May of 1802, and he leased the complex for ten years to the firm of Blackford & Thornburg. In 1811, Baker Johnson died, his will having been probated on 1 July with the furnace complex sold by his executors on 12 August to Willoughby and Thomas Mayberry of Philadelphia (Porter 1936:4). Blackford & Thornburg continued to lease the furnace until at least April of 1812. Willoughby bought out Thomas' share soon after they had made the purchase, then sold the entire complex and associated lands to John Brien in 1820.

During this period, there was one stack at Catoctin Furnace: a charcoal fueled, cold blast furnace capable of producing 900 tons of iron per year. The newspaper notice, placed by the Executors for Baker Johnson's estate, describes the property in 1811:

The valuable property...--consisting of a large blast furnace --the stack, wheel and bellows, and all of the buildings of the furnace are built in the best manner and are in complete order. The several tracts of land attached thereto (all adjoining each other) contain about 4611 acres, between 6 and 700 acres of which are arable land, about 60 acres meadow (a great part is well set with timothy)--The residue of the land is well covered with wood and young timber, and is deemed sufficient to furnish coal wood for the furnace for many years. The ore being immediately on the spot, and so universally known and admitted to be of superior quality for making all kinds of castings, renders it unnecessary to say more than that it is easily raised, and the bank apparently inexhaustible. The stream is constant and sufficiently large for the purpose of blowing the furnace at any season. The limestone quarry is also very convenient, not more than 200 yards from the furnace bank--The other improvements on the property are considerable, and consist of a large two story stone dwelling house, with necessary outhouses attached to it, and a fountain pump at the kitchen door. Two convenient store houses, a chopping mill for the use of the place, stone smith shop, barns, stables, corn houses, &c.--also from 15 to 20 houses for the accommodation of workmen, all in good order [*Frederick Town Herald* July 13, 1811].

The notice continues by saying that the lease to Benjamin Blackman was due to expire on April 1, 1812.

John Brien bought Catoctin Furnace from Willoughby Mayberry in 1820 (Contract Archaeology 1971:23; James 1974:2). Mayberry had encountered financial troubles, presumably due to the post-war depression of the late teens and early twenties. After obtaining the complex, Brien made improvements to expand productivity. Contract Archaeology (1971) cited Lesley (1859:50) as stating that the furnace was enlarged in 1831 to 9 x 33 ft, providing an annual capacity of 1,700 tons. It was sold after Brien's death in 1841 to John McPherson Brien. At his death in 1841, he also was in debt, presumably as a result of the Depression of 1837. James (1974:2) stated that Brien sold it in 1843, while Contract Archaeology (1971:23) stated that John McPherson, trustee for the heirs of Brien, sold it on August 14, 1843. Both sources agree that it was purchased by Peregrine Fitzhugh of Washington County.

Fitzhugh also encountered economic troubles. Part of this was brought on by his initial investments in the furnace complex, part by the appearance of the new coke furnaces in Maryland and Pittsburgh. Contract Archaeology (1971:24) reported that the furnace burned on January 25, 1853.

In 1856, Fitzhugh constructed a steam powered hot-blast furnace along side of the 1787 stack. This Stack No. 2, named Isabella, is the one standing in the complex today. Because of the expense involved, Fitzhugh sold half of his interest in Catoctin Furnace to Jacob M. Kunkel of Frederick on November 26, 1856 (Contract Archaeology 1971:24; James 1974:2). At that time, the complex included two furnace stacks, whatever steam powered equipment was necessary, and possibly a small gauge railroad.

The Fitzhugh-Kunkel partnership was dissolved on April 21, 1858, with the understanding that Fitzhugh would operate the furnace for a year to cover his partnership debts (Contract Archaeology 1971:24). In October, 1858, the complex was sold to John Kunkel by decree of the Frederick County Circuit Court as part of an equity case (James 1974:3). John Kunkel died in 1861, and the complex passed to sons Jacob M. and John B. Jacob M. and his wife sold their share of the estate to John B. in June, 1866.

Kunkel operated the furnace complex from 1866 until his death in 1885. During that period, he expanded the land holdings from 7,000 to 11,000 acres. He upgraded the furnace operation in 1873, adding a new hot-blast coke furnace, a cylindrical iron stack 50 ft high and 11.5 ft across (Contract Archaeology 1971:25). This was Stack No. 3, named Deborah for his wife. It had an annual capacity of 9,000 tons.

From 1873 through 1885, the complex operated three furnaces. Tax records for 1876 indicate that three furnaces were operating on the property (Porter 1936:6,8). Contract Archaeology (1971:37) indicated that the combined output had the capacity of 14,000 tons per year. This agrees well with Scharf (1882), who stated that the furnace as a whole had an annual capacity of 10,000 - 12,000 tons. At that time, the complex included two steam engines.

With his death in 1885, Kunkel's children established the Catoclin Iron Company (James 1974:3). Although this venture went bankrupt in 1887, during its existence the Monocacy Valley Railroad was added. This was a four mile long line completed in 1886 that connected the furnace complex with the Western Maryland Railroad in what is now Thurmont. Its purpose was to haul coke to Catoclin Furnace, and then haul pig iron to market (Contract Archaeology 1971:27).

The company was in receivership for a year, then it was sold in 1888 to the newly formed Catoclin Mountain Iron Company. Citing the 1888, 1890, and 1892 volumes of the *Directory of the Iron & Steel Works of the United States*, published by the American Iron & Steel Institute, Contract Archaeology (1971:27) noted that all three furnace stacks were operating at least into 1890. The 1787 stack was "dismantled" in 1890.

The scrap iron and east iron markets collapsed in 1892. This was followed soon after by the "Panic of 1893," which saw 600 bank failures and 15,000 bankruptcies, starting a depression that lasted five years. Contract Archaeology (1971:27) stated that the Catoclin Mountain Iron Company ceased operations in 1892. James (1974:4) stated that operations ended in 1896 when the manager died and creditors as well as stockholders brought suit. Both sources agree that the furnace was purchased from the receivers on April 17, 1899, by Ernest Sharp of Baltimore, who then sold the complex on August 1, 1899, to the newly formed Blue Mountain Iron and Steel Company.

The Blue Mountain Iron and Steel Company began operations in 1900, enlarging Stack No. 3 (Deborah) to 60 ft high and 13 ft across, and dismantling Stack No. 2 (Isabella). Contract Archaeology (1971:28) stated that "only portions of it [Stack No. 2] remained in 1904." By 1900, then, only one furnace was left, although it had an annual production capacity of 15,000 tons. The Blue Mountain Iron and Steel Company filed for bankruptcy on December 17, 1903, and the last furnace went out of blast.

On February 19, 1906, trustees of the bankrupt firm sold the complex and associated lands to Joseph E. Thropp. Thropp owned and operated the Earleton Furnace and Mill in Everett, Pennsylvania. He salvaged equipment and materials from the Catoclin Furnace complex for his Everett operation. He continued to extract ore from the Fitzhugh and Kunkel Ore Bank (historic site 18 FR 330) until 1912. Plagued by financial troubles, Thropp closed his Earleton Furnace in 1923.

Thropp sold the Catoclin Furnace complex and other holdings, ironically, to Lancelot Jacques and Stanley E. Hauver in 1923. Jacques was the great-grandson of Launcelot Jacques, who had joined with Thomas Johnson 155 years earlier in obtaining the Catoclin Furnace area (Rice n.d.). Jacques and Hauver sold portions of their holdings, first to Lawrence Richey in 1926, and later to E.A. Nicodemus in 1937. Sometime between 1925 and 1936, the east wall of the casting house attached to Stack No. 2 (Isabella) was torn down. Photographs accompanying Lantz's (1925) article show the wall in place; Waesche's (1936) photographs show it gone. In 1937, Nicodemus, now possessing other areas of Catoclin Furnace land, sold a large tract to the United States Department of Interior. This land was added to the newly formed Catoclin Mountain Demonstration and Recreation Area.

The National Park Service conveyed a large portion of the Catoclin Mountain Demonstration and Recreation Area to the State of Maryland in 1954. At that time, Catoclin Furnace became part of Cunningham Falls State Park.

Research Expectations and Hypotheses

Dominant Questions

There are several questions regarding the physical plant at Catoclin Furnace, of which three have been dominant: 1) Was the furnace built in 1774 located at the present Catoclin Furnace complex? 2) Where was the oldest of the three stacks at Catoclin Furnace located? and 3) When and why was the extensive retaining wall system constructed? At this time, the first question appears close to being answered by a placement of the 1774 furnace near 18 FR 320, about 0.75 miles south of the furnace complex. This location agrees with Alexander's (1840) statement and with the most parsimonious interpretation of the

archeological evidence from 18 FR 320 (John Milner Associates 1980, 1982). Although the issue is not completely resolved, for the sake of this discussion it is assumed that Alexander's (1840) source was correct and that the 1774 stack was not located in the present furnace complex (18 FR 29).

The remaining two questions cannot be answered with certainty. There are four possible locations for the 1787 stack at Catoclin Furnace. The first, based upon Alexander (1840), Lesley (1859), Swank (1884), and the 1888, 1890, and 1892 volumes of the *Directory of the Iron & Steel Works of the United States*, suggests that the 1787 furnace was just north of Stack No. 2 (Isabella).

To some extent, this location is substantiated by Waesche's (1936) paper. In his paper, Waesche has three photographs that show Stack No. 2 (Isabella), as well as the masonry wall area to the north. Waesche labeled the first of these (the fourth photograph in his paper) as showing "the two charcoal furnaces," the second of these (the seventh photograph in his paper) as showing "one of the old charcoal furnaces," and the third of these (the tenth photograph in his paper) as showing "the two charcoal furnaces...at the right and the Anthracite and Coke furnace...at the left" in a general view of the complex. Clearly, he felt that remains of both charcoal furnaces were present.

It is possible that Waesche was a relative of L. Randolph Waesche, who built the Monocacy Valley Railroad in 1886. Waesche (1936:5) stated that "The statements that follow [covering the history from 1841 until 1912] are based mainly on information obtained from L. Randolph Waesche, of Thurmont, at one time manager of the property." Thus, it is possible that Waesche's information is dependable.

If Waesche information is dependable, it means that recognizable ruins of the 1787 stack were visible in 1936. This would mean, in turn, that Singewald's (1911:147) use of the plural "furnaces" could have been based upon visual observation. (It should be noted that, like Waesche [1936], Singewald [1911:147] attributed much of his historic information to the same L. Randolph Waesche. However, it should be cautioned that Waesche's [1936:7-9] passages on the history of the furnace read very similar to Singewald's [1911:147].) The argument that the 1787 furnace stack was destroyed beyond recognition is not indicated in the background literature. This literature (the 1890 *Directory of the Iron & Steel Works of the United States*) only says that the stack was dismantled. It says the same in 1904 of Stack No. 2 (Isabella), which, while it might have been dismantled from industrial operation, was not physically disassembled. Thus, there may have been sufficient structural evidence for Singewald to view when he was doing his dissertation work in 1909, of which the 1911 monograph is an adaptation.

In 1976, Orr and Orr stated that "our examination of this site appears to reveal the stack [sic] 1 east opening arc top, and a brick circle suggestive of a bosh cross-section on top of the presumed Stack 1" (1976:14). The argument for this location had been presented to the Orrs by William G. Renner, who had served as their informant on this and earlier projects. Renner was the son of William L. Renner, who was mentioned by Waesche (1936) as living in what is now termed the Ironmaster's House in 1936. William L. Renner was the photographer for the Blue Mountain Iron & Steel Company (Spaur 1980:A-8).

The second possible location for the 1787 stack was suggested by Mentzer (1974:3) as "just behind (west) the existing stack [Stack No. 2 (Isabella)] and a little to the south". Ironically, Mentzer, who was superintendent of Catoclin Mountain Park from 1968 to 1972, had been transferred to the Southwest Regional Office of the National Park Service in Santa Fe, New Mexico, so he was not present when a 25 ft section of the wall located in the area just described collapsed on February 6, 1973. This revealed that "the type of soil behind the wall...[was] just cinders and furnace by-products" (Love 1973: no page given).

Contract Archaeology (1971:field map) indicated a somewhat similar area, located south and adjacent to the extant retaining wall just west of Stack No. 2 (Isabella). Their text does not provide a rationale for this location. Orr and Orr (1976:14) placed four test units in this area and found what they interpreted to be massive drain stones commensurate with a water wheel pit.

The third location for the 1787 stack would be where Stack No. 3 (Deborah) was built. This location was given by a National Park Service publication (1969:9):

Kunkel elected to keep the 15-year-old hot blast furnace and get rid of the nearly-a-century-old Johnson cold blast stack. On the site of the original furnace he constructed his new anthracite stack, in 1873.

No source is given for this suggestion, although it follows from an earlier passage (National Park Service 1969:8):

In 1858 or 1859 [Fitzhugh] erected a new steam-powered hot blast furnace.

To locate this furnace, Fitzhugh extended the stone furnace bank to the north, creating the great wall that now remains. At the north end he built the existing furnace [Stack No. 2 (Isabella)], charged from a bridge from the abutment immediately behind it. At the top of the wall he erected a charcoal storage shed to serve both furnaces. This shed is visible in existing photographs, as are the structures that served the hot blast furnace.

No source is given for the above passage. It is possible that one of the photographs mentioned is one of the entire complex (Figure 7), taken by the elder Renner in the late 1800s, but that is conjectural. The replacement of the 1787 stack by the Deborah stack contradicts historic sources that indicate that two charcoal and one anthracite furnaces were operating at Catoctin Furnace from 1873 into 1890.

The fourth possible location is a variation on the one mentioned above. In some of the photographs taken of the Catoctin Furnace complex, the top of a structure is visible north of the engine house, west of the Deborah stack, and east of the large retaining wall segment (Figures 8 and 9). This is the structure upon which men are standing in Plate 3B of the Contract Archaeology report (1971:63), stated to have been taken by Renner in 1907. An earlier photograph, copyrighted 1906 by C. R. R. Beck (Singewald 1911:Plate VIII, Fig. 2; Figure 9), also shows the top of this structure, which in turn is surmounted by four black metal "smoke stacks."

Of the four options for a location, the one best supported, both in terms of earliest references and eyewitnesses, is the first. This would mean that remains of the 1787 stack still exist, but are now partially buried north of Stack No. 2 (Isabella). John Milner Associates (1981:73) elaborated on this argument:

It is also possible, however, that Stack II was constructed adjacent to Stack I and used its slag heap as a charging ramp. Since both stacks were operating at the same time, it would seem most efficient for them to be located in the same industrial area, as was the case with Stacks II and III. In the absence of other locational determinants it seems unlikely that Stack II would have been removed from the area of Stack I, especially if it required transporting Stack I slag to construct an artificial charging ramp at the site of Stack II.

The third question is the age and purpose of the retaining wall. Despite its dominance of the Catoctin Furnace complex, the only mention of the wall and its age is in the National Park Service (1969:8) publication. There appear to be no contemporaneous accounts. It is uncertain if the large retaining wall system could date from the mid-1850s, since the south end of the wall system seems to have been built intentionally to accommodate the ceiling joists associated with the Stack No. 3 (Deborah) engine house. That is, the notches or gaps in the stone wall that would receive the ends of the joists appear to have been made at the time the wall was constructed. There is no evidence that stones were removed or chiseled out; the gaps are regularly spaced and regular in size, while the stones making up the wall are irregular in size and courses. Mentzer (1974:4) argued that the retaining wall system probably post-dated Stack No. 3 (Deborah).

The engine house was not needed until 1873, when Stack No. 3 (Deborah) was built. Unless there was an earlier structure in place that was modified to accommodate machinery, then it seems likely that the retaining wall system also dates from around 1873. It might be noted that the south end of the retaining wall system is the only place where such structural accommodations were made; the rest of the main wall system is free of notches, gaps, or other modifications suggestive of yard-level structures (the isolated northeast wall segment, commonly associated with the water-powered bellows house, has notching for roof or floor beams).

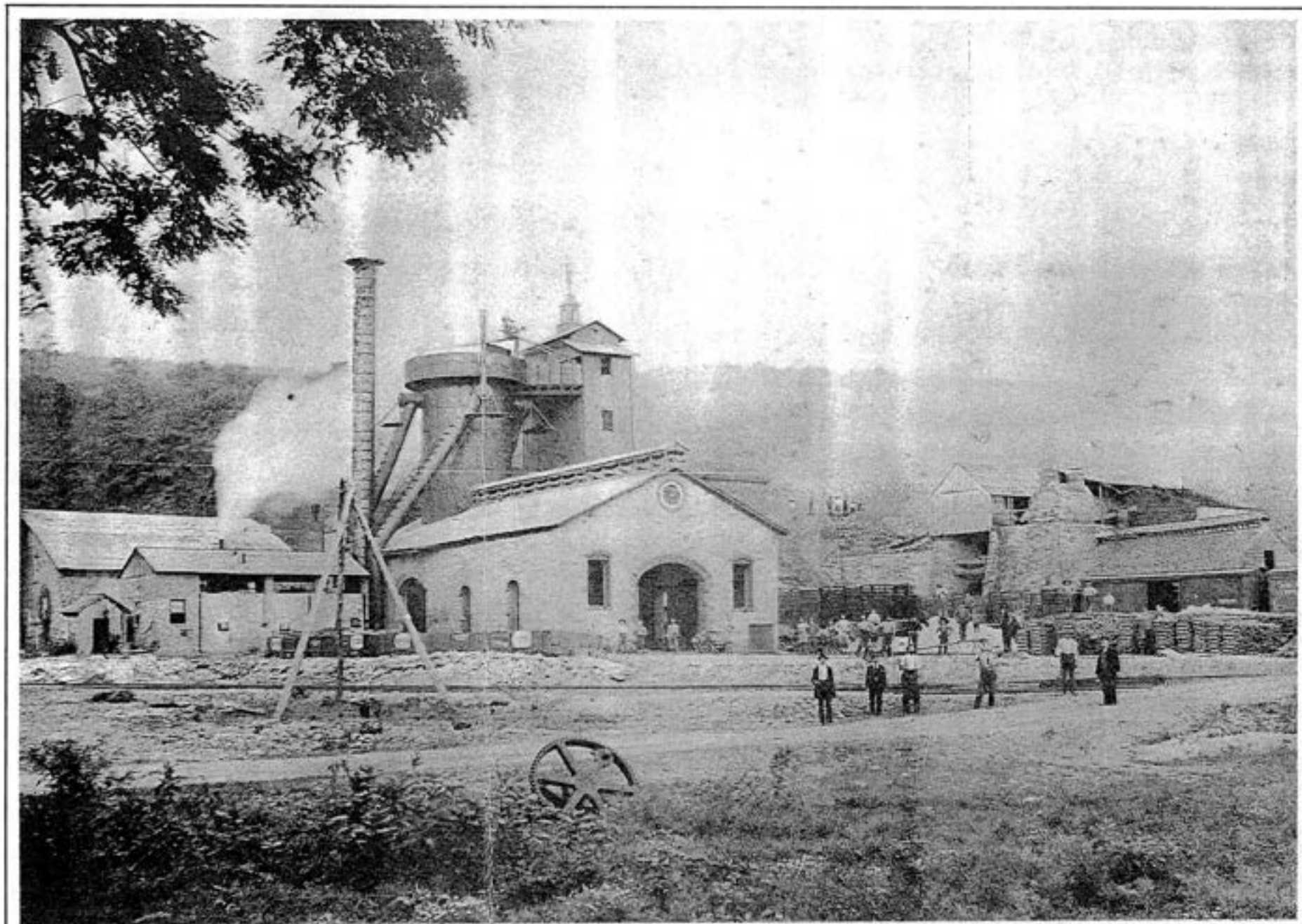


Figure 7. View of Catoclin Furnace from southeast, ca. 1890 (photograph courtesy of Joel Anderson).

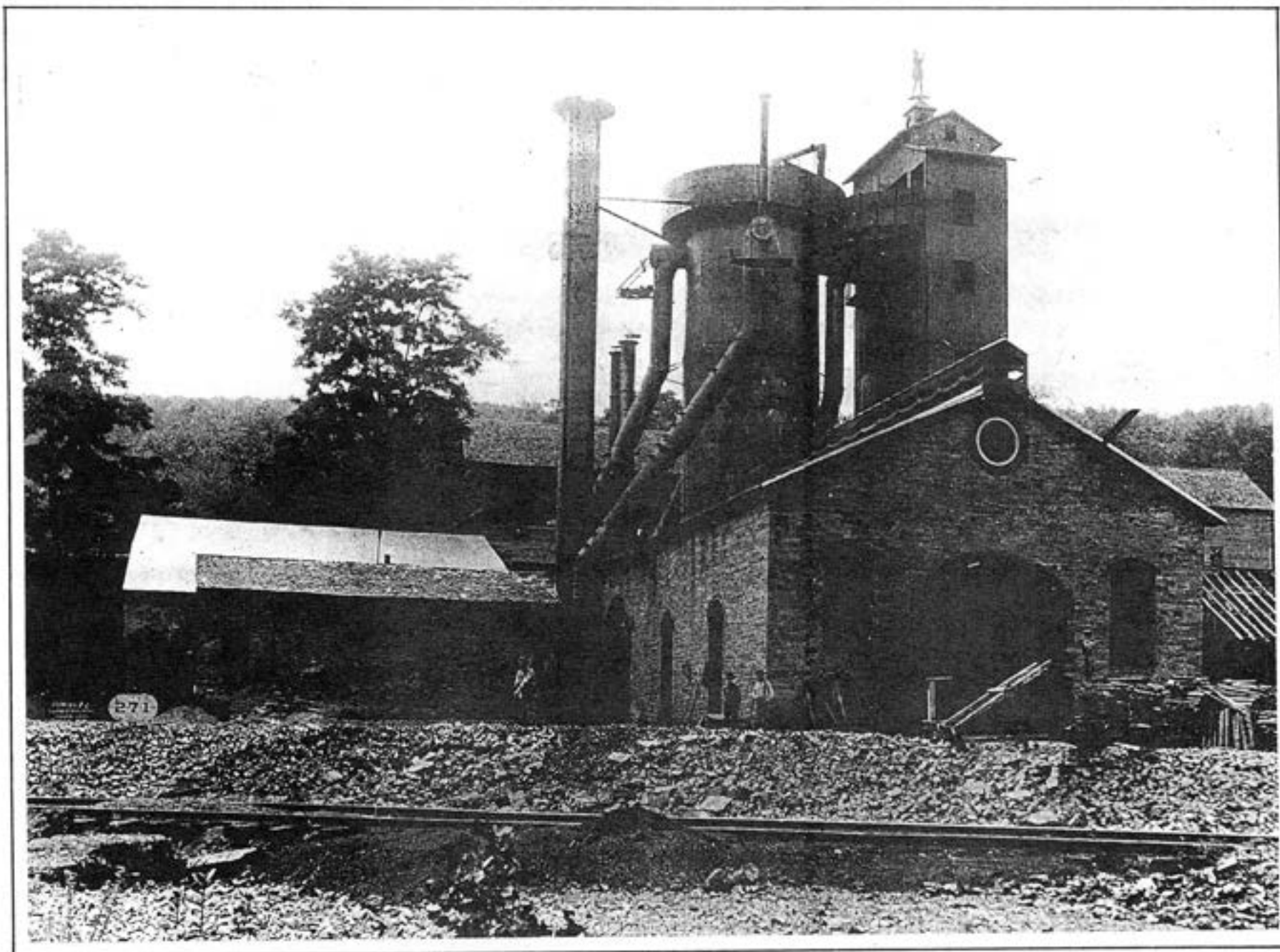


Figure 8. View of Catoclin Furnace from southeast, ca. 1903 - 1906 (photography courtesy of Joel Anderson).

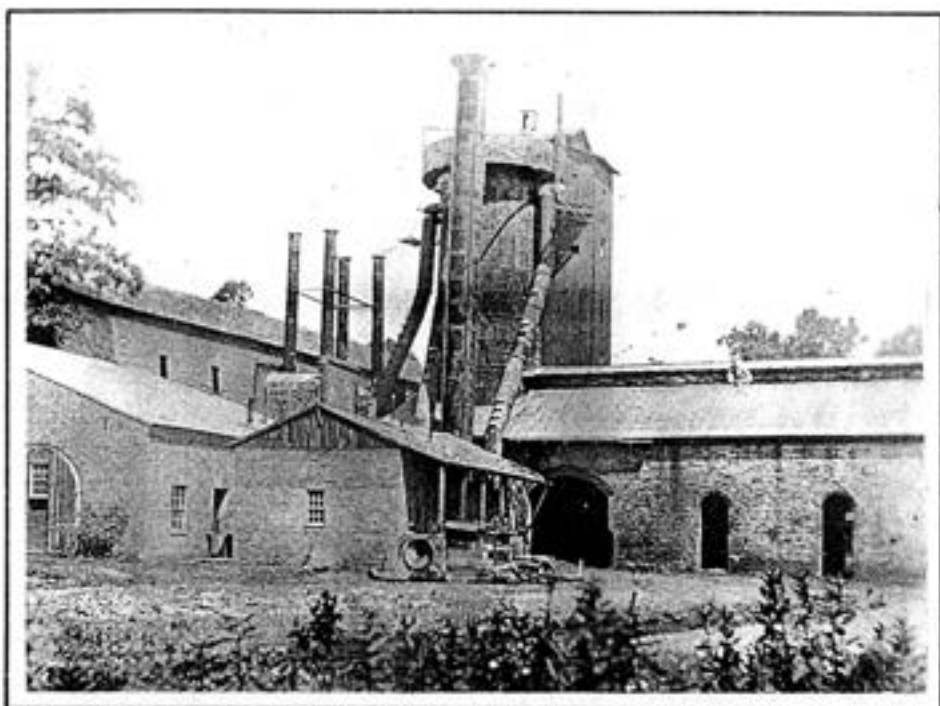


Figure 9. View of Catoclin Furnace from south, ca. 1906 (from Singewald 1911: Plate VIII, Fig 2; photograph courtesy of Joel Anderson).

The function of the retaining wall system also is uncertain. Again, there seem to be no contemporaneous accounts. In the passage quoted from the National Park Service (1969:8), it is implied that the function of the retaining wall was to give access to the top of the 1787 and 1856 stacks. That is, the toe slope of Catoclin Mountain was cut back, and "a stone wall, the furnace bank, was usually built to retain the hillside" (Mentzer 1974:6). Mentzer (1974:4,5) suggests that the retaining wall was built to hold back the accumulated mass of furnace waste that had been piled in that area. This is also implied by John Milner Associates (1981:73), who noted that an earlier series of borings indicated that the bank adjacent to Stack No. 2 (Isabella) on the west side was composed of 20 ft of slag and general fill.

Five borings were made at the furnace complex in 1974, of which four were between 10-15 ft from the retaining wall, on the west or uphill side (Balter 1974). All four recovered slag, ash, and fill to depths between 19-27 ft below the surface. The boring placed on the west side of the conjectured location of the 1787 stack (Boring B-4) recovered brick fragments between 16-23 ft below the surface, the only boring to do so. The presence of deep fill in this last area had been known since 1973, when the retaining wall west of Stack No. 2 collapsed (Love 1973). (The fifth boring was done east of the central retaining wall segment, in what would be the furnace yard. This recovered slag and fill to a depth of 4 ft.)

Orr and Orr (1977:35, 36, 38, 39) indicated that the entire area west of the retaining wall system was a "slag-filled plateau," a suggestion that they seem to have derived from a figure published by Mentzer (1974:5). One of the Orrs' test units confirmed that the toe slope of the land about 125 ft west of the wall system was slag fill. They also noted that:

Mentzer's Map (1974) shows the slag cap surrounding the Carty House [site of historic structure occupied into the 1920s, located 190 ft southwest of the main wall system] in a right angle, at a distance of 100 feet. It was obviously constructed with a view of avoiding the house and its yard. This suggests that the house preceded the construction of the retaining wall and the build-up of the slag plateau behind it [Orr and Orr 1977:35-36].

Based upon this, as well as on the evidence from the test units, on Mentzer's interpretation, and on the borings done in 1974, the Orrs implied that the main retaining wall system existed, at least in part, to provide a bulwark against the accumulating pile of slag and other furnace waste deposited just west of the furnace complex.

There are three photographs of the furnace complex, taken during or soon after the end of its operation, that show trees growing over the "slag-filled plateau." One of these is said to have been taken around 1890 (Figure 7; Joel Anderson, personal communication 1989), another was taken between 1903 and 1906 (Figure 10; the date is based on the enlarged size of Stack No. 3 and the absence of the "Indian Maiden" on top of the elevator; Wireman [1969:14] dates it as 1895, which is inconsistent with the size of the stack), and the third also was taken between 1903 and 1906 (Figure 8; the date is based on lack of repair of the boiler house roof and the disassembly of the stock house on the retaining wall). The earliest, Figure 7, shows relatively large trees growing behind the retaining wall west of Stack No. 3, the heights of which probably were on the order of 30 ft. The second, Figure 10, shows six open-growth trees located on the south end of the "slag-filled plateau." Based upon parallax with the utility poles in the foreground, these trees would have been between 40-60 cm dbh. One of these has the growth characteristics of an elm, two of the others have the silhouettes of maples (cf. *Acer saccharum* or *Acer saccharinum*). This would suggest that the trees were established around 1850, approximately a half century before the photograph was taken.

The third photograph, Figure 8, shows two mature trees in the same general area, both of which were probably 30-40 cm dbh at the time the photograph was taken. These trees probably became established sometime just after the Civil War.

The photographs suggest that the "slag-filled plateau" behind the retaining wall existed, at least in part, by the middle of the nineteenth century. This does not negate that the land behind the retaining wall system is made of slag fill. In terms of scale, its estimated 610,000 ft³ volume is much less than the estimated 1,963,500 ft³ volume of the slag mound reported by John Milner Associates to the north (1981:46).

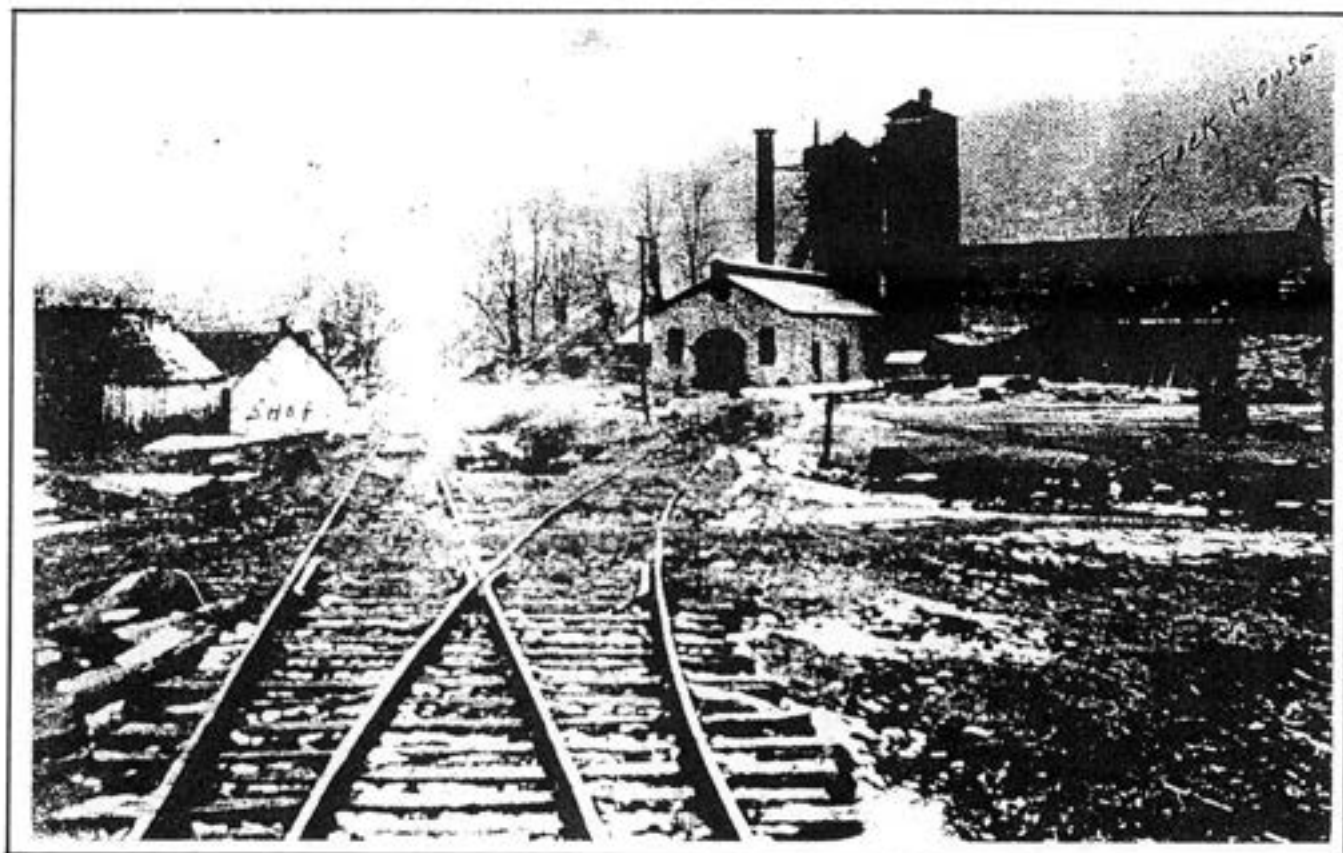


Figure 10. View of Catoctin Furnace from northeast, ca 1903 - 1906 (photograph courtesy of Joel Anderson).

From this, it might be conjectured that the retaining wall was built to restrict encroachment of a large slag mound into the furnace yard, and that the area immediately behind the wall was brought up to even grade with additional slag and fill after the wall was built. The retaining wall system, then, might represent one of the improvements said to have been made by Kunkel between 1866 and 1873. In this case, it would have been cosmetic, as well as functional.

The Anderson Hypotheses

John Milner Associates (1981) point out that iron production in the late eighteenth and early nineteenth century required or precipitated a specific community organization. Drawing on the work by Bining (1938), Walker (1966), and Rutsch (1974), they presented an overview of how an iron working operation, like Catoctin Furnace, would have been organized. More important, they also note what physical structures should have been present in the immediate area.

The basic pattern was centered about the furnace stack. The iron master's house was located nearby, close enough to serve a supervisory role as well as a center for community social activities. Workers' housing also was located nearby. These often were company owned structures that were rented to the workers. Generally, the timber needed for charcoal would be within five miles of the furnace. At Catoctin Furnace, the charcoal sources were certainly this close, while the iron ore sources were within a couple miles of the furnace complex.

The furnace complex required sheds for storing charcoal, limestone, and ore; casting houses; structures for the power plant, whether steam or water based; and other sheds and outbuildings. This also is discussed to some extent by Mentzer (1972), and it is important in considering what structural remains may be present at Catoctin Furnace.

Drawing on this kind of model, Joel Anderson (n.d.) developed six general propositions, with subsidiary hypotheses, about the locations and functions of structures associated with Catoctin Furnace. These are organized here by the structures to which they refer. The Anderson hypotheses were incorporated into the Detailed Work Plan for this archeological testing project at Catoctin Furnace.

Stack No. 1 (1787 Stack). One conjectured location of Stack No. 1 has been promulgated by Anderson (n.d.) and Contract Archaeology (1971). On the stabilization plan, however, this area was labeled as "bellows house foundation wall." Orr and Orr (1977) showed "Stack 1" in the area where Anderson and Contract Archaeology showed the bridge house (Figure 6). In the area labeled "Stack No. 1" and "Casting House" in Figure 6, Orr and Orr (1977) showed a building, labeled as "Bellows House," which also included a water wheel; they tested this area in 1976 (Orr and Orr 1976). Large flagging stones similar to the drain stones found in the floor of the restored casting house (Orr and Orr 1975) were exposed by them. There are three related questions: 1) was this the location of a stack or a bellows house; 2) was it located where conjectured; and 3) on what side did the associated race run?

The structure, whether Stack No. 1 or a bellows house for Stack No. 2 (Isabella), would have been located partially within the northeast sections of Areas D1, D3, and D4 (Figure 6). Initial field work plans permitted testing two hypotheses regarding Stack No. 1.

Hypothesis 1: If this is the location of Stack No. 1, then evidence of a stack foundation should be present. Associated artifacts should pre-date 1890, by which time the stack was known to have been dismantled (Contract Archaeology 1971). Data needed to falsify the hypothesis would be absence of a foundation with associated charcoal and burning, or presence of a foundation with artifacts post-dating 1890. This would also require falsification of Hypothesis 15 and Hypothesis 16. Data that would not falsify the hypothesis would be presence of a foundation with associated charcoal and burnt earth, and associated artifacts pre-dating 1890. This would also require that Hypothesis 15 and Hypothesis 16 would not be falsified.

Hypothesis 2: If this is the location of a bellows house, then there should be an associated water wheel pit. If Anderson (n.d.) and Orr and Orr (1975, 1976, 1977) are correct, it will be found on the west side of the stack. If Contract Archaeology (1971) and Renner (1982) are correct, it will be found on the east side of the stack. Data needed to falsify the hypothesis would be the absence of a water wheel pit. Data needed to falsify the location of a demonstrated water wheel pit would be finding said pit on a side of the stack opposite where it was conjectured to be. Data that would not falsify the hypothesis would be the presence of a water wheel pit, which would represent water deposited sediments. Falsification of Hypothesis 14 automatically will falsify Hypothesis 2.

Charcoal House for Stack No. 1 (1787 Stack) and Stack No. 2 (Isabella). Anderson (n.d.) suggested that a charcoal shed should have been present for Stack No. 1 and Stack No. 2 (Isabella). His research failed to locate either photographic or verbal reference to such a shed or house. However, furnaces of the period (pre-1860) had such associated with them. It should be noted that a generalized map of the furnace area, prepared by Renner (1982) showed a scales building located in the area shown in Figure 6.

The conjectured location of the charcoal house would be toward the north end of Area B (Figure 6). Three hypotheses were advanced regarding the charcoal house that may have been associated with Stack No. 1 and Stack No. 2 (Isabella). These are presented below.

Hypothesis 3: If the charcoal house was located where Anderson (n.d.) suggested, then evidence of charcoal should be found in a sharply delimited area. Data needed to falsify the hypothesis would be the absence of dense concentrations of powdered and fragmentary charcoal from the shovel tests in the north end of Area B. If charcoal was present, the hypothesis would be falsified if the density of charcoal was no different than that found in any of the other shovel tests conducted over the area. Data needed to not falsify the hypothesis would be the finding of dense concentrations of powdered or fragmentary charcoal, confined to a contiguous set of shovel tests within the north end of Area B.

Hypothesis 4: If the charcoal house was located where Anderson (n.d.) suggested, then there should be evidence of structural remains, either as support post stains or as a prepared foundation. Because of the testing regime, it was not possible to falsify this hypothesis. Evidence of structural remains would serve to avoid falsification.

Hypothesis 5: If the charcoal house was associated with Stack No. 2 (Isabella), then the associated artifacts should pre-date 1860. Data needed to falsify this hypothesis would be satisfaction of H3 but recovery of artifacts post-dating 1860 associated with an in situ band of charcoal. Data that would not falsify this hypothesis would be satisfaction of Hypothesis 3 and recovery of artifacts pre-dating 1860.

Function of Structure On Top of the Retaining Wall. Anderson (n.d.) noted that a large stock house associated with Stack No. 3 (Deborah) once stood on top of the long segment of the retaining wall system. This structure is shown in several historic photographs of the furnace complex. Presumably, raw materials for the furnace would have been stored there, transported into the structure by a small gauge rail line, then distributed by gravity through bins to the elevator for Stack No. 3 (Deborah). The only reference to a small gauge rail line was given by Contract Archaeology (1971), who showed on their site map the center line of the ore railroad (built ca. 1850) entering the furnace area from the north and terminating at the north end of where Anderson (n.d.) placed the bridge house in Figure 6.

This stack house would be located within Areas A and B (Figure 6). The question is not the presence of the structure, but its function. Initial field work plans permitted testing three hypotheses regarding the function of the structure on top of the retaining wall. These are presented below.

Hypothesis 6: If the structure served as a stock house, then there would be evidence of a small gauge railroad needed to load and off-load fuel. Data needed to falsify this hypothesis would be the absence of a rail bed. Data that would not falsify this hypothesis would be the presence of a rail bed.

Hypothesis 7: If the structure served as a stock house for Stack No. 3 (Deborah), then anthracite coke, limestone, and iron ore will be present. Data needed to falsify this hypothesis would be failure to

recover anthracite coke, limestone, and iron ore. Data that would not falsify this hypothesis would be recovery of anthracite coke, limestone, and iron ore in quantities exceeding the background noise possible from recovery of similar materials from adjacent areas of Areas A and B.

Hypothesis 8: If there were bins within the stock house that unloaded by gravity from underneath, then evidence of footings for a gravity-fed bin system should be present. Data needed to falsify this hypothesis would be failure to expose footings and a rail connection arrangement necessary for a gravity-fed bin system. Data that would not falsify this hypothesis would be exposure of the footings and rail connection arrangement necessary for a gravity-fed bin system.

Engine House and Blowing Machinery for Stack No. 3 (Deborah). Anderson (n.d.) noted that there are several questions surrounding structures and activities in the area at the south end of the retaining wall system. However, Orr and Orr (1976) documented the engine house, both in terms of its construction and extent. Behind or west of Stack No. 3 (Deborah), and north of the engine house, historic photographs show four still stacks, the functions of which are not known. However, the still stacks might represent the presence of another hot air oven.

The west half of the engine house is crossed by sections of Areas D1, D3, D4, and E (Figure 6). Initial field work plans permitted testing four hypotheses regarding the engine house. These are listed below.

Hypothesis 9: If the area indicated at the south end of the wall was the location of the engine house associated with the Stack No. 3 (Deborah), then evidence for such a structure would be encountered. Data needed to falsify the hypothesis would be the absence of a structure floor. Data that would not falsify the hypothesis would be the presence of a structure floor. It should be noted that Orr and Orr (1976) did identify the presence of a structure there. Their evidence indicates that the hypothesis cannot be rejected.

Hypothesis 10: If the area indicated at the south end of the wall was the location of the engine house associated with the Deborah furnace, then evidence that blowing machinery had once been present should be found. The testing regime was inadequate for demonstrating that machinery was not present. Data that would not falsify the hypothesis would be the presence of footings/mountings for machinery. It should be noted that Orr and Orr (1976) identified floor features within the structure that they interpreted as engine pits.

Hypothesis 11: If the four still stacks were associated with the Stack No. 3 (Deborah), then there should be no evidence of another hot air oven to the west of Stack No. 3 (Deborah). Data needed to falsify the hypothesis would be evidence that a hot air furnace was present west of the Deborah furnace. Data that would not falsify the hypothesis would be the lack of evidence for a hot air furnace west of Stack No. 3 (Deborah).

Hypothesis 12: If the Deborah furnace was hot-blast, then there should be no evidence of another hot air oven to the west of Stack No. 3 (Deborah). The data needed to test this hypothesis would be the same as those for Hypothesis 11.

Location of Steam Boiler. Anderson (n.d.) noted that photographs of the exploded boiler to the south of Stack No. 3 (Deborah) suggest that the steam boiler had been located to the east or in front of the location of the engine room discussed above. He noted as well that this has not yet been confirmed.

Contract Archeology (1971), in examining the same photograph, stated that it had been taken in 1907 and portrayed the dismantling of Stack No. 3 (Deborah). They pointed out that the structure on top of the retaining wall system is not shown in the photograph, suggesting that it had been removed at the time the photograph was taken. The furnace shown is the version of Stack No. 3 that was enlarged in 1900. The wood frame structure is present on photographs from both before and after Stack No. 3 was enlarged.

The area south of Stack No. 3 (Deborah) and east of the location for the engine room did not fall within the current impact area (Figure 6). However, one hypothesis regarding the location of the steam boiler could be tested given the initial field work plans. This is presented below.

Hypothesis 13: If the steam boiler associated with Stack No. 3 (Deborah) was not located to the east of the conjectured location of the engine house, then it would have been located within the engine house. To test this, given the areas explored, the hypothesis must be phrased as: The steam boiler was located in the conjectured location of the engine house.

The testing regime may not have been adequate to falsify this hypothesis. Falsification would require evidence of an intact engine room floor showing no evidence of the damage that would have been caused by an exploding boiler, as well as evidence of non-boiler machinery that would account for both the space within and the function of the conjectured engine house. Data that would not falsify the hypothesis would be the combined presence of: 1) evidence that a building had been present; 2) evidence that the building suffered an explosion; 3) evidence of boiler footings; and 4) evidence of coal or coal ash (as opposed to the coke that would have been associated with the Deborah furnace). The results from Orr and Orr (1976) appear to falsify this hypothesis. They found intact timber beams in place. These probably would have been damaged by a boiler explosion.

Spillway and Stack No. 1 (1787 Stack). Anderson's (n.d.) last proposition involved the possible location of a spillway associated with Stack No. 1. There should be evidence of a spillway coming from the foundations of the building housing the machinery of Stack No. 1. Orr and Orr (1977) would position it on the west side of the structure; Contract Archaeology (1971) and Renner (1982) would position it on the east side.

The conjectured location of No. 1 Stack is partially covered by Areas D1, D3, and D4 (Figure 6). Initial field work plans permitted testing of one hypothesis regarding the spillway.

Hypothesis 14: If this was the location of a water powered bellows house (H1), and if there was an associated water wheel pit (H2), then a spillway should be present. If Anderson (n.d.) and Orr and Orr (1977) are correct, it would be found on the west side of the structure. If Contract Archaeology (1971) and Renner (1982) are correct, it would be found on the east side of the structure. Data needed to falsify the hypothesis would be the absence of a spillway. Data needed to falsify the location of a demonstrated spillway would be finding said pit on a side of the structure opposite its conjectured location. Data that would not falsify the hypothesis would be the presence of a spillway containing water deposited sediments.

Additional Hypotheses

The initial sampling regime permitted testing three additional hypotheses associated with two propositions, both of which were implicit in the site map prepared by Contract Archeology (1971). These are given below. The first involves the possible presence of a casting house next to Stack No. 1 (1787 Stack). The site map presented by Contract Archeology (1971) showed that a casting house associated with Stack No. 1 may have been located to the south of the stack. This remains to be tested.

The conjectured location of the casting house was crossed by the shovel test corridor associated with Area E (Figure 6). Initial field work plans permitted testing two hypotheses regarding the existence of the conjectured casting house.

Hypothesis 15: If a structure existed to the south of No. 1 Stack, then a sand floor over subsoil, consisting of multiple sand layers and burnt sand, should be present (Orr and Orr 1975). Data needed to falsify the hypothesis would be the absence of evidence for a floor. Data that would not falsify the hypothesis would be the presence of a floor.

Hypothesis 16: If a casting house had been located adjacent to the south side of Stack No. 1, then evidence indicative of the function of the structure would be present in the form of iron slag and small solidified iron droplets. Data needed to falsify the hypothesis would be falsification of Hypothesis 15 plus the absence of the casting residue that would be expected in such a structure. Data that would not falsify the hypothesis would be the presence, above background noise, of iron slag and/or solidified iron droplets. This also requires that H15 is not falsified.

The second set of hypotheses involves the location of the race. The site map prepared by Contract Archaeology (1971) showed that the mill race continued more or less south out of the complex. This has not been confirmed. This would represent a tailrace. Such a feature exposed by Frye (1984:62, 64) at the Antietam Iron Works, was a 3 ft wide corbelled vaulted tunnel located at least 3.5 ft below the ground surface. It had partially filled with silt, and Frye's illustration makes it look functionally similar to a field "tile" drain. The conjectured path of the race crosses the eastern end of Area C (Figure 6). Initial field work permitted testing one hypothesis regarding the location of the race.

Hypothesis 17: If the course of the race did trend to the south-southwest, then evidence of this race in the form of a channel and sediments should be located within the east part of Area C. Data needed to falsify the hypothesis would be the absence of a channel filled with water-deposited sediments. Data that would not falsify the hypothesis would be the presence of a channel containing water deposited sediments. If the tailrace was similar to that found at the Antietam Iron Works, then it may have functioned in a manner similar to a field drainage system. Ancillary data that would not falsify the hypothesis would be the drainage of a large volume of water flowing across the projected course of the race.

CHAPTER IV RESEARCH METHODS

Archival Investigations

Archival investigations focused on establishing the chronology of furnace ownership and the nature and history of previous investigations conducted at Catoctin Furnace. Information pertaining to archeological sites, archeological reports, popular accounts, and historic maps were obtained at the Maryland Geological Survey in Baltimore. The Maryland Historic Trust in Annapolis provided information on historic structures and on the Catoctin Furnace Historic District. Historic background information on Catoctin Furnace also was obtained at the Maryland Room of the C. Burr Artz Library in Frederick, and at the J. H. Library of Hood College.

Field Investigations

Field investigations consisted of shovel testing, small unit excavation, trench excavation, mechanical stripping, and topographic mapping. A master grid was set in the plateau area west and above the main retaining wall system, with the north-south axis being the line through the southwest and northwest corners of the main retaining wall system. Metric tapes were used to triangulate and plot the locations of shovel tests, and other units and trenches. A site datum, an aluminum capped, concrete monument, was placed 20 cm north of and 10 cm east of the southeast corner of Stack No. 2 (Isabella), and all grid points were linked to this site datum using a transit.

Fill was removed by natural stratigraphy where present, and by 10 cm arbitrary levels within natural levels. Twenty-five per cent of all non-recent, undisturbed fill was screened through 1.27 cm (0.5 inch) hardware mesh, as specified in the Scope of Work. Artifacts were placed in resealable plastic bags, labeled by provenience. At least one wall of each shovel test unit, small excavation unit, and trench was profiled and photographed.

As mentioned in Chapter I, the original research design was modified during field work. The restructured sampling strategy focused subsurface testing on the area within 25 ft (7.6 m) west of the central retaining wall segment. It is easiest to discuss the field work in terms of the project impact areas A - E (Figure 3).

Area A

Area A overlapped with the eastern 25 ft (7.6 m) of Area B and the northwest corner of Area C. Sixteen shovel tests from Area B and six from Area C were located within Area A. Two 1.5 x 1.5 m test units also were excavated in Area A, one on the north side of the main retaining wall system (Unit A-1), and one on the south side (Unit A-2). Unit A-1 was excavated to a depth of 60 cm. Half of Unit A-2 was excavated to 50 cm; the other half was excavated to 75 cm.

Two hand excavated trenches were opened in Area A. Trench A-1 measured 3.0 m north-south and 7.6 m east-west. The trench was subdivided into 8 1.5 x 1.5 m units and two 1.5 x 1.6 m units. The units making up the north half of the trench were excavated to 10 cm below the surface; those making up the south half were excavated to 25 cm below the surface. Trench A-2 measured 1.0 m north-south and 7.5 m east-west. The trench was subdivided into five 1.0 x 1.5 m units. These were excavated to 25 cm below the surface.

Two mechanically excavated trenches were opened in Area A. Trench A-3 was 3.0 m east-west and 19.6 m north-south. This trench connected Trenches A-1 and A-2. Trench A-4 was 1.5 m east-west and 13.6 m north-south. It extended north from Trench A-1; its east wall was in line with the east wall of Trench

A-3. Fill was removed with a 60 cm wide backhoe bucket, on which the teeth had been capped with a spot-welded steel plate. The surface then was shovel scrapped, and troweled.

Four shovel-test-like exploratory units were opened north of Trench A-1 and west of Trench A-4. Units A-3, A-4, and A-5 measured 50 x 50 cm; Unit A-6 measured 50 x 100 cm. All were excavated to 25 cm below the surface in an attempt to trace possible structural stains exposed in Trench A-1.

Area B

In Area B, 112 50 x 50 cm shovel tests were opened at 4.6 m intervals. These were excavated to depths between 50 - 75 cm below the surface. Sixteen of these were located within Area A. Three trenches were opened in Area B. Two continued trenches started in Area A. Trench B-1 extended west from Trench A-1. It was 1.0 m north-south and 4.5 m east west, and it was subdivided into three 1.0 - 1.5 m units and excavated to 25 cm below the surface. Trench B-2 extended west from Trench A-2. It was 1.0 m north-south and 3.0 m east-west, and it was subdivided into two 1.0 x 1.5 m units. Trench B-3 was a 0.5 x 1.5 m trench that extended south from Trench B-1. It also was excavated to 25 cm below the surface.

Three 1.5 x 1.5 m test units also were opened in Area B, two (Units B-1 and B-2) to the south of Trench B-2 and one north of Trench B-1 (Unit B-3). These were excavated to 25 cm below the surface. A 10 cm deep, 0.75 x 2.0 m exploratory unit, Units B-4, extended south from Unit B-2 along the east side of Unit B-1.

Area C

Nineteen 50 x 50 cm shovel tests were opened at 3.5 m intervals in Area C; six of these overlapped Area A. Ten of the shovel tests were opened in the area above and southwest of the retaining wall system; seven were opened at the base of the slope south of the retaining wall system. The remaining two were opened on the hill slope. All except those on the slope were excavated to 50 cm below the surface. One 1.5 x 1.5 m test unit, Unit C-1, was opened at the base of the slope south of the retaining wall system. This was excavated to a depth of 50 cm below the surface.

Area D

Project plans divide impact Area D into four subsections, based upon both physical area and stabilization task. Areas D1 and D3 cover the same part of the site, and are discussed together.

Area D1/D3. Two 1.0 x 1.5 m test units were opened in Area D1/D3. Unit D-1 was set 11.25 m north from the southwest corner of the central retaining wall segment; Unit D-5 was set adjacent to the northwest corner of the central retaining wall segment. Both units were excavated to 30 - 65 cm below the surface.

Area D2. No test excavations were conducted Area D2, the center of the limestone talus in the southwest corner of the main retaining wall system. One shovel test from Area D4 was located on the same limestone talus (Figure 11).

Area D4. Thirteen shovel tests, spaced at 3.5 m intervals, were opened in Area D4. One was east of the southeast corner of the retaining wall system; three were in a transect parallel to the north-facing wall segment; the remaining nine were parallel to the central retaining wall segment. All were 3.8 m from the retaining wall. These were excavated to 20-50 cm below the surface, depending upon field conditions.

One 1.0 x 1.5 m test unit, Unit D-3, was opened 1.5 m east of the eastern edge of Area D4. It was excavated to 11 - 31 cm below the surface.

Area E

Twenty-two 50 x 50 cm shovel tests were opened at 3.5 m intervals in Area E. These were excavated to 10-30 cm below the surface, as specified in the Scope of Work.

Laboratory Methods

All artifacts were washed, sorted by material classification, and then placed into bags labeled by provenience. These materials were encoded into a computerized site catalog to allow manipulation of part or all of the data sets. For ceramics, glass, and nails, descriptions comprised formal archeological classifications. Identification and classification of other classes of artifacts were limited to descriptive overviews of the nature of the recovered materials.

CHAPTER V ANALYSIS AND RESULTS

Site Description

Catoctin Furnace (18 FR 29) is a 0.6 ha (1.5 acre) site located approximately 5.6 km (3.5 miles) south of Thurmont in Frederick County, Maryland (Figure 11). The site represents the ruins of a late eighteenth through early twentieth century iron smelting complex. The ruins are dominated by a 5.5 - 6.1 m high (18.0 - 20.0 ft) dry lain stone retaining wall. This wall system is approximately 55.3 m (181.4 ft) long north to south. It has a southern north-south face that is 15.5 m (51.0 ft) long, and a central north-south face 41.5 m (136.2 ft) long. Northeast of the retaining wall system is an isolated wall segment approximately 7.6 m (25.0 ft) long and 4.0 m (13.0 ft) high. East of this segment are the ruins of Stack No. 2 (Isabella), which was built in 1856. This is a 9.4 m (30.8 ft) high, dry lain masonry structure in the form of a truncated pyramid; its sides at the base are 8.0 m (26.4 ft) long. Against the east side of Stack No. 2 is a reconstruction of its casting shed. The casting shed area is listed as a separate site, 18 FR 333.

About a meter north of Stack No. 2 is a dry lain masonry wall (Figure 11). Oriented east-west, it forms the north interior wall of the casting shed. This wall, which varies in height from roughly 8.0 m (26.2 ft) opposite Stack No. 2 to around 4.3 m (14.0 ft) where it extends under the casting house roof, appears to have been built in two stages. The first stage is represented by stone courses that step down from west to east, starting opposite the northeast corner of Stack No. 2. The second stage is represented by the masonry that raised and levelled the steps to provide support for the north eve of the casting house roof.

North of Stack No. 2, and on the north side of the stone wall just mentioned, is a partially exposed stone wall approximately 3.0 m (9.8 ft) wide at its base. The top of this stone wall is covered with sod, although an overgrown erosion channel running off of the top has exposed brick rubble fill. Orr and Orr (1976) argued that this masonry wall and associated brick rubble are the remains of the east face of Stack No. 1 (1787 Stack; Figure 6).

East of the southern segment of the retaining wall system are the remains of the engine house said to have been associated with Stack No. 3 (Deborah; Figure 6). This engine house, listed as 18 FR 334, is represented by four small, 60 - 75 cm (2.0 - 2.5 ft) deep depressions, and by 41 3.8 cm (1.5 in) diameter threaded tie irons (Figure 11). These are located in a rectangular area 10.2 m (33.5 ft) north-south, and which extends 8.2 m (26.9 ft) east from the base of the retaining wall.

A series of rubble mounds are present against the long central retaining wall segment. A tall conical talus mound is located in the southwest corner (Figure 11). Orr and Orr (1976) argued that this was a pile of limestone flux, and geological assays by Fauth (1982) indicated that three different kinds of limestone were present, none of which are known to be available locally. The other piles north of the limestone talus mound are composed of partially refined iron ore slag and sandstone. Some of the iron ore slag appears to have cooled and solidified inside of a furnace stack.

A small mound overgrown with ailanthus saplings is present in the yard area of the furnace complex (Figure 11). This is probably the remains of the masonry casting house associated with Stack No. 3 (Deborah). The yard itself slopes from east to west, abruptly dropping about a meter in the area where Stack No. 2 (Isabella) and its associated casting house are located (Figure 11). Stack No. 2 probably is located on the original ground surface; the boring by Balter (1974) would suggest that most of the yard is built up with 1.2 m (4.0 ft) of furnace slag and associated fill. The yard area is between 149.7 - 151.8 m (491.1 - 498.0 ft) amsl, ignoring the talus mounds and other irregularities.

The area west of the retaining wall is relatively level for a distance of 23.0 m (75.5 ft) west of the central retaining wall segment (Figure 11). Elevations are between 158.5 - 160.8 m (520.0 - 527.6 ft) amsl. Past that distance the land is disturbed by a low mound that borders the east edge of the drainage ditch dug along the east side of U.S. Highway 15. The land surface drops abruptly over 3.0 m (9.8 ft) into what may have been an ore pit southwest of the retaining wall. Both Mentzer (1974) and Orr and Orr (1977)

argued that all of the higher land behind the retaining wall system is composed of slag (Figure 6). Balter's (1974) borings suggest that slag fill extends to between 5.8 - 8.2 m (19.0 - 27.0 ft).

Results of Investigations in Impact Areas

Area A

Four trenches (Trenches A-1, A-2, A-3, and A-4), two 1.5 x 1.5 m units (Units A-1 and A-2), three 50 x 50 cm units (Units A-3, A-4, and A-5), and one 50 x 100 cm unit (Unit A-6) were excavated in Area A (Figures 3 and 11). Trenches A-1 and A-2 had extensions into Area B, and it is more convenient to consider those extensions, labeled Trenches B-1, B-2, and B-3, here. Only one structure is known definitely to have been in Area A (Figure 6). This was the long, narrow, end-gabled frame stock house that early photographs (Figures 7, 8, 9, & 10) seem to show resting with its east wall on top of the long central retaining wall segment.

These two test units were placed to examine the nature of the fill near the retaining wall, and to open a large enough area to determine if undocumented structural remains were present. Both test units revealed the presence of fill within 3.0 m (9.0 ft) of the north and south facing segments of the retaining wall.

Unit A-1, placed south of the north facing wall segment, was excavated to 55 - 60 cm below the surface (Figures 11 and 12). The profile consisted of: 0 - 5 cm, 10 YR 2/1 (black) silt; 5 - 8 cm, 10 YR 3/1 (very dark gray brown) loamy sand; 8 - 11 cm, 10 YR 4/2 (dark grayish brown) sand with gravel and slag; 11 - 17 cm, 2.5 Y 2/0 (black) loamy sand with charcoal; and 17 - 25 cm, 10 YR 3/2 (very dark grayish brown) sand with gravel and slag. From 25 - 60 cm on the south side of the unit, and 25 - 33 cm on the north side, there was a layer of 2.5 YR 4/3 (reddish brown) sand with cobble sized pieces of slag, slag glass, and iron. Under this layer, to a depth of at least 60 cm, was a 10 YR 6/6 (brownish yellow) silty clay containing quartzite and iron ore cobbles.

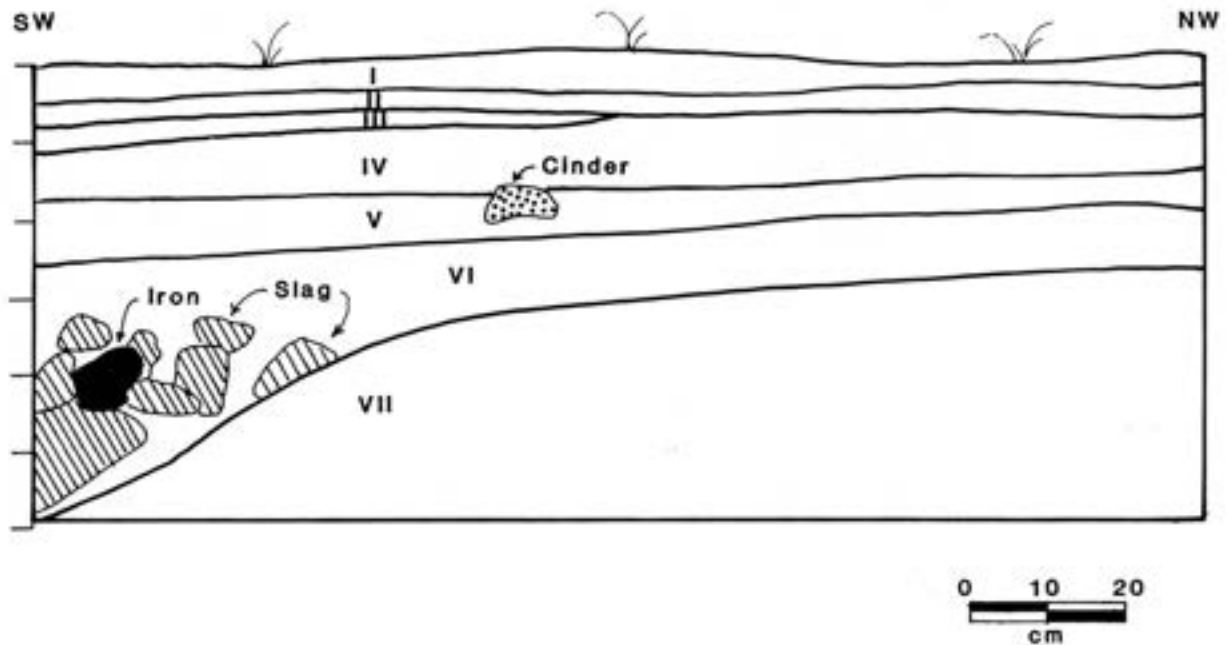
At the time that the unit was excavated, it was believed that the brownish yellow silty clay represented the original subsoil. However, subsequent stratigraphic evidence from the north end of Trench A-4, and the absence of a topsoil resting between the slag layer and the subsoil-like material, indicated that this silty clay also comprised a fill episode.

Unit A-2, placed north of the south facing wall segment, was excavated to 75 cm below the surface (Figures 11 and 13). Between 0 - 12 cm, the unit exposed a 0 - 12 cm, 7.5 YR 2/0 (black) clay loam containing window glass, slag, and iron ore. Between 12 - 17 cm at the north end and continuing from 12 cm to 50 cm at the south end was a 10 YR 2/2 (very dark brown) sandy loam layer containing slag, iron ore, and large rocks. Beneath this were layers of a 10 YR 4/4 (dark yellowish brown) silt and 20 YR 4/2 (dark grayish brown) clay loam. Beginning at 17 cm at the north end and continuing to at least 140 cm (based on soil probes) was a 2.5 YR 3/4 (dark reddish brown) sandy silt. This layer, which appeared to be made of a deep deposit of expended casting house sand, also contained large rocks.

The dark reddish brown sandy silt, occasionally containing flecks of charcoal, was encountered as a thick, compacted layer over a large portion of the north end of Area B. Stratigraphic evidence at the north end of Trench A-4 indicates that the brownish yellow subsoil-like fill overlies the dark reddish brown silt in this part of the furnace complex.

The trench system, four small test units in Area A, and three 1.5 x 1.5 m units in Area B, were excavated to locate signs of the frame stock house. Shovel testing had indicated that the area 7.5 m west of the retaining wall system was capped by a 10 - 15 cm thick black to very dark grayish brown sod and silt layer, with patches of cobble sized, vitreous slag. Below this was a 5 - 15 cm thick yellow brown subsoil-like lens around 30 m or so north to south and at least 8 m east to west. Below that subsoil-like fill layer, the stratigraphy revealed in the shovel tests varied considerably in terms of what was present, depositional order, and thickness. The impression was of multiple fill events and/or lenses.

WEST WALL PROFILE - UNIT A-1

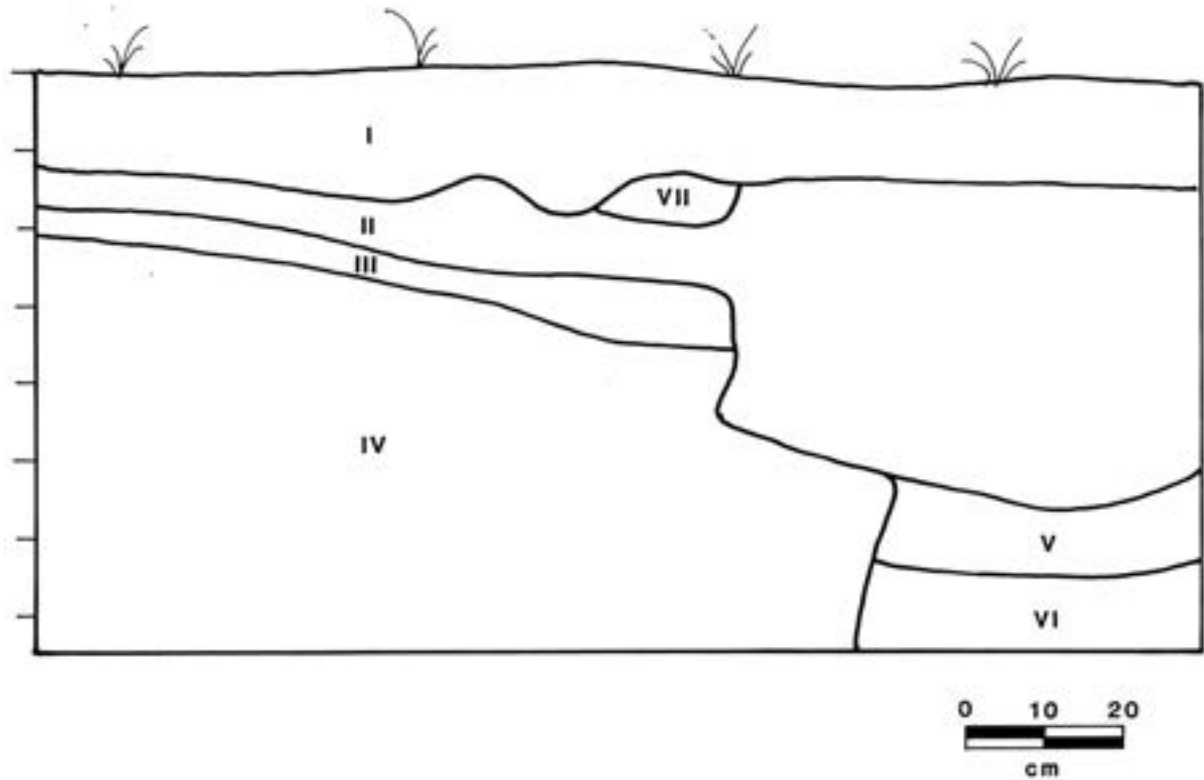


- I. 10 YR 2/1 Black Silt - A1 Horizon
- II. 10 YR 3/1 Very Dark Gray Loamy Sand - A2 Horizon
- III. 10 YR 4/2 Dark Grayish Brown Sand With Gravel, Slag - Fill
- IV. 2.5 Y 2/0 Black Loamy Sand With Charcoal - Fill
- V. 10 YR 3/2 Very Dark Grayish Brown Sand With Gravel, Slag - Fill
- VI. 2.5 YR 4/3 Reddish Brown Sand With Slag, Slag Glass, Cinders, And Pieces Of Iron - Fill
- VII. 10 YR 6/6 Brownish Yellow Silty Loam - Subsoil Fill

KEY:
 Cinder
 Iron
 Slag

Figure 12. West Wall Profile, Unit A-1.

EAST WALL PROFILE - UNIT A-2



- I. 7.5 YR 2/0 Black Clay Loam With Window Glass, Slag, Slag Glass, Iron
- II. 10 YR 2/2 Very Dark Brown Sandy Loam With Slag, Slag Glass, Iron
- III. 10 YR 3/2 Dark Brown Silt Loam With Brick, Slag
- IV. 2.5 YR 3/4 Dark Reddish Brown Silt Loam
- V. 10 YR 4/4 Dark Yellowish Brown Silt Loam
- VI. 10 YR 4/2 Dark Grayish Brown Clay Loam
- VII. 2.5 YR 3/4 Dark Reddish Brown Sandy Silt

Figure 13. East Wall Profile, Unit A-2.

Four interconnected trenches were excavated in Area A (Figure 11). Trench A-2, located 7 - 8 m north of the southwest corner of the retaining wall system, was 1.0 m north-south; it extended 7.5 m west from the retaining wall system. It was continued another 3.0 m by Trench B-2. Trench A-3 was 3.0 m east-west; it extended 19.6 m north from the north wall of Trench A-2 to the south wall of Trench A-1. This trench was approximately 2.4 m from the retaining wall. Trench A-1 was 3.0 m north-south; it extended 7.6 m west from the retaining wall. Trench B-1 extended west from Trench A-1 another 4.5 m. Trench B-1 was 1.0 m north-south. Extending south from Trench B-1 was Trench B-3, a 0.5 wide, 1.5 m long slit trench located 1.0 m west of the end of Trench A-1. Trench A-4 was 1.5 m east-west; it extended 13.6 m north from the north wall of Trench A-1. The east wall of Trench A-4 was in line with the east wall of Trench A-3.

Trenches A-3 and A-4 were stripped using a backhoe with a steel plate spot welded over the bucket teeth, after which the floors were shovel scraped, troweled, and mapped. The northern 10.95 m of Trench A-4 was excavated to the brownish yellow subsoil-like clay fill located between 21 - 46 cm below the surface. All other trenches were excavated by hand. The northern half of Trench A-1 (1.5 x 7.6 m) was excavated to 15 cm below the surface. With the exceptions of the northern half of Trench A-1 and of the northern end of Trench A-4, all trench floors were at the same elevation, approximately 25 cm below the surface.

Beginning 1.5 m from the retaining wall, Trench A-1 exposed five roughly parallel, 5 - 20 cm (average: 10 cm) wide black to very dark brown bands 15 cm below the surface. The bands had rounded (elliptic) cross-sections, were around 2 cm thick, and were oriented roughly north-south. The north half of the trench was left at 15 cm below the surface; the south half was excavated another 10 cm. At 2.3 m from the west end of the trench, six new bands, with the same roughly north-south orientation, appeared at 25 cm below surface. These had the same characteristics as the bands recognized earlier. However, those nearest the west end of the trench contained 96 machine-cut nails. Some of these bands also were rich in charcoal.

It was felt that these bands represented remains of the frame stock house flooring. Trench B-1 was extended to the west to locate where these bands ended. Earlier photographs of the stock house, particularly Figure 8, suggested that the stock house probably was between 9.1 - 10.6 m (30 - 35 ft) wide (Figure 6). The bands within 1.5 m of Trench A-1 produced another 521 machine-cut nails, as well as six wire nails.

An attempt was made to trace two of the bands. It was reasoned that if these bands constituted the remains of the structure, then following one to either the north or south end would locate the end of the structure, from which the corners of the building could be identified. Units A-3/A-5, A-4, and A-6 were excavated at 1.5 m intervals north from Trench A-1 (Figure 11). Units A-3 and A-5 located signs of the band, although no nails were found. Units A-4 and A-6 located only slag. Trench B-3 was extended south from one of the bands identified in Trench B-1 (Figure 11). The band ended after 60 cm; slag began at 80 cm from Trench B-1. No nails were found.

Trench A-2 and its extension B-2 sought signs of structural remains similar to those in Trench A-1, but at what would have been the southern end of the frame stock house. Three wide, shallow, irregular dark brown bands unlike those in Trench A-1, were identified within 4.5 m of the wall. These were oriented southeast to northwest, they were not parallel, and their widths were between 30-40 cm.

In the westernmost section of Trench A-2, directly south of the western end of Trench A-1, 25 machine-cut nails were found. In the adjoining section of Trench B-2, 163 machine-cut nails were found. The nails were located in areas directly south of where 96 machine-cut nails (Trench A-1) and 521 machine-cut nails (Trench B-1) has been recovered. However, unlike those northern trenches, the sections of Trenches A-2 and B-2 that produced the nails had no signs of band-like stains. Instead, they exposed a layer of coke. Thus, the southern trenches failed to produce direct evidence of structural remains.

Trench A-3 was opened to explore the southern extent of the bands identified in Trench A-1. With the exception of a gently curved, 6.1 m long and 30-40 cm wide band located along the east wall and starting at Trench A-1, no bands were exposed that were similar to those in Trench A-1. Beginning 8.1 m north of Trench A-2 and continuing around 4.0 m south, there were five 30-50 cm wide, 2 cm deep bands.

Instead of being roughly parallel, these had a fan-like distribution. The band nearest the east wall was oriented north-south, while those near the west wall were oriented southeast-northwest. Three more bands were found within 4.0 m of Trench A-2; all were oriented southeast-northwest.

Like Trench A-3, Trench A-4 attempted to trace some of the band-like stains north. These bands continued for 1.9 m, abruptly ending in a deposit of cobble sized, vitreous slag. The slag layer began 5 cm below the surface and continued to 21 - 46 cm below the surface. At that point, it rested on the same kind of brownish yellow subsoil-like material encountered in the floor of Unit A-1. This brownish yellow fill continued north 12.3 m from Trench A-1, where it ended at a dark reddish brown sandy silt deposit like that exposed in Unit A-2. A 30 x 30 cm test was excavated where the subsoil-like material met the sandy silt. This revealed that the dark reddish brown sandy silt extended under the subsoil-like material to an unknown depth, indicating that the subsoil-like material in reality was part of a fill deposit. It also suggests that the similar material previously found in Unit A-1 also was part of a fill deposit (Figure 14).

The subsoil-like fill material exposed in Trench A-4 contained two roughly parallel, 20 cm wide, 4-6 cm deep, parallel sided pale brown bands running south to north. The matrix was gravelly. These bands were approximately 15-20 cm deeper than the bands exposed in Trench A-1. It is doubtful, given their fill, extent, and depth, that these represent structural remains.

Thus, testing in Area A indicated deep fill deposits. These fill deposits included large volumes of a brownish yellow, subsoil-like material. No indisputable evidence of structural remains was identified, although the high concentration of machine-cut nails located between 7.5 - 9.0 m from the retaining wall suggests that the structure's west side may have been in that area. The presence of coke in Trenches A-2 and B-2 suggest that a stockpile of coke was present within the frame structure. The origin of the bands identified in the floors of the trenches, especially Trench A-1, is not known.

Area B

One-hundred-twelve 50 x 50 cm shovel tests, three 1.5 x 1.5 m test units (Units B-1 - B-3), and one 0.75 x 2.0 m test unit (Unit B-4) were excavated in Area B, in addition to the three trenches discussed above (Figure 11). Shovel tests were placed at 4.6 m intervals, and excavated to 50 - 75 cm below the surface. They were labeled by east-west transect from south (Transect 1) to north (Transect 21), and sequentially east to west, so that shovel test B 19-1 would be the easternmost shovel test in Transect 19 (Figure 11).

All shovel tests encountered a 5 - 15 cm thick, 10 YR 3/1 to 10 YR 3/3 (very dark gray to dark brown) silty loam topsoil. Below that topsoil, however, stratigraphy was highly variable. Shovel tests in Transects 1 - 4 generally encountered a 10 YR 4/4 (dark yellowish brown) clay loam around 30 cm below the surface (Figure 11). Three shovel tests (B 1-3, B 1-4, B 2-4) excavated on the west slope also encountered the subsoil-like material, although some slag was present in upper levels.

Beginning with Transect 5 and continuing to Transect 12, the stratigraphy was more variable (Figure 11). In most cases, a 10 cm thick 10 YR 4/4 (dark yellowish brown) silty clay, subsoil-like band was encountered immediately below the topsoil. Below that, interbedded 5-10 cm thick 2.5 YR 2/4 (dark reddish brown) sandy silt and 7.5 YR 2/0 (black) charcoal-rich silty loam were present. In some places, these strata surmounted the subsoil-like material; in other shovel tests, a 10 YR 5/3 (brown) silty loam replaced the reddish or black layers, and the subsoil-like material was not found. However, all shovel tests excavated 4.6 m from the retaining wall (B 7-2 to B 12-2), demonstrated the subsoil-like material, with iron ore inclusions, between 20 - 30 cm below the surface.

Beginning with Transect 13 and continuing north through Transect 19, the thin subsoil-like band immediately below the topsoil pinched out (Figure 11). In its place was a 20 - 30 cm thick series of alternating reddish brown sandy silt, brown silt loam, and black charcoal above a 20 - 40 cm thick, compacted 2.5 YR 4/2 (dark reddish brown) sandy silt.



Figure 14. Subsoil Fill Over Reddish Brown Sandy Silt: North End of Trench A4.

Transects 20 and 21 rarely contained any of the dark reddish brown deposit. If present, like in shovel tests B 20-1, B 20-2, and B 21-1, it was found 40 - 48 cm below the surface. The majority of the shovel tests in these transects contained layers of brown, gray-brown, and black fill.

With the exception of the distribution of broken bottle glass (see **Artifact Analysis** below), the shovel tests revealed no artifact patterns, either horizontal or vertical. The tests did indicate late nineteenth and twentieth century disturbance to variable depths. Shovel test B 11-5 contained a fragment of a "NO DEPOSIT" bottle in a charcoal band 41 - 47 cm below the surface. A D-cell battery was found between 0 - 15 cm below surface in shovel test B 18-6. Coal cinders were found between 46 - 70 cm below the surface in shovel test B 9-3. According to historic sources, coal was not used in furnace operations until after 1873. In shovel test B 11-3, coal and coal ash were found between 45 - 51 cm below the surface.

The four test units were opened in an attempt to locate the northwest corner (Unit B-3) and the southwest corner (Units B-1, B-2, B-4) of the frame stock house (Figures 6 and 11). Unit B-3 was placed opposite the north end of the long retaining wall segment, and excavated to 20 - 25 cm below the surface. From 0 - 10 cm, a 10 YR 3/1 (very dark gray) silty clay loam topsoil was present. A 6 cm thick, 10 YR 6/8 (brownish yellow) sandy clay loam tapered out 50 cm from the west wall. Under this was a 2 cm thick band of 2.5 YR 4/4 (reddish brown) sand, above a 10 cm thick, 2.5 YR 4/4 (reddish brown) compacted sandy clay loam. No nails or other artifacts were recovered from Unit B-3; there was no evidence of structural remains.

Units B-1 and B-2 were excavated to 30 cm below the surface. These units were placed opposite the south end of the long retaining wall segment, straddling the line where the historic photographs indicated the south end of the stock house. From 0 - 12 cm, there was a 10 YR 3/1 (very dark gray) silt loam topsoil above a 10 YR 6/6 (brownish yellow) silt loam that was at least 18 cm thick and contained quartzite cobbles. No artifacts were recovered; there was no evidence of structural remains. Unit B-4 was extended from the south wall of Unit B-2. It was excavated to the base of the topsoil. It also showed no evidence of structural remains, although one of the two wrought nails found at Catocin Furnace was recovered from this unit.

Thus, testing in Area B indicated the presence of multiple fill events to at least 75 cm below the surface. Some of this fill consisted of subsoil-like material, which seems to have been deposited within 4.6 m of the retaining wall. The dark reddish brown sandy silt fill identified in Unit A-2 was found to extend over the area northwest of the retaining wall system. The first 15 cm of the deposit had been disturbed by twentieth century activities; depth of disturbance was variable. Test units failed to locate evidence of the frame stock house corners.

Area C

Nineteen 50 x 50 cm shovel tests and one 1.5 x 1.5 m test unit (Unit C-1) were excavated in Area C (Figure 11). The shovel tests were excavated to 50 cm below the surface. Shovel tests 1 and 2 in Transects 1 and 2, and shovel tests 1, 2, and 3 in Transect 3, were located at the base of the slope south of the retaining wall system. Shovel tests 1 and 2 in Transect 4 were located on the slope south of the retaining wall system. Shovel tests 3 - 7 in Transects 1 and 2 were located above the slope, south and west of the retaining wall system. Unit C-1 was located below the slope.

The ten shovel tests above the slope, west and south of the retaining wall system, revealed stratigraphy similar to that of Unit A-1 and the shovel tests in Area B, Transects 4 - 6. This consisted of a 4 - 10 cm thick, 10 YR 4/2 (dark grayish brown) silty clay loam over a variably thick series of gravel, slag, and stone layers. Shovel tests farther from the edge of the slope revealed the same brownish yellow subsoil-like material exposed in the floor of Unit A-1. As the edge of the slope was approached, the gravel, slag, and stone deposits became thicker. Two shovel tests on the slope were excavated to 20 and 30 cm. These revealed slag deposits.

The remaining seven shovel tests were excavated below the slope, south of the engine house area. The stratigraphy in this area, as in Area B, appeared to have resulted from multiple fill events. Like the slope, the deposits dipped to the southeast. All were capped with a 5 - 19 cm thick, 10 YR 2/2 (dark brown) silty loam. Below this nascent topsoil layer were three or four layers, each between 9 - 20 cm thick, of sandy loam slag, ash, and occasional brick fragments.

Unit C-1 was opened west of shovel test C 2-1; it was excavated to 50 cm below the surface. This unit confirmed the fill nature of this part of Area C. Seven strata were recognized (Figure 15). The profile varied across the unit, but in general consisted of 0 - 10 cm of 10 YR 3/6 (dark yellowish brown) loamy sand; 10 - 28 cm, 10 YR 5/4 (yellowish brown) loamy sand with slag; 28 - 50 cm over the southwest corner of the unit, 10 YR 4/4 (dark yellowish brown) sand with brick and charcoal; a 2 cm thick band at 28 cm in the northwest corner, 7.5 YR 3/4 (dark brown) compacted sand; a 6 cm thick band at 28 cm in the northeast corner, 2.5 Y 2/0 (black) sand-sized cinders; 30 - 50 cm over the northwest corner of the unit, 10 YR 4/4 (dark yellowish brown) compacted sand; and, 29 - 50 cm over the northeast corner of the unit, 5 YR 3/3 (dark reddish brown) sandy clay loam.

Artifacts recovered from the unit include five nails and two pieces of window glass, and three metal objects. This conforms to the contents of the seven shovel tests in this part of Area C. Of the 59 artifacts recovered from those shovel tests, 54 were Architecture related (including 26 nails and 23 pieces of window glass).

Thus, the section of Area C on top of the slope, west and south of the retaining wall system, revealed the presence of slag, gravel, and stone over a subsoil-like material. The shovel tests on the slope south of the retaining wall system contained slag. The test unit and shovel tests in the area below the slope and south of the engine house evidenced multiple fill or dumping episodes.

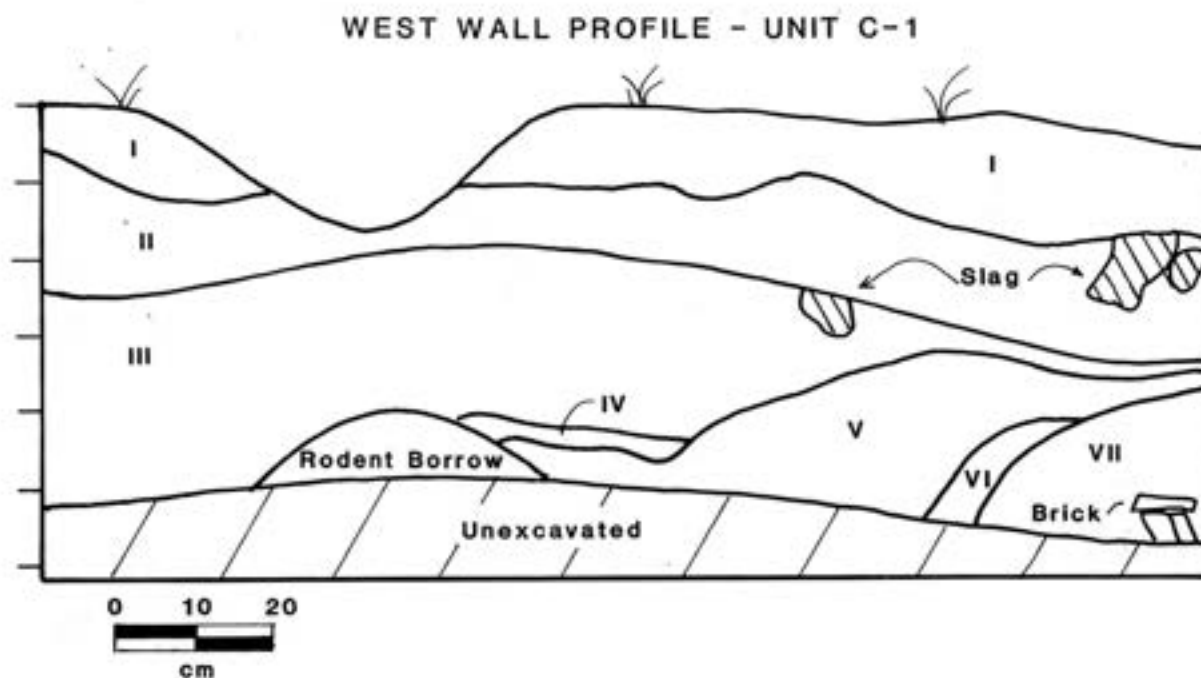
Area D

Area D1/D3. Two 1.0 x 1.5 m test units were excavated against the central retaining wall segment in Area D1/D3 (Figure 11). These units were labeled Unit D-1 (toward the south end of the wall) and Unit D-5 (at the north end of the wall). These numbers had been pre-assigned and the units were excavated before the field strategy was modified. There were no units D-2 and D-4. Unit D-3 is considered under Area D4. The purpose of the two test units D1 and D5 was to determine, if possible, the depth of fill at the base of the retaining wall. They also were designed to test for possible structural remains.

Unit D-1 was excavated into the rubble slope at the base of the retaining wall (Figure 16). Although the floor was level, the west (retaining wall) end was 60 cm below the surface and the east end was 35 cm below the surface. The stratigraphy consisted of 0 - 12 cm, 10 YR 2/1 (black) silty clay loam with pebble to boulder sized fragments of limestone (20 per cent of count), iron ore (40 per cent of count), and sandstone (40 per cent of count); 12 - 35 to 60 cm, 10 YR 3/2 (very dark grayish brown) sandy loam with pebble to boulder sized fragments of limestone (30 per cent of count), iron ore (35 per cent of count), and sandstone (35 per cent of count); 29 - 35 cm at the east end, 5 Y 4/2 (olive gray) sandy clay loam with pebble to boulder sized fragments of limestone (30 per cent of count), iron ore (60 per cent of count), and sandstone (10 per cent of count). The sandstone was similar to the material used in the construction of the furnace complex.

In the southwest corner of the unit, against the retaining wall, a 45 cm high, 70 cm deep sandstone and mortar feature was present that may represent structural remains (Figure 16). Approximately 35 per cent of this feature consisted of mortar; the sandstone was not set in even courses. Of the 18 artifacts recovered from Unit D-1, 14 were bottle glass fragments (12 machine-made amber). All artifacts came from the top 12 cm. The glass is thought to have been tourist deposited.

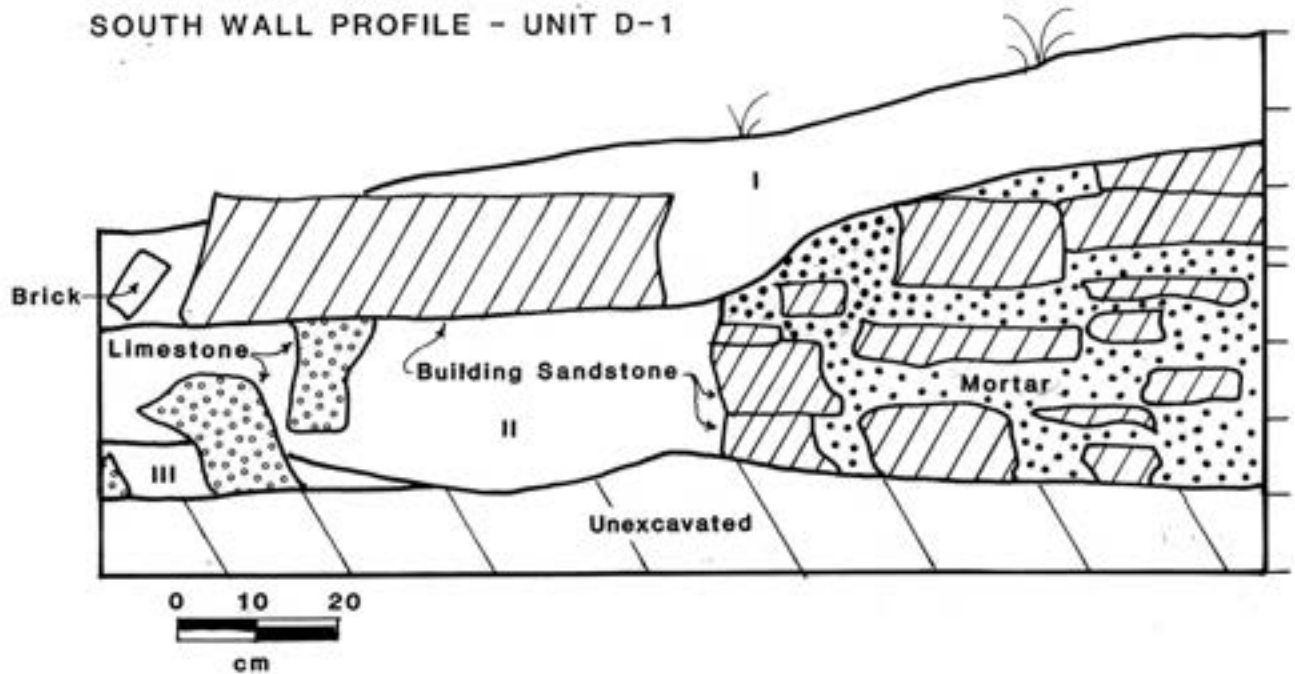
Unit D-5 was excavated into the rubble slope at the north end of the central retaining wall segment, 61 cm from the south-facing wall segment (Figure 17). The surface sloped west to east; the unit was excavated 50 cm deep at the west end, and 38 cm deep at the east end. Two strata were observed: 0 - 10



- I. 10 YR 3/6 Dark Yellowish Brown Loamy Sand
- II. 10 YR 5/4 Yellowish Brown Loamy Sand With Slag
- III. 10 YR 3/3 Dark Brown Sandy Loam With Brick And Charcoal Fragments
- IV. 10 YR 4/3 Brown/Dark Brown Extremely Compact Sandy Loam With Cobble-Sized Rock
- V. 7.5 YR 3/4 Dark Brown Sand
- VI. 10 YR 6/8 Brownish Yellow Extremely Compact Mottled Sandy Loam
2.5 Y 2/0 Black Extremely Compact Mottled Sandy Loam
- VII. 10 YR 4/4 Dark Yellowish Brown Very Compact Sand

Figure 15. West Wall Profile, Unit C-1.

SOUTH WALL PROFILE - UNIT D-1



- I. 10 YR 2/1 Black Silty Clay Loam With Angular Pebble-Boulder Size Limestone, Iron Ore, And Building Sandstone Fragments
- II. 10 YR 3/2 Very Dark Grayish Brown Sandy Loam With Angular Pebble-Boulder Size Limestone, Iron Ore, And Building Sandstone Fragments
- III. 5 Y 4/2 Olive Gray Sandy Clay Loam With Angular Pebble-Boulder Size Limestone, Iron Ore, And Building Sandstone Fragments

Figure 16. South Wall Profile, Unit D-1.

NORTH WALL PROFILE - UNIT D-5

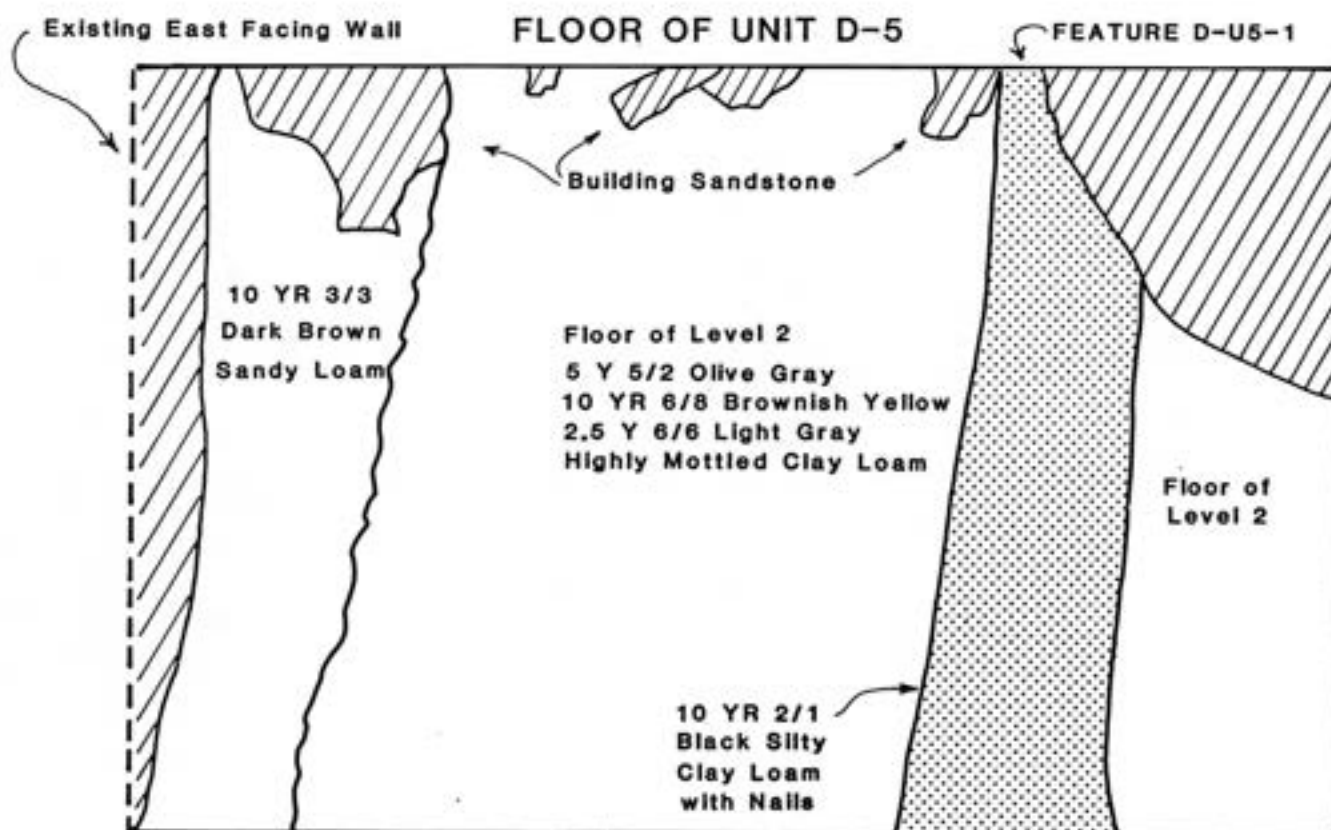
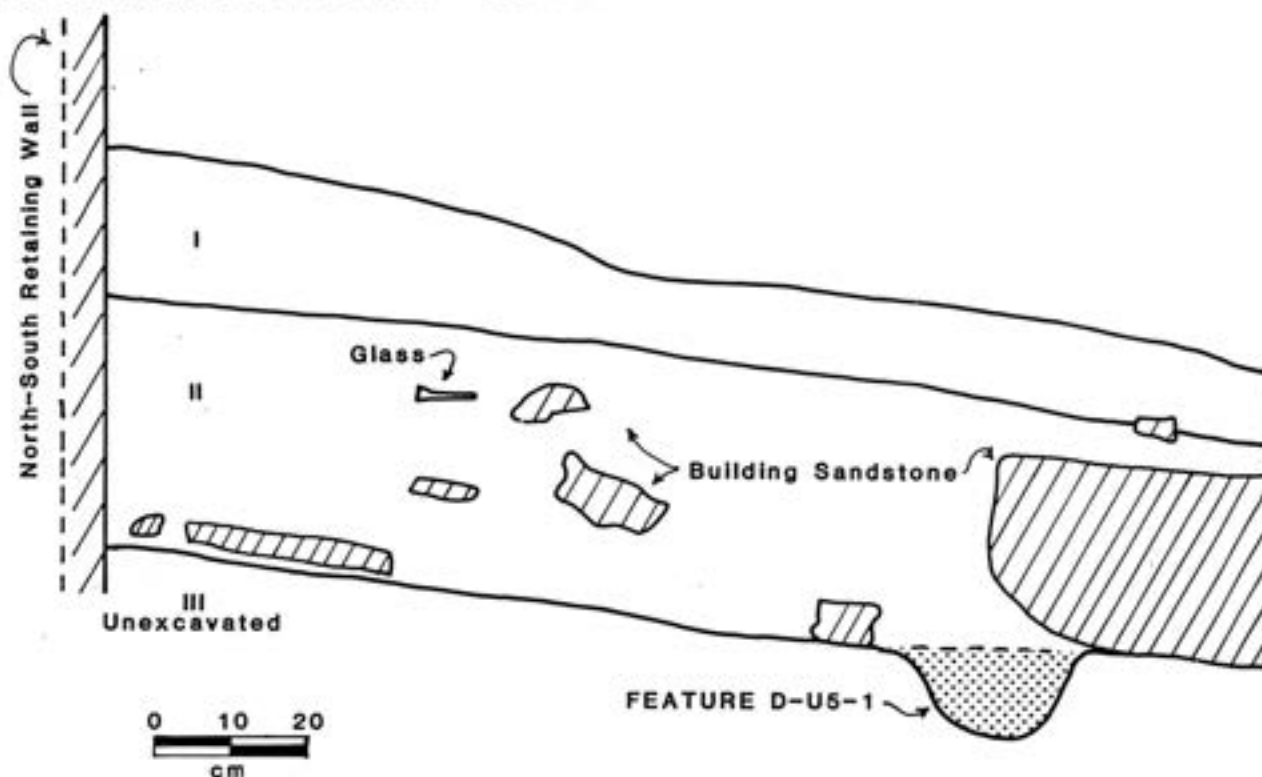


Figure 17. Plan View and Profile of Unit D-5 and Feature D-U5-1.

to 19 cm, 10 YR 2/1 (black) silty clay loam with sandstone and some slag; and 10 - 38 cm (east) to 19 - 50 cm (west) 10 YR 2/1 (black) compact silty clay loam with slag, slag glass, and historic artifacts. The floor of the unit was a 5 Y 5/2 (olive gray) clay loam.

Extending north-south across the west end of the unit floor was a 25 cm wide, 9 cm deep, feature similar in general appearance to the bands identified in Trench A-1 (Figure 17). This was labeled Feature D-U5-1; it consisted of 10 YR 2/1 (black) silty clay fill that included four wire nails and two unidentified pieces of metal. It is not known what the feature represented; it may have been the impression or cast of a board that was related to a structure in the area.

Six artifacts recovered from the top stratum included two amber glass bottle fragments, a flower pot fragment, a canning jar lid fragment, and two unidentified metal objects. Thirty-five artifacts came from the second stratum, of which 15 were broken bottle pieces, three were window glass fragments, and one was a wire nail.

Thus, the two units excavated in Area D1/D3 revealed the presence of possible structural remains. These consisted of a mortared sandstone feature in Unit D-1, and of a 25 cm wide, 9 cm deep stain in the floor of Unit D-5.

Area D4. Thirteen 50 x 50 cm shovel tests were excavated in Area D4 (Figure 11). A 1.0 x 1.5 m test unit (Unit D-3) also was excavated 1.5 m east of Area D4 (Figure 11). The remains of the engine house are present in Area D. This area was raked, photographed, and mapped.

Area D4 included the 3.5 m (10 ft) wide rectangular areas where compacted shale fill would be placed during construction. There were four such areas: one east of the south wall segment; one north of the north-facing wall segment; one east of the long central wall segment; and one south of the isolated northeast retaining wall. Shovel tests were placed as follows: one (D4-5) at the north end of the area east of the south wall segment; three, spaced at 3.5 m intervals, in the area north of the north-facing wall segment; and nine (D4-9 - D4-17) in the area east of the long central wall segment. No shovel tests were excavated opposite the isolated northeast retaining wall segment.

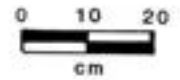
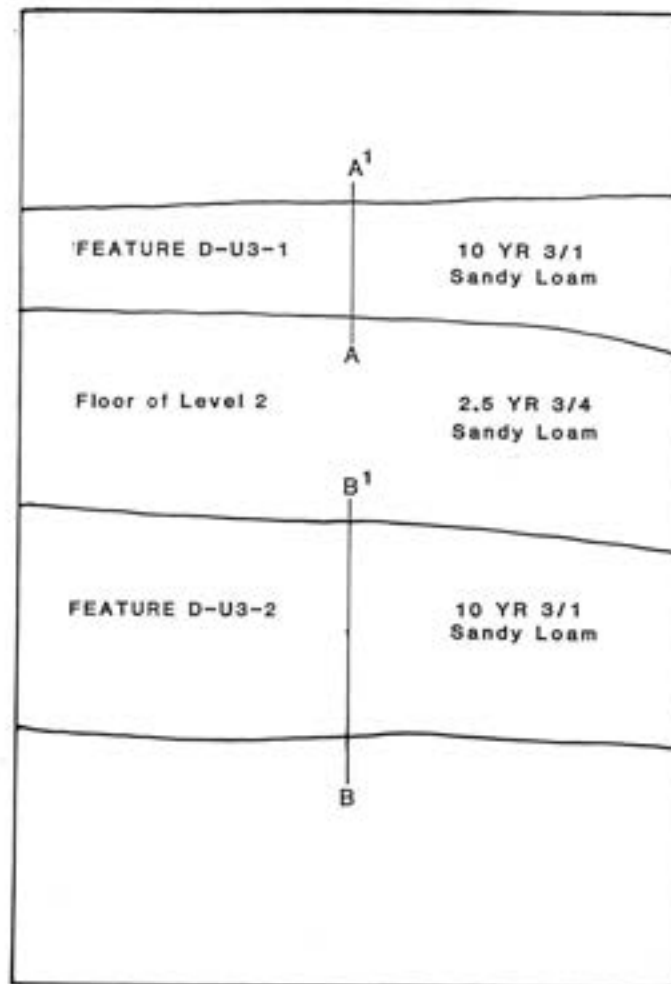
Shovel tests were excavated to 30 - 40 cm below the surface. Only D4-5 and D4-6 contained evidence of topsoil formation, in both cases about 10 cm thick. D4-5 was located near the engine house; the yellowish brown subsoil-like material was exposed at 11 cm below the surface. D4-6 exposed three layers of fill, stopping at 28 cm because of building stone.

The remaining 11 shovel tests were placed across the debris mounds east of the central retaining wall segment. Depending upon location, these revealed the presence of slag, partially refined iron ore, iron ore, and sandstone. Seven shovel tests recovered a total of 11 artifacts, six of which were broken bottle glass, two were pieces of slate roofing, one was a machine-cut nail, one was a button, and one was an unidentified piece of metal.

Unit D-3 was excavated into the toe slope of one of the debris piles, to explore the nature of the debris pile and to determine if structural remains were present under the pile. The surface of the unit sloped from west to east. The final excavation floor was level, although the west end was 31 cm below the surface and the east end was 11 cm below the surface. Two strata were exposed, a 10 YR 2/1 (black) silty clay loam with pebble to boulder sized slag and slag glass, above a 2.5 YR 3/4 (dark reddish brown) sandy loam which formed the floor of the unit. The only cultural materials present were three pieces of amber bottle glass.

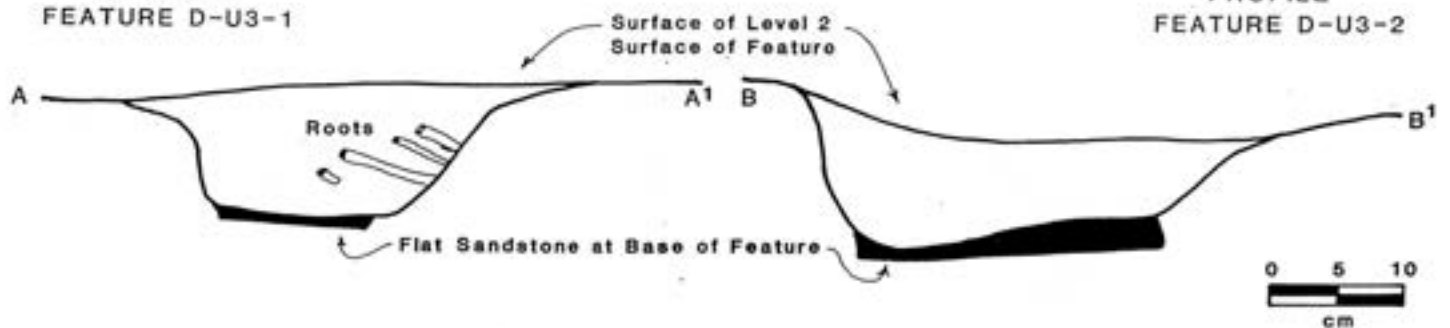
Two features similar to Feature D-U5-1 in Unit D-5 were exposed in the floor of Unit D-3. These were labeled Feature D-U3-1 and Feature D-U3-2 (Figure 18). Feature D-U3-1 was a 15 - 24 cm wide, roughly parallel sided, 11 cm deep band that extended north-south across the floor of the unit. Feature D-U3-2 was a 33 cm wide, roughly parallel sided, 10 cm deep band that was east of and parallel to Feature D-U3-1. Both features had in-sloping sides and flat bottoms. At the base of each of these stains was a flat, 1 - 2 cm thin piece of sandstone. The fill in both features was a 10 YR 3/1 (very dark gray) silt loam. Feature D-U3-1

UNIT D-3



N

PROFILE FEATURE D-U3-1



PROFILE FEATURE D-U3-2



Figure 18. Plan View and Profiles of Features D-U3-1 and D-U3-2.

contained two machine-cut nails; Feature D-U3-2 contained two machine-cut nails, a wire nail, and an unidentified iron object. These features may represent impressions or casts of boards that were related to a structure in the area.

Thus, shovel tests in Area D4 revealed that the debris piles east of the central retaining wall segment consisted of limestone, sandstone, partially smelted iron ore, and iron ore. In some cases (e.g., D4-15), the partially smelted iron appeared to have solidified within a furnace stack. Two features, similar to the band-like feature found in Unit D-5, were exposed in Unit D-3. It is possible that these features represent remains of a structure.

Area E

Twenty-two 50 x 50 cm shovel tests were excavated to 30 cm at 3.5 m intervals along the line that was Area E (Figure 11). The shovel tests were labeled sequentially from south to north. Eight of the shovel tests (E1 - E8) were near or crossed the engine house area (Figures 6 and 11). Shovel tests E1 and E2 had 20 - 22 cm of topsoil containing brick rubble over a yellowish brown to olive sandy clay loam. E3 exposed large, angular rocks. E4 exposed 18 cm of brick fragments. E5 could not be excavated because of a rock at the surface. E6 also exposed brick rubble to 30 cm, while E7 exposed an intact brick wall. E8, like E5, was stopped at the surface by a large rock.

The first eight shovel tests recovered 54 artifacts, including 39 fragments of window glass, five wire nails, two machine-cut nails, and one each of an unidentified nail, bottle glass fragment, perfume bottle, unidentified metal hardware, and a horseshoe. Architecture related items, then, accounted for 48 of the 54 artifacts. This, combined with the abundance of brick rubble, suggests that these materials derived from the engine house, and that the engine house was demolished.

The next three shovel tests (E9 - E11) exposed a previously undocumented structure at 7 - 15 cm below surface (Figure 19). Mortared stone and brick were set in a pavement or floor-like pattern. The land surface sloped from E9 up to E11, and the impression was that the structure floor exposed in E11 was also higher than that exposed in E9. In E11, a large chunk of iron was exposed in the shovel test. Only six artifacts were found in these shovel tests, all in E11. These consisted of four amber glass bottle fragments and two unidentified iron objects.

The next three shovel tests (E12 - E14) exposed stratigraphy like the casting house deposits described by Orr and Orr (1975) and Frye (1984). These three shovel tests had the same profiles: 0 - 7 to 11 cm, 10 YR 2/1 (black) silty loam with pebble sized slag fragments; 7/11 - 12/15 cm, 5 YR 5/4 (reddish brown) iron ore and brick fragments in sand; 12/15 - 22/23 cm, 10 YR 3/2 (very dark grayish brown) sandy loam with pebble sized stone, slag, and brick fragments; and 22/23 - 30 cm, 10 YR 6/8 (brownish yellow) - 7.5 YR 3/4 (dark brown) - 10 YR 4/4 (brownish yellow) sandy clay loam with pebble sized slag and limestone fragments. Eight artifacts were recovered: two machine-cut nails; two miscellaneous metal objects, and one each wire nail, spike, and bolt/bracket. Six of the eight objects were Architecture related.

Shovel tests E15 - E19 all contained a 6 - 17 cm thick black topsoil layer over deposits of slag and coal cinders (Figure 11). Much of the slag was cobble to boulder in size, suggesting a coke furnace. The reddish layers noted in shovel tests E12 - E14 were not present; instead, the colors tended toward gray and yellow browns.

Two shovel tests, E17 and E19, produced artifacts. E17 contained a clear glass bottle fragment, a window glass fragment, and a spike. E19 contained an amber glass bottle fragment and four pieces of roofing slate. Shovel tests E20 and E22 could not be dug because of large stones at the surface. E21 had the same stratigraphy as E15 - E19, except that no artifacts were recovered.

Thus, shovel tests across Area E documented deposits related to the demolition of the engine house (E1 - E7), a previously undocumented structure (E9 - E11), and a possible industrial activity area (E12 - E14).



Figure 19. Mortared Stone and Brick Floor in Shovel Test E 11.

Artifact Analysis

The 1,669 artifacts recovered are listed in Appendix I by provenience. The artifacts are distributed across nine functional categories (Table 2): Architecture, 1,052 (63.03 per cent); Kitchen, 497 (29.78 per cent); Furniture, 14 (0.84 per cent); Clothing, 10 (0.60 per cent); Activities, 7 (0.42 per cent); Personal, 4 (0.24 per cent); Arms, 1 (0.06 per cent); Transportation, 1 (0.06 per cent); and Miscellaneous or Unidentified, 83, (4.97 per cent).

Most of the Architecture category consisted of nails (920 of 1,052; 87.45 per cent), of which 870 were machine-cut, 33 were wire, and two were wrought. Another 92 items were fragments of window glass. Most of the window glass (53 pieces) was recovered from Area C (Unit C-1 and shovel test C 3-2), or from the nearby shovel test E2. These tests were immediately west of the engine house location (Figure 11), and the location of plate glass confirms results of Orr and Orr's (1976) testing in the engine house area. Of the six pieces of plate glass that they recovered, five came from their Unit 6, which was the southernmost of their test units (Orr and Orr 1975a).

The vast majority of the machine-cut nails (836 of 870) were recovered from the two sets of east-west trenches that crossed Area A into Area B. All of these were badly rusted; most came from the narrow, north-south, band-like stains exposed in the floors of the trenches. A minor concentration of machine-cut nails (22 nails) was recovered from two of the shovel tests and from the test unit in Area C. These also were rusted badly. Of the remaining 12 machine-cut nails, four were recovered from shovel tests immediately north of the engine house area (shovel tests E6, E7, and E12), five were recovered from Area D4 (shovel test D4-13, Unit D4-3), and three were recovered from shovel tests and a test unit north of the retaining wall system (shovel tests B 19-2, B 19-6, Unit A-2).

Thirty-three wire nails also were recovered. Unlike the machine-cut nails, which were concentrated in Area A, the greatest concentration of wire nails (11) was found in the general vicinity of the engine house area, with six coming from a shovel test and the test unit in Area C (shovel test C 3-2 and Unit C-1), and five from two shovel tests in Area E (shovel tests E2, E6). Six wire nails were found in two units excavated near the northern end of the central retaining wall segment (Units D4-3, D4-5). Four wire nails came from as many shovel tests south-southwest of the retaining wall system (shovel tests C 1-1, C 1-6, C 2-2, B 6-2). Another six came from Trench B-1, and one other came from Unit A-2. The remaining four wire nails came from shovel test B 16-5, which was located in a recent refuse pile northwest of the retaining wall system.

The condition of the machine-cut nails prevents exact dating. Uniformly produced, machine cut and headed nails were produced in the United States between 1830 - 1890 (Fontana and Greenleaf 1962). Although machines for cutting nails were used widely beginning in the late eighteenth and early nineteenth centuries, they were generally hand-headed (Nelson 1962; Hume 1970). In the 1830s, the French invented wire nails, and these were machine produced in France by 1850. Between 1850 - 1855, a few wire nail machines were exported to the United States. The wire nails produced were small, being used for cigar boxes, bookbinding, and the like (Nelson 1962). It was not until around 1870 that wire nails were manufactured in quantity for construction purposes (Fontana and Greenleaf 1962; Nelson 1962; Hume 1970). By around 1890, wire nails began to outnumber machine-cut nails.

Orr and Orr (1975b) cataloged two machine-cut nails from the engine house area, both of which still had wood adhering to them. It was conjectured earlier that the engine house probably dates from the early 1870s, since it was associated with the operation of Stack No. 3 (Deborah), built in 1873.

If wire nails were not available for general construction in the United States until around 1870, but exceed 50.0 per cent of the nails used by 1890, it may be possible to seriate the nail concentrations from around the engine house and from Area A. The engine house area produced 25 machine-cut nails from Areas C and E, and 11 wire nails from the same areas. Ignoring other factors, a generalized nail chronology would suggest that by 1890, 18 of the 36 nails recovered would be wire nails. Since 11 of the 36 nails found in the vicinity of the engine house were wire nails, this would suggest that 61.11 per cent (11/18ths) of the intervening 20 years between 1870 and 1890 had passed. This would result in an estimated date of 1882 for such a mixture of wire and machine-cut nails. In the trenches in Area A, 836 were machine-cut and 6

Table 2.

Distribution of Artifacts from Catoctin Furnace by Functional Category and Type

Functional Category	Material	Classification	Number
Architecture	metal	nail, wrought	2
	metal	nail, machine-cut	870
	metal	nail, wire	33
	metal	nail, unidentified	15
	metal	bolt/bracket	2
	metal	spike	10
	metal	other	10
	glass	window	92
	glass	light bulb	12
	stone	slate roofing	2
Kitchen	glass	bottle, clear	153
	glass	bottle, aqua	8
	glass	bottle, cobalt	6
	glass	bottle, green	12
	glass	bottle, amber	219
	glass	bottle, amethyst	2
	glass	other	28
	ceramic	redware	2
	ceramic	whiteware	7
	metal	screw cap	2
	metal	crown cap	5
	metal	tableware	1
	metal	canning jar lid	3
	metal	pull-tab	1
	plastic	other	1
	bio	shell	47
Activities	---	---	7
Furniture	---	---	14
Clothing	---	---	10
Arms	metal	cartridge	1
Transportation	metal	horseshoe	1
Miscellaneous	---	---	83

were wire. Using the same reasoning as before, this would result in an estimated date of 1870 for such a mixture of machine-cut and wire nails. Although this seriation is speculative and necessarily lacks precision, the relative proportion of wire nails in both areas indicates a date after 1870, when wire nails first were becoming available for construction, but before 1890, when wire nails generally made up at least half of the nails used.

Artifacts in the Kitchen category were the next most abundant, after Architecture materials, to be recovered from Catoctin Furnace (Table 2). Of the 497 items recovered, 400 were fragments of bottle glass, 28 were fragments of non-bottle glass, nine were ceramics, and 12 were an assortment of plastic and metal items like bottle caps and canning jar lid pieces.

Most of the bottle glass was either clear (153 pieces) or amber (219 pieces). Clear glass bottles would date roughly from the mid-nineteenth century to the present. According to Munsey (1970), clear bottles that depend upon arsenic as a decolorizing agent would date from the 1920s to the present. Amber colored bottles date from the latter half of the nineteenth century and continue to the present. Light colored amber bottles, using selenium as a decolorizing agent, became available in the early twentieth century and also continue to the present.

At Catoctin Furnace, the majority of the amber bottle fragments came from broken beer bottles. Most of these (150 pieces) were concentrated in the area north and northwest of the retaining wall system, while another 23 were found in test units and shovel tests placed in Area D1/3 and D4 east of the central retaining wall segment. These two areas also contained most of the clear glass bottle fragments (135 pieces). The distribution of the amber and clear bottle glass seems to represent sheet litter from visitors to Catoctin Furnace. The area northwest of a line between shovel test B 16-5 and B 20-5 appears to be a recent tourist refuse area. Ninety-seven of the amber bottle fragments and 111 of the clear bottle fragments came from shovel tests B 16-5, 19-6, and 20-6, as did 12 of the 14 items from the Furniture category, three of the seven from the Activities category, and three of the four from the Personal category. In fact, 309 of the 1,669 artifacts (18.51 per cent) recovered from testing at Catoctin Furnace came from those three shovel tests.

Other items in the Kitchen category that otherwise would have been useful for dating, i.e., cobalt blue glass fragments (6 pieces), whiteware (7 pieces), redware (2 pieces), were found in deposits that also contained twentieth century refuse.

Testing of Hypotheses

Eighteen hypotheses were proposed prior to field work. These are presented above in Chapter III, and are addressed here in light of the results of testing.

Hypothesis 1: If the northeast section of Area D1/D3 and D4 is the location of Stack No. 1 (Figure 6), then evidence of a stack foundation should be present. Associated artifacts should pre-date 1890, by which time the stack was known to have been dismantled (Contract Archaeology 1971). Data needed to falsify the hypothesis would be absence of a foundation with associated charcoal and burning, or presence of a foundation with artifacts post-dating 1890. This also would require falsification of Hypothesis 15 and Hypothesis 16. Data that would not falsify the hypothesis would be presence of a foundation with associated charcoal and burnt earth, and associated artifacts pre-dating 1890. This also would require that Hypothesis 15 and Hypothesis 16 would not be falsified.

Four shovel tests, E16 through E19, crossed the area in question (Figure 11). These were excavated to 25-30 cm below the surface. At the deepest levels, the shovel tests exposed coal cinders and boulder size slag. Slag of this size is associated with coke fueled iron furnaces (John Milner Associates 1981:46; cf. Frye 1984:110). Based upon this evidence, the shovel tests did not extend below deposits associated with the coke-fueled operation of Stack No. 3, which would post-date 1873. Consequently, field work was not adequate to test Hypothesis 1.

Hypothesis 2: If the northeast section of Area D1/D3 and Area D4 is the location of a bellows house (Figure 6), then there should be an associated water wheel pit. If Anderson (n.d.) and Orr and Orr (1975a, 1976, 1977) were correct, it would be found on the west side of the stack. If Contract Archaeology (1971) and Renner (1982) were correct, it would be found on the east side of the stack. Data needed to falsify the hypothesis would be the absence of a water wheel pit. Data needed to falsify the location of a demonstrated water wheel pit would be finding the pit on a side of the stack opposite its conjectured location. Data that would not falsify the hypothesis would be the presence of a water wheel pit, which would represent water deposited sediments. Falsification of Hypothesis 14 automatically will falsify Hypothesis 2.

As with Hypothesis 1, the shovel tests excavated in the appropriate area did not penetrate through the post-1873 deposits associated with Stack No. 3. The water-powered bellows house would date from the late eighteenth century. Consequently, field work was inadequate to test Hypothesis 2.

Hypothesis 3: If the charcoal house was located where Anderson (n.d.) suggested (northwest of the retaining wall system; Figure 6), then evidence of charcoal should be found in a sharply delimited area. Data needed to falsify the hypothesis would be the absence of dense concentrations of powdered and fragmentary charcoal from the shovel tests in the north end of Area B. If charcoal was present, the hypothesis would be falsified if the density of charcoal was no different than that found in any of the other shovel tests conducted over the area. Data needed to not falsify the hypothesis would be the finding of a dense concentrations of powdered or fragmentary charcoal, confined to a contiguous set of shovel tests within the north end of Area B.

Approximately 30 shovel tests were excavated across the north end of Area B within the bounds of where Anderson (n.d.) suggested that the charcoal house might be located (Figure 11). Charcoal frequencies ranged from few through common and abundant to pure lens in the following shovel tests: B 10-5; B 11-5, B 11-6; B 12-4; B 13-3 to B 13-6; B 14-3 to B 14-6; B 15-2 to B 15-5; B 16-1 to B 16-5; B 17-1, B 17-2, B 17-4, B 17-5; B 18-1, B 18-4 to B 18-6; and B 19-1, B 19-4 to B 19-6. These shovel tests cover a contiguous area, with the distribution of charcoal extending west from behind Stack No.2 and the probable location of Stack No. 1, then west and southwest after passing the retaining wall system (Figures 6 and 11). The densest charcoal concentrations were located between 38 - 50 cm below the surface.

A dense concentration of charcoal located in a contiguous set of shovel tests was encountered. Based upon this evidence, Hypothesis 3 cannot be falsified.

Hypothesis 4: If the charcoal house was located where Anderson (n.d.) suggested (Figure 6), then there should be evidence of structural remains, either as support post stains or as a prepared foundation. Because of the testing regime, it was not possible to falsify this hypothesis.

None of the shovel tests mentioned in regard to Hypothesis 3 exposed structural remains between 38-50 cm below the surface. The only Architecture Item recovered from those shovel tests, at depths greater than 20 cm, was a machine-cut nail from 50 cm in shovel test B 19-6. This evidence is inconclusive. Consequently, field work was inadequate to address Hypothesis 4.

Hypothesis 5: If the charcoal house was associated with Stack No. 2 (Isabella), then the associated artifacts should pre-date 1860. Data needed to falsify this hypothesis would be satisfaction of H3 but recovery of artifacts post-dating 1860 associated with an in situ band of charcoal. Data that would not falsify this hypothesis would be satisfaction of Hypothesis 3 and recovery of artifacts pre-dating 1860.

Although Hypothesis 3 was not falsified, only one artifact was recovered from below 20 cm in the shovel tests listed when Hypothesis 3 was addressed. This was the machine-cut nail from B 19-6. As with Hypothesis 4, the nail is inconclusive with respect to testing Hypothesis 5.

Hypothesis 6: If the frame structure shown above the central retaining wall segment in Figures 7, 8, 9, and 10 served as a stock house, then there would be evidence of a small gauge railroad needed to load and off-load fuel. Data needed to falsify this hypothesis would be the absence of a rail bed. Data that would not falsify this hypothesis would be the presence of a rail bed.

evidence for such a rail system within what would have been the stock house, this does not mean that such a line could not have been present west of the structure. Hypothesis 6 was found to be untestable as phrased.

Hypothesis 7: If the frame structure shown above the central retaining wall segment in Figures 7, 8, 9, and 10 served as a stock house for Stack No. 3 (Deborah), then anthracite coke, limestone, and iron ore will be present. Data needed to falsify this hypothesis would be failure to recover anthracite coke, limestone, and iron ore. Data that would not falsify this hypothesis would be recovery of anthracite coke, limestone, and iron ore in quantities exceeding the background noise possible from recovery of similar materials from adjacent parts of Areas A and B.

Trench A-2, Unit 5, and Trench B-2, Unit 1 exposed a low mound of coke. Trench B-2, Unit 2, exposed limestone gravel. These excavations were within the limits of the frame structure (Figures 6 and 11). Based upon this evidence, Hypothesis 7 cannot be falsified.

Hypothesis 8: If there were bins within the stock house, mentioned in Hypotheses 6 and 7, that unloaded by gravity from underneath, then evidence of footings for a gravity-fed bin system should be present. Data needed to falsify this hypothesis would be failure to expose footings and a rail connection arrangement necessary for a gravity-fed bin system. Data that would not falsify this hypothesis would be exposure of the footings and rail connection arrangement necessary for a gravity-fed bin system.

No evidence of bins, footings, or a rail system were exposed in Trenches A-1 through A-4 or B-1 through B-3. Hypothesis 8 is rejected: there is no evidence that the structure above the retaining wall system contained a gravity-fed bin system.

Hypothesis 9: If the area indicated at the south end of the wall was the location of the engine house associated with the Stack No. 3 (Deborah; Figure 6), then evidence for such a structure would be encountered. Data needed to falsify the hypothesis would be the absence of a structure floor. Data that would not falsify the hypothesis would be the presence of a structure floor. It should be noted that Orr and Orr (1976) did identify the presence of a structure there. Their evidence indicates that the hypothesis cannot be rejected.

Although the restructured field work conducted by Goodwin & Associates, Inc., excluded the possibility of exposing a structure floor in this area, it did document the presence of the engine house structure. This was represented by four limited depressions and by 41 3.8 cm (1.5 in) diameter threaded tie irons located in a rectangular area measuring 10.2 m (33.5 ft) north-south and 8.2 m (26.9 ft) east-west (Figure 11).

Hypothesis 10: If the area indicated at the south end of the wall was the location of the engine house associated with the Deborah furnace, then evidence that blowing machinery once had been present should be found. The testing regime was inadequate for demonstrating that machinery was not present. Data that would not falsify the hypothesis would be the presence of footings/mountings for machinery. It should be noted that Orr and Orr (1976) identified floor features within the structure that they interpreted as engine pits. Field work by Goodwin & Associates, Inc., did not alter that interpretation.

Hypothesis 11: If the four still stacks mentioned by Anderson (n.d.) and shown in Figures 8 and 9 were associated with the Stack No. 3 (Deborah), then there should be no evidence of another hot air oven to the west of Stack No. 3 (Deborah). Data needed to falsify the hypothesis would be evidence that a hot air furnace was present west of the Deborah furnace. Data that would not falsify the hypothesis would be the lack of evidence for a hot air furnace west of Stack No. 3 (Deborah).

The testing regime proved to be inadequate to address Hypothesis 11. Evidence of a structure was exposed in shovel tests E9 - E11 (Figure 11). This consisted of a mortared brick and stone floor. Too little area was exposed to determine the nature of this structure.

Hypothesis 12: If the Deborah furnace was hot-blast, then there should be no evidence of another hot air oven to the west of Stack No. 3 (Deborah). The data needed to test this hypothesis would be the same as those for Hypothesis 11. As with Hypothesis 11, the data available are insufficient to test Hypothesis 12.

Hypothesis 13: If the steam boiler associated with the Stack No. 3 (Deborah) was not located east of the conjectured location of the engine house, then it would have been located within the engine house. To test this, given the areas explored, the hypothesis must be phrased as: the steam boiler was located in the conjectured location of the engine house.

Falsification of this hypothesis would require evidence of an intact engine room floor showing no evidence of the damage that would have been caused by an exploding boiler, as well as evidence of non-boiler machinery that would account for both the space within and the function of the conjectured engine house. Data that would not falsify the hypothesis would be the combined presence of: 1) evidence that a building had been present; 2) evidence that the building suffered an explosion; 3) evidence of boiler footings; and 4) evidence of coal or coal ash (as opposed to the coke that would have been associated with the Deborah furnace). The results from Orr and Orr (1976) appear to falsify this hypothesis. They found intact timber beams in place. One such beam was identified and mapped by Goodwin & Associates, Inc., during the course of field work. These beams probably would have been damaged by a boiler explosion.

The proposition from which Hypothesis 13 is drawn is based in part upon Anderson's (n.d.) interpretation of a photograph that was reprinted by Contract Archaeology (1971:Plate 3B). Contract Archaeology (1971) argued that the photograph was taken in 1907 and portrays the dismantling of Stack No. 3 (Deborah). What Anderson (n.d.) would interpret as the exploded boiler, Contract Archaeology (1971) would interpret as the fallen smoke stack on the south side of Stack No. 3. It should be noted that the four smaller "smoke stacks" shown on the structure behind Stack No. 3 in Figure 9, as well as the frame structure that was on the retaining wall system, are not shown in the photograph under consideration. That photograph and Figure 7 both were taken from the same vantage.

Hypothesis 14: If a water powered bellows house was located just south of the isolated northeast retaining wall (H1), and if there was an associated water wheel pit (H2), then a spillway should be present. If Anderson (n.d.) and Orr and Orr (1977) were correct, it would be found on the west side of the structure (Figure 6). If Contract Archaeology (1971) and Renner (1982) were correct, it would be found on the east side of the structure (Figure 6). Data needed to falsify the hypothesis would be the absence of spillway. Data needed to falsify the location of a demonstrated spillway would be finding of such a pit on a side of the structure opposite its conjectured location. Data that would not falsify the hypothesis would be the presence of a spillway, containing water deposited sediments.

Testing of this area was insufficient to determine if a spillway was present. The shovel tests that crossed this area, E16 - E19 (Figure 11), were 30 cm deep, as specified in the Scope of Work. This depth proved inadequate to penetrate below the post-1873 deposits in this part of the site.

Hypothesis 15: If the structure that existed south of the isolated northeast retaining wall was Stack No. 1 (Figure 6), then a sand floor over subsoil, consisting of multiple sand layers and burnt sand, should be present (Orr and Orr 1975a). This would represent the associated casting house. Data needed to falsify the hypothesis would be the absence of evidence for a floor. Data that would not falsify the hypothesis would be the presence of a floor.

As with Hypotheses 1, 2, and 14, field work in this area was insufficient to test Hypotheses 15. The four shovel tests, E16 - E19, did not reach below what appear to be post-1873 deposits.

Hypothesis 16: If the structure that existed south of the isolated northeast retaining wall was Stack No. 1 (Figure 6), and if a casting house had been located adjacent to the south side of Stack No. 1, then evidence indicative of the function of the structure would be present in the form of iron slag and small solidified iron droplets. Data needed to falsify the hypothesis would be falsification of Hypothesis 15 plus

the absence of the casting residue that would be expected in such a structure. Data that would not falsify the hypothesis would be the presence, above background noise, of iron slag and/or solidified iron droplets. This also requires that H15 is not falsified.

As with Hypotheses 1, 2, 14, and 15, field work in this area was insufficient to test Hypothesis 16. The four shovel tests, E16 - E19, did not reach below what appear to be the post-1873 deposits.

Hypothesis 17: If the course of the race did trend to the south-southwest (Figure 6), then evidence of this race in the form of a channel and sediments should be located within the east part of Area C. Data needed to falsify the hypothesis would be the absence of a channel filled with water-deposited sediments. Data that would not falsify the hypothesis would be the presence of a channel containing water deposited sediments. If the tailrace was similar to that found at the Antietam Iron Works, then it may have functioned in a manner similar to a field drainage system. Ancillary data that would not falsify the hypothesis would be the drainage of a large volume of water flowing across the projected course of the race.

Subsurface testing did not reveal the presence of a tailrace. The ancillary data were present. At the time that field work was conducted, water was flowing from a spring that seemed to emerge from the base of the central retaining wall segment, approximately 11.0 - 12.0 m from the south end of the wall (Figure 11). This flowed east approximately 20 m, forming a 25 m² pool over shovel tests E8 and E9. This pool had a maximum depth of around 30 cm. Water flow was measured at 3006.5 cm³/sec, or roughly 180.4 liters/minute.

A second spring emerged on line with the center of the long retaining wall segment. This also flowed east for around 20 m, saturating a 7 m² area around shovel test E15 (Figure 11). Water flow was measured at 251.3 cm³/sec, or roughly 15.1 liters/minute.

In both cases, water continued to flow at the measured rates for at least a month, yet neither the 25 m² pool nor the 7 m² saturated area ever got any larger or deeper. Thus, over a 30 day period an estimated 8,445,600 liters of water flowed across a line around 20 m east of the retaining wall system and disappeared. Examination of the area east of the site, across Maryland Route 806, did not show any signs of water. The low lying area around Stack No. 2 (Isabella) and the casting house did not show any signs of water. The 60-75 cm deep depressions within the engine house area remained dry. It appears that a subsurface drainage system exists within the yard of Catoclin Furnace. It is possible that this system is based upon a tailrace that runs from the area of the isolated northeast retaining wall south out of the complex area (Figure 6).

Discussion

Depositional evidence from subsurface testing does not contradict the assertion by Mentzer (1974) and Orr and Orr (1979) that the land above and behind the retaining wall system is composed of slag fill and furnace spoil. The tests reported here were not sufficiently deep to determine the extent of this fill, but it is evident from testing that it extends at least 75 cm below the current land surface.

The presence of subsoil-like fill near the retaining wall initially was misinterpreted. It was thought at first that the wall had been built against a cut-back part of the Catoclin Mountain toe slope. Depositional evidence, especially from Trench A-4, suggests that this subsoil-like material was fill. Its source is unknown, but the observation by Fauth (1982) that the iron ore used by the furnace operation came from such material would suggest that the fill is spoil from iron mining operations. If an iron ore mine was located west and southwest of the current retaining wall system, the source of the subsoil-like material may be there.

The depositional evidence from Areas A and B would suggest that the dark reddish brown sandy silt prevalent over the northern part of those areas came from the operation of Stack No. 1 and Stack No. 2. This is based on three lines of reasoning. First, that massive deposit predates the deposition of the subsoil-like fill directly behind the retaining wall system. The material above that subsoil-like fill is laced with the cobble sized, vitreous slag associated with coke furnace operations. Furthermore, Unit A-2 indicates

that the dark reddish brown sandy silt deposit was cut back when the retaining wall was built, indicating that it pre-dates the retaining wall. Thus, the dark reddish brown sandy silt may pre-date the coke furnace, and therefore derives from the two charcoal furnaces.

Second, the dark reddish brown sandy silt is located nearest the two charcoal stacks, and dissipates as distance from them increases. This is as if a set height, roughly equal to the top of Stack No. 2, had been achieved, and the deposition of similar fill was made "overbank" in a southwesterly direction.

Third, charcoal at 38 - 50 cm below the surface extends west and then southwest, away from the charcoal stacks. A contiguous concentration of charcoal of this kind is not found south or east of a line drawn from shovel test B 9-5 northeast to shovel test B 14-2 (Figure 11).

This kind of pattern does not contradict the photographic evidence nor the suggestion that the subsoil-like fill came from iron mining operations. In Chapter III, it was observed that the trees shown south of the retaining wall system, especially in Figure 10, indicate that the rise in land probably was present in the mid-nineteenth century. If the dark reddish brown sandy silt represents the initial accumulation of furnace spoil behind Stack No. 1 and Stack No. 2, and if the mine fill was piled in an area south of where the retaining wall is now, then it is possible that a trough existed between these two points prior to the construction of the retaining wall. The retaining wall would have served, in part, to provide a barrier against which fill could be piled to level the area behind the wall. An interesting question that has not been asked, is why the wall is recessed back or west 15 - 20 m. If there was not a dual-mound arrangement of spoil before the wall was built, this would mean that an additional 3,700 m³ of fill had to be moved to accommodate the layout for an industrial plant that probably had yet to be built.

The presence of the end gabled, frame stock house on top of the retaining wall is known from historic photographs. No clear evidence, besides the distribution of nails and a coke pile, was found for this structure. It seems likely that the nails were deposited as a by-product of salvaging the building. The nails were not burned; in fact, there are no burned nails in the collection. Thus, it is unlikely that the frame building burned. Figure 8 seems to show the frame building being taken apart at the south end; at least, much of the clapboard siding is removed.

How the building was used is not known. The presence of coke may mean that it served for coke storage prior to the building of the Monocacy Valley Railroad in 1886, after which the historic documents suggest that coke was delivered to the yard area. Although it is not known what the band-like stains found in the trenches represent, it seems likely that not all are related to the structure. This is true especially for the fan-like arrangement found in Trench A-3, 4.0 - 8.1 m north of Trench A-2. The spread is reminiscent of land leveling, or of a pattern that occurs on a construction site when grading is done. The fact that these and other band-like stains are found, at least in Trench A-1, one above the other, means that they cannot be accepted as structural evidence without also accepting that the building component they would represent had been replaced numerous times. Certainly the two long, pale brown marks found in the top of the subsoil-like fill in Trench A-4 are not structural.

It is doubtful if much can be learned about the earlier furnace operations in the yard area, at least under present conditions. Balter's (1974) core suggests that slag fill exists to a depth of 1.2 m (4.0 ft) over some of this area. It seems likely that the east part of Stack No. 2 and the casting house rest close to the original elevation of the land. There may be a relatively thick blanket of furnace debris scattered over the mid-nineteenth century furnace yard.

The engine house appears to have been demolished, with the remains disposed to the south, at least based upon subsurface evidence in Area C (Figure 11). Area C also has evidence of fill episodes. However, that fill appears to contain much building rubble and waste: whole and broken bricks; nails; and broken window glass. That the land south of the engine house area is roughly level with the rest of the furnace yard also suggests that the earlier, mid-nineteenth century furnace yard may be buried below a substantial blanket of more recent refuse.

The furnace yard has a subsurface water drainage system, either intentional or accidental. One by-product of the retaining wall system and the fill behind it is that it fosters subsurface water discharge. That is, springs flow from the base of the retaining wall. The springs emerge from the recessed central retaining wall. There was no subsurface or surface water flow in the engine house area, despite a more permeable wall, the presence of a thick slag layer above that wall, and the 60 - 75 cm deep depressions within the bounds of the engine house. There also was no such flow on the north side of the furnace complex. All of this suggests that the subsurface water flow behind the retaining wall is focused before emerging. One possibility is that a trough-like landscape, now filled-in, once may have been present.

The volume of water during the period of field work was enormous. Orr and Orr (1976) also noted the presence of a spring emerging from the center of the retaining wall system. Their informant, William Renner, maintained that spring fed a horse watering "pond." Because of the need to remove water, it is possible that a tailrace survives under the deposits in the furnace yard. If it was built like the one documented by Frye (1984) at the nearby Antietam Iron Works, then it would have functioned like field drain tile. Given the effort expended on construction of the retaining wall, Kunkel may have had a subsurface drainage system built across the furnace yard.

CHAPTER VI SUMMARY OF RESULTS AND RECOMMENDATIONS

Summary of Results

Area A

Six test units and four trenches were excavated in Area A. Two of the test units (Units A-1 and A-2) were placed in areas east of the central retaining wall segment. Unit A-1 demonstrated a cobble sized vitreous slag over a subsoil-like fill. Unit A-2 revealed a massive deposit, at least 1.6 m thick, of dark reddish brown sandy silt, that probably represents waste from charcoal furnaces. This reddish brown deposit had been cut back from the south in a manner that suggested that it was in place prior to the construction of the retaining wall.

The four trenches exposed 109.5 m² within Area A adjacent to the central retaining wall segment. These trenches, generally excavated to 25 cm below the surface, sought traces of the end gabled frame stock house known from historic photographs. The excavations found no conclusive evidence of structural remains, although rusted machine-cut nails, probably left from the demolition of the building, were found in areas close to the approximate location of the building's west side.

One trench, Trench A-4, revealed that the subsoil-like fill material, encountered in shovel tests as well as in Unit A-1, rested over the dark reddish brown sandy silt fill identified in Unit A-2. Based upon this evidence, as well as on evidence from earlier borings (Balter 1974), it appears that considerable volumes of subsoil-like material were used as fill adjacent to the retaining wall. The source of the subsoil-like material is not known, but it bears a strong resemblance to the kind of iron ore bearing material described by Fauth (1982). Thus, it may be spoil from iron ore mining operations.

Area B

One-hundred-twelve shovel tests, four test units, and three trenches were excavated in Area B. The shovel tests revealed that fill in the south part of Area B included subsoil-like material at depths around 50 cm. This material was absent from the central part of Area B, which instead contained multiple layers or lenses of dark reddish brown sandy silt, brown silt loam, and black charcoal-rich silty loams. All of these were capped by 15 - 20 cm of recent topsoil and subsoil fill. The north part of Area B contained thick deposits of the dark reddish brown sandy silt, as well as banding similar to that found in the central area. Most of the charcoal found during shovel testing was located between 38 - 50 cm below the surface in the northern third of Area B. This charcoal may indicate the earlier presence of a charcoal house that served the needs of Stack No. 2 (Isabella).

The test units and trenches were excavated to locate signs of the end gabled frame stock house. Two of the trenches, Trench B-1 and Trench B-2, were western extensions of Trench A-1 and Trench A-2. Together, the units and trenches exposed 14.25 m². No conclusive evidence of structural remains was exposed. A large quantity of rusted machine-cut nails was recovered from Trench B-1 and Trench B-2 in the vicinity of where the west side of the frame stock house may have been.

Artifacts were limited in Area B. Besides nails, the most common artifact type recovered was amber glass bottle fragments. Most glass bottle fragments came from within 20 cm of the surface, with nearly all being located in the northern third of Area B. This material is thought to derive from tourist activities.

Area C

Nineteen shovel tests and one test unit were excavated in Area C. Ten of the shovel tests were placed south and west of the retaining wall system, near Unit A-1. These tests exposed layers of slag, slag

glass, and limestone, at times resting on subsoil-like material. Two more shovel tests were excavated in the slope south of the retaining wall system; both exposed slag layers. Together, these 12 shovel tests indicate that slag fill dominates the area behind the retaining wall, to depths of 50 - 75 cm.

The remaining seven shovel tests and the test unit were placed below the slope, south of both the retaining wall system and the engine house area. These documented multiple fill events, and building rubble and debris. Wire and machine-cut nails as well as broken window glass were recovered. It is possible that this deposit represents the remains of the demolished engine house. No trace was found of the possible underlying tailrace; however, the tests may not have been sufficiently deep to encounter that feature.

Area D

Area D1/D3. Two test units were excavated in Area D1/D3. Both were placed against the central retaining wall segment. Unit D-1 exposed a mortared stone feature of unknown purpose. The volume of mortar relative to stone was large. It is not known if this was an in situ structural fragment, or part of a demolished building piled into this area.

Unit D-5, set in the northwest corner of the retaining wall system, exposed a narrow, north-south band in the unit floor. Labeled Feature D-U5-1, this band contained four wire nails and two unidentifiable nails. This feature may represent the remains of a structure. However, similar bands were identified in the trenches in Areas A and B, where they did not appear to represent structural remains.

The artifacts recovered from these two test units were dominated by broken bottle glass. Of the 59 artifacts recovered from non-feature fill, 31 were pieces of broken bottle glass. The broken glass is thought to derive from tourist activity.

Area D4. Thirteen shovel tests were excavated in Area D4, and one test unit was placed 1.5 m east of the east edge of Area D4. These shovel tests confirmed that the rubble piles located at the base of the central retaining wall segment consist of slag, partially smelted iron ore, iron ore, limestone, and building sandstone.

Unit D-3 was excavated into the toe slope of one of the rubble mounds to determine if this or other of the mounds rested over structural remains. The unit exposed two band-like features, labeled Features D-U3-1 and D-U3-2, that were similar to Feature D-U5-1. Both were narrow, roughly parallel sided, trough-like stains oriented north-south. Both contained nails. Again, it is not confirmed that these represent structural remains, since similar impressions also containing nails were found in Areas A and B, where their structural relationship was unclear.

The remains of the engine house were located primarily in Area D4. Shovel tests associated with Area E crossed the engine house area, but no other subsurface testing was done. The engine house area was raked clear of vegetation, mapped, and photographed.

Area E

Twenty-two shovel tests were excavated along the silt barrier line represented by Area E. The southernmost seven of these (E1 - E7) exposed materials similar to those found in the below-slope part of Area C. These materials appear to represent debris from a demolished building, possibly the engine house. The artifacts were dominated by broken window glass and nails.

Three shovel tests (E9 - E11), located northeast of the north corner of the southernmost wall segment, exposed the masonry floor of an undocumented structure. This floor may be related to the structure shown in Figures 8 and 9 immediately west of Stack No. 3 (Deborah). Very little of this floor was exposed; the function of the structure could not be determined. Most of the artifacts recovered consisted of amber glass bottle fragments.

The remaining shovel tests documented variable fill layers across the remainder of the furnace yard. Cobble sized slag was found in many of these shovel tests; this slag is seen to be a by-product of Stack No. 3 (Deborah). The slag and fill deposit in this area agrees with Balter's (1974) coring that indicates fill to a depth of 1.2 m (4.0 ft).

Water flowing from two springs that emerged from the central retaining wall segment pooled and then disappeared around shovel tests E9 and E15. Water flow was measured at approximately 180.4 liters/minute for one and 15.1 liters/minute for the other. The water disappeared underground. It did not emerge across the Maryland Route 806 to the east, in the lower area around Stack No. 2 to the northeast, or in the 60 - 75 cm deep depressions in the engine house area to the south. The water flow continued at the above rate for at least 30 days, without the area of standing water becoming larger. Based upon this, it is possible that a subsurface drainage system exists for the furnace yard, either constructed intentionally, or as a by-product of the suspected north-south tailrace.

Recommendations

Catoctin Furnace (18 FR 29) is listed on the National Register of Historic Places as part of the Catoctin Furnace Historic District. It is described as an archeological site with some above ground remains (Rivoire et al. 1972). Consequently, it has been determined that the archeological deposits possess the quality of significance. Areas to be avoided, protected, or monitored during stabilization activities are shown in Figure 20.

Area A

Historic background research indicated that an end gabled frame structure, possibly a stock house, was present along the central retaining wall segment. This structure was present as early as 1890 and as late as 1906, based on historic photographs. Subsurface testing in Area A failed to locate irrefutable evidence of the structure. Artifacts, primarily machine-cut nails, that may have been related to its dismantling were found concentrated between 6.0 - 9.1 m (19.7 - 29.9 ft) from the retaining wall, a distance that is close to the structure's estimated maximum width of 9.1 - 10.7 m (30.0 - 35.0 ft). No other evidence of structures, documented or undocumented, was encountered in Area A.

Subsurface testing in Area A indicated that deposits immediately behind the retaining wall consist of fill to depths of at least 60 cm. Earlier boring data (Balter 1974) indicates fill to depths between 5.8 - 8.2 m (19.0 - 27.0 ft). Based upon this evidence, there is no indication that intact archeological deposits related to documented furnace activities or structures will be adversely impacted by construction activities. No further work is recommended for Area A.

However, since subsurface testing was shallow compared with the depths of fill documented by the earlier boring data, and since questions remain about the composition of the land behind the retaining wall, it is recommended that the excavations behind the wall be monitored by an archeologist. The purpose of the monitoring would be to document the nature and depth of the fill behind the wall, and to certify that structural remains are not present at deeper levels.

It must be cautioned that construction activities in the northeast part of Area A will be very close to the documented water race and locations of structures associated with later operation of Stack No. 2. No construction activity or machinery movement in Area A should extend beyond the eastern edge of the south-facing retaining wall segment.

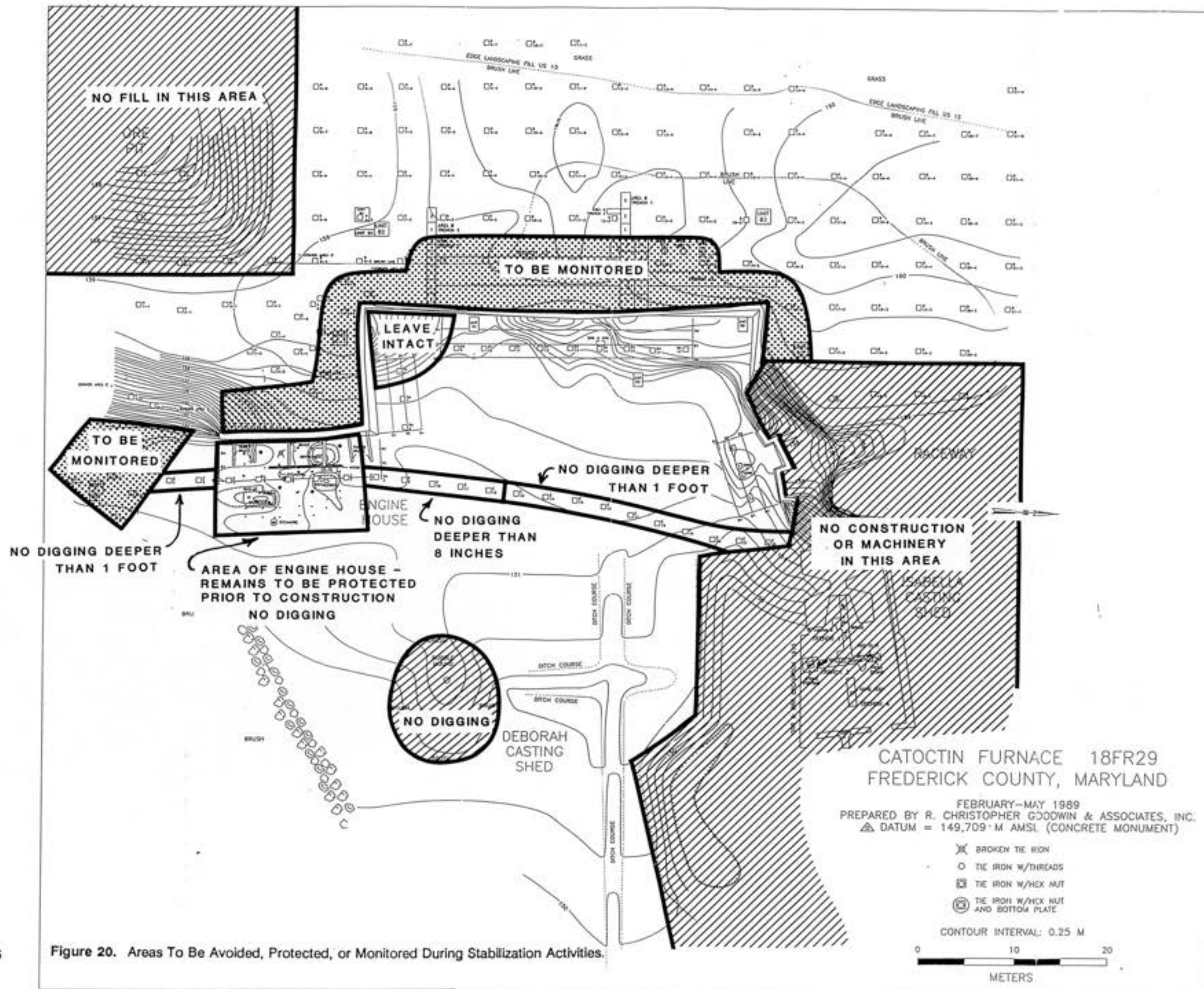


Figure 20. Areas To Be Avoided, Protected, or Monitored During Stabilization Activities.

Area B

Historic background research indicated the possibility that a charcoal house associated with mid-nineteenth furnace activities could be located in the northern part of Area B. Subsurface testing in Area B documented a contiguous area of charcoal between 38 - 50 cm below the surface. It is possible that this could be related to the possible charcoal house. Other subsurface testing in Area B indicated that the frame stock house located along the central retaining wall segment could have extended from Area A into Area B.

Subsurface testing in Area B revealed that the deposit consisted of multiple fill events to depths of at least 75 cm. Recent twentieth century artifacts were found in places over 40 cm below surface. Generally, the top 15 - 20 cm of the area appears to be recent fill. The north part of Area B appears to consist of furnace and casting house waste from the mid-nineteenth century and, possibly, earlier. The south end of Area B appears to consist of fill from iron ore mining operations.

Construction activities in Area B will consist of the movement of heavy machinery and the stockpiling of fill. The heavy machinery will not disturb deposits below 30 cm. The fill is to be placed in the southwest and northwest corners of Area B.

The absence of intact archeological deposits or structural remains above 30 cm, the recent nature of the fill to at least 15 - 20 cm, and the location at 38 - 50 cm of charcoal possibly related to a charcoal house, all indicate that the movement of heavy machinery in Area B will not have an adverse impact on intact archeological deposits. Similarly, the stockpiling of fill in the northwest corner of Area B will not adversely impact known cultural deposits. No further archeological work is recommended in these areas.

The stockpiling of fill in the southwest corner of Area B is not recommended. This area corresponds to the depression associated with the possible location of one of the earliest iron ore mines. This ore mine is considered to be a contributing element of the furnace complex. Stockpiling of fill in this area would fill part of that depression, thus destroying its character.

Area C

Historic background research and subsurface testing did not reveal the presence of intact archeological deposits or structures in Area C. The slope and above-slope parts of Area C appear to consist of coke-furnace slag over subsoil-like fill. There is no subsurface evidence to suggest that other archeological deposits related to furnace operations are located in those two parts of Area C.

The below-slope part of Area C appears to consist of building rubble and multiple fill events. No evidence of intact archeological deposits or building remains was encountered in this part of Area C. However, there is a possibility, based upon extrapolations from historic records as well as the subsurface drainage pattern observed at the site, that a surviving tailrace extends under this part of the furnace complex. Subsurface testing, which extended to 50 - 75 cm below the surface, was inadequate to locate such a feature. Construction plans call for excavation to a maximum depth of 1.5 m (5.0 ft) for a sediment trap in this area. Thus, it is recommended that the excavation of the sediment trap be monitored by an archeologist.

Area D

Area D1/D3. Historic background research, shovel testing, and surface reconnaissance indicated the presence of engine house ruins in Area D1/D3 at the south end of the retaining wall system. These ruins consist of four 60 - 75 cm deep depressions related to the design of the building, 41 vertical tie irons, one long wooden beam left from the building, and a series of near-surface masonry walls. Construction activities in this area call for placement of near-vertical support beams in individual holes.

Placement of the beams, which is necessary for consolidation of the existing retaining wall segment, appears to justify the minimal subsurface disturbance that will accompany placement of the near-vertical beams. However, movement of equipment over this area to gain access to the retaining wall segment is not recommended without measures being taken to prevent disturbance/destruction of the engine house ruins.

It is recommended that the surface of the engine house area, as well as the vertical tie irons, be protected from the movement of heavy machinery. It may be possible to fill the area with road gravel or a similar matrix to above the tie irons, to compact the introduced material, and then to move machinery above this mound. The construction contractor and an engineer should be consulted as to the best method for avoiding damage to the engine house ruins during the consolidation of this part of the retaining wall.

Subsurface testing and historic background research regarding the rest of Area D1/D3 only indicate that a structure, probably a water-powered bellows house, may have existed below the isolated northeast wall segment. Testing against the central retaining wall segment exposed traces that may be interpreted as structural remains, but the evidence is insufficient for a final determination. Most of this area is covered by deep piles of slag, partially smelted iron ore, and stone rubble. No adverse impact to the possible underlying structure remains is expected from the movement of machinery in this area, nor is it expected in the area below the isolated northeast retaining wall segment.

Placement of the near-vertical wall braces may have an adverse impact, depending on how their footings are excavated. It is recommended that excavation for these braces be limited strictly to the size of the necessary footing hole, and not extend beyond that size.

Area D2. Construction plans recommend that Area D2 be probed by the construction contractor for building stone. One shovel test was excavated into the slope of the talus mound that is represented by Area D2. Previous investigators have argued that this mound represents a stockpile of limestone flux for furnace operations. Given this and the intact nature of the surrounding retaining wall faces, it is doubtful if building stone suitable for the consolidation of the retaining wall will be found in Area D2. Unless required for the stabilization of the retaining wall, it is recommended that this pile of limestone, which may represent an integral part of the operation of the furnace complex, be left undisturbed.

Area D4. Area D4 represents the locations of compacted shale mounds that will serve as footings for angled wall bracing. With the exception of the engine house area, which was considered under Area D1/D3 above, there are no indications that construction activities will adversely impact intact archeological deposits or structural remains. No further archeological work is recommended.

Area E

Historic background research and subsurface testing revealed that Area E, which is the line along which either a straw bale or silt fence sediment trap will be placed, crosses the engine house area and part of an undocumented structure. Plans call for setting the straw bale line in a 10 cm (4.0 inch) deep trench, and the silt fence in a 20 cm (8.0 inch) groove. Because of the shallower disturbance, the use of straw bales is recommended.

In the area of the engine house, it is recommended that this line be moved east around 6.1 m (20.0 ft), beyond the limits of the engine house bolts. In the area of the undocumented structure, it is recommended that, instead of digging a shallow trench, the ground surface be raised 10 cm (4.0 inches) along either side of the bale line. This would avoid disturbing deposits related to the structure.

REFERENCES CITED

Alexander, J.H.

- 1840 *Report on the Manufacture of Iron*. Addressed to the Governor of Maryland. Wm. McNeir, Annapolis.

Anderson, Elizabeth Y.

- 1982 Catoctin Furnace Portrait of an Iron-Making Community. Paper presented in partial fulfillment for departmental honors in History in the Department of History and Political Sciences, Hood College, Frederick, Maryland.

- 1984 *Faith in the Furnace: A History of Harriet Chapel, Catoctin Furnace, Maryland*. Privately printed.

Anderson, Joel

- n.d. Hypotheses for Catoctin Furnace. Ms. prepared 1989 and on file with R. Christopher Goodwin & Associates, Inc., Frederick, Maryland.

Balter, Robert B.

- 1974 Boring profiles. Prepared by Soil & Foundation Consultants, Inc. and presented on Sheet 3 of plans for Retaining Wall and Stack Stabilization at Catoctin Furnace, Cunningham Falls.

Bastian, Tyler

- 1973 Historical and archeological significance of an abandoned iron mine in Cunningham Falls State Park near Catoctin Furnace, Frederick County, Maryland. Typescript, 19 pp. Manuscript on file Maryland Geological Survey.

Bining, Arthur C.

- 1938 *Pennsylvania Iron Manufacture in the Eighteenth Century*. Pennsylvania Historical and Museum Commission, Harrisburg.

Conrad, Geoffrey W.

- 1975 *Archeological Reconnaissance of U.S. 15 from Putnam Road to MD 77, Frederick County, Maryland*. Report submitted to the Maryland Department of Transportation.

Contract Archaeology, Inc.

- 1971 *An Historical and Archaeological Survey of Land Affected by the Dualization of U.S. Route 15 at the Catoctin Iron Furnace 1971*. Prepared by Contract Archaeology, Inc., for the State Highway Administration, Maryland Department of Transportation.

Fauth, John L.

- 1972 Re: Catoctin Furnace site: location and identification of iron ore and limestone(?) pit. Typescript, 3 pp. Manuscript on file Maryland Geological Survey.

- 1982 Report of the geological consultant. In *The Catoctin Furnace Archaeological Mitigation Project Final Report of the 1979 Excavation Contract F522-152-770. Part 1. Investigations and Site Synthesis*, compiled by Kenneth G. Orr and Ronald G. Orr, Appendix A. Prepared by Orr & Son, Archaeological Consultants, for the Maryland State Highway Administration.

Fontana, Bernard L., and J. Cameron Greenleaf

- 1962 Johnny Ward's Ranch. *The Kiva* 28 (1-2). Journal of the Arizona Archaeological and Historical Society.

Frye, Susan Winter

- 1984 *Archeological Excavations at the Antietam Iron Furnace Complex (18WA288) Washington County, Maryland*. Maryland Historical Trust Manuscript Series No. 37, Maryland Historical Trust, Annapolis.

Harrington, Jonathan W.

- 1982 A preliminary palynological analysis of borings at Catoctin Furnace, Maryland. In *The Catoctin Furnace Archaeological Mitigation Project Final Report of the 1979 Excavation Contract F522-152-770. Part 1. Investigations and Site Synthesis*, compiled by Kenneth G. Orr and Ronald G. Orr, Appendix B. Prepared by Orr & Son, Archaeological Consultants, for the Maryland State Highway Administration.

Hume, Ivor Noel

- 1970 *A Guide to Artifacts in Colonial America*. Knopf, New York.

James, Pamela

- 1974 Catoctin Furnace site history. Typescript, 4 pp. Prepared by Maryland Historical Trust. Manuscript on file, Maryland Geological Survey.

John Milner Associates

- 1980 *A Report on Archeological Excavations at Site 18FR320 Catoctin Furnace, Frederick County, Maryland*. Prepared by John Milner Associates, Inc., West Chester, for the Maryland State Highway Administration (*The Catoctin Furnace Archaeological Mitigation Project Final Report of the 1979 Excavation Contract F522-152-770. Part 2*).

- 1981 *Archeological Survey of Catoctin Furnace, Cunningham Falls State Park and Adjacent Areas, Frederick County, Maryland*. Prepared by John Milner Associates for State of Maryland Department of National Resources and Department of General Services.

- 1982 *A Report on the Excavation of an Ancillary Area (Site 18FR320) of the Historic Ironworking Complex at Catoctin Furnace, Frederick County, Maryland*. Prepared by John Milner Associates and submitted to the State Highway Administration, Maryland Department of Transportation.

Lantz, Emily Emerson

- 1925 Catoctin Furnace has rich past. *Baltimore Sun*, 1 October 1925: 7, 10.

Lesley, J.P.

- 1859 *The Iron Manufacturer's Guide to Furnaces, Forges and Rolling Mills of the United States*. New York.

Love, Ann Burnside

- 1973 Catoctin Furnace wall collapses. *The News* [Frederick, Maryland] 7 February 1973.

Matthews, Earl D.

- 1960 *Soil Survey of Frederick County, Maryland*. United States Department of Agriculture, Washington, D.C.

Mentzer, Frank

- 1972 The time and times of Catoctin Furnace. Serialized as 16 chapters in *The News* [Frederick, Maryland], 18 March - 5 April 1972.

- 1974 Catoctin Furnace, Catoctin, Maryland. *Echoes of History* 4(1): 1, 3-8

Mid-Atlantic Archaeological Research, Inc.

- 1980 *Archaeological Investigations at Catoctin Furnace, Frederick County, Maryland*. Prepared by Mid-Atlantic Archaeological Research, Inc., for the Maryland State Highway Administration (*The Catoctin Furnace Archaeological Mitigation Project Final Report of the 1979 Excavation Contract F522-152-770. Part 3*).

Munsey, Cecil

- 1970 *The Illustrated Guide to Collecting Bottles*. Hawthorn Books, New York.

National Heritage Corporation

- 1975 *Catoctin Furnace, Cunningham Falls State Park, Thurmont, Maryland: An Interim Report on the Status of the Historical Research Program*. Prepared by National Heritage Corporation for the State of Maryland Department of Natural Resources.

National Park Service

- 1969 *Man on Catoctin Mountain: Catoctin Furnace*. Man in His Environment Publication. National Park Service, Department of the Interior, Washington, D.C.

Nelson, Lee H.

- 1962 *Nail Chronology as an Aid to Dating Old Buildings*. National Park Service Technical Leaflet 15.

Orr, Kenneth G., and Ronald G. Orr

- 1975a Field Report on the Archaeological Situation at the Catoctin Furnace Stack 2 Casting Shed Site, Frederick County, Maryland. Ms. prepared for the Office of Design and Construction, Department of General Services, State of Maryland, and the Division of Archaeology, Maryland Geological Survey.
- 1975b Catoctin Furnace Wall Brace Cleats Project (F04), 1975: Field Catalogue. Handwritten manuscript, 12 pp. On file Maryland Geological Survey.
- 1976 Field Report on the Archaeological Investigations (FO4) of Areas of the Catoctin Furnace, Frederick, Maryland, Disturbed by 13 Temporary Shored Cleats of the Retaining Wall. Ms. prepared for the Maryland Department of Natural Resources, Annapolis.
- 1977 An Intensive Archaeological Survey of Alignment Corridor, U.S. Route 15 from Putnam Road to Maryland Route 77 in Frederick County, Maryland: Preliminary Draft. Ms. prepared for the Maryland Department of Transportation, State Highway Administration, Baltimore.
- 1982 *The Catoctin Furnace Archaeological Mitigation Project Final Report of the 1979 Excavation Contract F522-152-770. Part 1. Investigations and Site Synthesis*. Prepared by Orr & Son, Archaeological Consultants, for the Maryland State Highway Administration.

Peck, Donald W.

- 1979 *Archaeological Resources Assessment of the Monocacy River Region, Frederick and Carroll Counties, Maryland: Phases I and II*. Maryland Geological Survey.

Porter, Charles W.

- 1936 Preliminary historical report on the Catoctin Iron Furnace. Typescript, 9 pp. Manuscript on file, Maryland Geological Survey.

Renner, William G.

- 1982 Catoctin Furnace 1776. Map prepared by William G. Renner for personal use.

- Rice, Fern
n.d. Catoctin Furnace. Typescript, 7 pp. Manuscript produced after 1954 and before 1960. On file at the Maryland Geological Survey.
- Rivoire, J. Richard, Nancy Miller, and J. Glenn Little II
1972 National Register of Historic Places, Inventory -- Nomination Form: Catoctin Furnace Historic District. Maryland Historical Trust.
- Rutsch, Edward S.
1973 The Colonial Plantation Settlement Pattern in New Jersey: iron and agricultural examples. In *Economic and Social History of Colonial New Jersey*, edited by William C. Wright. New Jersey Historical Commission, Trenton.
- Scharf, J. Thomas
1882 *History of Western Maryland*. Two Volumes. Louis H. Everts, Philadelphia.
- Singewald, Joseph T., Jr.
1911 Report on the iron ores of Maryland, with an account of the iron industry. *Maryland Geological and Economic Survey* 9: 121-328.
- Spaur, Michael L.
1980 What's in the Catoctin Furnace Road Name? *The Post* [Frederick, Maryland] 24 September 1980: A-8.
- Stewart, R. Michael
1987 Rhyolite quarry and quarry-related sites in Maryland and Pennsylvania. *Archaeology of Eastern North America* 15: 47-57.
- Swank, James M.
1884 *History of the Manufacture Iron in All Ages*. James M. Swank, Philadelphia.
- Waesche, Norman E.
1936 Economic history of Catoctin Furnace. Paper submitted in Dr. Broadus Mitchell's course in American Economic History, Johns Hopkins University. Typescript, 31 pp. Manuscript on file at Maryland Geological Survey.
- Walker, Joseph E.
1966 *Hopewell Village: The Dynamics of a Nineteenth Century Iron-Making Village*. University of Pennsylvania Press, Philadelphia.
- Weeks, John R.
1941 Climate of Maryland and Delaware. In *Climate and Man. Yearbook of Agriculture 1941*, pp. 904-913. United States Department of Agriculture, Washington, D.C.
- Wireman, George W.
1969 *Gateway to the Mountains*. Hagerstown Bookbinding and Printing, Hagerstown.

ACKNOWLEDGEMENTS

This report was prepared with the assistance and support of many individuals. R. Christopher Goodwin & Associates, Inc., is grateful to Mr. Herbert D. Belknap, Department of General Services, State of Maryland; to Mr. Tyler Bastian, State Archeologist; to Ms. Beth Cole, Maryland Historical Trust; and, to Mr. William Miller, Superintendent, Cunningham Falls State Park, for their support and assistance.

The staffs of the Maryland Historical Trust in Annapolis and of the Maryland Geological Survey in Baltimore made available state site files, maps, and reports. The staff of the Maryland Room at the C. Burr Artz Library in Frederick, and of the Historical Society of Frederick County, in Frederick, were very helpful. We also would like to acknowledge the able and generous assistance of Mr. Joel Anderson, who made early photographs of the furnace complex available for use in this report, and who participated actively in research design formulation ("The Anderson Hypotheses").

Paul Patterson and Norman Charles served as crew chiefs; Colby Child, Nancy Hildreth, and Jeff Creasy worked in the field. Cyd Goodwin, Leslie McFaden, and Shirley Rambeau prepared the maps and figures for this report. Christy Bennett produced the report.

APPENDIX I
ARTIFACT PROVENIENCE TABLE

CATOCTIN FURNACE ARTIFACT PROVENIENCE TABLE

UNIT/STP LEVEL		DEPTH	FUNC	MTRL	CLASSIFICATION	#
A-U2	1		misc	stone	coal	4
			architec	glass	window glass	19
			kitchen	glass	aqua bottle fragment	1
			architec	metal	common nail	1
A-U2	3(str)	24-39	architec	metal	machine cut nail	1
A-U2	4	55-75	kitchen	glass	clear bottle fragment	1
A-T1-1	1		kitchen	plastic	bag	1
A-T1-3	2		architec	metal	machine cut nail	3
A-T1-4	2		architec	metal	spike	1
			architec	metal	machine cut nail	1
A-T1-5	2		architec	metal	machine cut nail	64
A-T1-5	3		architec	metal	machine cut nail	30
A-T1-5	4	14-25	architec	metal	machine cut nail	2
A-T1-7	1		kitchen	glass	aqua mach made base	1
			kitchen	glass	aqua bottle fragment	1
A-T1-10	1		kitchen	glass	clear mach made base	1
			kitchen	glass	clear bottle fragment	2
			kitchen	glass	cobalt bl bottle frag	3
			kitchen	glass	cobalt bl mach base	1
			kitchen	metal	screw cap	1
A-T2-1	2		architec	metal	machine cut nail	2
A-T2-2			architec	metal	machine cut nail	10
			architec	glass	window glass	1
A-T2-3	1		misc	metal	unidentified iron obj	5
			kitchen	metal	pulltab/key opener	2
A-T2-3	1		misc	metal	unidentified iron obj	1
			architec	metal	machine cut nail	3
			architec	metal	unidentified nail	1
			architec	glass	window glass fragment	1
A-T2-5	1		architec	metal	machine cut nail	25
			architec	metal	unidentified nail	3
A-T3	bckdrt		architec	metal	machine cut nail	4
			kitchen	glass	cobalt blue bot frag	1
B 2-4	1	0-15	architec	metal	cut/wrought nail	1
B 7-2			kitchen	glass	amber bottle fragment	2
B 1-4			architec	metal	spike	1
B 3 -1	1	0-17	architec	metal	spike	1
B 3 -3	3		kitchen	glass	amber bottle fragment	5
			kitchen	glass	clear bottle fragment	2
B 5 -7			misc	metal	unidentified iron obj	1
B 6 -2	1		architec	metal	wire common nail	1

B 6 -5	2		misc	metal	unidentified iron obj	1
B 6 -5	3,4,5		kitchen	glass	clear bottle fragment	1
			misc	metal	unidentified iron obj	5
			misc	metal	unidentified object	1
			architec	metal	other hardware	1
B 7 -1			misc	stone	coal	2
			kitchen	glass	unidentified tablegla	1
B 7 -2			misc	biological	charcoal	2
B 7 -6	1		kitchen	glass	amber bottle fragment	3
			kitchen	glass	amber machine mde lip	3
B 7 -7	1		kitchen	ceramic	redware,clear glaze	2
B 9 -2	1	0-29	kitchen	glass	amber bottle fragment	13
		0-29	kitchen	glass	clear bottle fragment	1
B 9 -5	1	0-17	kitchen	glass	clear bottle fragment	1
B 10-3	10	54-65	kitchen	glass	clear mach mde bottle	1
B 10-6	1		kitchen	glass	unidentified tablegla	2
			kitchen	biological	nuts/seeds/pits	1
B 11-5	8		kitchen	glass	amber bottle fragment	1
B 12-3	1		kitchen	glass	cobalt bl bottle frag	1
B 13-2	1		kitchen	glass	unidentified tablegla	1
B 13-4	1	0-16	kitchen	glass	clear bottle fragment	8
B 13-6	1	0-20	kitchen	glass	clear bottle fragment	1
		0-20	kitchen	glass	amber bottle fragment	9
		0-20	kitchen	biological	land snail	1
B 14-3	1	0-20	kitchen	glass	amber mach made base	1
		0-20	kitchen	glass	amber bottle fragment	1
B 16-4	surface		kitchen	glass	amber mach mde bottle	1
B 16-5	surface		activities	metal	tin can	1
			kitchen	metal	crown cap	1
			misc	plastic	unidentified syntheti	1
			kitchen	glass	clear bottle fragment	5
			kitchen	glass	clear mach made base	2
			kitchen	glass	amber mach made base	2
			kitchen	glass	clear mach made lip	4
			kitchen	glass	amber mach made lip	1
			kitchen	glass	amber bottle fragment	7
			kitchen	glass	amber mach mde bottle	1
B 16-5	1	0-15	kitchen	glass	clear mach mde bottle	1
		0-15	kitchen	glass	clear mach made base	6
		0-15	kitchen	glass	clear mach made lip	4
		0-15	kitchen	glass	clear bottle fragment	65
		0-15	kitchen	biological	unidentified bone	1
		0-15	personal	plastic	other	1
		0-15	architec	glass	light bulb	12
		0-15	kitchen	glass	tumbler	18
		0-15	kitchen	glass	green machine mde lip	5
		0-15	kitchen	glass	amber mach made base	1
		0-15	kitchen	glass	amber bottle fragment	60
		0-15	misc	metal	unidentified iron obj	3

		0-15	kitchen	glass	clear bottle fragment	5
		0-15	architec	metal	common nail	4
		0-15	furniture	metal	clock part	1
		0-15	furniture	metal	spring	1
		0-15	personal	metal	toothpaste tube	1
		0-15	kitchen	metal	table knife	1
		0-15	kitchen	glass	clear bottle fragment	3
		0-15	kitchen	metal	crown cap	4
		0-15	kitchen	metal	canning jar lid	2
		0-15	activities	metal	tin can	1
		0-15	personal	metal	razor blade	1
		0-15	furniture	ceramic	flower pot fragment	10
		0-15	kitchen	glass	amber bottle fragment	3
		0-15	kitchen	glass	clear bottle fragment	1
		0-15	kitchen	biological	butchered bones	18
		0-15	clothing	biological	fabric-machine sewn	8
B 16-5	2	15-28	misc	metal	unidentified iron obj	1
		15-28	kitchen	glass	clear bottle fragment	2
B 16-5	3	15-28	kitchen	glass	amber bottle fragment	1
			kitchen	glass	amber bottle fragment	1
B 17-2	1	0-29	kitchen	glass	amber bottle fragment	3
		0-29	architec	glass	window glass fragment	1
B 17-4	1	0-22	kitchen	glass	amber bottle fragment	25
		0-22	kitchen	glass	clear bottle fragment	2
		0-22	kitchen	glass	amber mach made lip	1
		0-22	kitchen	glass	amber mach made base	1
B 17-6	1	0-22	misc	metal	unidentified iron obj	2
			kitchen	glass	amber bottle fragment	5
B 18-2	1		kitchen	glass	amber mach made base	1
			kitchen	glass	amber mach made lip	1
B 18-3	1		kitchen	glass	amber mach made lip	2
			kitchen	glass	amber bottle fragment	1
B 18-4	1		kitchen	glass	amber bottle fragment	1
			kitchen	glass	amber mach made lip	1
			kitchen	glass	aqua mach made lip	1
			kitchen	glass	green bottle fragment	1
			kitchen	glass	clear bottle fragment	1
B 18-5	1	0- 9	kitchen	glass	machine made	1
B 18-7	1		kitchen	glass	table glass-plate	2
B 18-7	2		clothing	metal	white metal button	1
B 19-2	1		kitchen	glass	machine made bottle	1
			kitchen	glass	amber mach made base	1
			kitchen	glass	amber bottle fragment	3
			kitchen	glass	clear bottle fragment	1
			misc	metal	unidentified iron	1
B 19-2	5	45-56	misc	stone	inidentified stone	1
		45-56	architec	metal	machine cut nail	1
B 19-3	4	20-35	kitchen	glass	clear bottle fragment	1
B 19-4	2	10-20	misc	stone	unidentified stone	7
B 19-5	2	0-10	kitchen	glass	clear bottle fragment	1
		0-10	kitchen	glass	amber bottle fragment	2
B 19-5	2	10-40	misc	stone	unidentified stone	4
B 19-5	3	40-?	kitchen	glass	amber mach made base	1
B 19-6			misc	stone	stone unidentified	10

B 19-6	1		architec	metal	machine cut nail	1
			kitchen	glass	green machine bottle	1
			kitchen	glass	amber bottle fragment	15
			kitchen	glass	amber machine base	1
			kitchen	glass	clear bottle fragment	4
			kitchen	glass	green bottle fragment	1
B 19-7	3	37-50	misc	stone	meta rock-lowgrade	2
		37-50	misc	stone	sedimentary rock	2
B 20-1	3	13-30	kitchen	glass	clear bottle fragment	9
		13-30	kitchen	glass	amber bottle fragment	4
B 20-5	5		architec	metal	other hardware	1
B 20-5	base of excava	50	architec	metal	spike	1
B 20-6	1		kitchen	glass	amber mach made lip	2
			kitchen	glass	clear mach made lip	4
			kitchen	glass	clear bottle fragment	4
			kitchen	glass	clear mach made base	1
			kitchen	glass	amber mach made base	3
			kitchen	glass	green bottle fragment	2
			architec	glass	window glass	1
			kitchen	ceramic	whiteware	3
B 21-1	1	0-16	misc	stone	inidentified stone	4
B 21-3	2	15-29	misc	stone	unidentified stone	11
B-T1-1	3		architec	metal	machine cut nail	521
			architec	metal	common nail	6
			architec	glass	window glass	1
B-T1-2	3		architec	metal	machine cut nail	1
B-T1-3	1	0-10	kitchen	glass	clear bottle fragment	1
B-T1-3	2		architec	metal	machine cut nail	1
B-T2-1			architec	metal	machine cut nail	163
B-T2-2	1		architec	metal	machine cut nail	10
C 1 -5		0-12	kitchen	glass	table glassware	1
		0-12	kitchen	ceramic	whiteware	3
C 1 -1	3	30-40	architec	glass	window glass	2
		30-40	architec	metal	common nail	1
		30-40	misc	metal	unidentified iron obj	1
C 1 -6	1	0-10	architec	metal	common nail	1
C 2 -1	3	18-50	misc	biological	unmodified wood	1
C 2 -2	1	0-15	architec	metal	cut/wrought nail	1
C 2 -2	2		architec	metal	common nail	1
C 2 -4	3	38-50	kitchen	glass	clear bottle fragment	1
		38-50	misc	stone	unidentified stone	1
C 2 -5	2	10-50	architec	metal	machine cut nail	1
C 2 -7	2	15-40	kitchen	glass	amber bottle fragment	1
C 3 -1	1	0-80	architec	metal	machine cut nail	5
C 3 -2	3		architec	metal	bolt/bracket	1
			architec	metal	spike	3
			kitchen	biological	land snail	1

			architec	metal	machine cut nail	13
			architec	metal	common nail	3
C 3 -2	4	45-66	architec	metal	machine cut nail	2
		45-66	kitchen	biological	oyster shell	1
		45-66	architec	glass	window glass	21
		45-66	architec	metal	common nail	1
C 3 -3	1	0-5	kitchen	biological	land snail	1
C-U1		8	kitchen	ceramic	whiteware	1
C-U1	1		architec	metal	machine cut nail	1
			architec	metal	unidentified nail	1
			misc	biological	charcoal	1
C-U1	3	NE corner	architec	metal	spike	1
		43-45	misc	metal	uniden non-ferrous	1
C-U1	4	43-45	architec	glass	window glass	2
			architec	metal	common nail	2
			architec	metal	unidentified nail	1
C-U1	5		misc	metal	unidentified iron obj	3
			misc	metal	unidentified object	1
			architec	metal	other hardware	1
D4-1- 6	1		clothing	metal	iron/steel button	1
D4-1- 8	1		kitchen	glass	amber bottle fragment	1
D4-1-11	1		kitchen	glass	aqua bottle fragment	1
			kitchen	glass	amber bottle fragment	2
			kitchen	glass	green bottle fragment	1
D4-1-12			kitchen	biological	turtle shell	22
			kitchen	glass	amber mach made lip	1
D4-1-13	1	0-30	architec	metal	machine cut nail	1
D4-1-14	1		misc	metal	unidentified iron obj	1
D4-1-15	1		architec	stone	slate roofing	2
DD-U1	1		kitchen	glass	amber mach made base	1
			kitchen	glass	green bottle fragment	1
			misc	biological	charcoal	3
			activities	metal	non-electrical wire	1
D-U1	2	38-43	kitchen	glass	amber mach made base	4
		38-43	kitchen	glass	amber bottle fragment	7
		38-43	kitchen	glass	aqua bottle fragment	1
D-U3	1		kitchen	biological	unidentified bone	1
			kitchen	glass	amber bottle fragment	2
			kitchen	glass	amber mach made base	1
D-U3-F1		2	architec	metal	machine cut nail	2
D-U3-F2		2	architec	metal	common nail	1
			misc	metal	unidentified iron obj	1
			architec	metal	machine cut nail	2
D-U5	1		kitchen	glass	amber bottle fragment	2
			misc	metal	slag sample	1
			furniture	ceramic	flower pot fragment	1
			kitchen	metal	canning jar lid	1
			misc	metal	unidentified object	1
D-U5	2		kitchen	glass	tumbler	1

			kitchen	glass	aqua bottle fragment	2
			architec	glass	window glass	3
			kitchen	glass	clear bottle fragment	4
			architec	metal	common nail	1
			furniture	ceramic	flower pot fragment	1
			misc	stone	unidentified	1
			misc	plastic	unidentified synthetc	1
			activities	metal	tin can	3
			kitchen	glass	amethyst bottle frag	1
			kitchen	glass	amber bottle fragment	1
			activities	plastic	other	1
			arms	metal	percussion cap	1
			kitchen	metal	screw cap	1
			architec	glass	plumbing/elec fixture	6
			kitchen	glass	amethyst mch mde base	1
D-U5	2		kitchen	glass	amber mach mde bottle	1
			kitchen	glass	clear mach mde bottle	5
D-U5-F1	3		architec	metal	common nail	4
			architec	metal	unidentified nail	2
E 1 -1	1	0-11	architec	glass	window glass	2
		0-11	kitchen	glass	clear bottle fragment	1
E 1 -1	2	11-30	misc	stone	unidentified	1
E 1 -2	2	10-17	architec	glass	window glass	30
		10-17	misc	stone	coal	1
		10-17	architec	metal	unidentified nail	2
		10-17	architec	metal	common nail	4
E 1 -2	3	17-30	architec	glass	window glass	7
E 1 -6	1		personal	glass	perfume bottle	1
			transportation	metal	horseshoe	1
			architec	metal	common nail	1
			architec	metal	machine cut nail	1
			architec	metal	other hardware	1
E 1 -7	1		architec	metal	machine cut nail	1
E 1-11	2		misc	metal	unidentified iron obj	2
E 1-11	16		kitchen	glass	amber bottle fragment	3
			kitchen	glass	amber mach made lip	1
E 1-12			architec	metal	machine cut nail	2
E 1-13	1	0-5	misc	metal	unidentified mtl obj	2
		0-5	architec	metal	common nail	1
E 1-13	2		misc	metal	slag	1
			architec	metal	bolt/bracket	1
E 1-14	1	0-10	architec	metal	unidentified nail	5
			architec	metal	spike	1
E 1-17	1		kitchen	glass	clear bottle fragment	1
			architec	glass	window glass	1
			architec	metal	spike	1
E 1-19	1		kitchen	glass	amber bottle fragment	1
			architec	stone	roofing slate	4

APPENDIX II

SCOPE OF WORK

Request for Proposal
Archeological Investigation at Catoctin Furnace,
Frederick County Maryland

Closing Date: November 25, 1988

I. General Information

1.1 Project Summary

The State of Maryland Department of General Services seeks proposals from qualified consultants to undertake intensive archeological testing adjacent to the historic retaining wall at Catoctin Furnace. The objective of the archeological work is to determine whether excavations for proposed stabilization of the retaining wall will disturb significant archeological deposits and, should the archeological testing indicate the need, to develop a plan for additional archeological work.

1.2 Issuing Office and Procurement Officer

The Issuing Office is:

Office of Engineering and Construction
Department of General Services
301 West Preston Street, Room 1405
Baltimore, Maryland 21201
(301) 225-4435

The Procurement Officer is Frank Kuchta, Director
Office of Engineering and
Construction

Herbert D. Belknap - Designee
Project Administrator
(301) 225-4344

The sole point of contact in the State for the purpose
of this RFP is the Procurement Officer, or his designee.

1.3 Pre-Proposal Conference will not be held in
conjunction with this RFP.

1.4 Questions and Inquiries.

Questions and inquiries should be directed to the Procurement Officer referenced above or his designee.

1.5 Amendment and Cancellation of RFP

If this RFP requires revision, the amendment will be provided to all vendors sent this RFP. Receipt of amendments must be acknowledged in writing by prospective vendors. The State may cancel this RFP in whole or in part, at any time before opening of the proposals.

1.6 Proposal Acceptance

The State reserves the right to accept or reject any and all proposals, in whole or in part, received as a result of this RFP, to waive minor irregularities, or to negotiate with all responsible vendors, in any manner necessary, to serve the best interests of the State of Maryland.

1.7 Incurred Expenses

The State will not be responsible for any costs incurred by any vendor in preparing and submitting a proposal.

1.8 Closing Date

The Issuing Office must receive an original and one copies of the proposal in a sealed envelope captioned "Proposal - Catoctin Furnace Archeology" at the above stated address no later than 3 P.M. on November 25, 1988. Proposals, modifications, or withdrawals received after 3 P.M. on the closing date will not be considered.

II. Vendor's Qualifications and Performance Standards

Offerers must have experience in successful completion of projects in industrial archeology including field work, data analysis, and report preparation. Key personnel qualifications and the archeological work are to conform to the Secretary of the Interior's 1983 "Standards and Guidelines for Archeology and Historic Preservation" and to the "Guidelines for Archeological Investigations in Maryland."

III. Scope of Services

3.1 Background

Catoctin Furnace is an extensive late 18th and 19th century iron mining and smelting complex located near U.S. Rte 15 north of Frederick, Maryland. The project area is in Cunningham Falls State Park administered by the Maryland Forest, Park and Wildlife Service, Department of Natural Resources. All of the project area is included in the National Register listed Catoctin Historic District.

This RFP concerns only a small part of the Catoctin industrial complex: a stone retaining wall at the primary iron smelting area (see attached drawings #8 and 11). The wall and an adjoining stack and reconstructed casting shed are the most prominent features in the project area.

The approved plan is to stabilize the wall by inserting concrete cribbing behind it as shown in drawing #8. Construction of the cribbing will require excavation of an area approximately 25 by 250 feet behind the wall as shown in drawings #8 and 11. In front of the wall, installation of temporary bracing will require excavation of a trench 1 foot deep by 4 feet wide along much of the exterior foot of

the wall and installation of mounded earth pads covering an area 10 by 200 feet in an area of above ground features and surface irregularities. Moreover, salvaging of fallen wall stones may also disturb archeological deposits.

Previous archeological work within the project area has included mechanical trenching and boring behind the retaining wall and small hand excavation in front of the wall. The archeological test trenches were mechanically dug roughly perpendicular to the wall during 1971 investigations in connection with the then proposed dualization of U.S. Rte. 15 (Contract Archaeology, Inc., 1971; see attached Exhibit A). These trenches extended into the present project area behind the wall and revealed slag fill but no evidence of the charcoal shed that once stood there. However, the excavation and deposits are not detailed in the project report, and since the trenches were dug mechanically, it is possible that archeological evidence of the charcoal shed and any other structures that may have been present were overlooked. Subsequent borings behind the wall indicated a loose mixture of sand, silt, ashes, and slag that varied in depth from 19 to 24 feet below the surface (National Heritage Corporation 1974). A more detailed archeological examination of the area behind the wall is now required as specified in 3.3 below.

Another archeological investigation was conducted in front of the wall in connection with the implanting of the cleats for the existing wood braces (Orr and Orr 1976). This work revealed a number of features and indicates the need for more evaluation of the archeological potential where there is to be ground disturbance in recovering fallen wall stone or installation of steel braces, especially the north pair near the standing stack and those at the south wall segment. Borings in front of the wall revealed four feet of sand, silt, and slag fill (National Heritage Corporation 1974).

Some archeological work may have been conducted by the National Park Service in 1936 in the area of wall collapse adjacent to the bellows house and perhaps elsewhere within the present project area, but the available source on that work is vague (Mentzer 1972). The 1936 work focused on the vicinity of the casting shed which is outside the area of present concern and was also the scene of archeological work in connection with the reconstruction of the casting house (Orr and Orr 1975). The extensive archeological work carried out in connection with the dualization of U.S. Route 15 is not directly relevant to the present project (except for the 1971 trench mentioned above).

Archeological work in connection with the proposed stabilization of the Catoctin retaining wall is to be

| 21 Oct 1988

carried out in three phases: (1) intensive testing, (2) data recovery in front of the wall and near the surface behind the wall, and (3) data recovery during contractor excavation of the deep trench behind the wall. THE PRESENT RFP CONCERNS ONLY THE FIRST PHASE: INTENSIVE TESTING.

The first phase will sufficiently test all areas to be impacted by the proposed stabilization project in order to develop a data recovery plan for those areas where significant archeological features are found. Excluded from the first phase is deep testing behind the wall where archeological excavation is not practical in terms of safety and deposit depth.

The second phase (not part of this RFP) will be data recovery in those areas identified during the first phase as requiring extensive excavation. It is not anticipated that this phase will involve excavation of deep deposits behind the wall.

The third phase (not part of this RFP) will involve monitoring of contractor excavation of the deep deposits behind the wall. These deposits are expected to be largely void of archeological interest except at or near their base where there may be important information about the age of

the wall and about use of the site prior to construction of the wall.

3.2 Purpose

Extensive archeological testing is required in order to determine if the proposed stabilization project will adversely impact significant archeological remains and, if it will, to prepare a detailed design for an appropriate archeological data recovery program.

3.3 Archeological Services Required

Relevant historical and archeological reports on the Catoctin Furnace retaining wall area are to be reviewed, and archeological field investigations are to be undertaken in areas to be disturbed by the proposed wall stabilization project as outlined above and detailed below. Reports and documents on previous archeological investigations at Catoctin Furnace are available for inspection at the Maryland Historical Trust and at the Maryland Geological Survey's Division of Archeology.

A grid system in English units consistent with previous work at the site is to be established.

The project area will be subjected to a detailed surface reconnaissance before excavation begins, and previously unrecorded surface features will be described and mapped.

All excavations will be backfilled.

The archeological testing is to consist of shovel test pits and 5- by 5-foot excavation units. Some of the latter may be contiguous. The shovel test pits are to be squarish, measure at least 1 1/2 by 1 1/2 feet on a side, and terminate in culturally sterile soil unless the disturbance exceeds 2 1/2 feet in depth as measured from the present ground surface. All artifacts and appropriate other samples will be retained separately from each shovel test pit. Annotated sections are to be drawn for each shovel test pit.

The 5- by 5-foot test units will be dug in stratigraphic layers (preferred) or in arbitrary levels. Artifacts from test units will be retained and labeled by layer/level. The test units will terminate within sterile subsoil unless the deposits of cultural origin exceed 4 feet in depth as measured from the ground surface. Annotated sections are to be drawn for at least two intersecting walls of each test unit.

Variances in the depths of shovel test pits and excavation units are specified in some instances in the following detailed specifications, however, in all cases they are to be terminated whenever undisturbed subsoil is penetrated.

Excavation of both the STPs and the test units are to be by large hand tools rather than by small tools unless fragile, diagnostic artifacts or features are encountered. Screening is to be limited to a 25% sample and then only when diagnostic material is likely to be present. Screens with a coarse mesh, up to 3/4 inch, may be used. Architectural features are to be left in place for later removal in connection with the future Phase II excavations as outlined above. The purpose of this work is to identify potentially significant archeological features and deposits rather than to carry out detailed excavation and analysis.

Specific areas to be investigated and the methods to be used are as follows:

A. Area approximately 25 by 250 feet adjacent to top of wall where building contractor will dig a deep trench to stabilize wall (drawing 8). Archeologist will excavate: (1) ten judgmentally placed 5- by 5-foot test units to

document the manner of fill placement and to explore for buried structural features, and (2) two 10- by 25-foot trenches oriented perpendicular to the wall and at least 6 inches below the surface and/or 20th century deposits for the purpose of identifying footings and other remains of the charcoal house and other features which may have been present. (The proposed deep excavations by the building contractor behind the wall have high potential for encountering significant archeological evidence about the construction of the wall and the earlier use of this area, but archeological investigation of these deep deposits is NOT part of the present scope of work.)

B. Area approximately 100 by 300 feet behind the wall subject to disturbance by heavy machinery used to excavate deep trench, placing and removing soil stockpile, and installation of straw bale dike (drawing 9). Archeologist will excavate: (1) 130 shovel test pits in a grid pattern at 15-foot intervals and (2), after completion of the shovel test pits, five judgmentally placed 5- by 5-foot test units one foot deep.

C. Area approximately 25 by 125 feet located south of wall to be disturbed by installation of temporary sediment trap and permanent rip-rap, drain pipe, and contouring (drawings 7, 9 and 10). Archeologist will

excavate (1) 15 shovel test pits at 10-foot intervals, and (2), after completion of the shovel test pits, three 5-by 5-foot test units 1 1/2 feet deep in trap/rip-rap/contour area and two 5- by 5-foot test units 4 feet deep in drain pipe area.

D. Area approximately 20 by 300 feet at foot of wall to be disturbed by temporary steel braces to set in ground against wall (drawings 8 and 11), probing by contractor for loose stones to repair retaining and bellows house walls (drawings 2,3 and 7), temporary compacted shale mounds (drawings 8 and 11), and regrading so area can be mowed (drawings 2, note 8). Archeologist will excavate: (1) ten 5- by 5-foot test units adjacent to foot of wall in areas where braces are to be set and where building contractor will probe for stone, (2) one 10- by 10-foot trench up to 8 feet deep in high mound in southwest corner of wall, (3) ten 5- by 5-foot test units in other areas to be probed for stone by building contractor, and (4) 20 shovel test pits at 10 foot intervals where temporary shale mounds are to be constructed. Archeologist will stockpile stones for later use by building contractor.

E. Straw bale dike in front of wall will disturb area about 225 feet long (drawing 9). Archeologist will

excavate 20 shovel test pits at 10-foot intervals and 1 foot deep.

F. Area of collapsed stone walls on both sides of bellows house wall. No archeological work proposed in these areas during this phase of project.

As field work progresses, and as field conditions and findings suggest, the archeologist may reallocate the number and kind of excavation units among the work areas in consultation with the Project Officer or his designee. The total amount of excavation will not change.

3.5 Deliverables

Findings, interpretations, and recommendations will be presented in a report that will include sections detailing field methodology, equipment used, field findings, artifact and feature analysis, illustrations, and recommendations for any necessary additional work. The report format shall conform to the recommendations in the "Guidelines for Archeological Investigation in Maryland." Artifact processing and storage preparation shall be in a form consistent with the Council for Maryland Archeology's curation standards. The report, field records, photographs, drawings, and artifacts are to be delivered to the Division

of Archeology, Maryland Geological Survey, 2300 St. Paul Street, Baltimore, Maryland 21218.

Five copies of the draft report and 25 copies of the final report will be provided to the Department of General Services according to the schedule below. The draft report will meet all requirements for content of the final report.

All specimens recovered, field records, photographs, laboratory notes, and other technical data generated by the project are the property of and are to be deposited with the State of Maryland.

3.6 Project Scheduling

The vendor will commence work within 10 calendar days after notice to proceed is issued by the Procurement Officer. Fieldwork is to be completed within 30 calendar days after receipt of the notice to proceed. The draft report is to be submitted within 60 calendar days after completion of the field work, and the final report, specimens, field records, etc. are to be delivered within 30 calendar days after receipt of comments on the draft report.

3.7 Payment Schedule

The consultant shall be paid in four equal installments upon satisfactorily demonstrating completion of each stage of the project as follows:

1. Detailed work plan.
2. Field work.
3. Draft report
4. Final Report and all other deliverables.

3.8 Weekly Meetings

Weekly field meetings at mutually convenient times will be held by the consultant, the Procurement Officer (or his designee), a representative(s) of the Department of Natural Resources, and other involved parties.

IV. Selected Bibliography

Contract Archeology, Inc.

1971 An Historical and Archaeological Survey of Land Affected by the Dualization of U.S. Route 15 at the Catoclin Iron Furnace. Report prepared for Maryland State Highway Administration.

National Heritage Corporation

1974 Catoclin Furnace: Stabilization Study. Prepared for the State of Maryland, Department of General

Services, Office of Resources. Project Number: P-16-732.

1975 Catoctin Furnace Historical Research: A Preliminary Study. A Report on an Historical Survey. Prepared for the State of Maryland, Department of Natural Resources Land Planning Services.

Orr, Kenneth G. and Ronald G. Orr

1976 Field Report on the Archaeological Investigation (F04) of Areas of the Catoctin Furnace, Frederick, Maryland, Disturbed by 13 Temporary Shoring Cleats of the Retaining Wall. Prepared for the Maryland Department of Natural Resources.

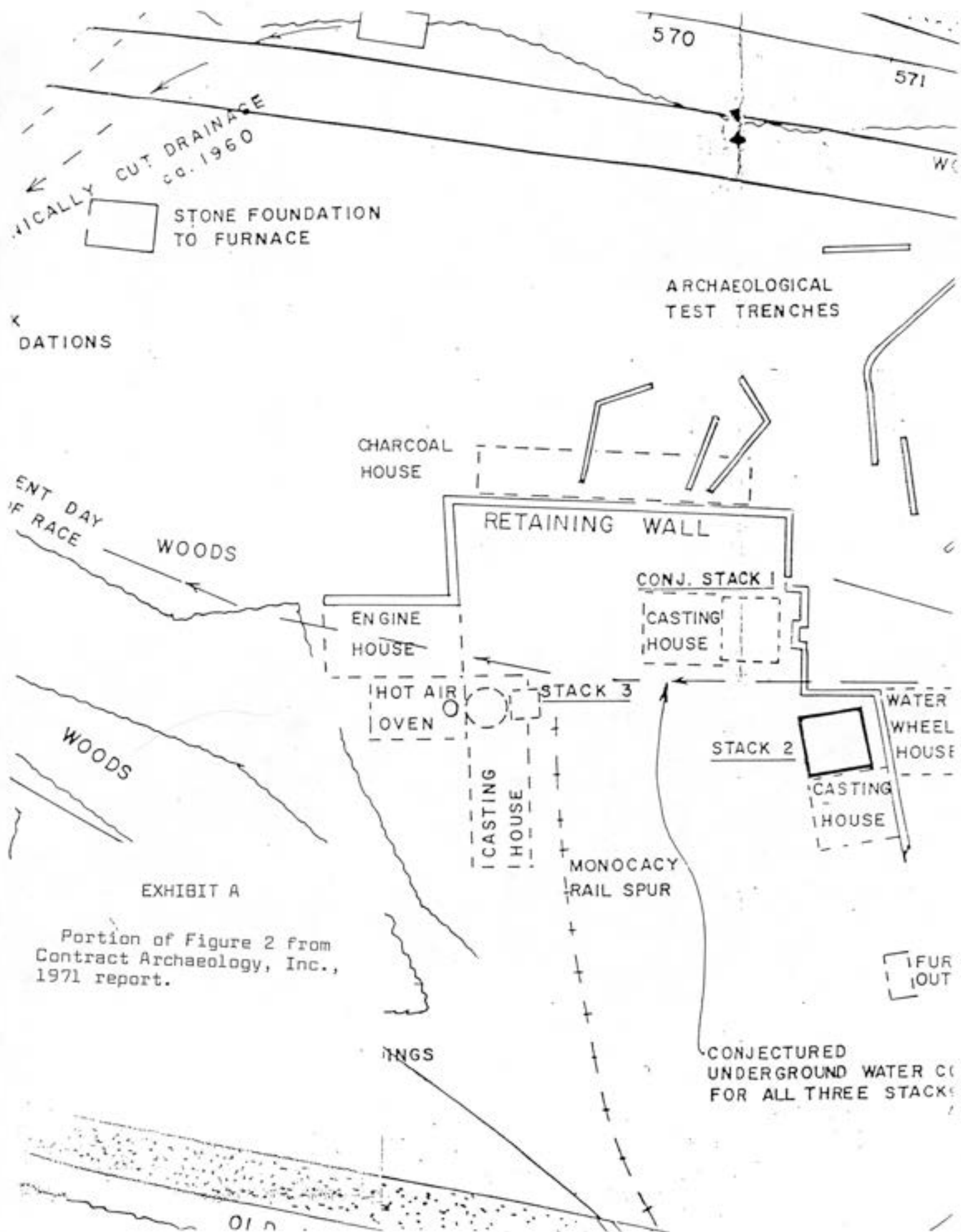
1977 An Intensive Archaeological Survey of Alignment Corridor, U.S. Route 15 from Putnam Road to Maryland Route 77 in Frederick County, Maryland: Preliminary Draft. Ms. prepared for the Maryland Department of Transportation, State Highway Administration, Baltimore.

Reed, Douglas and Paul

[1985] Catoctin Furnace, Construction History of the Retaining Wall.

Struthers, Thomas L.

1981 Archeological Survey of Catoctin Furnace,
Cunningham Falls State Park and Adjacent Areas,
Frederick County, Maryland. Report prepared for
State of Maryland by John Milner Associates.





APPENDIX III

CURRICULUM VITAE OF KEY PERSONNEL

R. CHRISTOPHER GOODWIN, Ph.D.

DIRECTOR OF RESEARCH

Education

Bachelor of Arts with Honors in Political Science, Tulane University, 1971.

Master of Science in Anthropology, Florida State University, Tallahassee, Florida, 1974.

Doctor of Philosophy (Ph.D.) in Anthropology, Arizona State University, Tempe, Arizona, 1979.

Postdoctoral Fellow - Scholar in Residence, Smithsonian Institution, Washington, D.C., 1979-1980.

Honors

Phi Eta Sigma Honor Society (1967); Alpha Epsilon Delta Honor Fraternity (1968); Pi Sigma Alpha Honor Society (1969); Sigma Xi Scientific Research Society (1977); University Fellow, Arizona State University (1978-1979); Elected Fellow, Virgin Islands Archeological Society (1978); Postdoctoral Fellow, Smithsonian Institution (1979-1980); Certificate of Merit, Universidad Central de Venezuela (1981); Certificate of Appreciation, International Wedgwood Society (1984); Friend of the Chitimacha Indians (1985); Certificate of Appreciation, Universidad del Norte, Barranquilla, Colombia (1985).

Professional Experience

President and Director of Research, R. Christopher Goodwin & Associates, Inc., New Orleans, Louisiana, 1981 to present.

Visiting Professor, Department of Anthropology, Universidad del Norte, Barranquilla, Colombia, 1985. Course taught: Archeological Method and Theory.

Visiting Professor, Department of Anthropology, Universidad Central de Venezuela, Caracas, Venezuela, 1982. Course taught: Archeological Ceramics.

Elected to Board of Directors, Museo Regional Altos de Chavon, Dominican Republic, 1981.

Visiting Professor, Nicholls State University, Thibodaux, Louisiana, Summer 1981. Course taught: Field Methods in Archeology.

Assistant Professor, Arizona State University, Summer 1979 (Archeological Field School). Courses taught: Archeological Field Techniques, Archeological Sampling, Graduate Research.

Chairman, Eighth International Congress for the Study of Pre-Columbian Cultures of the Lesser Antilles, St. Kitts, West Indies, Summer 1979.

Graduate Associate, Department of Anthropology, Arizona State University, 1979.

Elected to Board of Directors, International Association for Caribbean Archeology, July, 1977 - July, 1979.

Research Associate, Climatic Impact Assessment Program, Department of Economics, Florida State University, 1974.

Staff Archeologist, Intercontinental Investments, Boqueron, Puerto Rico, 1973. Prehistoric and historic sites archeology, cultural resources management.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

Visiting Professor of Anthropology, InterAmerican University, San German, Puerto Rico, Summer 1972.
Special Assistant to the President, the Puerto Rico International Undersea Laboratory (PRINUL), Cabo Rojo, Puerto Rico, 1971 - 1972.

Civic and Community Activities

Washington Program Chairman, National Exploration Awards, Boy Scouts of America, 1976 - 1977.

Member, Education and Youth Activities, The Explorers Club, 1976 - 1977.

National Chairman, National Exploration Awards, Boy Scouts of America, 1978. NEA is Scouting's highest honor in recognition of scientific achievement and potential.

Member, National Events Committee, Boy Scouts of America, 1978.

Proposal Reviewer, Committee on Research and Exploration, National Geographic Society, Washington, D.C., 1979 -present.

Proposal Reviewer, National Endowment for the Humanities, 1979 - 1983.

Special Skills

Court-qualified Expert in Archeology and Cultural Resources Management. Forensic skeletal analysis; Spanish and French archival research, spoken Spanish.

Manuscripts, Publications, and Papers Presented

- | | |
|-------|---|
| 1971 | <u>United States Seabed Resource Policy</u> . Honors Thesis, Department of Political Science, Tulane University, New Orleans, Louisiana. |
| 1973 | Saving an Early Taino Site in Southwest Puerto Rico. <u>Revista Interamericana</u> 3(2):127-134. San Juan. |
| 1974a | Dental Morphology and Pathology of the Sowell Mound Population, Bay County, Florida. <u>American Journal of Physical Anthropology</u> 41(3):482. Philadelphia. |
| 1974b | Salvage Archeology at Villa Taina (with J.B. Walker). <u>Proceedings of The Fifth International Congress for the Study of Pre-Columbian Cultures of the Lesser Antilles</u> , pp. 1-10. Gainesville, Florida. |
| 1975a | <u>Villa Taina de Boqueron: The Excavation and Analysis of an Early Taino Site in Southwest Puerto Rico</u> . InterAmerican University Press, San Juan. |
| 1975b | A Review of Human Dental Remains from a Weeden Island Necropolis. Paper presented at the twenty-seventh annual meeting of the Florida Anthropological Society. |
| 1976 | Archeological Investigations on St. Kitts, West Indies. Research report submitted to the Superintendent of Public Works, Basseterre, St. Kitts. |
| 1977 | St. Kitts Salvage Archeology. <u>Explorers Journal</u> 55(1):20-23. New York. |
| 1978a | The Lesser Antillean Archaic: New Data from St. Kitts. <u>Journal of the Virgin Islands Archeological Society</u> 5:6-16. St. Thomas. |
| 1978b | The History and Development of Osteology in the Caribbean Area. <u>Revista Interamericana</u> 8(3):463-494. San Juan. |

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1978c The Prehistoric Cultural Ecology of St. Kitts: The Research Design. Behavioral Sciences Foundation Occasional Papers in Anthropology 1. Basseterre, St. Kitts.
- 1978d A Selected Bibliography of Physical Anthropology in the Caribbean Area (with A. Gus Pantel). Revista Interamericana 8(3):531-540.
- 1979a Archeological Sampling on Utila, Bay Islands, Honduras (with Cyd Heymann and Glen T. Hanson). Journal of the Virgin Islands Archeological Society 7:3-26. St. Thomas.
- 1979b Seriation and Clustering of Archeological Excavation Units from Potsherd Frequencies (with Peter F. Thall). University of Texas at Dallas Technical Report in Mathematical Sciences No. 62. Richardson, Texas.
- 1979c The Prehistoric Cultural Ecology of St. Kitts, West Indies: A Case Study in Island Archeology. Unpublished Ph.D. dissertation, Department of Anthropology, Arizona State University, Tempe.
- 1980a The Preservation and Study of Prehistoric Coral and Coral Artifacts (with A.E. Dittert, Jr., E.S. Sipe, and J.P. Collins). Anthropological Research Papers No. 22, pp. 246-253. Tempe, Arizona.
- 1980b Demographic Change and the Crab-Shell Dichotomy. Proceedings of the Eighth International Congress for the Study of Pre-Columbian Cultures of the Lesser Antilles, pp. 45-68. Tempe, Arizona.
- 1980c The Conservation of Shell and Shell Artifacts from Archeological Contexts (with A.E. Dittert, Jr. and E.S. Sipe). Anthropological Research Papers No. 22, pp. 218-236. Tempe, Arizona.
- 1980d An Archeological Inventory of the Keyser Wastewater Treatment Lagoon Site (46-MI-41). Research report submitted to the City of Keyser, West Virginia, 109 pp.
- 1981a Cultural Resources Survey of the Peabody Coal Terminal, St. Rose Plantation, St. James Parish, Louisiana (with Laura A. Landry). Research report on file, New Orleans District, U.S. Army Corps of Engineers, 69 pp.
- 1981b Cultural Resource Survey of the Maynard Oil Company Well Site and Access Road, Iberville Parish, Louisiana (with Laura A. Landry and Cyd Heymann). Research report on file, Division of Archeology, Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana, 37 pp.
- 1981c Report on Human Skeletal Remains from Ruth Canal, St. Martin Parish, Louisiana. Research report submitted to Sheriff Charles A. Fusilier, The Courthouse, St. Martinville, Louisiana, 35 pp.
- 1981d Cultural Resources Survey of the Proposed Sewerage System Development Project, East Bank of St. Charles Parish, Louisiana. Research report on file, Division of Archeology, Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana, 45 pp.
- 1981e Production Step Measures and Prehistoric Caribbean Ceramics: An Exploratory Study (with Peter F. Thall). Proceedings of the Ninth International Congress for the Study of Pre-Columbian Cultures of the Lesser Antilles.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1981f Review of Iraida Vargas: La Tradición Saladoide del Oriente de Venezuela; Mario Sanoja: Las Culturas Formativas del Oriente de Venezuela; and, Mario Sanoja and Iraida Vargas: Antiguas Formaciones y Modos de Producción Venezolanos. **American Anthropologist** 83:226-228. Washington, D.C.

- 1982a Data Recovery at the New Orleans General Hospital Site, 16 OR 69 (with Jill-Karen Yakubik). Submitted to the Division of Archeology, Department of Culture, Recreation, and Tourism, State of Louisiana, Baton Rouge, 237 pp.

- 1982b Report on the Level II Archeological Survey of Magnolia Plantation, Plaquemines Parish, Louisiana (with Jill-Karen Yakubik). Submitted to the Division of Archeology, Department of Culture, Recreation, and Tourism, State of Louisiana, Baton Rouge, 118 pp.

- 1982c Clifford Evans, Jr. - An Obituary. **American Anthropologist** 84(3):636-638.

- 1983a Archeological Survey of the New House Site, Harlem Plantation, Plaquemines Parish, Louisiana (with Peter A. Gendel and Jill-Karen Yakubik). Submitted to the Department of the Army, New Orleans District, Corps of Engineers, Contract No. DACW29-83-M-0977, 114 pp.

- 1983b Historic Archeology at the Old Courthouse Site, Convent, St. James Parish, Louisiana 16 SJ 35 (with Peter A. Gendel and Jill-Karen Yakubik). Submitted to the Division of Archeology, Department of Culture, Recreation, and Tourism, State of Louisiana, Baton Rouge, 92 pp.

- 1983c Archeological Assessment of Two Sites on the Mississippi River: 16 PC 33 and 16 EBR 46 (with Peter A. Gendel and Jill-Karen Yakubik). Submitted to the Department of the Army, New Orleans District, Corps of Engineers, Contract No. DACW20-83-M-0186.

- 1983d Historic Archeology at Star and Bourbon Plantations (with Jill-Karen Yakubik and Peter A. Gendel). Submitted to the Department of the Army, New Orleans District, Corps of Engineers, Contract No. DAW29-83-M-0521.

- 1983e Analysis of Historic Remains from Two Archeological Test Units at Chalmette National Historic Park (with Jill-Karen Yakubik). Submitted to Jean Lafitte National Historical Park, Order No. PX7530-3-0104.

- 1983f The Historic Archeology of Elmwood Plantation (with Jill-Karen Yakubik and Cyd Heymann Goodwin). Submitted to the Division of Archeology, Department of Culture, Recreation, and Tourism, State of Louisiana, Baton Rouge.

- 1983g Comptes Rendus des Communications du Neuvieme Congres International d'Etudes des Civilisations Precolombiennes des Petites Antilles. Centre de Recherches Caraibes, Université de Montreal, Canada.

- 1984a Evaluation of the National Register Eligibility of the M/V Fox, An Historic Boat in Lafourche Parish, Louisiana (with Galloway Walker Selby and Laura Ann Landry). Submitted to the Department of the Army, New Orleans District, Corps of Engineers, Contract No. DACW29-84-D-0029, LMNPD-84-30.

- 1984b Elmwood: The Historic Archeology of a Southeastern Louisiana Plantation (with Jill-Karen Yakubik and Cyd Heymann Goodwin). Jefferson Parish Historical Commission, Metairie, Louisiana.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1984c Preserving the Past for the Future: A Comprehensive Archeological and Historic Sites Inventory of Jefferson Parish, Louisiana (with Jill-Karen Yakubik, Peter A. Gendel, Kenneth R. Jones, Debra Stayner, Cyd H. Goodwin, Galloway W. Selby, and Janice M. Cooper). Submitted to the Division of Archeology, Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana, 3 vols.
- 1984d The Historic Archeology of the Morgan City Floodwall Boat. Submitted to the Department of the Army, New Orleans District, Corps of Engineers, Contract No. DACW29-84-D-0029.
- 1984e Archeological Findings on the Use of Creamware in New Orleans and Environs (with Jill-Karen Yakubik). Paper presented at the Twenty-Ninth Wedgwood International Seminar, New Orleans, Louisiana.
- 1984f Archeological Data Recovery at Algiers Point (with Jill-Karen Yakubik and Peter A. Gendel). Submitted to the Department of the Army, New Orleans District, Corps of Engineers, Contract No. DACW29-84-D-0029, 2 vols.
- 1984g Cultural Resources Survey of Five Mississippi River Revetment Items (with Debra Stayner, Jill-Karen Yakubik and Kenneth Jones). Submitted to the Department of the Army, New Orleans District, Corps of Engineers, Contract No. DACW29-84-D-0029.
- 1984h Archeological and Historical Assessment of the Proposed Riverway Gas Pipeline Company's Pipeline Corridor in St. Bernard and Orleans Parishes, Louisiana (with Jill-Karen Yakubik). Submitted to the Division of Archeology, Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana.
- 1984i Archeological Monitoring Plan for Four Floodwall Projects in the City of New Orleans (with Debra Stayner, Kenneth Jones, Jill-Karen Yakubik, and Janice Cooper). Submitted to the Department of the Army, New Orleans District, Corps of Engineers.
- 1985a An Archeological and Historic Sites Inventory of Bayou Teche Between Franklin and Jeanerette, Louisiana (with Jill-Karen Yakubik, Kenneth R. Jones, Galloway W. Selby, Debra Stayner and Janice M. Cooper). Submitted to the Division of Archeology, Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana.
- 1985b Evaluation of the National Register Eligibility of Burrwood, Plaquemines Parish, Louisiana (with Kenneth R. Jones and Debra Stayner). Submitted to the U.S. Army Corps of Engineers, New Orleans District, Contract No. DACW29-84-D-0029.
- 1985c Cultural Resources Survey of the Morgan City and Vicinity Hurricane Protection Project (with Galloway W. Selby, Jill-Karen Yakubik, and Kenneth R. Jones). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1985d Cultural Resources Survey of the Proposed 30" Pipeline from Larose to Paradis, St. Charles and Lafourche Parishes, Louisiana (with Galloway W. Selby). Submitted to Riverway Gas Pipeline Company, New Orleans, Louisiana.
- 1985e Cultural Resources Survey of the Angelina Revetment Item, St. James Parish, Louisiana (with Herschel A. Franks, Peter A. Gendel, and Jill-Karen Yakubik). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1985f Cultural Resources Survey of the Burnside Revetment Item, Ascension and St. James Parishes, Louisiana (with Jill-Karen Yakubik, Peter A. Gendel, and Herschel A. Franks). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1985g Cultural Resources Survey of the White Castle Revetment Item, Iberville Parish, Louisiana (with Peter A. Gendel, Jill-Karen Yakubik and Herschel A. Franks). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1985h Between Two Levees: Archeological Testing and Evaluation of the National Register Eligibility of the Bayou Goula Landing Site, Iberville Parish, Louisiana (with Peter A. Gendel and Jill-Karen Yakubik). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986a Cultural Resources Survey of the Bayou Courtableau Enlargement Project, St. Landry Parish, Louisiana (with Jill-Karen Yakubik, Peter A. Gendel, and Herschel A. Franks). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986b Archeological Monitoring of Three Floodwall Projects in the City of New Orleans (with Gail Larson Peterkin). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986c Cultural Resources Survey of West Bank Construction Items, Waggaman to Gretna, Louisiana. Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986d Archeological Testing at 16 CM 61, a Prehistoric Shell Midden in Cameron Parish, Louisiana. Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986e Review of Cannon's Point Plantation, Living Conditions and Status Patterns in the Old South, by John Solomon Otto. Studies in Historical Archeology. **American Scientist** 74(1):95.
- 1986f Review of Ball Courts and Ceremonial Plazas in the West Indies, by Ricardo Alegria, Yale University Publications in Anthropology No. 79, **American Antiquity** 51(4):875.
- 1986g Cultural Resources Inventory of the Montz Freshwater Diversion Project Corridor, St. Charles Parish, Louisiana (with Herschel A. Franks, Jill-Karen Yakubik, Jeffrey E. Treffinger, and Paul C. Armstrong). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986h Ethnohistory of the Filipinos of Southern Louisiana (with Herschel A. Franks, Debra M. Stayner, and Kenneth R. Jones). Submitted to U.S. Department of the Interior, National Park Service, Jean Lafitte National Historical Park, Louisiana.
- 1986i Cultural Resources Survey of the New Orleans to Venice Hurricane Protection Project, Reach C Enlargement, Plaquemines Parish, Louisiana, 3 vols. (with Marvin D. Jeter, Mark A. Catlin, Jeffrey E. Treffinger, Paul C. Armstrong, Jill-Karen Yakubik, Roderick Lincoln, Mary K. Knill, Herschel A. Franks, and Carol Poplin). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986j Cultural Resources Inventory of the Bonnet Carre' Spillway, St. Charles Parish, Louisiana (with Jill-Karen Yakubik, Herschel A. Franks, and Carol Poplin). Submitted to U.S. Army Corps of Engineers, New Orleans District.
- 1986k Archeological Research to Locate and Identify the French "Fort on the Mississippi" (1700-1707), Plaquemines Parish, Louisiana (with Marvin D. Jeter). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986l Cultural Resources Survey of the Wax Lake Outlet Control Weir, Atchafalaya Basin, Louisiana Project (with Kenneth R. Jones). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1986m A Cultural Resources Survey of the Western Sections of the Larose to Golden Meadow Hurricane Protection Project (with Eric C. Poplin, Kenneth G. Kelly, and Donald L. Bascle). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1986n Archeological Assessment of the Barataria Unit, Jean Lafitte National Historical Park (with John Stuart Speaker, Joanna Chase, Carol Poplin, and Herschel Franks). Submitted to the National Park Service, Southwest Region, Contract No. PX 7530-5-0100.
- 1987a Cultural Resources Assessment of the Faulkner Lake Revetment, East Baton Rouge Parish, Louisiana (with Eric C. Poplin). Submitted to the U.S. Army Corps of Engineers, New Orleans District, New Orleans, Report No. COELMN/PD-87/01.
- 1987b Cultural Resources Survey of the East Atchafalaya Basin Protection Levee Item E-44, Iberville Parish, Louisiana (with Kathy Manning, Paul C. Armstrong, and Eric C. Poplin). Submitted to the U.S. Army Corps of Engineers, New Orleans District, New Orleans, Report No. COELMN/PD-87/02.
- 1987c Evaluation of the National Register Eligibility of the Inner Harbor Navigation Canal Lock in Orleans Parish, Louisiana. Submitted to the U.S. Army Corps of Engineers, New Orleans District, New Orleans, Report No. COELMN/PD-87/05.
- 1987d Cultural Resources Investigations and Assessment of the Mound City Shipyard and Marine Ways (11 PU 40), Pulaski County, Illinois (with Kenneth R. Jones). Submitted to the U.S. Army Corps of Engineers, Memphis District, Memphis, Contract No. DACW66-85-M-1445.
- 1987e Archeological Monitoring of the Montegut Street to Independence Street Floodwall Project in the City of New Orleans, Orleans Parish, Louisiana (with Carol J. Poplin). Submitted to the U.S. Army Corps of Engineers, New Orleans District, New Orleans.
- 1987f Archeomalacology on a Small West Indian Island. In Coasts, Plains and Deserts: Essays in Honor of Reynold J. Ruppe'. Arizona State University Anthropological Research Papers No. 38.
- 1987g Level II Archeological Survey, Big Woods Development Area Environmental Educational Center-Phase I Barataria Unit, Jean Lafitte National Historical Park, Jefferson Parish, Louisiana (with Eric C. Poplin). Submitted to the National Park Service, Southwest Region, Contract No. PX-7029-7-0599.
- 1987h The Battle of Fort Bisland: Historical Research and Development of an Archeological Research Design (with Eric C. Poplin and Lawrence Hewitt). Submitted to the U.S. Army Corps of Engineers, New Orleans District, New Orleans, Contract No. DACW29-85-D-0113.
- 1987i Identification of Historic Ceramic Sherds from Archeological Compliance Excavations, Chalmette Unit, Jean Lafitte National Historical Park (with Vergil E. Noble). Submitted to the National Park Service, Southwest Region, Contract No. PX 7029-6-0396.
- 1987j Cultural Resources Review of the Fort Benning Master Plan - Phase II (with Eric C. Poplin). Submitted to Gulf South Research Corporation and the U.S. Army Corps of Engineers, Savannah District, Savannah, Georgia, Contract No. DACW21-86-D-0020.
- 1987k Historic Overview of Jones Point, Barataria Unit, Jean Lafitte National Historical Park (with Paul C. Armstrong). Submitted to the National Park Service, Jean Lafitte National Historical Park, Contract No. PX7530-6-0344.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1987l Cultural Resources Survey of St. John the Baptist and St. Charles Parish Construction Items (with George W. Shannon, Jr. and Laura A. Landry). Submitted to U.S. Army Corps of Engineers, New Orleans District, New Orleans, Contract No. DACW29-85-D-0113.
- 1987m Phase I Archeological Survey of A 21-Acre Parcel Known as the "Avondale Property," Carroll County, Maryland (with Kenneth Robinson, April M. Fehr, and Richard Geidel). Submitted to Ridgeview Chase Association.
- 1987n New Orleans is Looking Forward to Its Past, An Archeological Survey and Plan for Sections of New Orleans (with Paul C. Armstrong, Eric C. Popline, David Moore, and Carol J. Poplin). Submitted to the Department of Cultural, Recreation and Tourism, Baton Rouge, Louisiana.
- n.d. The Ceramic Age in the Lesser Antilles. Procedimientos del Primer Simposio sobre la Arqueologia del Caribe, Caracas, Venezuela (in press).
- 1988a An Ethnohistory of Yugoslavs in Louisiana. Submitted to the National Park Service.
- 1988b Archeological Testing at Two Sites Near White Castle, Iberville Parish, Louisiana: 16IV147 and 16IV149 (with Paul C. Armstrong, E. Jeanne Harris, and James M. Wojtala). Submitted to the New Orleans District, U.S. Army Corps of Engineers.
- 1988c An Archeological and Historical Overview of the Wyoming Valley Flood Protection Study Area, Susquehanna River Valley, Luzerne, Montour, and Northumberland Counties, Pennsylvania (with April M. Fehr, Richard Geidel, Kenneth, and Thomas W. Neumann). Submitted to the Baltimore District, U.S. Army Corps of Engineers.
- 1988d Phase I Archeological Investigation of the Taylor Land Resources, Inc., Bayard Road Tract, Anne Arundel County, Maryland (with April M. Fehr and Leslie D. McFaden). Submitted to Taylor Land Resources.
- 1988e Phase I Archeological Survey of 262 Acres at Fort Belvoir, Virginia (with April M. Fehr, Leslie D. McFaden, and Richard Geidel). Submitted to the Baltimore District, U.S. Army Corps of Engineers.
- 1988f Phase I Archeological Survey of the Saybrooke Pond and Windrush Farm Subdivisions, Anne Arundel County, Maryland (with April M. Fehr, Paul Patterson, and Leslie D. McFaden). Submitted to G. W. Koch Associates.
- 1988g Phase I Archeological Survey of Northern Virginia Electric Cooperative Properties in Prince William and Fauquier Counties, Virginia (with Richard Geidel, Leslie D. McFaden, and April M. Fehr). Submitted to Northern Virginia Electric Cooperative.
- 1988h Archeological Survey and Testing on Main Street, Downtown Jeanerette, Iberia Parish, Louisiana (with E. Jeanne Harris and Paul C. Armstrong). Submitted to the State of Louisiana, Department of Culture, Recreation, and Tourism.
- 1988i Archeological Monitoring of the Jackson Avenue to Thalia Street (Phase I) Floodwall Project in the City of New Orleans, Orleans Parish, Louisiana (with E. Jeanne Harris, James M. Wojtala, John A. Turner, and Leslie D. McFaden). Submitted to the New Orleans District, U.S. Army Corps of Engineers.
- 1988j Phase I Archeological Investigation of the Greenspring East Lime Kiln Site (18BA326), Baltimore County, Maryland (with Leslie D. McFaden, Richard Geidel and April M. Fehr). Submitted to Daft-McCune-Walker.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1988k Phase I Archeological Survey of The Windsor Farm Subdivision, Anne Arundel County, Maryland (with Paul Patterson, E. Jeanne Harris, Leslie D. McFaden, and April M. Fehr). Submitted to Harrison C. Murray.
- 1988l Level II Cultural Resources Survey at 16SB41, A Prehistoric Shell Midden in St. Bernard Parish, Louisiana (with John A. Turner). Submitted to St. Bernard Parish.
- 1988m The Battle of Fort Bisland: Historical Research and Development of an Archeological Research Design (with Eric C. Poplin and Lawrence L. Hewitt). Submitted to the New Orleans District, U.S. Army Corps of Engineers.
- 1988n Archeological Monitoring of the Montegut Street to Independence Street Floodwall Project in the City of New Orleans, Orleans Parish, Louisiana (with Eric C. Poplin). Submitted to the New Orleans District, U.S. Army Corps of Engineers.
- 1988o Cultural Resources Sample Survey Mechanized Infantry Training Area Fort Benning, Georgia (with Eric C. Poplin). Submitted to Gulf Engineers & Consultants, Inc., and the Savannah District, U.S. Army Corps of Engineers.
- 1988p Cultural Resources Survey Selected Timber Harvesting Areas Fort Benning, Georgia (with Eric C. Poplin). Submitted to Gulf Engineers and Consultants, Inc., and the Savannah District, U.S. Army Corps of Engineers.
- 1988q Phase II of the Cultural Resources Inventory of the Bonnet Carre' Spillway, St. Charles Parish, Louisiana (with Eric C. Poplin, Paul C. Armstrong, and Carol Poplin). Submitted to the New Orleans District, U.S. Army Corps of Engineers.
- 1988r Archeological Data Recovery at Site 16SJB29, Near Willow Bend, St. John the Baptist Parish, Louisiana (with William P. Athens, Stephen Hinks, E. Jeanne Harris, and Jennifer Cohen). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1988s Cultural Resources Survey of Gretna Phase II Levee Enlargement Item, M-99.4 to 95.5-R (with William P. Athens, Stephen Hinks, Paul C. Armstrong, and Jennie A. Cohen). Submitted to the U.S. Army Corps of Engineers, New Orleans District.
- 1988t Phase I Archeological Investigation of the Robert Thieme Minor 88-316 Subdivision, Anne Arundel County, Maryland (with April M. Fehr).
- 1988u Archeological Reconnaissance of Chincoteague National Wildlife Refuge, Accomack County, Virginia (with April M. Fehr, Leslie D. McFaden, and E. Jeanne Harris). Submitted to U.S. Fish and Wildlife Service.
- 1988v Phase II Cultural Investigation of the Knapps Narrows and Tilghman Harbor Maintenance Dredging Project: Upland Dredge Disposal Site, Talbot County, Maryland (with Janet S. Shoemaker and E. Jeanne Harris). Submitted to the Baltimore District, U.S. Army Corps of Engineers.
- 1988w Step I of the Mitigation Procedures (Phase III), Cowanesque Lake Modifications, Tioga County, Pennsylvania (with Thomas W. Neumann, E. Jeanne Harris, April M. Fehr, and Janet S. Shoemaker). Draft report. Submitted to Baltimore District, U.S. Army Corps of Engineers.
- 1988x Cultural Resources Survey of Gretna Phase II Levee Enlargement Item, M-99.4 to 95.5-R (with William P. Athens, Stephen Hinks, Paul C. Armstrong, and Jennifer A. Cohen). Draft report. Submitted to New Orleans District, U.S. Army Corps of Engineers.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1988y Cultural Resource Survey of Three Iberville Parish Levee Enlargement and Revetment Construction Items (with Rebecca E. Bruce, Lawrence L. Hewitt, and E. Jeanne Harris). Draft report. Submitted to New Orleans District, U.S. Army Corps of Engineers.
- 1989a Significance Assessment of 16ANZ6 New River Bend Revetment (with Stephen Hinks, Jennifer A. Cohen, Paul C. Armstrong, Sylvia I. Favret, Lawrence L. Hewitt, and William P. Athens). Draft report. Submitted to New Orleans District, U.S. Army Corps of Engineers.
- 1989b Phase II Intensive Survey of Historic and Prehistoric Archeological Components at the Packer Site (36CN7A), Clinton County, Pennsylvania (with Jennifer A. Cohen, Thomas W. Neumann, and Stephen Hinks). Draft report. Submitted to Baltimore District, U.S. Army Corps of Engineers.
- 1989c Phase I and Phase II Archeological Investigations of the Barbara Fritchie Tea Room, Frederick, Maryland (with April M. Fehr, E. Jeanne Harris, and Janet S. Shoemaker). Submitted to Gregory Franta Architecture, Inc.
- 1989d Phase A and B Cultural Resources Evaluation of the Gillis Falls Reservoir Project, Carroll County, Maryland (with Thomas W. Neumann, April M. Fehr, and Janet S. Shoemaker). Submitted to Black and Veatch, Inc.
- 1989e Phase I Archeological Survey of the Pettebone Farm Development, Anne Arundel County, Maryland (with April M. Fehr, Paul Patterson, and Janet S. Shoemaker). Submitted to Dennis Hudak, Patten Corporation.
- 1989f Intensive Archeological Survey of the Dearbought Farm Development, Frederick County, Maryland (with April M. Fehr, Larry Hewitt, Janet S. Shoemaker, Paul Patterson, and E. Jeanne Harris). Submitted to Maerk Limited Real Estate Developers.
- 1989g Phase I Archeological Sampling within the Wyoming Valley Local Flood Protection Study Area, Susquehanna River Valley, Luzerne County, Pennsylvania (with Gary D. Shaffer, Ph.D., Antonio Segovia, Ph.D., April Miller Fehr, M.A.). Draft Report. Submitted to Department of the Army, Baltimore District, Corps of Engineers.
- 1989h Phase I Archeological Investigation of the North Shore at Anchorage Project Area, Boston Street, Canton National Historic District, Baltimore, Maryland (with Leslie D. McFaden and Paul Patterson). Submitted to Anchorage Plaza Ltd. Partnership, c/o Manekin Corporation.
- 1989i Phase I Historical Archeological Investigations at the Cowanesque Lake Reformulation Project Area Tioga County, Pennsylvania (with Kenneth Robinson, Richard Geldel, Thomas W. Neumann, and Leslie D. McFaden). Submitted to the Department of the Army, Baltimore District, U.S. Army Corps of Engineers.
- 1989j An Intensive Phase I Survey of the Herman/Shindel Farm, Washington County Airport, Washington County, Maryland (with Paul Patterson, Janet S. Shoemaker, and E. Jeanne Harris). Submitted to The Board of Commissioners of Washington County and the Federal Aviation Administration.
- 1989k Phase II Investigations at 36Ti31 and 36Ti47, Tioga County, Pennsylvania (with Thomas W. Neumann). Submitted to Baltimore District, U.S. Army Corps of Engineers.

R. CHRISTOPHER GOODWIN, Ph.D. - Continued

- 1989l Phase I Cultural Resources Reconnaissance, Washington D.C. and Vicinity Local Flood Protection Project (with Janet S. Shoemaker, E. Jeanne Harris and April M. Fehr). Draft report. Submitted to Baltimore District, U.S. Army Corps of Engineers.
- 1989m Phase I Archeological Investigations of Proposed Recreational and Campground Sites at Curwensville Lake, Clearfield County, Pennsylvania (with Gary D. Shaffer, Ph.D). Submitted to Department of the Army, Baltimore District.
- 1989n Phase I Survey of the Proposed Naval Intelligence Command Headquarters Location at the Suitland Federal Center, Prince Georges County, Maryland (with April M. Fehr and Janet Shoemaker). Submitted to Department of the Navy, Chesapeake Division, Naval Facilities Engineering Command.
- 1989o Phase I Archeological Investigations of the Brightwood Development, Baltimore County, Maryland (with Janet S. Shoemaker and Thomas W. Neumann). Submitted to MacKenzie & Associates, Inc.
- 1989p Archeological Reconnaissance of Back Bay National Wildlife Refuge, Virginia Beach, Virginia (with April M. Fehr and Leslie McFaden, with contributions by Antonio Segovia, Ph.D.). Prepared for U.S. Fish and Wildlife Service.
- In Press Phase I Archeological Reconnaissance of Belt's Wharf, Fells Point National Historic District, Baltimore, Maryland (with Paul Patterson, Janet S. Shoemaker, and E. Jeanne Harris). Prepared for Belt's Wharf Limited Partnership.

Education

Ph.D. in Anthropology, University of Minnesota, Minnesota, 1979.

M.A. in Anthropology, University of Minnesota, Minnesota, 1975.

B.A. in Anthropology, University of Kentucky, Lexington, 1973.

Professional Experience

Supervisory Archeologist, R. Christopher Goodwin & Associates, Inc., Frederick, MD. 1987 - Present.

Senior Partner, Neumann & Sanford, Cultural Resource Assessments, Syracuse, New York. 1985 - 1987.

Research Associate, Research Foundation of the State University of New York, SUNYC-Potsdam, Potsdam, New York. 1985, 1986 - 1987.

Assistant Professor, Department of Anthropology, Syracuse University, Syracuse, New York. 1979 - 1986.

Founding Director, Field Archaeology Program, Department of Anthropology, Syracuse University, Syracuse, New York. 1979 - 1986.

Founding Director, Center for Archaeological Research and Education, Inc., Houston, Minnesota. 1982 - 1984.

Research Associate, Terrestrial Environmental Specialists, Inc., Phoenix, New York. 1980 - 1983.

Instructor, Department of Anthropology, University of Minnesota, Minneapolis, Minnesota. 1977 - 1979.

Professional and Community Activities

Society for American Archaeology
American Association for the Advancement of Science
American Anthropological Association
New York Academy of Sciences
Current Anthropology (associate)
Eastern States Archaeological Federation

Special Interests

Eastern United States: Late Archaic - Middle Woodland Transitions
Landscape ecology/landscape history
High-magnification lithic analysis
Application of predatory-prey and competition models to human subsistence
Information Theory
Ethnography and ethnohistory of the Southeastern United States
Application of archaeology to Third World development problems

THOMAS W. NEUMANN, Ph.D. - Continued

Manuscripts, Publications, and Papers Presented

- 1975a Report on the archaeological survey of the proposed Osceola Industrial Park. Filed with the Economic Development Agency, Chicago, and the Wisconsin State Archaeologist.
- 1975b Report on the archaeological survey of William O'Brian State Park. Filed with the Minnesota State Archaeologist.
- 1975c Report on the archaeological survey of the proposed housing development in Lake City, Minnesota. Filed with the Economic Development Agency, Chicago, and the Minnesota State Archaeologist.
- 1975d A Study of 21 CA 58: An Analysis of a Multi-Component Middle Woodland Site on the Shores of Prehistoric Lake Gayash. Master's thesis, University of Minnesota.
- 1976a The physiological consequences of child-rearing among the Creek, Chickasaw, and Choctaw. Anthropologica 18: 3-14.
- 1976b Classification of net impressed pottery from central Minnesota. First Annual Symposium, Council for Minnesota Archaeology, Science Museum of Minnesota, St. Paul, Minnesota.
- 1976c Field report on 21 FE 11: Mounds on Big Island in Helmer Myer State Park. Filed with the Minnesota State Archaeologist.
- 1976d Report on the archaeological survey of the proposed access road in Balsam Lake, Wisconsin. Filed with Economic Development Agency, Chicago, and the Wisconsin State Archaeologist.
- 1977a A biocultural approach to salt taboos: The case of the Southeastern United States. Current Anthropology 18:289-308.
- 1977b On salt taboos. Current Anthropology 18: 547-549.
- 1977c Theoretical aspects of human-wildlife competition in prehistoric subsistence systems. Second Annual Symposium, Council for Minnesota Archaeology, Hamline University, St. Paul, Minnesota.
- 1978a A model for the vertical distribution of flotation-size particles. Plains Anthropologist 23: 85-101.
- 1978b More on salt taboos. Current Anthropology 19: 413-415.
- 1978c Classification of net impressed pottery from central Minnesota. Pp. 56-65 in Some Studies of Minnesota Ceramics, edited by Alan R. Woolworth and Mark A. Hall. Occasional Publications in Minnesota Archaeology No. 2. Minnesota Historical Society.
- 1978d Report on the consolidation of Structure I, Chicanna (with Lewis C. Messenger, Jr.). Filed with the Centro Regional del Sureste, Instituto Nacional de Antropología e Historia, Merida.
- 1979a Patrow Site lithic analysis. Midcontinental Journal of Archaeology (with Elden Johnson), 4: 79-111.
- 1979b Test excavations at the Fish Lake Dam Site: A Supplement to Steinbring and Whelan (1971). Minnesota Archaeologist 38: 32-51.

THOMAS W. NEUMANN, Ph.D. - Continued

- 1979c Culture, Energy, and Subsistence: A Model for Prehistoric Subsistence. Ph.D. dissertation, University of Minnesota. Ann Arbor: University Microfilms International.
- 1980 Report on Informal surface collection taken at Ridgefield Estates, Danville, Kentucky. Filed with the Kentucky State Archaeologist.
- 1981a Archaeologists dig up soil-saving lesson. Syracuse University Alumni News (with Linda Kristensen), 62 (1): 9.
- 1981b Cultural Resource Assessment of Proposed Baker Street Extension. Phoenix: Terrestrial Environmental Specialist.
- 1982a Delimiting an archaeological site using near-infrared aerial photography. American Philosophical Society Grantee Reports 1982: 151-152.
- 1982b Cultural Resource Assessment for the Proposed Jefferson Village, Canandaigua, Ontario County, New York. Syracuse: Presidential Development Corporation.
- 1983 Report on possible archaeological resources: Sheraton Inn, Syracuse. Filed with Terrestrial Environmental Specialists, Inc., Phoenix.
- 1984a An examination of the differences between Gull Lake Net Impressed and Brainerd Net Impressed. Minnesota Archaeologist 43: 38-60.
- 1984b The opossum problem: Implications for human-wildlife competition over plant foods. North American Archaeologist 5: 287-313.
- 1984c Results of test excavations at the Indian Hill II Site: 1980-1981. William M. Beauchamp Chapter NYASAA Journal 4(1):15-31.
- 1984d Some thoughts on the continuation of field work at the Indian Hill II Site. William M. Beauchamp Chapter NYASAA Journal 4 (1): 32-37.
- 1984e Comments on photograph of wall trench stain, plate I. William M. Beauchamp Chapter NYASAA Journal 4 (1): 41-42.
- 1984f Report on Exploratory Excavation of the Avery Carriage House. Syracuse: Landmarks Association of Central New York.
- 1985a Human-wildlife competition and the passenger pigeon: Population growth from system destabilization. Human Ecology 13: 389-410.
- 1985b A Cultural Resources Survey: PIN 7NEW.27 Route 12, Lowville-Glenfield, New York (with Robert M. Sanford). SUNYC-Potsdam Public Archaeology Report 5 (3).
- 1985c A Cultural Resources Survey: PIN 7012.07 Route 126, Carthage, New York (with Robert M. Sanford and Nicole Missio). SUNYC-Potsdam Public Archaeology Report 5(2).
- 1985d A Cultural Resource Assessment of the Proposed Onondaga Senior Center (with Robert M. Sanford). Syracuse: Quatrier.
- 1985e Test Excavations at the OSC Site: Phase II Cultural Resource Assessment (with Robert M. Sanford). Syracuse: Quatrier.
- 1985f A Cultural Resource Assessment of the Wegerski Property (with Robert M. Sanford). Syracuse: Quatrier Printing.

THOMAS W. NEUMANN, Ph.D. - Continued

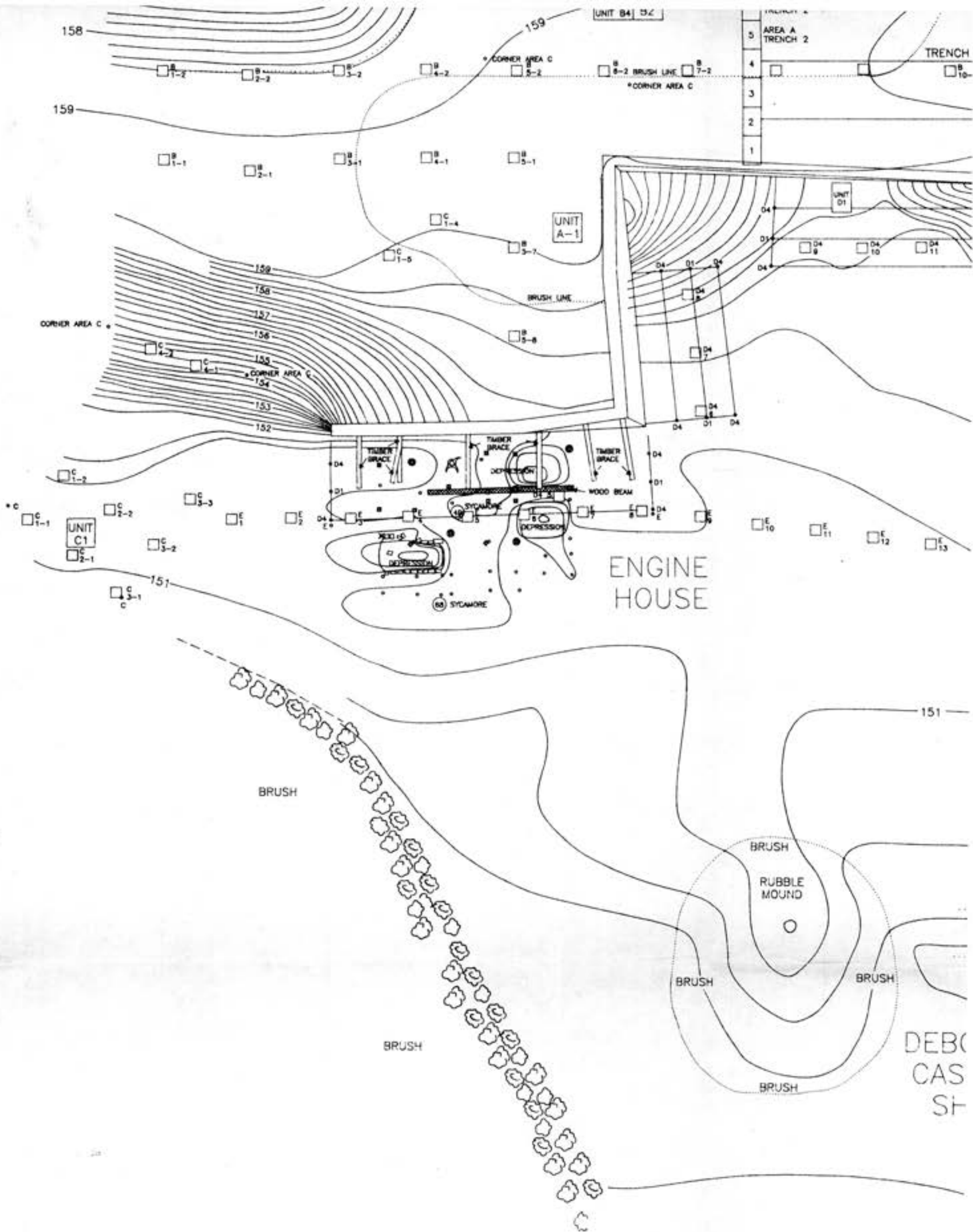
- 1985g Late Archaic - Middle Woodland occupations in southeastern Minnesota. Fiftieth Annual Meeting, Society for American Archaeology, Denver.
- 1985h Cultural resources and a sustainable future (with Robert M. Sanford). Fourteenth Annual Meeting, North American Association for Environmental Education, Chevy Chase, Maryland.
- 1985i Proposal for an Archaeology Program at Bucknell University. Syracuse: Quatrier.
- 1986a Proposal for a Cultural Resource Management Program at the State University of New York College of Environmental Science and Forestry (with Robert M. Sanford). Syracuse: Quatrier.
- 1986b A Cultural Resources Survey: PIN 3017.05 Route 49, Central Square, New York (with Robert M. Sanford). SUNYC-Potsdam Public Archaeology Report 6 (2).
- 1986c A Cultural Resources Survey: PIN 3107.05 Route 481, Volney-Scriba, New York (with Robert M. Sanford, Ronald P. Cochran, and Richard A. Warms). SUNYC-Potsdam Public Archaeology Report 6 (3).
- 1986d A Cultural Resources Survey: PIN 3045.29 Route 104, Mexico, New York (with Robert M. Sanford). SUNYC-Potsdam Public Archaeology Report 6 (5).
- 1986e A Cultural Resources Supplemental Survey Report: PIN 3750.80 and BIN 3-31336-0 Oswego County Route 1, New Haven, New York (with Robert M. Sanford). SUNYC-Potsdam Public Archaeology Report 6 (7).
- 1986f A Cultural Resource Assessment of the Euclid Water District Proposed Extension No. 6 (with Robert M. Sanford). Syracuse: Quatrier.
- 1986g Session chair, Method and Theory: Variation in embodied energy due to climatic change: Onondaga Iroquois A.D. 1290 - 1590. Fifty-first Annual Meeting, Society for American Archaeology, New Orleans.
- 1987a The urban tree as cultural artifact. Northeastern Environmental Science (special forestry volume) (with Robert M. Sanford) 6:46-52.
- 1987b A Cultural Resources Survey: PIN 3082.11/BIN 1-04491-0 Route 290 East Syracuse, New York (with Robert M. Sanford). SUNYC-Potsdam Public Archaeology Report 7(3).
- 1987c A Cultural Resources Survey: PIN 3019.10/BIN 1-03921-0 Route 173 Manlius, New York (with Robert M. Sanford). SUNYC-Potsdam Public Archaeology Report 7(4).
- 1987d A Cultural Resource Assessment of the Gates Run Development, Town of Pompey, Onondaga County, New York (with Robert M. Sanford). Syracuse: Quatrier Printing.
- 1987e The Weston Site: Phase III Cultural Resource Mitigation of the Southeast Area (with Robert M. Sanford). Syracuse: Quatrier Printing.
- 1987f A Cultural Resource Assessment of the Bersani Property at Division St./W. Terrace St., Village of East Syracuse, Onondaga County (with Robert M. Sanford). Syracuse: Quatrier Printing.
- 1987g Proposal for an Archaeology Program at Bucknell University. Revised. Syracuse: Quatrier Printing.
- 1987h A Cultural Resources Survey: PIN 3082.11/BIN 1-04491-0 Route 290 East Syracuse, New York (with Robert M. Sanford). SUNYC-Potsdam Public Archaeology Report 7 (3).

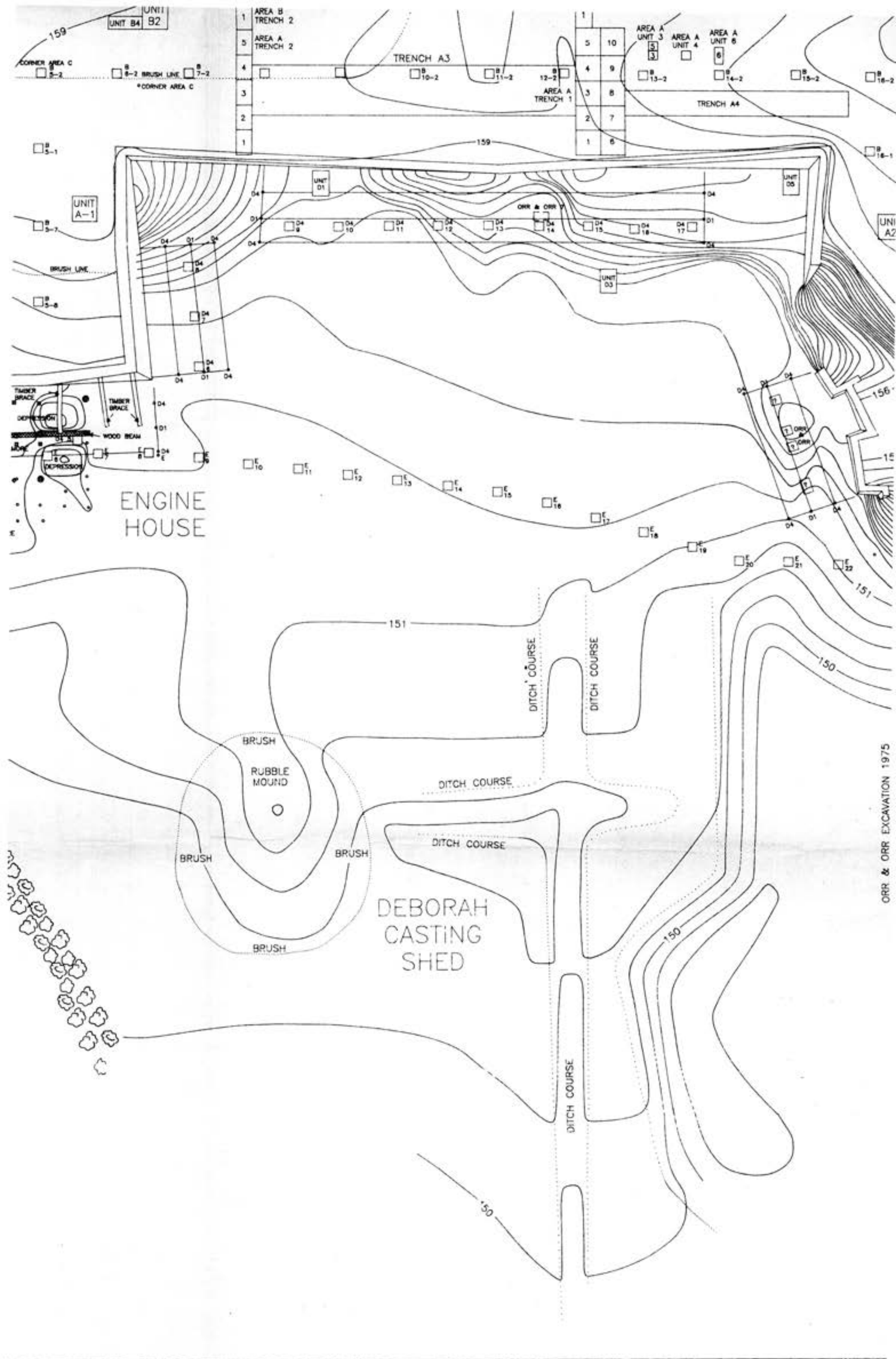
THOMAS W. NEUMANN, Ph.D. - Continued

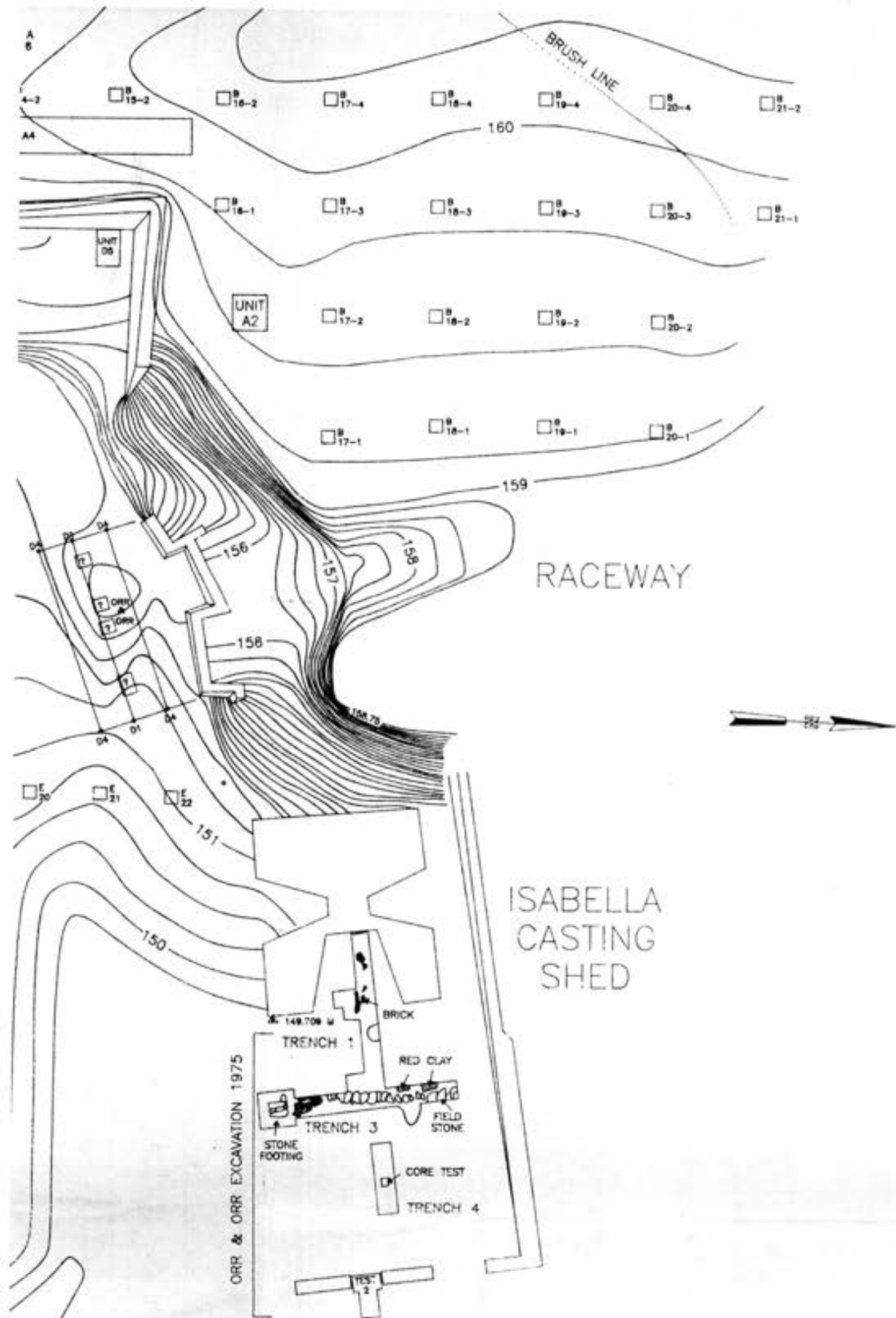
- 1987i A Cultural Resources Survey: PIN 3019.10/BIN 1-03921-0 Route 173 Manlius, New York (with Robert M. Sanford). SUNYC-Postdam Public Archaeology Report 7(4).
- 1987j A Cultural Resource Assessment of the Gates Run Development, Town of Pompey, Onondaga County, New York (with Robert M. Sanford). Syracuse: Quatrier Printing.
- 1987k The Weston Site: Phase III Cultural Resource Mitigation of the Southeast Area (with Robert M. Sanford). Syracuse: Quatrier Printing.
- 1987l A Cultural Resource Assessment of the Bersani Property at Division St./W. Terrace St., Village of East Syracuse, Onondaga County (with Robert M. Sanford). Syracuse: Quatrier Printing.
- 1988a High-magnification use-wear analysis of projectile points from Southeastern Minnesota. Plains Anthropologist 33:367-375.
- 1988b The use of vegetation successional stages in cultural resource assessments. American Archaeology (with Robert M. Sanford) 6:119-127.
- 1988c Prehistoric background. Pp. 56-76 in An Archeological and Historical Overview of the Wyoming Valley Flood Protection Study Area, Susquehanna River Valley, Luzerne, Montour, and Northumberland Counties, Pennsylvania. (with R. Christopher Goodwin, April M. Fehr, Richard A. Geidel, and Kenneth W. Robinson). Submitted to U.S. Army Corps of Engineers, Baltimore District.
- 1988d Phase II Intensive Survey, Historic and Prehistoric Archeological Investigations at Lock Haven, Clinton County, Pennsylvania. Draft final report submitted by R. Christopher Goodwin & Associates, Inc., to the U.S. Army Corps of Engineers, Baltimore District.
- 1988e Step 1 of the Mitigation Procedures (Phase III), Cowanesque Lake Modifications, Tioga County, Pennsylvania. (with Janet Shoemaker, E. Jeanne Harris, April M. Fehr, and R. Christopher Goodwin). Draft final report submitted to the U.S. Army Corps of Engineers, Baltimore District.
- 1989a Human-wildlife competition and prehistoric subsistence: The case of the Eastern United States. Journal of Middle Atlantic Archaeology 5:29-57.
- 1989b Developing local cultural resource policy through environmental impact assessments. In Policy through Impact Assessment, edited by Robert V. Bartlett (with Robert M. Sanford and James Palmer). Greenwood Press, Westport, CT.
- 1989c Archeological Data Recovery from Prehistoric Site 36 FA 363, Grays Landing Lock and Dam, Monongahela River, Pennsylvania. Draft final report submitted by R. Christopher Goodwin & Associates, Inc., to the U.S. Army Corps of Engineers, Pittsburgh District.
- 1989d Phase II Intensive Survey of Historic and Prehistoric Archeological Components at the Packer Site (36N79), Clinton County, Pennsylvania (with R. Christopher Goodwin, Jennifer A. Cohen, and Stephen Hinks). Draft final report submitted to the U.S. Army Corps of Engineers, Baltimore District.
- 1989e Phase A and Phase B Investigations of the Gillis Falls Reservoir Project Area, Carroll County, Maryland (with R. Christopher Goodwin, April M. Fehr, and Janet Shoemaker). Submitted to Black & Veatch, Inc.

THOMAS W. NEUMANN, Ph.D. - Continued

- 1989f Phase I Historic Archeological Investigations at the Cowanesque Lake Reformulation Project Area, Tioga County, Pennsylvania (with R. Christopher Goodwin, Kenneth W. Robinson, Richard A. Geidel, and Leslie D. McFaden). Submitted to U.S. Army Corps of Engineers, Baltimore District.
- 1989g Phase II Investigations at 36Ti31 and 36Ti47, Tioga County, Pennsylvania (with R. Christopher Goodwin). Baltimore: U.S. Army Corps of Engineers.
- 1989h Phase I Archeological Investigations of the Brightwood Development, Baltimore County, Maryland (with R. Christopher Goodwin and Janet S. Shoemaker). Submitted to MacKenzie & Associates, Inc.







CATOCTIN FURNACE 18FR29 FREDERICK COUNTY, MARYLAND

FEBRUARY-MAY 1989 T.W. NEUMANN
 △ DATUM = 149,709 M AMSL (CONCRETE MONUMENT)

- ⊗ BROKEN TIE IRON
- TIE IRON W/THREADS
- ⊠ TIE IRON W/HEX NUT
- ⊞ TIE IRON W/HEX NUT AND BOTTOM PLATE

CONTOUR INTERVAL: 0.25 M



