THE CATOCTIN FURNACE ARCHAEOLOGICAL MITIGATION PROJECT

FINAL REPORT OF THE 1979 EXCAVATION

CONTRACT F522-152-770

Investigations and Site Synthesis
(Consultant's Team)

Archaeological Excavations at Site 18PP320
Catoctin, Maryland
(Team A)

Archaeological Investigations at Catoctin
Furnace, Frederick County, Maryland
(Team B)

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November, 1980

Prepared for the Maryland State Highway Administration, Baltimore.
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PART 1: INVESTIGATIONS AND SITE SYNTHESIS

(CONSULTANT'S TEAM)

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Prepared for the Maryland State Highway Administration, Baltimore
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Members of the following organizations were most helpful and crucial in their contributions to the success of the project.

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Catoctin Furnace Historical Society
Cunningham Falls State Park
The Office of the Md. State Archaeologist
The Advisory Panel of the Project
The Advisory Council on Historic Preservation
The Office of the Md. State Historic Preservation Officer.
The Kindly Citizens of the Towns of Thurmont and Catoctin Furnace.
The Catoctin Furnace Historical Society
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B. Harrington, Jonathan W., Ph.D. A Preliminary Polynological Analysis of Borings at Catoctin Furnace, Maryland, 9 Pages.

C. Angel, J. Lawrence. Laboratory Analysis of 1979 Skeletal Material, 3 Pages.


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- Check 19: Limestone Quarry. Sta. 467 - 468.
Archaeological Salvage and Mitigation Project Proposal
Alternate No. 1, U.S. Route 15, through the Catoctin Furnace Area
Based on Maryland State Highway Administration Map Fig. 26,
Following P. 124 in Final EIS (1977)
Kenneth G. Orr, Ph.D. Consulting Archaeologist

Foldout Map

Sta. 580
Check 11: Race Pond
Ex-Right of Way
Raceway

Check 16: Fitzhugh–Kunkel Ore Bank
Sta. 57+40'

Md. Route 806
U.S. Route 15

Equality
Sta. 587+48.60 Back
Sta. 0+00.00 Ahead
INTRODUCTION

Objectives

The SHA requested an archaeological investigation of those areas of the Catoctin National Historic District to be impacted by the dualization of U.S. Route 15. The areas affected consisted of the right of way of the proposed alignment which proceeded through the heart of the Catoctin Furnace iron-working complex, a late 18th to early 20th centuries site.

The objectives of the archaeological investigation were to carry out to the extent applicable the archaeological requirements contained in the Memorandum of Agreement between the SHA and the Advisory Council on Historic Preservation (May 28, 1978).

The requirements of the Agreement were designed to mitigate the adverse effects of the road dualization on the archaeological resources of the site as follows:

1. To complete the archaeological survey to identify all cultural and historical aspects of the District.
2. To relocate the graves situated within the existing corridor.
3. To design a monitoring program to assess the effect of site excavation and burial on sites within the District, and
4. To outline the plans for the conservation, storage and disposition of all artifacts retrieved from the sites within the District.

The writers, who had excavated at the Catoctin Furnace site since 1975 were requested to conduct the archaeological mitigation excavation.

Methodology

Prior to the beginning of excavation a Sites Specifications and Research Designs paper was prepared and submitted to the Advisory Council in accordance with 36CPC Part 66 "Recovery of Scientific, Prehistoric, Historic and Archaeological Data: Methods; Standards and Reporting Requirements" (Orr, et al, July 12, 1979). The specifics of methodology used for each site unit is discussed along with an account of the excavations (see below). In general the approach was to bring together the specialists in the fields required by the Agreement. The investigating team included a geologist, a geological botanist, a ceramist, a physical
Results

Three excavating teams and the specialists mentioned above were assembled and excavations began in July 1979. The investigation of 13 sites continued through the summer and fall of 1979. Two sites were not completed due to the exhaustion of funds prior to gaining the mitigation objectives. These were: Check 3, 18FR320, iron-working site excavated by John Milner Associates (Team A), and Check 6, 18FR323, burial site, excavated by Mid-Atlantic Research. An interim report was submitted (Orr, et al, Jan. 30, 1980). Funds were provided and the burial was completed in the Spring of 1980 with Orr & Son as Consultant. However, the completion of Check 3 site is still pending. The finds of the 1979 excavation are in the charge of the State Archaeologist. The skeletal material of both the 1979 and the 1980 excavations are in the charge of the Head Curator of Physical Anthropology at the Smithsonian Institution.
Mitigation Summaries

Archaeological mitigation consists of approaches and devices for lessening the adverse effect of the impact of construction on archaeological resources (Advisory Council on Historic Preservation, Jan. 30, 1979; pp.6074-6077). The nature of the adverse effect on archaeological sites of the construction for the dualization of U.S. Route 15 was determined in the 1977 intensive survey (Orr and Son, August 1977). The basic objectives of this report are (1) to determine the extent to which the 1979 excavations satisfied the mitigation requirements of the project, and (2) to define and propose additional mitigation activities if required for the project.* Following is a short summary of the mitigation factors for each site in the 1979 project - the excavations of which are discussed in Parts 1, 2, and 3 of this report. The mitigation requirements for the project were spelled out in a paper which was submitted to the Advisory Council on Historic Preservation prior to the beginning of excavations in July 1979 (Orr et al., July 12, 1979), and are reviewed with the 1979 excavations in this report.

Check 3. Iron-working Site (18FR320). The "forge", located in the eastern area of the site, was determined to be unaffected by the proposed road construction and its contingency funds were allotted to the excavation of the "Old Forge" in the western area. (John Milner Associates report is Part 2 of this paper)

Due to the extent and complexity of features in the western area of the site they couldn't be satisfactorily mitigated within the allotted time. Specifically, the impacted area of the site represented a multi-purpose iron-working unit(s) with many of its functions, such as water-power pits, forge hammer location, and the like, still to be unearthed.

*An interim report defined the time and cost of the additional mitigation activities defined herein as necessary (Orr, Jan. 30, 1980). As of the date of the present paper the excavation of the burial ground Check 6 (Part 3) has been completed.
Edward Heite, industrial archaeologist of the project, has indicated that a logical paradigm for the "Old Forge" site is the Charlottesburg Middle Forge (northern New Jersey). Here a series of small water wheels on each side of a structure powered hammers, bellows, and other machinery of an iron-working unit. (Lenik, 1974)

The site represents a series of interrelated early period features which will be impacted by overlay of Alignment 1. These features are unique and not likely to be duplicated outside of the impacted area in other parts of the Catoctin Furnace site. Since the historical information which they contain forms a valuable and not otherwise available portion of the Catoctin Furnace record it is proposed that additional time be allowed for excavation and analysis in order to complete the mitigation of the site.

It is noted that the mitigation of the Auburn Dam has been completed as a result of the present excavations of Orr and Son team (Check 17, Trenches 6 and 7) and Orr and Son, 1977, intensive survey (pp.8-17); but that excavations under the Dam are called for.

It is understood that closest cooperation between the principal investigator, and the project industrial archaeologist and records analyst will be required to achieve the desired mitigation of the site.

Oral history and land records data seek to identify the functions, location, and time period of the features to amplify and confirm interpretations of the archaeological data.

Check 4. The Spring-Bathhouse Site (18FR321). It is believed that the archaeological findings at this site provide satisfactory mitigation for the adverse effects produced by the overlay burial of this site by the proposed road building. However, oral history data is particularly needed to interpret the 19th century features and materials found in abundance in this site. Since the site was utilized until about 1915 much data is expected for the Bathhouse period from the Oral History project proposed.* Land records research has already given some data in the form of the Fitzhugh-McPherson surveys map of 1858 (volunteer information provided by Mrs. Marie Burns). An organized study on this subject (Orr, Feb. 8, 1980) will be of greatest importance in substantiating archaeological interpretations. The site has been selected for monitorization (see below). The site was excavated by Orr and Son (Part 1).

Check 5. Amerindian Site (18FR322). This site was an Archaic

Period transient camp. Since it is likely that little or no permanent or semi-permanent structures were used it is recommended that no further archaeological investigations be considered necessary for mitigation purposes. (Mid-Atlantic Archaeological Research, Part 3)

Check 6. Historic Cemetery Site (18FR323). Twenty-six burials were removed by Mid-Atlantic Archaeological Research, Inc. in the 1979 excavation and an additional 9 burials were excavated. The remains are now in the Laboratory of Physical Anthropology, Smithsonian Institution, where all adult skulls have been identified as negroid by Dr. Lawrence Angel, Chief Curator (Appendix C). It was obligatory to remove all skeletal material in cemeteries and steps were taken by SHA to clear the right of way through a second excavation by MAAR in the spring of 1980.

Check 7. Miner's House (18FR324). The "yard" of this site within the right of way was excavated by MAAR adjacent to the foundation of the so-called Carty House. The features found, including a subsurface trash deposit, brick walk and slab and postholes associated with the house structure, as well as innumerable posthole tests defined the nature of the area to be impacted by the construction of Alignment 1. No further excavation is considered necessary to assure the area satisfactory mitigation. However, the State Archaeologist and Advisory Panel of the project requested that the protection of the house foundation (on the edge of the right of way) be assured by filling with sand. At present the advice of the Bureau of Soils and Foundations is being sought in regard to the best method of protecting this site from possible construction damage when actual road construction begins.

Check 9. Lime-tone Quarry (18FR325). The aborted limestone quarry reveal sufficient details concerning its archaeological situation to be considered sufficiently mitigated for the overlay impact anticipated as a result of the construction of Alignment 1 (Orr and Son, Part 4).

Check 10. Exhumed Cemetery (18FR326). This site did not require mitigation as it represented a family cemetery (not an historic site). If skeletal material remained following its exhumation by a SHA crew several years ago, there is no evidence of this or likelihood of such being disturbed by the proposed impact of the area in road construction. (Orr and Son, Part 1).
Check 11. Race Pond (18FR327). The race pond investigations include backhoe and hand excavations, observations, and borings. The borings put down into the pond and in the vicinity to get the subsurface archaeological situation revealed an iron mine underneath the pond. The observations included studies of raceways outside of the right of way for their implication on understanding the target area of SHA road construction. Oral history and land records findings proposed as an extension of the 1979 project are needed to assist in interpreting the archaeological findings. (Orr and Son, Part 1)

Check 12. Iron Mines and Charcoal Road. The three iron mine areas, Features 1, 2 and 4, were excavated by backhoe and Feature 2 and 4 examined by borings which are analyzed in Appendix A and B by Dr. Fauth and Dr. Harrington, consulting geologists at SUNY/Cortland. The Charcoal Road (Feature 6) was excavated with backhoe and by hand. It is believed that further excavation will not be required for mitigation. However, oral history and land records studies of the area are regarded as necessary for fullest interpretation of the archaeological findings. (Orr & Son, Pt. 1)

Check 15. Ore Railroad (18FR329). Excavations, and observations are believed sufficient to satisfy mitigation requirements for this site. Oral History data available on the Big Ore Bank mine of which Check 15 is part is needed to check accounts already gathered and new information. (Orr & Son, Part 1)

Check 16. Fitzhugh-Kunkel Ore Mine (18FR330). The entrance to the mine was excavated by hand revealing railroad and country road features as anticipated. The information gathered was considered sufficient for mitigation purposes. Oral history data being sought in the proposed project will support and amplify understanding of the site area since the roads were in use until 1911. (MAAR, Part 3).

Check 17. Raceway (18FR331). The backhoe trenches and tests were excavated by hand to give a detailed picture of two systems of hydraulic power. The excavations are generally sufficient for mitigation purposes. This is because for the most part the raceways' sections represent the waterway section in which water was being transported, and one section of the site gives similar information to another section. It is believed desirable to have further excavation of the raceway as it approaches Check 3, iron-working site in the vicinity of Auburn Dam. The plan submitted by Milner Associates for examination of the raceway at this point appears adequate. Oral History and Land Records Projects' contributions to understanding this site are invaluable.
Check 19. Limestone Quarry and Kiln (18FR332). The limestone kiln of this site was determined to be too close to the road (on the shoulder) to be excavated. It was located under approximately 6 feet of shoulder soil, the removal of which would imperil traffic. The trench placed by backhoe into the quarry proper was sufficient to provide mitigating data and further excavation will not be required. It is expected that oral history data will greatly amplify and assist in the interpretation of the archaeological evidence. (Orr & Son, Part).

Monitorization Analysis

It was requested by the Advisory Panel and the State Archaeologist the Check 4, Feature 1, Spring-Bathhouse be prepared for monitorization. This site was excavated fully to provide mitigation clearance and was recorded by photograph and maps so as to allow the site to be re-opened in the future to see the effect of the Alignment 1 road on the site. It is planned to pack the site with sand after a drain has been erected to carry away the underground spring water. These plans are under the advisement of the SHA Bureau of Soils and Foundations. (See Appendix E)

Site Synthesis

A basic objective of an archaeological data recovery operation is to secure information from the property being studied that will provide a usable sample of data on all research problems that reflect the property's research value.* The Catoctin Furnace sites that will undergo impact from SHA road construction contain research data that contributed to the understanding of the site as a whole, which, in turn contributes to an understanding of the development of the American iron industry in the 18th and 19th centuries. A broad and penetrating synthesis is therefore required as an end result in the mitigation process. (*Federal Register, v.42, No.9, Jan. 28, 1977, Par. 66.2A2-(iv), p. 5376)

A preliminary synthesis was attempted following the intensive survey of the site (Orr & Son, Aug. 1977, pp. 91-92). This outline of Early, Middle, Late and Post-Furnace periods was modified and augmented with the data of the 1979 in the present synthesis.

Included also are data and the interpretations deriving from data previously excavated and available on the archaeology of the Catoctin Furnace: Mentzer c.1972 (WPA dig 1935), Contract Archaeology, Inc. 1971 (historic and archaeological survey).

- 7 -
Orr and Orr 1975 (casting shed of Stack #2), Orr and Orr 1976 (engine house of Stack #3, retaining wall base tests), Orr & Son 1977 (intensive survey). Materials excavated by the writer are not believed to be attainable for observation and comparison with the finds of 1979 due to lack of funds. (in the Division of Archaeology, Maryland Geological Survey, Johns Hopkins University)

A series of conferences involving the principal investigators, advisory panel and interested persons were held at the field laboratory in Thurmont, Maryland in preparation of the Final Report. Data from the proposed oral history and land records projects will contribute to the final synthesis required for full mitigation.

Chonological Position of the Archaeological Features (Fig. 2)

Fig. 2 is an attempt to make as good an estimate of the chronological position as possible with the data obtained in the excavations and observations. The data has been organized into cultural periods of early, middle, late and post furnace spanning the period of nearly 200 years during which the site was continuously in use. The data supports the contention that an early iron-working complex located in the Auburn area to the south of the present location of the furnaces. The Auburn complex of iron-working features continued to operate into the late period in the use of the Auburn dam to power the forge which lies buried under some 10 feet of slag. But the ever presence requirement for iron ore shifted the center of the furnace activity to the north. At the time of shut down of the furnaces the supply of iron had again shifted to the north and the Kunklin ore mine (Check 16) was the last feature of the mine complex to shut down in 1911.

The story of the development of the iron industry at Catoctin Furnace is just beginning to emerge. The gradual aggrandizement of the industry is epitomized by the data indicating the increase in iron production from 600 tons of pig iron per year in 1775 to an annual capacity of 15,000 tons of pig iron per year in 1900 (Directory of Iron and Steel works in Contract Archaeology 1971, Chronological Chart). The raceways develop from simple channels fur into the base clay (as seen in Trench 6 and 7 of Check 17) to complete layering, buttressing and preparation of clay basins (as seen in Trenches 2 and 3 of Check 17). The mines change similarly from shallow rabbit warren diggings (as seen in Check 12-1 and 2) to deep and extensive excavations with the use of steam equipment (as in Check 16 mine and in the deep excavations of Check 12-4 and Check 15 the Big Ore Bank).

A comparison of the archaeological features of Catoctin Furnace
## Industrial Features

<table>
<thead>
<tr>
<th>Date</th>
<th>Cultural Periods</th>
<th>Furnaces</th>
<th>Working Areas</th>
<th>Hydraulic Systems</th>
<th>Roads</th>
<th>Quarries &amp; Mines</th>
<th>Domestic Features</th>
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<tr>
<td>1960</td>
<td>POST FURNACE</td>
<td>PARKS</td>
<td>PAINT</td>
<td>SYSTEM B.</td>
<td>CK12-6</td>
<td>CK9 QUARRY</td>
<td>CK20 MINERS</td>
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<td>1940</td>
<td>Land Devel.</td>
<td>STACK #2</td>
<td>CRIST</td>
<td>WOOD INDUST.</td>
<td>CK14-1</td>
<td>CK15 MINE</td>
<td>CK17 Horses</td>
</tr>
<tr>
<td>1920</td>
<td>Fish Hatch.</td>
<td>STACK #3</td>
<td>DAW MILLS</td>
<td>C11 ORE WASH</td>
<td>CK12-2</td>
<td>CK16 MINE</td>
<td>CK20 MINERS</td>
</tr>
<tr>
<td>1900</td>
<td>Wood Indust.</td>
<td>STACK #2</td>
<td>CRIST</td>
<td>C3 MULT-IRON-</td>
<td>CK11</td>
<td></td>
<td>CK20 MINERS</td>
</tr>
<tr>
<td>1880</td>
<td>LATE</td>
<td>STACK #1</td>
<td>C3 CONJ. FORGE</td>
<td>C11 ORE WASH</td>
<td>CK11</td>
<td></td>
<td>CK17 MINE</td>
</tr>
<tr>
<td>1860</td>
<td>(Steam Power)</td>
<td>STACK #1</td>
<td>C3 CONJ. FORGE</td>
<td>C11 ORE WASH</td>
<td>CK11</td>
<td></td>
<td>CK17 MINE</td>
</tr>
<tr>
<td>1840</td>
<td>MIDDLE</td>
<td></td>
<td>C3 CONJ. FORGE</td>
<td>C11 ORE WASH</td>
<td>CK11</td>
<td></td>
<td>CK17 MINE</td>
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<tr>
<td>1820</td>
<td>Catoctin Complex</td>
<td></td>
<td>C3 CONJ. FORGE</td>
<td>C11 ORE WASH</td>
<td>CK11</td>
<td></td>
<td>CK17 MINE</td>
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<tr>
<td>1800</td>
<td>EARLY</td>
<td>ORIGINAL</td>
<td></td>
<td></td>
<td>CK11</td>
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<td>CK17 MINE</td>
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<tr>
<td>1780</td>
<td>(Water Power) Auburn</td>
<td></td>
<td></td>
<td></td>
<td>CK11</td>
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<td>CK17 MINE</td>
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<tr>
<td>1760</td>
<td>Complex</td>
<td></td>
<td></td>
<td></td>
<td>CK11</td>
<td></td>
<td>CK17 MINE</td>
</tr>
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Fig. 2 Chronological Chart of Catoctin Furnace Archaeological Features.
Site with those of other furnace sites (Hopewell, Cornwall, and PineGrove) shows that these interesting sites which largely paralleled our site in time and which have seen been set up as public displays, do not have the the rich plenopaly of features that Catoctin Furnace does. Years will be needed to work out the details of this rich story. A comprehensive start has been made in the efforts of the 1979 excavation.

Cultural Materials Conservation Plan

Mrs. Edith Dietz, of the Smithsonian Institution Conservation Laboratory, was the conservator of the project. She visited the site to work in the field laboratory a total of 8 times during the course of the excavation. Her conservation plan for cultural materials visualizes two phases (1) the field, and (2) the depository or museum.

The field phase requires first aid to "needy" artifacts and temporary stabilization as required. The depository phase requires additional and permanent stabilization for all cultural material and possibly restoration. We were concerned with the field phase only since the cultural materials have been turned over to the Maryland State Archaeologist for disposition in the Division of Archaeology laboratory in Baltimore. Mrs. Dietz's role was to set up a field lab and to prescribe field phase treatment for the artifacts. The excavating teams were to carry out her suggestions in preparing the cultural materials for shipment to the depository.

The categories of cultural materials included: metal (principally iron), wood, ceramics, glass, and miscellaneous (including slag and stone), and skeletal material. This is a typical pattern of materials for the historic Euroamerican site. The one Amerindian site (Check 5) contained only a few fragments of stone which presented no problem of preservation.

The treatment for skeletal material was simple and effective: (1) remove gross adherences of soil, and (2) allow the bone to dry out gradually over a period of weeks. This was accomplished in a dry attic over the kitchen. Dr. J. Lawrence Angel, of the Smithsonian Institution, was the physical anthropologist of the project. He was well pleased with the success of both the excavating techniques and the field phase conservation techniques as he was able to analyse the bulk of the burials. The original condition of the bone ranged from poor to good. The final deposition of the skeletal material is hopefully in the smithsonian, as requested by Dr. Angel who considers the Catoctin Furnace burial ground collection both unique and valuable. New regulations require that the archaeological service of the Department of the Interior must be advised in the case of an ethnic (Black) cemetery so that concerned organizations of that ethnic group can be referred to for possible suggestions on the final deposition of the bones. While in the
Smithsonian the bones have been hardened, analysed and placed in permanent storage boxes (Appendix C).

Ceramic, glass and stone artifacts were uniformly in good condition and required only washing. Iron artifacts varied in condition ranging from good to very poor. Nails, for example, were often reduced to rust. In general the older the iron artifact was the more oxidation it had undergone. Some, with good drainage conditions, were in fair to good condition. This was because the pH factor of acidity-alkalinity was about 7.5 in a total scale of 14 - or nearly neutral. This relatively stable condition in regard to salinity was also reflected in the condition of the mountain water used to wash the artifacts. Nevertheless Mrs. Dietz prescribed boiling the iron artifacts in distilled water and storing them in non-humid, cool conditions. It proved very difficult to control the heat and humidity in the old building used as lab since air conditioning was lacking. Nevertheless efforts to control the humidity were partly achieved by the use of plastic wrapping and containers. And throughout most of the year the house was cool.

Wood artifacts also proved difficult on account of humidity. Here the requirement was for slow drying and avoidance of excess dryness. This could be partly achieved by the use of plastic containers.

Mrs. Dietz preserved a number of spikes, large nails, and other iron objects (Check 3 iron pan), as well as wooden objects (Ck6, casket wood). A iron clasp knife with tortoise shell handles (found under the Auburn Dam bank at Check 17, Trench 1) was also preserved. Mid-Atlantic Research treated a number of coffin nails to facilitate their type identification as a chronological indicator. Milner Associates also treated some sprue and gates found as a by-product of the casting process (Check 3) by the electrolysis process restoring them to pristine condition.

The use of air conditioning and a special lab area provided with running water is recommended for future field laboratories. However inadequate the storage facilities (especially for iron), the low salinity and temporariness of the phase were saving factors. In regard to suggestions for the permanent storage of the artifacts in the depository in Baltimore, Mrs. Dietz reiterated the vital importance of place the responsibility for the artifacts in the capable hands of a trained conservator.
CHECK 4. BATH AND SPRING HOUSE  
(18FR321)

Research Design

The Check 4 area research design underwent some changes as the result of excavations and the recommendations of the Advisory Panel of the project. The original plan to salvage the stones of Feature 1, the Bathhouse, for possible reconstruction was abandoned due to the quantity and complexity of the remains. In its place a plan to "monitorize" the feature when the highway had been constructed was substituted. This consisted of carefully excavating, measuring and recording the remains, and installing instruments to observe the effect of the road on the ruin in regard to vibration, compaction, torque-stress, chemical changes and the like. (Orr et al, July 1979, pp. 19-23; Appendix 2).

As the raceway feature which was originally part of the Check 4 complex increased in size and complexity, it was seen desirable to extend Check 17 as a linear zone to the perimeter of Check 3, iron-working site to the South. Also, as a result of excavation and oral history studies, the Spring site (Feature 2) was recognized as a recent feature constructed by the Tresselt family to assist in their goldfish hatchery in the 1920's.

The Bathhouse site (Feature 1) was discovered to have an early level at which time it was a springhouse. Additional time and effort had to be allocated to accommodate this turn of events. On the other hand, the search for pathways to and from the feature proved less rewarding than expected, with the exception of the area directly around the bathhouse. Interior drainage problems both faced by the original builders and the excavators proved more complex and pressing than visualized since the site was situated on a spring. Finally, quantities of ceramic artifacts, also not anticipated but very welcome, were found associated with the site features.

The 1979 Excavation

Exterior of Feature 1, Spring-Bathhouse.

Four test trenches were placed at the corners of the feature (Trenches 1-1A, 2-2A, 5-5A, Testpit 6-Trench 6; Fig. 3).
The trenches were dug to the subsoil, perpendicular to the walls, then expanded to explore up to half the entire length of each wall. In addition, two pathway trenches were dug (Trench 6-6A, Trench 3), exposing the area immediately in front of the doorway, and in a likely area 8 feet east of the southeast corner. Here a pathway, bowl-shaped and 4 foot wide, was discovered leading in a southerly direction. The pressing time factor and overburden of stones and debris in the general area did not allow for further excavation of pathways.

Oral history notes that slave women heated water in a large kettle for the baths of the women of Auburn House and the Iron Master's cottage. This common understanding got some support with the discovery of charcoal fragments near the front door and behind the opposite wall. Here an iron pipe with screwed-on elbow joint was found. Oral history suggests that this pipe was part of a ram jet pump which sent water from the spring up to the Auburn House and also that the same pipe brought water down for the bathing from the raceway directly to the west. The pipe, non-commitally, was found extending to the raceway stone wall - which also pointed in the direction of the Auburn House. No well-defined builder's trench was found along the grid west wall. Here the foundation stones had been laid up against the subsoil loosely. The grid South wall had a more pronounced band of discolored soil, indicating a wide cut outward into the subsoil in laying the foundation stones and door step. In the grid North wall builder's trench large stones and mixed clay fill had been dumped in an effort to divert the stream of spring water located at subsoil level.

The cultural material from the builder's trenches included 29 redware sherds. These and the other redware sherds found in the 1979 excavations were identified by Ms. Betty Cosans, project ceramist, as local wares. The Makley family of Thurmont operated a redware pottery kiln in the 2nd half of the 19th century. The kiln, located in the present-day "Crow's Nest" camping area near where U.S. 15 crosses Maryland route 77 according to members of the family visited by our team, supplied local needs for the greater part of the 19th century. Location of the kiln site and its excavation would be an important task for the future. Four blue transfer print decorated sherds (19th century, pre-1860), and 3 blue-shell-edged sherds, both groups being pearlware were found. The shell edged sherds may be of the late 18th century but predate 1840. One shell-edged pearlware sherd was dated by Ms. Cosans as 1820-40 in the later phase of that style. (Noel-Hume, 1970, pp. 129-133). Other finds from the builder's trenches included several dozen cut nails of various sizes and a few wrought iron ones, brick fragments, and an iron casting of a sprue or gate, by-product of a casting mold, a curved piece of thick iron of unknown use, and numerous small grey and shiny slag fragments. These and other similar materials found in the north, south, and east wall trenches appeared to indicate a time period from the early to the middle of the 19th century. (See Tables 4, 5 and 8).
Interior of Feature 1, Spring-Bathhouse.

After clearing away the overburden of humus, wall stones, and wall plaster, flagstones were revealed forming a floor. The flagstones one to two feet wide and two to three feet long were extraordinarily thick (5-6 inches) and weighed from 50 to 130 pounds each. A two-foot square metal basin occupied the southeast corner of the floor to a depth of 29 inches below the floor level (Feature 1B). The basin was filled with water and functioned as a catchment basin being fed by a channel which funneled spring water from an iron-grated square hole in the west wall. A similar opening also grated with pointed iron "teeth" was opposite the basin allowing egress for the constant supply of spring water. (See horizontal overview Fig. 3, and wall profiles Figs.13 and 14).

Wooden boards were seen on the western edge of this basin extending underneath the flagstone floor (Feature 1W). In order to explore this lower level the floor stones along the north and west walls were taken up in a two-three foot wide L-shaped trench. A foot-thick layer of dark soil mixed with numerous brick fragments and bats, as well as glass fragments and sherds, intervened between the two levels. At the bottom of this dark fill was a thin, sandy silt layer (4 to ½ inch thick) covering 1 inch-thick wooden boards. The boards were partly deteriorated. They were one foot wide and were lined up two abreast running parallel to the north and west walls. Evidence that these were trough boards was found in four corners of Feature 1. Here several vertical wooden edges 2-4 inches high indicated their function in channeling the spring water which continually flowed from the ground. A test pit in the interior of the floor showed that the trough boards did not extend over the entire floor but hugged the edges. This test pit revealed a sandy layer several inches thick located a foot below the flagstone floor and a light scattering of brick fragments. This pointed to the possible presence of a coursé brick floor at the wooden trough level - the first floor for the springhouse. Underlying the sandy zone was a thin layer of slag similar to that found in the builder's trenches. In the test opposite the front door bricks were found which had been put in, on second thought, over a non-functioning wooden trough board.

In the process of removing sections of the stone floor, a 10 to 12 foot long double tiered two-abreast row of bricks was found in the underlying clay layer (Feature 1S). It stretched, in a Y-shape from the middle of the west wall diagonally to the metal catch-basin in the northeast corner of Feature 1. The Y-opening was adjacent to the opening with the iron "teeth" noted above. A square metal pipe ½-1 inch thick was discovered at the top of the catch-basin (Feature 1A; Fig. 13). This pipe, over 2 feet long, exited through the stone wall into an outside piled-stone drain that ran underground toward the stream located 10-15 feet north of Feature 1 (Feature 1R, stone drain). This appeared to be an elaborate drainage system to channel water outside of the springhouse. (See Fig. 4)
Oral history has identified a large bathtub (wooden, plaster or both) said to have occupied the southwest corner. A pipe hole was found beneath the stone floor, paralleling the west wall below the flagstone floor but above the wooden trough was an iron pipe 4 inches in diameter and 4+ feet long. The pipe end coincided with the entrance of the brick drain and could possibly have acted as a drain for water either originating at the spring or somehow flowing out of the bath tub. Ladies from the Auburn Mansion and perhaps elsewhere, according to oral history, bathed here only in the summer. There was certainly no evidence of interior heating. It is easy to surmise that they partook of light refreshments as suggested by ornate cut glass sherds found on the bathhouse floor along with cup and saucer sherds (Table 2).

Summary

Phase 1, the Pre-occupation Period.

Before the Spring-bathhouse was built this was a gently sloping spring area. It was probably used as a spring area due to its proximity to the iron-working area directly to the south. A spout or gate from a casting house and furnace tailings at the top of subsoil zone may come from the late 18th century site.

Phase 2, The Springhouse Period.

Construction started in the early 19th century when pearlware, with transfer prints and blue and green shell edges, as well as cut nails were well established as common artifacts. The springhouse may have been built about the same time as the Auburn Mansion with which it is associated in oral history (1803). The mansion, home of the furnace owners, was located on the same property a few hundred feet to the west. A variety of crockery sherds found associated with the spring water troughs and catchment basin indicated its use as a refrigerator for foods. Ms. Betty Cousens, ceramist of the project, found the pottery associated with the springhouse period to have a preponderance of sherds between the time period of 1820-60. A land record of 1858 (Frederick Co. Courthouse Liber BGF 3 F312) recording a survey made for Mr. Fitzhugh and the bearings of Dr. Wm. S. McPherson of the "Old Forge" area mentions "bank of race, springhouse and spring" and locates their bearings.

* Or support of the brick drain.
Phase 3, the Bathhouse Period.

The troughs and floor of the springhouse were covered by a new floor when it was made into a bathhouse. One reason for terminating the Springhouse may have been technological with the increased use of pond ice for refrigeration. Secondly, there is a springhouse which is much smaller and closer to the mansion. Bathing spas were also increasingly popular in the late 19th century and the idea of a special house for women's bathing would have been considered fashionable. Two informants saw the tub used for the bathing in situ but were unable to agree on its description.

Phase 4, Disintegration Period.

According to oral history indoor plumbing came to Auburn Mansion in 1915. It was no longer necessary to bath in the bathhouse and it fell into disuse. The walls were torn down to provide stones for the wall of a nearby driveway.

Associated Features.

The raceway wall which forms a backdrop for the bathhouse and supports the 20 foot-wide raceway structure came in at the time of the building of the Auburn Dam for which it supplied water. This was probably in the earlier part of the 19th century.

The present spring had been constructed in a square shape with a cement box enclosing the spring in the 1920's. It was probably an enlargement of an earlier spring, but no evidence of a springhouse was found.

Conclusions

The 1979 excavation was sufficiently extensive to give a comprehensive view of the archaeological situation at the Check 4 area. Fully 50% of the site was excavated with 400 bags of artifact fragments collected. The stratigraphic complexity of the site was thoroughly studied and the sequence of events appreciated. In order to realize fully on the value of this site additional oral history studies and land record analyses are being proposed.

To complete the monitorization of the site an overflow trench is needed carrying away the spring water from the site. The site will be filled with sand after instruments are planted with cables leading to a cement bunker (Appendix E)
Tabulation and Analysis of Cultural Material

From the Check 4, Feature 1, Bathhouse-Springhouse Site
Table 1. Check 4, Feature 1, Cultural Material
From Beneath Bathhouse Floor
(Test Pit 8, Trenches 8, 8A, 9, 10, 11, 11-11A, 12)

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<th>Features(F)</th>
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<tr>
<td>L Head</td>
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<td>5 6</td>
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<td>T Head</td>
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1Types and Dates from Nelson, 19-1790-1820's. 21815-late 1830's. 31830-late 1830's. 4Late 1830's-Present. 517th-19th centuries. 6Late 1800's-Present. 7Impressed base and neck seam included - early 20th century.
Table 1. (Continued)

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*Five whole brick samples taken from Top FIB (2) and S.F1S (3).
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¹See Table 1 footnotes for chronology. ²Medicine c.1867. ³20th century. ⁴19th century, pre-1860. ⁵1820-1900+. - 21 -
Table 2. (Continued)

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619th-20th centuries 73 round and 3 cut nails
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119th-20th C
Table 4. Check 4, Feature 1, Artifacts from Outside Bathhouse  
(Test Pit 1, Trenches 1, 1A)

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<td>Bottle</td>
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1Late 1815-1830’s.  2Late 1830’s to Present.  3Top of FlC
4Late 19th Century - Present.  5Post 1867.
Table 4. (Continued)

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619th C. pre-1860. 71820-40. 817th-20th C. - most likely 19th C. 919th-20th C. 1020th C. 11Pro bly late 19th C.
Table 5. Check 4, Outside Feature 1
Artifacts from Outside Bathhouse
(Test Pit 2, Trench 2-2A)

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1805-1820. 21815-1830's. 3Late 1830's-Present. 4Late 18th-Mid-19th C. 519th C. Pre-1860. 617th-20th C. 719th-20th C.
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12 Plus 1 whole brick. 13 Slate.
Table 6. Check 4, Feature 1, Test Pit 3 and Trench 3

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1Late 18th C., pre-1840. 217th-20th C. 3Prob. 19th-20th C.

Table 7. Check 4, Feature 1. Artifacts from Test Pit 5 and Trench 5, 5A.

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11804-20. 21815-1830's. 3Late 1830's-Present. 4possibly burrow.
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5c. 1900. 6Late 19th C. 7Prob. 19C, pre-1840. 8Late 18thC-Mid 19th C. 919th C.
Table 8. Check 4, Feature 1, Artifacts
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11805-1820. 21830's-Present. 3Late 19thC-Present
4Late 18thC.-Mid 19thC. 51820-1850. 619thC, pre-1860.
718thC. pre-1840. 817thC-20thC. 9most likely 19th-20th C.
101 with blue glaze. 11plus 1 whole brick.
Analysis of Bricks from Check 4, Feature 1, Spring-Bathhouse Site

The Common Brick

Of the 18 whole bricks found on the site all but two were associated with features having to do with the Middle Period when the springhouse was remodeled as a bathhouse (Feature 1V-1, south end Feature 1S-3, F1S-1, fill Layer 3-2, fill Layer 4, Trench 2-2A-1 and Feature 1X-1, and after the bathhouse's destruction (top of Feature 1B-1). The two other whole bricks were from Feature 1L builder's trench (in Trench 6A), and the bottom of Feature 1B metal catch basin.

All the whole bricks appeared to have been hand molded, being porous with some possessing distinctive mold marks (laceration or imperfections; also sand adhering). They were orange to buff-red in color.

Four bricks averaged c.8" long by 2½" thick by 4" wide. All came from the south end of Feature 1S. Those bricks measuring less than 4 inches in width come from the brick drain Feature 1S, the builder's trench Feature 1L, the top of Feature 1B, a sandy lobe arm of the drainage system, the middle of the bathhouse Feature 1B and from fill layer 3. The average size of such bricks is c. 3 3/4" X 8" X 2⅞" (in Feature 1L the exception measured 3½" X 7 5/8" X 2⅞" and was buff red in color). Only two whole bricks were reconstructed from bats found in Layer 3 inside Feature 1.

Of the 40 brick bats having 2 dimensions which were measured almost half (17) came from the fill Layer 3 which had been put in over the springhouse floor to elevate the stone floor of the bathhouse, followed by 6 bricks coming from the destruction period (top of Feature 1B); the rest were evenly distributed among the features and layers already mentioned (except for new additions from Feature 1C and Feature 1R, stone drain). The bats (as with the whole bricks) were porous, orange to red-buff with mold markings evident in some as well as sand adhering to the sides. Twenty bats out of 40 measured under 4" wide (3 5/8" - 3 15/16") and come from areas considered related to the bathhouse construction. These areas included Feature 1S, mid to bottom of Feature 1B, top of Feature 1B, south end of F1S, brick drain, fill layer 3, and the top of F1C3. The other 20 bats, 4" wide, came from fill Layer 3, south end of F1S, early builder's trench of F1, and fill layer 4, Trench 2-2A. The average thickness for the majority of bats was c. 2½". Their two dimensional measurements were about the same as those of the whole bricks.
The Firebricks

Four bats and one whole brick were identified as firebricks. They were tan in color of a roughly texture "lumpy" ware type with impressed letters reading "Berry's Premium". Similar bricks were found in the casting house stratigraphy of the Catoctin Charcoal Furnace, Stack No. 2 ("Isabella") built in the late 1850's (Orr and Orr, 1975). The one whole fire brick found measured 8 3/4" x 2 3/4" x 4". The bats were roughly, though not identically similar in 2 dimensions (width and thickness). These were found in Feature IX, a sandy lobe to accommodate the old springhouse stream and bathhouse drainage - see ground plan) and on top of Feature IB in building rubble from post-destructive period. The whole fire brick came from the fill layer in Trench IA hypothesized to have been filled in at the same time the springhouse was converted to a bathhouse.

Conclusions

The post middle of the 1800's date for the firebricks help verify the date of the reconstruction of Feature believed to have taken place in the late 1800's. The common bricks analysed were probably made until the late 1800's with the wider bricks, often more orange in color and porous in texture, indicating an earlier style extending back to the beginning of the 1800's. All the wider bricks, though found in later contexts were definitely found in the builder's trench Feature 1C. Conversely, a smaller size brick found in the builder's trench Feature 1L might point to a late intrusion of that feature. Brick size, as such is unreliable when taken as a single criterion since bricks of differing sizes were used for different purposes during the same time period. However, we have observed that the common brick is generally larger in all dimensions in earlier colonial times and that the seriation trend was toward small and more compact bricks up to the present time. Because only a few bricks were obviously reconstructible from the brick bats it is assumed that most of the brick fragments were included in fill brought in from elsewhere - rather than representing, for example, an original brick springhouse floor. Also, the brick drain may have contributed some spalls and bats during its construction.
Ground Plans and Profiles of the
Check 4, Feature 1, Bathhouse-Springhouse Site
Fig. 3. Ground Plan of Check 4, Feature 1, Bathhouse-Springhouse.
Fig. 4. Ground Plan of Check 4 Features, Bathhouse-Springhouse.

- 36 -
Fig. 5. Profiles of AB (Trench 8), Trench 11 & 13, Check 4, Bathhouse-Springhouse.
Fig. 6. Profile of CD (Trench 10, 11, Inside East Wall of Feature 1) Check 4.
Legend:
La. 1 - humus
La. 2 - mortar mixed with humus
La. 3 - old humus; La. 3A - course red soil
La. 4 - clay and mixed sandy soil fill
La. 5 - silt
La. 6 - sandy clay subsoil
--- = trench excavation
--- = hypothetical boundary

Fig. 7 Profile of EF (Trench 1A), Check 4, Feature 1.
Fig. 8. Profile of GH (Trench 2-2A), Check 4, Feature 1.
La.3 - sandy clay
La.1 - dark humus
La.2 - sandy soil mixed with
datum plane (grid S.W corner) humus.

Legend:
--- = trench excavation
--- = hypothetical boundary

scale: 1 ft.

Fig. 9 a. Profile 1J (Trench 3), b. Profile KL (Trench 5A), Check 4, Feature 1.
Fig. 10. a. Profile of MN (Trench 6), b. Profile of OP (Trench 6A), Check 4, Feature 1.
Fig. 11. Profile of QR (Trench 8A, 10, Inner South Wall of Feature 1),
Check 4.
Fig. 12. Profile of CD (Trench 10, 11, East Wall of Feature 1), Check 4.
Fig. 13. Profile of UV (Trench 9; North Wall of Feature 1)
Check 4.
Fig. 14. Profile of WX (Trench 8, 8A, 9A), Check 4, Feature 1.
CHECK 9. LIMESTONE QUARRY  
(18FR325)

Research Design

The objective was to mitigate the effect of the impact from road construction on this small limestone quarry site. A partially exposed limestone outcrop was faced by a 40x40' box-like depression approached by a 12 foot ramp. It was planned to excavate up against the outcrop to get information on the techniques used in mining, and hence an idea of the purpose of the mining. A second purpose was the chronological position of the quarry. A backhoe dug an irregular trench across the face of the outcrop.

The 1979 Excavation (Fig. 15, 16)

The base of the backhoe trench was approximately 6 feet below the surface of the open pit depression, itself some 7 feet below the surrounding surface of the ground. Quantities of limestone chips 6-12 inches in diameter and smaller came from the lower level of the trench. These chips had obviously been produced by the use of an iron hammer or maul on the outcrop. Quantities of green bottle glass, a three legged iron pot, and a battered liquid container with a small spout (kerosine tin?) were found along with a number of faggots of charcoal. In the 1977 survey refuse soil with small chips of limestone were found overlaying the burial ground (Check 6) directly to the north. At this time burial stones were found (2) keeled over as it were by a horse-drawn slip - the probable method of excavating the quarry pit.

Check 8, alleged silver mine 75 feet southwest of Check 9, was determined to be a miners' test concerned with the same limestone strata which was quarried in Check 9. (Orr and Orr 1977, p. 43). Dr. Fauth, geologist of the 1977 and 1979 excavations, came to the conclusion that this limestone, a dolomite, could have been used as a flux but was marginal in its properties, and was probably not extensively used (Appendix A, pp. 15-18).
Cultural Material from Check 9, Limestone Quarry

**Catalog #501.** Test 3, 10 inches below surface.

1 iron object, 8" long resembling a housing for electrical apparatus.

**Catalog #502A.** Square North 20, East 5, 1 - 8" below surface.

- 1 drawn metal wire.
- 2 clear brown glass (bottle?) fragments.
- 2 clear green glass (bottle?) fragments.
- 5 wood chips

**Catalog #502B.** Square North 20, East 5, 3' below surface.

2 charred branch fragments (firewood?)

**Catalog #502C.** Square North 20, East 5, resting on limestone outcrop base, 4" below surface.

9 limestone fragments 3-5" long, multifaceted.

Note: These are a sample of similar fragments which littered the base of the outcrop. The facets were made by percussion impact of a heavy instrument such as an iron hammer.

1 clear, window-glass, fragment, 1/16" thick.

Note: This clear but thin glass is typical of the late 19th century.

2 anthracite coal fragments.

Note: Coal fragments were common in the second half of the 19th century and early 20th century.

1 black ash fragment (coal ash?)

1 iron pot fragment with raised gate ridge at base.

Note: A common cooking utensile during Catoctin Furnace period and probably made nearby (see Check 3).

**Catalog #503.** Square North 20, East five, 2' below surface.

1 iron screw fragment.

**Catalog #504.** Square North 20, East 5, 5' below surface.

1 ribbed metal can with small spout (keosine can?).

**Note:** Cultural material of Catalog #501, 502A, 503 are associated with use of the quarry depression as a dump in the 20th century.

Cultural material of Catalog #502B, #502C, and #504 are associated with the mining period of the site in the late 19th century.

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Interpretation

1. The limestone quarry was an experiment to get limestone for use as flux in the Catoctin furnace. Larger pieces of the crushed limestone, mauled from the outcrop, were removed for this purpose, and the debris scattered over the nearby ground.

2. The miners ate their lunches in and around the depression leaving charred wood, iron pot, and bottle fragments. Kerosine was used to start the fires. These artifacts appear to be in the style of the late 19th century.

3. Only a few feet of outcrop was removed. The quarry was probably abandoned due to the lack of suitable quality limestone. In Appendix A, Dr. Fauth, geologist of the project, reported that the limestone appeared to have numerous impurities - and that this made it undesirable as a flux ingredient in the furnaces.

Conclusions

Sufficient excavation was done here to gain the essential facts about the site and to interpret the site as an aborted limestone quarry originally opened in search of flux for the iron-making process. The site is next to Check 8, presumed silver mine which was interpreted to be also a test excavation - looking for iron ore. Oral History informs us that in the last days of the furnace considerable testing for ingredients to use in the furnaces took place. (Orr and Orr, 1977, pp. 40 et seq.)
Fig. 15. Map of Check 9, Limestone Quarry, and adjacent sites (excavated by MAAR).

Check 8, Test Shaft investigated in Orr and Son, 1977 (pp. 40-44)
Fig. 16. Check 9, Limestone Quarry. a. Grid #1, Ground-plan; b. Profile, E20-N0-N35; c. Profile N028:E25.
This site was an exhumed cemetery removed by SHA right of way personnel a few years ago. It contained bodies of perhaps a dozen burials and a headstone bearing the date "1787". On the assumption that other burials might still be present the site was included in the 1979 excavations. It was learned, however, that burial grounds per se including this one did not qualify as historic monuments unless famous personages were buried there. However, it was also indicated that if there appeared to be a possibility that burials were still to be encountered there and if they would be disturbed by the road construction that excavation could proceed. The State Archaeologist and the Project Director visited the site and determined that the site resembled typical family burial grounds. One measuring about 20 by 15 feet and surrounded by an iron fence occurred a mile south and on the west side of the road (well clear of the road construction). It was also determined that the impact would not disturb the soil deeply enough to encounter any remaining skeletons. With this information it was decided not to excavate the site. Request had been previously made to utilize the funds allocated for this site on other sites of the project.
The race pond was recognized as a major feature in the hydraulic power system of the iron industry at Catoctin Furnace. Research was designed to explore the origins, functions and dimensions of the original pond now partly buried under the existing U.S. route 15, and scheduled to be nearly covered by the proposed alignment construction. The investigations were accomplished by a series of borings drilled to bed rock by the SHA Bureau of Soils and Foundations and by excavations undertaken by the Consultant's team (Team C). The objective was to reconstruct to the degree possible the history of the pond (Orr et al., July 1979, pp. 29-31).

The 1979 Investigations (Fig. 17)

Geological Investigations - The Borings.

41 borings were taken by the SHA engineers and analysed by Dr. John Fauth and Dr. Jonathan Harrington, State University of New York/Cortland. Dr. Fauth was asked to determine the deep subsurface structure under the pond where standard excavating techniques could not go. Dr. Harrington was asked to study the spore content of the pond and compare it with that of the Auburn Pond. It was hoped to get a spore profile indicating variations in vegetation resulting from timber cutover to satisfy the demands for charcoal. The reports are in the appendices of this report. (Appendices A and B)

Fauth discovered that a depression extending to 50 feet below the surface underlay the pond. The depression contained fill at a minimum of 18-22 feet below the surface. The fill contained an abundance of iron ore, iron granules, brick, charcoal, glassy slag, pottery, and wood. He reasoned that this depression was not natural and that it was much deeper than needed for the efficiency of a race pond. It must therefore represent a mine that had been excavated and refilled with debris. Time and money were not available for an archaeological examination of the fragments of cultural material recovered in the 2" wide augers. The collection is housed in the laboratory of the Department of Geology at SUNY/Cortland.

Harrington prepared a preliminary palynological analysis of 18 samples from the race pond ranging from 0 to 32 feet.
He detected a number of species of trees of the "sprouting" type which invariably spring up when forests are cut over, several flowers associated with open fields, and some swamp plant species. However, the frequencies of the collection were below what was needed for significant results. Also the fact that some of the data came from the fill area raised the suspicion that this was not in situ. Thirdly muck lithologies suitable for recovery of palynomorphs were lacking in the cores of the Auburn Dam site. There was no evidence that selective cutting of timber was employed and the presence of oak and chestnut in most samples confirmed that the forests were clear-cut (approximately every twenty-five to thirty-five years according to Kaylor, 1946) and of the "sprout" type rather than a clearly developed plant succession. The presence of Chestnut predates the racepond prior to the chestnut blight in 1912.

Check 11, Trench 1, Racepond. (Fig. 18)

A backhoe trench was cut through the SHA construction layers bulwarking U.S. Route 15 as built in 1960-61. The black muck of the pond was revealed some 3 feet below the overlay mantles of road construction earth. Due to the high water table the cut began to cave-off as soon as it was excavated by the backhoe. No artifacts were recovered. It was noted that the north end of the trench revealed a stone facing to the side of the racepond up against the side of the pond.

Check 11, Trench 7 (Fig. 19)

A series of test pits and trenches were placed in the plateau to the north of the racepond area between the pond and the Little Hunting Creek. The strata consisted of mottled grey and tan clay with iron nodules occurring in zones. This resembled the strata found on the washer ramp of Check 15 during the intensive survey of the site (Orr and Orr, August, 1977 p.60 et seq.). Such puddled areas were the result of sloshing water over iron ore to separate the clay and sand from the ore (nuggets and/or ferrous oxide lumps). Such ore washing had taken place at the Trench 7 area directly on the cobbles and coarse sand of the old stream bed. Finally a shallow pit was dug in the top of the mottled clay and used as a dump area. The following cultural material was recovered:

Cat. No. 2048. 52" b.s. at south end of trench. 1 wire spike.

No. 2050. Fl, bottom layer. 19 frags. charcoal, 1 peach pit.

No. 2053, Fl, bottom layer, 2½' below surface:
1 metal horseshoe
3 brick fragments
5 glassy slag fragments

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No. 2055. Fl, 12-24" b.s.:
14 slag fragments, green glass (charcoal furnace).
6 glass fragments of a moulded medicine bottle of green
glass with "A7" in raised letter on base (2nd half 19th C)
9 iron frags. badly rusted spike included.

No. 2058. Fl, 12-24" b.s.
7 glass frags. (1 green bottle, 6 clear window).
29 rocks (stream worn)
2 iron nails. T-head, cut nails (Post 1830 to present)
6 slag fragments
15 charcoal fragments (1 pig iron end, 7" long; 1 bolt, 1,
iron tool like a strap
11 whiteware sherds ("ironware")
1 salt glaze greyware sherd (crock)
1 crock sherd with white exterior and dark brown interior
(late 19th C).
2 blue shell-edged pearlware (early 19th C)
22 redware sherds
1 blue on white porcelain sherd
1 peach pit

No. 2064. Fl, 12-18" b.s.
3 brick bats, stick molded 3½x2 1/8th" (19th C).
19 redware sherds (17 brown glaze)
6 rusted nails
1 large rusted spike
1 Light blue transfer print rim sherd (post 1840)
3 whiteware sherds
1 curved clear glass fragment
1 flat, clear window glass frag.
1 frag. clear glass
8 slag fragments
3 charcoal fragments
31 small rock fragments, possibly hematite.
4 badly rusted chunk

Interpretation. The first use of the area was to wash iron
ore, probably secured from nearby and washed with water from the
creek. In the latter part of the 19th century refuse and debris
from both domestic and industrial areas were carefully buried here
in dug pits.

Check 11, Trench 8 (Fig. 20)

This was a deep backhoe dig to old stream bed subsoil. A
layer of mottled grey clay from ore washings was sandwiched in
between a brown soil fill containing brick fragments and charcoal
and a light brown soil stratum containing some furnace tailings.
No artifacts were recovered. A path had been cut near the edge
of the built up plateau overlooking the creek - possibly to provide
stabilization in drainage (SHA for 1960 U.S. Route 15 construction?)
Check 11, Trench 9, ore washings at edge of racepond. (Fig. 21)

This long, backhoe trench started in the filled in racepond bottom and cut into the west bank. The top strata of the bank (6,7,8) consisted of mottled clay, grey and yellow a fill of loose clay and light brown soil. Under the top mantle was an iron bearing strata and a grey clay gumbo. Directly to the east was a heavy sand stratum overlying a light grey clay stratum - both heavily impregnated with water to the point of caving in frequently. No artifacts were found.

Interpretation. The top strata on the bank resembles the droppings from ore washings. It rests, however, on natural strata that is reminiscent of ore mine strata (as in Check 12 digs). The soft strata, sand and clay form part of the original racepond now in a semi dry condition. It appears that this edge of the pond was used for washing ore. The ore washing preceded the use of the area as a pond since the coarse sand layer is superimposed in part on the ore washing layers. Ore mine strata underlies the area. Stratum 2 appears the top part of a fill extending for an unknown depth (borings indicate that this is the edge of the mine which occupied the area prior to the racepond.

Check 11, Trench 10, Ore washings and Berm Ditch. (Fig. 22)

Oral history (Renner) identified the large ditch as the west end of the racepond as a burn ditch to carry off water feeding into the remnant of the racepond from springs located several hundred feet to the north. The same ore washing debris is found in the stratified profile resting as in the case of the trenches discussed above on the old creek bed.

Miscellaneous Tests.

Test pits 1 and 5 revealed the same combination of furnace tailing and ore washing debris noted above.

Trench 6 a mound some 7 feet high and 50 feet in diameter was also tested by a backhoe trench. The mound consisted of largely sterile earth filled with stream-worn rocks and boulders. It was interpreted as the dirt pile resulting from the SHA construction of the berm ditch.

Limestone Outcrop. A mound 25 feet in diameter and 9 feet high was found in the southwest portion of the racepond area. This mound was not recorded on the Maryland Department of Natural Resources April 16, 1978 maps which form the basic maps of our study. The feature is entered as an overlay (Fig. 17). This mound is a large outcrop of limestone which was avoided in the mining operations. Subsequently the racepond waters engulfed it as an island.
Check 12, Feature 5, Head of the Raceway (Fig. 23)

A backhoe cut a 32 foot trench 3 to 5 feet wide and 2 to 4 feet deep across the 10 foot deep ditch which formed the head of the raceway channel carrying water power to the furnaces, mills and forges of the Catoctin iron-working complex. The profile of this trench laid bare the stratigraphy of the water channel and revealed a number of phases of development of the raceway.

It was discovered that large fieldstones had been placed at intervals up the slopes of both banks of the U-shaped channel under a mantle of soil 2-3 feet thick. Three to four feet below the surface at the bottom of the ditch a square-bottomed inverted truncated pyramid-shaped cut was seen intruding into the subsoil in both east and west profiles. The cut, measuring 3' wide by 3' deep, was lined with 6 inches of clay. Deposits of sand and small stones were found at the top of this clay lining to a thickness of 4-6 inches. Over these strata was a mixture of humus, clay and sand filling to a depth of some 2 feet from the surface down. The only artifact found in this fill, at about 1' below surface was a piece of modern type clear glass (20th century). On top of the clay lining a piece of anthracite coal was found; and in the clay layer at 14" b.s. a light brown glazed redware sherd was found. The redware was similar to that found elsewhere in Catoctin Furnace site features of the 19th century. The coal suggested the latter part of the 19th century by which time it had become the major source of energy.

The banks of the channeled area were seen to be a series of built up soil layers consisting of a burnt ore layer (4 inches thick) sandwiched in between fill soils. The clay lining of the channel cut ran half way up the banks, higher up the north than the south bank of the raceway. The north bank had about a dozen large stones at the base of its mound. These stones were covered with clay at the edge of the raceway. Large quartz stones were found two-thirds of the way up the north bank and similar large stones were found on N.Bank. The stones rested on the burnt ore layer.

Interpretation. The box-shaped cut at the bottom of the ditch represented the original clay lined raceway channel. The banks of the original raceway were were only a foot or two above the water level. The banks were built up an additional 2½ feet with furnace tailing and stream sand in stages which were stabilized by the use of the large rocks to give a retaining veneer if not a wall. The purpose of the build up was to provide a channel for an additional flow of water in the raceway. The highest extent of the clay lining then was during the period of greatest need for water, or the fullest development of the water wheel to provide power for the mills and forge but especially for the charcoal blast furnaces. The banks built up of furnace tailing were heavily impregnated with charcoal fragments. With the advent of coal, steam engines replaced the water wheels in providing a hot air blast.
The fill over the clay lining of the water channel was the result of ground water erosion following the abandonment of the water system. Finally, Lanceolot Jacques developed his deer park lakes through the use of the partially filled raceway which conveyed water from the Little Hunting Creek stream much as the original race pond had (see above). Renner reports that at that time a boat could navigate between the race pond and the deer park lake in the Check 12, Feature 2 mine hole, the Check 12, Feature 3 mine excavation being filled in with a stone wall dam.

It is probable that the high point of the use of water power came during the period of overlap of the two charcoal burning blast furnaces Stack No. 1 and Stack No. 2 from 1857 to 1887 (Contract Archeology 1971, Chronological Chart p.37).

According to Renner the remains of a wooden aqueduct was found in the raceway channel just south of the Jacques dam between the two mines. It seems unlikely that a passage would be cut across a vital water channel in search of iron ore, so we must conclude that the aqueduct and hence the water system itself post-dated the mine operations in this area which included the mine which later became the race pond.

Observations.

1. Fauth notes the right-angled construction of the west bank of the racepond area and suggests a deliberate cutting of this zone in a mining operation maneuver reminiscent of the box bunkers identified in Check 12, Feature 1A and 1B below. (Fauth, Appendix A, Fig. 3). A road approximately 15 feet wide and 2 feet deep was discovered leading into the mine and heading off to the west (Fig. 17).

2. Oral history suggests that water from a spring a few hundred feet west of the northwest corner of the racepond provided water for the racepond. It does provide water for the remnant of the pond which is a mere fraction of the original pond. The excess trickles back to the stream through the SHA berm ditch to the north. (Fig. 17)

3. Post-furnace features constructed by Lanceolot Jacques, owner and real estate developer of the Catoctin Furnace area during the 1920's included: cemented dam and intake valve (dated 1908) for bringing the Little Hunting Creek water into the race pond. The water was used to create lakes in the adjacent iron mine excavations. - Check 12, Feature 1 and 2. This was part of his "deer park" development of which Bill Renner, our interviewee, and local expert on Catoctin Furnace oral history, was custodian.
4. Jacques dam had a look of age and stability about it. Although only a foot or so high, it was probably considerably higher originally. A well-developed stone wall extended along the south side of the creek for a distance above and below the dam; and an area 150x130 feet appeared carved out on the low north side behind the dam. In addition, The remnant of an old raceway leads off from the intake valve toward the racepond. It appears probable that Jacques contributed the intake valve but simply utilized a renovated and lower dam, mill pond on the stream, and the raceway to the old racepond to set up his deer park lakes. It is hypothesized that this same water source was used to augment the spring water in the mine excavations to a point where the pond could function as a racepond in providing energy for the waterwheels of the Catoctin Furnace industry.

5. A large earth and stone barrage (some 200' long by 6 feet high) and cut through by the creek is located some 2000 feet northwest of the racepond. A raceway 6-15' wide and 2-4' deep leads off in a southwest direction for a quarter mile or so before it becomes confused with a mountain road. This hydraulic system, which requires detailed archaeological attention in the future, is believed to predate the racepond system. Renner postulates a third millpond to provide yet another water system about 1/2 mile east of the furnaces along Windy Farm road which borders the creek.

6. Oral history (Renner) noted presence of remnant of large wooden aqueduct to convey water from tailrace (Check 12 Feature 5) to raceway proper over a gap cause by the connection of iron ore mines Check 12, Feature 2 and Check 12, Feature 3 (not excavated). This gap probably existed prior to the construction of the hydraulic power system out of the racepond - resulting from the earlier mine excavations in that area. Excavations are needed to substantiate this plausible possibility with aqueduct parts preserved in sections under the muck of Jacques deer park lake water supply.

5. The stone dam between Check 12, Feature 2, iron mine, and Check 12, Feature 3, iron mine (probably) was erected in the 1920's by Jacques to impound water for his lakes.

Interpretations

1. The Racepond area was originally an ore mine similar to those tested in Check 12 (Features 1, 2, 3, 4) - Phase 1.

2. The mine filled with ground and spring water and the banks were used as an ore washing area with water drawn from the pond and the adjacent creek. - Phase 2.

3. The ore washing pond was converted into a racepond with additional water tapped from a millpond dam area connected to the racepond by a raceway - Phase 3.

4. The capacity of the racepond was increased by building up the banks of the tailrace to twice their original height. This increase was to take care of the water supply needs for the maximum period of use - sometime after 1857 when the second Charcoal blast furnace (Isabella or Stack #2) was built.
5. The racepond falls into disuse. This was probably not much before 1903. Phase 4.

6. The racepond, millpond and headrace were revived by a real estate development scheme in the 1920's (Lanceolot Jacques) - Phase 5.

7. Oral history says that President Hoover and President Franklin Delano Roosevelt used the pond for catching mountain trout. At this time the pond was also used for raising goldfish a profitable business which expanded and continues to the present time elsewhere in the vicinity. The goldfish were removed and the pond stocked with government hatchery trout for the presidents - then replaced when their catch was completed. A small school of large (2 feet in length) carp goldfish are frequently seen in the remaining water of the pond. They are descendants of the first goldfish sent to stock the Whitehouse pool in Washington during the 1920's by Bill Renner.- Phase 6. (Orr and Orr, 1977, 45-47)

8. The pond again fell into disuse during the 1930's.- Phase 7.

9. About two-thirds of the original racepond was covered over in the construction of the existing U.S. Route #15 in 1960.- Phase 8.

Conclusions

It is believed that an adequate effort have been made in excavating and core-drilling to realize the archaeological situation of the raceway feature. However, it is believed that an organized oral history program and land records project such as proposed by the consultant will strengthen the interpretations of the findings and add to the accumulation of historical facts about the racepond.
Jacques Intake Valve (1920's)
Old Raceway
Spring stream
SHA Burnt Ditch (1961)
Old Road
Mill Pond

Race Pond (1961)
Limestone Outcrop

Fig. 17. Map of Check 11, Race Pond, including Check 12, Feature 5.
1-Brown Soil Fill, Road Construction 1961.
2-Red Clay Fill, Road Construction, 1961.
3-Stream-rounded rocks, Bank of Racepond.
4-Black Muck of Racepond.
Fl-Intrusive pit of debris including iron, ceramic, glass artifacts in dark brown soil.
1-Mottled light grey and tan clay with iron ore fragments (nuggets). Ore washings.
2-Light Tan Clay gumbo zone. Ore Washings.
3-Stream-rounded cobbles and boulders in coarse sand, old creek bed.
4-A series of mottled clay groups like 1. Ore washings.

Fig. 19. Check 11, Trench 7. Trash Pit (Feature 1) with ore washings zones.
To Little Hunting Creek

Trench Path following edge of plateau overlooking creek.

Scale

Vertical [1']
Horizontal [1']

1. Furnace Tailing, Glassy Slag
2. Yellow Sand, old stream bed
3. Grey Mottled Clay from Ore Washing
4. Brown Soil Fill; bricks; Charcoal
5. Light Brown Soil

Fig. 20. Check 11, Trench 8, Debris and Iron Ore Washings surrounding Racepond Iron Ore Mine.
Fig. 21 Check 11, Trench 9. Strata 4, 5, 9-Iron Mine; Strata 2, 3, 6, 7, 8-Iron Ore Washings; Stratum 1-racepond.
1-Large stream-rounded rocks, coarse yellow Sand; Little Hunting Creek Strata.
2-Grey Mottled Clay with Light Yellow lenses.
2A-Ore Washing lens of Yellow and Grey mottled Clay.

Burm Ditch Constructed 1960 for run-off from remnant of racepond under U.S. Route 15

Fig. 22. Check 11, Trench 10. West edge of Debris and Ore Washing plateau at Racepond.
Fig. 23. Check 12, Feature 5, Raceway. A. Profile, B. Ground Plan. Legend for A and B.

- 1-digit 1: humus
- 2-sandy loam: 2A- yl. brn. sandy lens.
- 3-mottled clay
- 4-orange yellow clay soil
- 5-retaining stones
- 6-burnt ore & charcoal
- 7-soft red-brown loam with some charcoal flecks, sm. stone inclusions
- 8-hard packed tan sandy soil
- 9-brown sandy soil mixed with clay
- 10-iron ore
- 11A-poss. raceway stone
- 11-mixed clay with humus, sand, small stones
- 12-sand: 12A-silt
- 13-small stones
- 14-raceway clay lining
- 15-orange yellow clay
CHECK 12: IRON ORE MINES AND CHARCOAL ROAD  
(18FR325)

Check 12 includes three mines (Features 1, 2, and 4) and a Charcoal Road. Feature 5, a raceway which carried water from the Race Pond belongs with Check 11. Feature 3, another mine, is outside the area of Alignment 1 construction; (Figs. 6-10 )

Research Design

The purpose of the research was to learn as much as possible about the features within the construction area before further impaction. Feature 1 will lose 10 feet from the top strata of the mine. Features 2 and 4 are mines almost completely covered by the existing U.S. Route 15 but will lose a bit more of their sides. The Charcoal Road through which Route 15 plowed through will lose another 75 feet. The mines required excavation and/or borings to reveal the configuration of the open pit, now completely covered. In this process, Feature 1 offered the chance to study the manner in which the ore was extracted, as well as its placement in relationship to the other natural stratigraphy as was the case with the other two mines. Oral history depicts the manner in which the charcoal-bearing wagons would come down the fanned-out charcoal trails to the main Charcoal Road; ring a bell in a tall sycamore to summon the charcoal weigher; then, depositing their charcoal faggots in the Charcoal House at the Furnace and return to their kilns along the same route - trailing charcoal dust. Backhoe-cut trenches were cut into the terrace on which the road ran, and along with careful hand excavation of the road surfaces unfolded clues supporting the image of the events of the past which still survived as memories.

Dr. John Fauth, geological consultant, reports on the interrelationship between geological and archaeological aspects of Check 12 features as revealed by his collaborations with the archaeological excavations and analyses of the SHA Bureau of Soils and Foundations borings (Appendix A).
The 1979 Excavations

The Iron Ore Mines

Feature 1, Box Mine. The original test trenches (Orr and Son, August, 1977, pp. 50-59) were enlarged and deepened revealing undisturbed natural strata on the sides of the box-like depression. Approximately ten feet of soil fill (clay and loam with fragments of iron ore) resulting from the mining operations occupied the box mine. The base of the mine excavations was fully ten feet below the present surface where a yellow soil marked the end of a layer of iron ore which was being mined. Six split rails sharpened and used as stakes were found at the bottom level along with a six-foot long squared beam containing large square spikes of iron and showing evidence of rope-wear in the middle. The fill layers were alternately thick bands of grey clay loosely consolidated and brown soil. The top layer of the fill was composed of numerous bands of soil and clay in a zone some 6-12 inches in thickness. These trenches are designated Feature 1A.

Feature 1B is the squared banks of the mine at the west end of the pit where the rising side of the mountain terminated the mining operation. An L-shaped trench was cut here to a depth of 5 feet with a backhoe. Natural strata consisting of grey clay and brown soil were encountered in the sides, and the loose fill of these strata found at the base of the excavation. A number of test pits were placed in the area between Feature 1A and 1B. In each case fill similar to that described for the upper layer of Feature 1A was found. These strata dug to a depth of 3 feet were screened (¼ inch mesh). No artifacts were found but quantities of cinders, typical of furnace tailing occurred. (Appendix A, Figs. 4, 5, 6)

Feature 2. Mine. Two backhoe trenches were cut into the banks of this mine, the greater part of which is covered by the existing Route 15. Trench 1, placed in a hillock adjacent to the Catoctin Hollow road, was cut with a backhoe for a distance of 25 feet. Natural strata including a thick zone of iron-bearing concretions were encountered. The concretions were considered to contain a sufficiently large concentration of iron to have been mined. The base of cut revealed slabs of concrete extending to an unknown depth. Trench 2 was a similar cut placed in a mound some 15 feet high and 150 feet long occupying the center of the mine surface. No iron ore or cultural features were found in its brown soil strata. Twelve borings drilled into the mine showed iron ore deposits still in position in a relatively shallow mine (Appendix A, Figs. 7, 8, 9, 10).
Feature 4, Mine. This mine, almost completely covered by Route 15, was revealed by an "as is" north-south profile mapped prior to the construction of the road (SHA Bureau of Design Map, 3/62, Sheet 17 of 31). Here a depression is seen 350 feet long and 30 feet deep. Attempts to use a backhoe to explore the mine strata were thwarted due to the steepness of the road embankments against the sides of the mine. A trench was cut in the vertical face of the Charcoal Road site at the north end of the mine, but no iron-ore was seen. A surface search by Dr. Fauth, our geologist, revealed iron ore nuggets at various levels of the mine. Two iron rails were found, one twisted badly, at the juncture of the mine wall and the road embankment. Seven borings revealed a deep ore mine below the present water table (Appendix A, Fig. 11).

Interpretations. The mines Features 2 and 4 are probably those described by geologist Singewald following his 1911 examination of the Catoctin Iron Industry then almost defunct (Singewald, 1911). A third mine was described in the area of these two. That mine is believed to be the Big Ore Bank now a pond and outside the area of Alignment 1 construction (Orr and Son, August 1977, Check 13, Fig. 68).

Feature 1, box mine, represented an exploration for iron ore made from Feature 2, mine. This mine was dug following the iron ore strata and avoiding sterile zones such as the large island of sterile strata explored by Trench 2 Feature 2. A "rabbit warren" pattern of mine excavation resulted. This is seen also in the Check 11, Race Pond, area where another "island" occurred as a result of a limestone outcrop. Feature 3, mine, not investigated since it is outside of construction area, represented a continuation of Feature 2 mine probably underneath the raceway which was carried by a wooden aqueduct at this point.

A model for the mining of open pits in the period represented by Feature 2 mine, and by inference Feature 3 and the race pond mine, is suggested by the data of Feature 1, box mine when considered with the presumed picture of a later period mine- the Big Ore Bank mine (Contract Archaeology, Inc. 1971, Plate 4A). This is visualized as a Middle Period mine lacking steam equipment and iron rails for the ore carts: (see sketch, Appendix A, Fig. 12)

1. Dig a squared face 40-50 feet wide and half as deep.
2. Proceed to dig forward by throwing non-ore soil to the rear and side and ore fragments into ore carts. Ore carts probably on sleds with furnace tailings used to give prepared surface. Because of softness of clay/loam soil sleds are visualized.

3. A wide step platform gradually lowered to base of mine (e.g. base of iron ore vein) results from this process. The sides are shorn up by the use of squared timbers held in tier positions by perpendicular split-rail stakes.

4. The total face is kept parallel and on the same plane by alternately digging adjacent 50x25 foot sections.

5. The vein of iron-ore is followed with sterile areas avoided. The digging stops when the overburden, as in a steeply rising mountain side is encountered, becomes too great, or the vein goes too deeply into the ground water. Ground water is kept drained by ditches, but excavation could not proceed as deeply as it later did with steam pumps.

Feature 4 mine is considered to belong to the later complex of mines including the Big Ore Bank and Fitzhugh-Kunkel mine because of its greater depth and presence of iron rails.

An idea of the amount of iron ore in Feature 1, box mine is gained by comparing the amount of fill left in the "box". This amounts to one-third to one-half of the total, original volume. Much of the ore taken from the mine contained soil which was washed off at the washer pond at Check 11, Race Pond. A comparison of the iron-bearing strata to non-iron bearing suggests that about one-fourth of the total soil contained iron ore. (Orr and Son, August 1977, Fig. 19)

Feature 6, The Charcoal Road.

Trench 1. A backhoe trench was cut directly across the road revealing a thick zone of grey slag which covered the north side of the upper terrace. A layer of gravel was found just under the surface. The gravel formed a strip some 15 feet wide which contained ruts, extending 6-10" into the ground and filled with gravel. The gravelled strip overlay a thick band of powdered charcoal which was resting on a band of red gravel from furnace tailings. It had a set of ruts of its own about wagon axil distance apart. These features in turn rested on a grey clay fill which resembled the soil resulting from ore washings. A thin zone of green slag intervened between the grey slag mantle and the fill. (See Fig. 28).
Several unrefined waste iron pieces and a possible brake handle, and an iron bar, possibly an ancony used as a transportable form of pre-wrought iron, came from the green slag zone.

A small midden at the grid west end of Trench 1, to the west of the charcoal feature extended to about 18" below the surface in mixed clay soils with the majority of material being of a domestic nature (beer and milk bottles of amber and clear glass, tin cans, etc.) of 20th century origin.

Trench 2. A trench similar to Trench 1 above was cut into a terrace located approximately 7 feet below the upper terrace and directly to the south. The trench contained three charcoal features similar to that described in Trench 1. Each was similarly underpinned by washer soil debris. Two, located on the terrace proper were about 12 feet in width. The third feature was located on the upper terrace. All rested on the same kind of fill. A wagon spring came from the charcoal of the charcoal feature furthest grid west on the edge of the slip of the lower terrace. (See Fig. 30)

Trench 3. A backhoe cut produced a nearly vertical trench at the edge of the terrace and next to Trench 1. It was excavated to a distance of about 12 vertical feet to the floor of Feature 4, iron mine. A thick mantle of charcoal draped over the side of the terrace. The grey clay fill proceeded to a light yellow subsoil near the base of the cut.

The same type of midden material of recent origin was found along the talus slope of the Charcoal Road mound and at the base where disturbed mixed clay soils down to 28" below surface revealed modern milk and scotch whiskey bottles and an electrical insulator pipe. The depth of this material that was probably a surface dump could be related to earth moving during the construction of nearby U.S. Route 15 (1960).

Grid 1. A 5 foot grid was placed over the gravel and charcoal areas at the surface of the upper terrace and excavated by hand. A brass fountain pen and fragments of bottle glass came from the gravel area. An aluminum key was found above the gravel. Two wide ruts were discovered in the charcoal layer. In the rut fills, consisting mainly of clay and grey slag, were found several clear bottle fragments of the 20th century along with a few machine cut nails. This indicated that the fill material was a late addition. Several iron droplets and small iron waste fragments were found on top of the charcoal layer's surface, but no artifacts other than a few amber and clear glass fragments mixed in with grey-hard, scattered slag, were found on this surface. (Fig. 29)

Test Pits and Post Holes. A series of test pits and postholes were put into the upper terrace surface for a distance of several feet. In Test Pit 5 several droplets of unrefined iron along with several machine cut nails were found in the base of the
Observations. On the west side of U.S. Route 15 some 500 feet up the maintain four roads or trails were found ranging in size from 10 to 12 feet in width and a few feet deep. The trails appears to converge on a line made by the extension of the charcoal road.

Interpretations.

1. The upper terrace, measuring 50 feet wide and 8-10 feet in thickness, was built of ore washings for the purpose of conveying charcoal in wagons from the charcoal hearths on the mountain to the furnace of Stack #1, and later Stack #2, both located directly to the East.

2. The converging trails on the mountain led to charcoal hearths where colliers rendered wood cut from the forest into the fuel used. (see charcoal trails exhibits in the Catoctin Mountain National Park).

3. The charcoal roads were marked by red furnace gravel mantles put down to support the wagon wheels. The roads and adjacent areas were covered with charcoal dust which came from the emptied wagons as they returned to the mountain hearths or the charcoal was intentionally placed as good road bed material. (*upper terrace).

4. The mountain trails converging on a projection of the Charcoal Road probably led into successively smaller trails terminating at the charcoal hearth areas.

5. As the demand for charcoal grew with the expansion of the iron industry at Catoctin Furnace a second terrace to the south of the first was added-as seen by the 1-2 foot thick mantle of red sandy soil on the grid west slope. This was probably originally used to prevent erosion. This mantle is seen underlying the extension of the lower slope. This terrace contained two charcoal roads corresponding to the two roads found on the upper terrace - one for coming and one for going to the charcoal depository found by Little at the edge of the retaining wall terrace (Contract A chaeology, 1971, folded map). The upper terrace was probably constructed in the latter part of the 18th century, and the lower road in the middle of the 19th century when the construction of Stack #2, the other charcoal blast furnace, and the Charcoal House depository took place, along with the retaining wall.

6. The charcoal road was probably in use as such until the late 19th century. The last charcoal furnace (Stack #2) was discontinued in 1893. An exposed section of road on the upper terrace
revealed the use of scattered, hard grey slag on the charcoal road surface. This slag is believed to have come from the Stack #3 furnace which burned anthracite coke.

7. A "dirt and stone public road" partly coinciding with the charcoal road was in use in the early 1960's, the prototype of the present Catoctin Hollow road (SHA Bureau of Design Map, as built revisions 2/17/64, Sheet 18A of 31). Part of this road with its early 20th century artifacts was excavated. It is believed that the grey slag veneer noted above and the grey slag buttressing on the north side of this road came from Stack #3. The stone gravel of the road is known as "crusher-run" gravel and dates back to the late 1800's. An inner layer of green slag, probably from Stack 2 could have been an earlier shoulder for the charcoal road. *

Conclusions

It is believed that the excavations, borings, and observations of this site satisfy the data requirements for the mitigation of the impacted sites. It must be stressed, however, that additional oral history and land records data should be sought to substantiate the interpretations of these data. During the incising impact of this site an on-site archaeologist is recommended for additional observations as the site is destroyed and for recovery of additional large artifacts unearthed in the road construction.

*The midden material found alongside the top terrace road consisted of common roadside dump debris for the 20th century.
Cultural Material from Charcoal Road, Check 12, Feature 6

Test Pit 3
0-6" b.s. 1 clear bottle fragment.

Test Pit 5
10½-12½" b.s. (base of charcoal layer and mottled clay fill):
2 iron droplets, 1 with grey slag attached.
2 machine cut nails.

Test Boring #1
0-6" b.s. 1 clear bottle fragment (possibly milk).

Test Boring #2
0-6" b.s. 1 small copper wire.

Trench 1, West End
0-6" b.s. 1 clear bottle glass (milk).
1 amber glass beer bottle, seams to top of lip, 20th C.
1 hand painted clear bottle fragment.
1 large can top.
6 small tin fragments.
1 metal jam jar top.
1 tin can.
1 paint can top.
1 shoe sole.
1 leather shoe heel.

6-12" b.s. 4 clear bottle glass
5 Amber glass. 2 bottle bases with raised letters "Clorox"
1 metal piston ring.
1 spark plug.
1 metal jar top with writing "try our ideal brand applesauce".
1 white glass screw type jar fragment.
1 thin tin fragment.
1 small bottle threaded neck. Indented base with raised lettering "Nestle, made in U.S.A."
1 small clear glass bottle, threaded lip, seams to lip with raised number "9".
2 clear glass hexagonal-shaped fragments.
1 multisided glass fragment.
7 sherds whiteware (from plate) with wavy edges.
Cultural Material from Charcoal Road (contd.)

Trench 1, West End (continued)

7-10" b.s.  2 matching thick green bottle glass with raised letters "ECT & 0".
          1 thin tin sheet, small fragment.
12-18" b.s. 1 clear bottle fragment.

Trench 1, East end.

0-6" b.s.  3 iron droplets, unrefined iron; 1 with slag attached.
12-18" b.s. 1 large irregular shaped flat iron piece 7 5/8" x 2 1/2-3" wide, c. 5/16" thick.

Trench 2, West end

Surface.  1 thick (1/8" clear bottle fragment.
12-18" b.s. 1 long flat iron bar covered in charcoal dust from charcoal layer, possibly wagon spring, 20 1/2 x c.2" x c. 3/4" thick.

Trench 3 base

Surface 1 gilt edged stippled transfer print sherd, colonial scene
4 milk bottles (recent) 2 quarts, 2 pints.
1 amber glass medicine bottle (seam to lip)
1 1/2 saucer plate, highly fired porcelain, c. 20th C.
0-18" b.s. 1 beer can
1 clear glass bottle (seam to lip)
1 amber glass fragment.
1 blue "Bromo Seltzer" bottle.
1 large bent aut body part.
1 clear glass bulbose bottle neck, threaded lip, seam to top of lip.
3 large stoneware sherds of large crock.
1 China sherd (white).
24-28" b.s. 2 metal fragments not identified.
1 turquoise glass fragment (flat).
1 "lint liquid" milk bottle
1 large amber glass bottle (scotch) "Fed. law prohibits sale or re-use of this bottle"; raised letters "Ballantine & Son". Aluminum twist off cap.
1 light greenish tinge bottle glass with raised letters "ECT".
1 large clear glass jar body fragment with raised letters "ATLA TRONG SHO MASO".
1 clear glass lid (3/16" thick) with raised letters "ATLAS EDJ SEAL"
1 small clay pipe - possibly for electrical insulation (bulbous end)
31" b.s.  1 tall amber bottle, seam to top, post 1903.
Cultural Material from Charcoal Road (Contd.)

Grid #1, N50E65
Surface
1 paint can top.
1 plastic hair beret.

Grid #1, N50E70
Surface
3 clear bottle fragments.
Layer 1
1 metal bottle cap
(thin humus) 1 clear bottle fragment
Rut fill
2 small clear bottle fragments
(clay & slag) 2 green painted wood slivers
1 1/4" thick cut nail, no head

Grid #1, N50E75
Layer 2 (soil 1 "Yale" aluminum key.
and slag) 1 iron droplet
1 cycle spoke center.
1 amber bottle fragment.
Layer 3
(Crusher run)
Top
Middle
Bottom
1 iron droplet, slag adhering.
1 wire nail.
Rut fill
2 clear bottle fragments.
(clay & slag) 1 1/4" thick machine cut nail (no head)
Layer 4
1 large square headed screw
Charcoal Road, top layer.

Grid #1, N50E85
Layer 1
1 green cloudy bottle fragment.
1 wire, clothes pin.
Layer 2
11 amber bottle fragments
1 amber bottle base with raised letters

Grid #1, N55E75
Surface
1 fire burnt clay "plug" fragment
1 iron wire piece.
1 tin foil piece.
Cultural Material from Charcoal Road (Contd.)

Grid #1, N55E75 (contd.)

Layer 2 1 brass pen sheath
       1 fire reddened clay "plug" (?) fragment.
Layer 4 1 \frac{1}{2}" long machine cut nail.
Rut Fill

Grid #1, N55E80

Layer 2 1 iron droplet
Layer 3A 1 thick wrought iron nail.
(1a under crusher run)
Charcoal Rd. 1 amber bottle fragment
Layer 3er 1 long iron fragment (unidentified)
Top

Grid #1, N55E85

Layer 3A 4 iron droplets.
(1A under Crusher run)
Rut fill 1 large machine cut nail.
Charcoal Rd. 1 iron droplet.
Layer Top

Grid #1, N55E90

Layer 3 1 Machine cut nail (deteriorated)

Grid #1, Trench 1

Charcoal Rd. 1 clear bottle fragment
Layer 1 amber bottle fragment.
top
Fig. 2h. Check 12, Feature 1 and Feature 2, Iron Ore Mines.
Fig. 25. Check 12, Feature 4, Iron Ore Mine, and Check 7 (MAAR)
"Charcoal Roads converge ↑ (c. 50 ft. west)

"Dirt & Stone Public Rd." ~ c. 1960

"Bell ringing tree" - Sycamore c. 1960

Fig. 26. Check 12, Feature 6, Charcoal Road.
Exposed Road

Post hole tests 1-7

Fig. 27. Ground Plan of Check 12, Feature 6, Charcoal Road.
Key

- F.1 - gravel road
- F.2 - charcoal road
- La.1 - humus; La.1A - older humus
- La.2 - brown clay
- La.3 - course red sandy soil
- La.4, 4A, 4B, 4C, 4D - clay fill soils
- La.5, 5A - road shoulder slag fill
- ore washings = sm. brown nodules
- trench cut = ——
- hypothesized = ---

Fig. 28 Profiles of Check 12, Feature 6, a. Trench 1 grid north profile; b. grid south profile.

- 83 -
humus with gravel inclusions

green slag
grey slag

humus
mixed humus and charcoal
carbon dust
ore washings
mixed brown &
grey clay

red soil
mottled clay
charcoal mixed with clay

humus

consolidated gravel lens (rut fills?)

4A ore washings

4C

yellow mixed with green

green mottled clay

F.1

humus with gravel inclusions & slag

ore washings in green clay

F.2

red soil

bluish clay

possible early road ruts

F.4

La.2

La.3

La.4
Legend:

La. 1 - thin humus, some gravel inclusions
1A - red sandy soil lens
La. 2 - reddish mixed soil and gravel (occasional slag); brown soil mixed with gravel-La.2A
1B - charcoal and mixed soil lens
La. 3 - crushed limestone gravel ("crusher run")  
mixed with some humic soil
Lens 3A - sandybrown soil lens mixed with yellow clay specks
" 3B - mixed reddish brown sandy soil - charcoal stained
" 3C - yellow brown clay with small stone nodules; clay soil with slag chunks-La.3D
La. 4 - charcoal dust (top of "Charcoal Road")

Fig. 29 Profiles of Grid #1, Check 12, Feature 6.
La.1 - humus
La.2 - thick charcoal dust layers (features 3, 5, 6)
La.3 - coarse re sandy soil
La.4 - blue-grey clay (fill soils)
La.5 - mixed brown-yellow clay (fill)
La.6 - large chunks of slag
La.2A - grey-green clay
La.2B - yellow clay
La.2C - yellow brown ore washings
Lens 2D - yellow clay

Legend:

Fig. 30. Grid South Profile of Trench 2, Check 12, Feature 6.
Fig. 31. Profiles of Test Pits 2, 3, 4, 5. Check 12, Feature 6.
Fig. 32 Profile (Grid East) of Trench 3, Check 4, Feature 6.
CHECK 15. ORE RAILROAD
(18PR329)

The original Check 15 of the intensive survey included most of the washer pond and ramp (Orr and Son, 1977, pp.60-73). When it was required to bring the Alignment 1 nearer to the existing Route 15 in the area of Check 15 only a small part of the original check area remained within the area of construction for dualization. The surviving area measuring some 250 by 25 feet, contained the outlet stream from the flooded Big Ore Bank mine (Check 13), a portion of the ore railroad area, and an abandoned ore cart lying on its side in the stream.

Research Design

The basic objective of the investigation was to get as much information about the ore transportation system as possible within the confines of the recent right of way. This involved excavating the ore cart and searching the stream for additional equipment which may have been abandoned. Test pits and trenches were planned for the area adjacent to the stream in search of possible railroad tracks.

The 1979 Excavations (Fig. 11)

The Ore Buggy and the Stream.

The cart was lying on its side with two axils, lacking wheels, and exposed above the stream soil to show 8 inches of badly weathered iron bars. When the cart was excavated from the stream it was found that the wheels had been removed from the other side also. The buried axil parts showed no rusting. Each axil was 48 inches in length and was attached by bolts and cleats to heavy square beams measuring 68 inches lengthwise and 34 inches across. Some of the beams still had red paint on them. The stream, which connected the flooded ore mine with the washer pond, was explored for approximately 30 feet on each side but no artifacts were found.

Test Excavations

A series of tests and trenches were placed at intervals of 10 feet along the bank of the stream in search of evidence of the
ore railroad, but subsoil was found in each test directly underneath a thin humus. It is believed that the railroad did come out of the mine and convey carts, drawn by mules, up the ramp to the south. A rail had been found upright at the end of the ramp and another rail reported found on the ramp (Orr and Son, 1977, pp. 64-65). A depressed area 6 feet wide, railway pie spike, and a broadaxe were also reported found earlier. It is probable that the rails and ties had been removed earlier. It is also probable that the ramp platform was changing constantly due to the addition of soil from the ore washings and that the tracks and ties were themselves in a sense portable and had left no permanent mark.

**Observations.**

It was noted that 220 feet east of Station 562 a square made of stones measuring 10 feet on a side were seen on the south bank of the raceway. Similar stones were noted on the north side of the raceway also. It is believed that these stones made an abuttment or base for a bridge over which the cars would go in returning from the ore washer ramp to the furnace area.

**Interpretation**

1. The ore cart is similar to that dredged from the Big Ore Bank Pond by Mr. Charles Sandy, superintendent of the Cunningham Falls State Park a few years ago. The wheels on Sandy's cart were dated 1871 and 1872. The vehicle depicted was similar to that shown drawn by mules in a picture reported to have been taken of the Big Ore Bank mine prior to its flooding in 1903. Such carts had large boxes for containing the ore mounted on a free spinning iron wheel. The rails found by Sandy had round (not flat) rail tops.

2. The railroad section which was outgoing to the ramp does not appear to have left evidence of its presence which could be recognized within the right of way area.

3. The railroad route returning from the ramp with cleaned ore enroute to the furnaces undoubtedly passed over a bridge spanning the raceway and indicated by a prepared base of stones.
Fig. 33. Check 15, Ore Railroad.
Research Design

The original research design for the raceway features in Checks 4 and 17, while essentially correct in conception, proved insufficient in scope (Orr et al., July 1979, Figs. 5, 11). The six small trenches called for in the plans became eight large trenches and several smaller trenches and test pits as the excavation proceeded. Instead of one raceway system, at least two materialized. The unexpectedly large size of the raceway cross-section was the cause of the miscalculation. This was only determined by extensive excavation. As the dig proceeded, the SHA backhoe in expert hands proved adequate to the enlarged task.

The objectives of the research remained the same as originally conceived namely to understand the form and function of the raceways and their interrelations with those discovered in other areas. The basic technological questions are remained constant - involving water source, flow volume and velocity for providing water power to produce the air blasts for the furnaces, to grind, saw, and hammer in the grist, lumber, and paint mills of the Catoctin industrial complex.

Land Records research, started as a volunteer activity by Mrs. Marie Burns of the Catoctin Furnace Historical Society, proved invaluable in providing locations for and data concerning the raceways and their water rights. The potential of oral history has also been felt in pointing out the several water power systems in operation during the long period the site was in operation.

The 1979 Excavations (Fig. 12-15)

Trench I.

This backhoe trench was cut into the north end of Auburn Dam where the raceway from the North runs into the dam. Feature 2 was found directly in line with the course of the raceway. It was a low truncated pyramid topped (under a thin humus) by a thick clay lens which rested on several layers of grey clay, thin layers of alternate sand and clay, and the dark muck of Feature 1.
Dark organic muck flanked the feature on the east and lapped-up the side of the dam bank. The bank was a mound of loam soil built on a thick base of furnace tailings. An iron clasp knife with a tortoise shell veneer handle came from the top of the tailings.

Feature 1 is a semi-circular pit located under Feature 2 and proceeding over 15 feet to the West, under the red fill of the SHA shoulder for existing Route 15. The basic soil in the pit is a dark, organic muck. The soil strata of Features 1 and 2 are waterborne.

**Interpretations.** Feature 2 is the terminal area of the raceway extending from the North and to which Trenches 2 and 3, and Test pits 1-3 belong. This hydraulic system, designated as System B provided water for the Auburn Dam. The dam waters powered a water wheel used in the conjectured forge lying some 10 feet under a slag layer (Orr and Urr, 1977, p. 9). Feature 1 is the raceway channel entering the dam area. Feature 2 is the delta of the raceway stream entering the dam lake. The water-borne sediments had been transported by the raceway and deposited to finally fill in the raceway channel and cover it with several feet of clay.

Trenches 2 and 3.(App.A, Fig.1) Two long and deep backhoe trenches explored a road-like feature with flanking retaining wall which is manifested several hundred feet north of the entrance to the Auburn Dam. The trenches revealed a feature (Feature 1 in each case) with similar construction characteristics leaving no doubt that the two features represented the same complex. In each case a profile had been cut into the natural strata of the hill side and the dug earth piled directly to the East of the cut. Trench contains more stones than Trench 3 as a result of the construction the result is the same - buttressing on the East of a roughly U-shaped cut some 6 feet deep. The cut was then filled with seven or more horizontal superimposed layers of furnace tailings, clay and sand. These layers supported the clay basin (15 feet by 1½ feet) and slightly convex which conveyed water. The uphill side of the complex was supported by a retaining wall of loose stones a few feet high. Iron fragments and a few ceramic pieces, mainly redware, came from the supporting horizontal strata. An extraordinary find consisted of 3 identical pieces of grey, salt-glaze, "German" ware one pieces of which bore the same of "Myers". One sherd came from the bottom horizontal layer, one from the clay basin, and the third sherd came from between the stones of the retaining wall. (Fig. 37)

Test Pits 1-3. Test pits indicated the continuity of the raceway supported by a high retaining wall in the area of Check 4.
Interpretation. The strata of Trenches 2, 3, and Trenches 4-6 are of the raceway of hydraulic System B which conveyed water in a wide clay basin to the Auburn Dam.

Trench 4. (Fig. 38)

This backhoe trench was cut into the Auburn Dam floor in an east-west direction. It revealed two main features consisting of superimposed bowls in which Feature 2 was inside Feature 1. Feature 1 contained yellow sand strata, and Feature 2 was a dark, organic soil. Feature 1 had been cut into the red Triassic geological period red clay which underlies the area and was used for construction purposes by both the Catoctin Furnace buildings and the Maryland State Highway Administration in the construction of existing Route 15.

Interpretation. Feature 1 represents the partially excavated bowl-base of the dam prior to entrance of the raceway stream. The stream scoured a channel in the brown muck deposit of the young dam and finally alternately cut and deposited (e.g. the sand layer). A smaller channel was scoured out by this means and dark muck was deposited, probably in the last days of the raceway stream.

Trench 5. (Fig. 39)

This is a trench cut into the shallow gumbo and sand strata of Auburn Dam on the East and a feature consisting of horizontal clay and sand strata on the West of unknown function which disappeared under the existing road.

Interpretation. No evidence of the raceway was seen at this point. It is possible that the raceway connecting that feature in Trenches 4 and 6 had been removed.

Trench 6. (Fig. 39)

This backhoe trench was cut through the Auburn Dam bank into the dam floor. Four major features were uncovered. Feature 1 was a semi-circular trough cut into the red clay subsoil and filled with yellow clay. Feature 2 was a semi-circular feature smaller than Feature 1 but also cut into the subsoil. It was filled with red clay fill. Feature 3 was the red clay fill of the dam bank construction. Feature 4 was the dark sand and clay of the dam fluvial deposits.
Interpretation. Features 1 and 2 were two phases of System A raceway. Feature 1 was the earlier raceway. It was filled with yellow clay and abandoned prior to the building of the dam bank. Feature 2 on the other hand was open at the time of the dam construction and was filled with the red clay fill of the dam bank. Feature 3 was the red clay fill of the dam bank construction. Feature 4 was the dark sand and clay of the dam fluvial deposits. The dam waters were at first swift, carrying grains of sand, and later became stagnant as seen in the mud deposit that comprised the bulk of the dam sediments.

Trench 7 (Fig. 40)

This backhoe trench was placed in the west side of the Auburn Dam stone wall. Feature 1 was a semi-circular trough cut into the red clay subsoil. A small stone wall had been built directly to the West of Feature 1. Stratum 1 was a foot-thick, dark organic soil which overlaid Feature 1 and disappeared under the stone wall of the dam. Feature 2 consisted of large stones of an unknown feature underneath the construction fill and debris of the dam. Red fill topped by humus completed the strata in this cut.

Interpretation. Feature 1 is a continuation of the raceway trough of System A. It was supported by a small retaining wall of loose stones. The trough was filled, upon completion of its function as a raceway, with yellow clay. The area was abandoned and not used for a time period as indicated by Stratum 1, dark organic zone. The dam construction took place on top of Stratum 1 indicating the passage of some time before that event took place following the abandonment of the System A raceway represented by Feature 1 of Trench 7 and Feature 1 of Trench 6 which closely resembled it. A large stone feature of unknown use was associated with the raceway. A period of construction of the dam followed by a period of stabilization is charted in Strata 2 and 3. Another period of construction took place, probably on the dam as seen in Stratum 6 which is topped by the present humus zone.

Observations. Trenches of the Team A excavations of Check 3 to the south of Trench 7 revealed the arc of a trough filled with yellow soil and overlaid with a dark, organic soil. The direction of the trough and overlay is toward the iron-working site of Check 3 investigated by Team A.

Interpretations. It is believed that the raceway of hydraulic System B powered the iron-working machinery of Check 3 site investigated by Team A. This occurred at a time period prior to the construction of the Auburn Dam.
Conclusions

Two systems of hydraulic power are evidenced in the two raceways found in this site. System A, the earlier one powered the southern complex below the Auburn Dam at a time when the dam had not been constructed. System B was built specifically to power the Auburn Dam at a later period. Additional information should be sought on System A as it pertains to the further exploration and mitigation of Check 3, iron-working site. The Trench 5, Feature 2, headrace did not belong to hydraulic system A or B, but represented a system which was in operation just before the construction of the Auburn dam at which time it was still open. This represents Hydraulic System C which should be further explored as leading to (or from?) the last iron-working features prior to the erection of the dam for powering the conjectured forge by means of the Hydraulic System B complex.
Fig. 34. Check 17, Raceways, and Check 4, Spring-Bathhouse.
Fig. 35. Map of Continuation of Check 17, Raceways with burn Dam.
SCALE
hor. - 2/10" - 1 ft.
vert. - 4/10" - 1 ft.

South Profile

Auburn Dam Bank

Legend
1. Dark humus
1A. Dark grey clay
1B. Dark clayey soil with red pebble inclusions
2. Lt. brown sandy loam
3A. Red sandy with slag furnace tailings
3B. Brown soil shot with charcoal flakes
4. Light brown subsoil with:
   Some charcoal & slag at top of subsoil
   Some iron flakes & yellow brown nuggets
5. Lt. grey & yellow clay

6. Dark grey clay with ripple marks at base
7. Lt. grey clay band (striated); with thin sand over it
   (both 2" thick).
8. Red clay fill
10. Grey clay strata

Fig. 36. Check 17, Trench 1, End of Raceway in Auburn Dam (Feature 2) over earlier Raceway (Feature 1)
Retaining Wall

Clay Basin for Raceway

North Profile

1-Humus and Talus
2-Grey Clay Basin
3-Yellow Subsoil
4-Shale Bedrock
5-Dark Soil
6-Shattered shale bedrock in dark soil
7-Alternate Layers of Sand and Clay
8-Stream rocks
9-Red Sand

Fig. 37 Check 17, Trench 2, Raceway of Hydraulic System B.
Fig. 38 Check 17, Trench 4. Feature 1, raceway of Hydraulic System A. Feature 2, raceway of Hydraulic System B. Berm Ditch and Strata 1 from Existing U.S. Route 15 construction. Strata 2 from earlier U.S. 15.
Check 17, Trench 6, Auburn Dam area. Feature 1, Raceway, Feature 2, Raceway?
LEGEND
1. Dark organic soil
2. Shattered rock
3. Red clay fill
4. Yellow clay fill
5. Red clay subsoil
6. Red Brown fill
7. Humus
7A. "Old" humus

Scale
hor. - 2/10" = 1 ft.
vert. - 4/10" = 1 ft.

Fig. 40. Check 17, Trench 7. Feature 1, Raceway; Feature 2, unknown feature.
CHECK 19. LIMESTONE QUARRY AND KILN (18PR332)

Research Design

It was originally planned to excavated the kiln which had been reported on SHA maps prior to the construction of the existing Route 15. However, the owner, Mr. Leatherman, pointed out that while the kiln was indeed in the position indicated (Fig.), it was buried under the shoulder of the existing road. It was decided not to excavate the kiln because of the problem of it being buried under the highway and the fact that an excavation would not be tolerated so close to the road strip.

The 1979 Excavation (Fig. 16)

A backhoe excavation was cut into the site for approximately 30 feet up against the face of the limestone quarry. The cut revealed the stone floor of the quarry 3 feet below the surface. The soil above the floor was a dark organic muck resulting from the pond which the owner indicated had occupied the center of the quarry excavation. Fragments of limestone resulting from the quarrying process littered the base of the excavation. However, no cultural materials were found. The owner indicated that another kiln was to be found across the road from the site on private property. The site predated the life span of Mr. Leatherman who is in his sixties.

Interpretation

The lack of evenly excavated blocks of limestone suggests that this quarry was not used for building stone, but rather was used to produce lime for fertilizer and for whitewash paint.

Conclusions

Additional oral history data is needed from this site, which is one of several in the vicinity providing limestone for the surrounding area. There is no evidence to date connecting the site with the Catoctin Furnace specifically.
Fig. 41. Ground Plan of Check 19.
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Mentzer, J. Frank.


Nelson, Lee H.


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U.S. Government

APPENDIX A

THE CATOCTIN FURNACE ARCHAEOLOGICAL MITIGATION PROJECT

U. S. ROUTE 15
PUTNAM ROAD TO ROUTE 77
FREDERICK COUNTY,
MARYLAND

REPORT BY THE GEOLOGICAL CONSULTANT

to
Dr. Kenneth Orr
Project Director

Dr. John L. Fauth
1 Louise Street
Cortland, New York

August 13, 1980
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INTRODUCTION

Purpose

This report describes the geologic setting and related aspects along the Corridor I alignment for dualization of U. S. Route 15 in the vicinity of Catoctin Furnace, Frederick County, Maryland. It also presents much detailed data obtained as a result of on-site geologic field work and the examination of a number of continuous-sample borings.

Evaluation and interpretation of these data in the context of available geological, archaeological, cultural, and historical information and records are presented to aid in formulating the history of Catoctin Furnace, and to underscore the particular significance of the geological and environmental factors on the origin, development, and eventual demise of the iron industry at this locality.

Scope

The basic scope of the geologic investigation was originally described in Specifications and Research Designs, The Catoctin Furnace Archaeological Mitigation Project, U. S. Route 15 from Putnam Road to Route 77 (Orr and Orr, 1979, pp. 18-45). The progress and preliminary results of archaeologic and geologic field work in July and August, 1979, justified some modification in the original plan. Consequently, this report focuses on aspects of the following localities: Check 3 (18 FR 320)-Auburn Dam, Check 9 (18 FR 325)-Limestone Quarry, Check 11 (18 FR 327)-Race Pond, Check 12 (18 FR 328) Iron Ore Mines, and Check 17 (18 FR 331)-Raceway.
Methods and Procedures

Field Program

Field work, equivalent to 12 man days, was carried out at various locations within the project area during August 1979.

Surface surveys and reconnaissance geologic mapping were employed: (1) to locate, describe, and sample rock outcrops at critical stations, and (2) to determine the areal extent, basic characteristics, and spatial relationship of appropriate major features.

Information obtained by surface surveys at Check 12 (Iron Ore Mines; specifically Features 1 and 2) and Check 17 (Raceway; namely trenches 1, 2, and 3) was augmented by sub-surface data obtained from hand-dug test pits and trenches excavated by backhoe. Those excavations selected for more than cursory study were prepared by shaving smooth one or both walls - first with a shovel and then, if necessary, by hand trowel. Stratigraphic units or elements comprising these faces were delineated on the basis of such physical characteristics as color, particle size or texture, composition, or included cultural material. Where detailed study and sampling were desired, stratigraphic units in these excavations were identified and delimited by numbered index cards attached directly to the "shaven face" and then the face was sketched.

Field sketches of excavations were constructed by "stringing" a level line across the surface at a convenient distance above the excavation to serve as a horizontal reference. At intervals along the level line (usually five feet), vertical measurements were made to boundaries of stratigraphic elements using a six-foot rule or
25-foot tape. This information was plotted, usually at a scale of one inch equal to five feet, in a field notebook. Direct sighting of the exposure aided in extending lines from one plotted data point to another so as to outline the form and extent of each stratigraphic unit and complete the field sketch. Upon completion of the profile sketch, the strata were sampled. Each sample was placed in a plastic bag, numbered, and secured for laboratory examination.

Based upon surface surveys and data obtained from excavations, a program for continuous-sample borings was prepared to obtain additional sub-surface information at several localities. An array of borings was designed and sited within Check 3 (Auburn Dam), Check 11 (Race Pond), and Check 12 (Ore Mines). Wherever possible, each boring penetrated the entire thickness of overburden and extended a minimum distance of 10 feet into bedrock so as to provide samples of all strata that might contain cultural material, reflect human activity, or have geologic significance.

This program was implemented by the Maryland State Highway Administration (SHA) in October 1979 and completed two months later. A total of 31 borings yielded samples representing an aggregate thickness of 1400+ feet of unconsolidated material and rock. These samples, along with the drillers' logs, were transported to Cortland, New York on January 23, 1980.

Laboratory Program

Cores of unconsolidated materials were split longitudinally or scraped to expose a fresh surface; selected rock samples were sawed lengthwise. All materials recovered in the borings were
examined, described, and identified megascopically. A binocular microscope and polarizing microscope were used to identify charcoal and slag in the unconsolidated deposits. Specimens of carbonate rock collected from surface exposures (e.g. Check 9-Limestone Quarry) and from the borings were stained using the procedures described by Friedman (in Carver, 1971, pp. 511-530) to distinguish between limestone and dolomite.

Most of the data generated by this project are compiled and presented in a series of cross-sections and profiles. Figure 1 is a comprehensive legend for those diagrams. Basic data on borings taken in conjunction with this study appear in Table 1.
FIGURE 1. Legend for Profiles and Sections.
### TABLE 1

Data on 1979 GOW Borings
Catoctin Furnace Project

<table>
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<tr>
<th>Boring Number</th>
<th>Check No.</th>
<th>Site</th>
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<th>Total Depth (feet)</th>
<th>Depth to Bedrock (feet)</th>
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<td>36.0</td>
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** Surface elevation of GOW boring established by field
survey is more than 2 feet from elevation interpolated from
base topographic map of project area.

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<th>Hole Depth</th>
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TABLE 1
(Continued)
GEOLGIC SETTING

The project area lies astride the boundary between the Blue Ridge geologic province, on the west, and the Triassic Lowlands section of the Piedmont geologic province (Figure 2). This position has particular geologic and historic significance because the boundary between the provinces approximates the location of iron ore deposits whose past exploitation determined the site and development of the Catoctin Furnace complex.

Rocks of contrasting character abut along the lower eastern slope of Catoctin Mountain. Quartzites and phyllites of the Weverton and Harpers formation dominate much of the mountainous terrain, whereas bedrock in the adjacent lowland includes carbonate rocks belonging to the Frederick formation, and red mudstones and sandstones of the Newark Group (Table 2). Throughout the Blue Ridge province, deposits of iron ore typically occur wherever quartzites and carbonates are juxtaposed at the foot of mountain slopes. At the base of Catoctin Mountain in Maryland, the only significant iron ore deposit identified is "the large and important occurrences on what is known as the Catoctin property" (Singewald, 1911, p. 193), a factor which influenced the history of the iron and steel industry throughout much of this region during the eighteenth and nineteenth century.
### TABLE 2

**IMPORTANT ROCK UNITS IN THE VICINITY OF THE CATOCTIN FURNACE PROJECT AREA (from Fauth, 1977a)**

<table>
<thead>
<tr>
<th>Rock Unit (Age)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colluvial fan deposits (Quaternary)</td>
<td>Mixed colluvial and alluvial debris consisting of large and small rounded boulders, cobbles, pebbles, and sand derived from quartzite, and to a lesser extent, from metabasalt and metarhyolite. Distal margins are dominated by sand and silt mixed with fragments of underlying red sediments of the Newark Group. Thickness varies both longitudinally and transversely across the deposits. Maximum drilled thickness 150-200 feet.</td>
</tr>
<tr>
<td>Newark Group (Triassic)</td>
<td>In general, poorly bedded, grayish red, reddish brown, and moderate red mudstone and thin-bedded shale. Subordinate interbeds of grayish red, laminated and cross-laminated siltstone and fine-grained sandstone.</td>
</tr>
<tr>
<td></td>
<td>In the area of Creagerstown Station, includes very thin to thin-bedded, grayish red, micaeous silty mudstones and local intervals of medium greenish gray, poorly bedded, argillaceous siltstones.</td>
</tr>
<tr>
<td></td>
<td>Locally a conglomerate or fanglomerate principally composed of subangular to subrounded clasts of gray-colored limestone floating in a reddish brown, calcareous, argillaceous to sandy matrix. Also includes minor amounts of fine-grained sandstone with quartz pebbles 2.0-5.0 mm in diameter. Clasts typically comprise 30-75% of rock. Occurrence local; thickness variable. Maximum exposed thickness 5-8 feet.</td>
</tr>
<tr>
<td></td>
<td>The base and top of the Newark Group are not exposed. Thickness is estimated to be in excess of 10,000 feet.</td>
</tr>
<tr>
<td>Frederick Formation (Cambrian)</td>
<td>Lime Kiln Member. Exposures uncommon. Principally fine-grained, thin-bedded and laminated, light gray limestone. Contains moderately abundant sand and silt-size fossil debris.</td>
</tr>
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## Table 2

(Continued)

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<th>Rock Unit (Age)</th>
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<td>Frederick Formation (Cambrian)</td>
<td><strong>Adamstown Member.</strong> Exposures adjacent to the Monocacy River include regularly bedded, thin-bedded, dark gray, argillaceous to silty limestone, and interbedded medium gray limestone and yellowish gray to light olive gray silty limestone. Thin intervals or individual beds of limestone are commonly separated by very thin, dark gray, argillaceous or silty partings. Light to medium light gray, micritic limestone also occurs.</td>
</tr>
<tr>
<td></td>
<td><strong>Rocky Springs Station Member.</strong> Medium to dark gray, very finely crystalline limestone. Characterized by light brown, dusky yellow or grayish orange silty partings and laminations. Overlies dark gray, very thin bedded to fissile pyrite-bearing, calcareous shales. Crops out in the valley area north of Thurmont. Exposures south of Catoctin Furnace are very light to light gray to very pale orange, massive and poorly bedded dense limestone and peloidal limestone.</td>
</tr>
<tr>
<td>Harpers Formation (Cambrian (?) )</td>
<td><strong>Basal part:</strong> Orange and brown weathering, light gray to yellowish gray phyllites and quartz phyllites overlain by light gray to dark gray, lustrous phyllite that contains discontinuous bands of elongated pebbles (?) of light to medium light gray quartzite 2.0-10.0 mm thick. Upper portion: thin to medium-bedded, olive gray to moderate olive brown, very fine grained graywacke and graywacke siltstone. Dark gray to black laminae occur at intervals of 5.0 - 25.0 mm. Light gray phyllite and darker, greenish gray to medium bluish gray phyllite and phyllitic graywacke also occur. These rocks are characteristically finely laminated, and weather to shades of yellowish gray and greensh gray.</td>
</tr>
<tr>
<td></td>
<td><strong>The thickness of the Harpers Formation is estimated as 300-500 feet.</strong></td>
</tr>
<tr>
<td>Rock Unit (Age)</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
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</table>
| Weverton Formation                     | Upper member contains a local, basal ferruginous quartzite and conglomerate which is characteristically medium to thick-bedded, moderate to poorly sorted, and laminated and cross-laminated. Fresh rock is medium bluish gray to light gray; weathering colors range from moderate orange pink to pale red brown. Succeeded by light gray to greenish gray, medium-bedded, medium to coarse grained, graywackes, protoquartzites, and quartzites. Interbeds of light gray and medium light gray to olive gray phyllite and quartz phyllite at irregular intervals. Thickness is approximately 150-250 feet.  
Middle member of "ledge-maker" quartzite. Prominent thick-bedded to massive, well-jointed, medium to coarse-grained quartzite. Generally very light to medium gray on fresh surface; weathers light gray grayish red, or grayish orange pink. Contains 2.7% subrounded, blue and gray quartz pebbles 2.0-4.0 mm in diameter. Near top of unit, quartzites contain dark red brown to very dusky red, hematite bearing laminae and cross-laminae. Thickness ranges from 50 feet or less near Mountaindale to approximately 110 feet in Thurmont Area.  
Lower Member. Mainly medium-bedded, light greenish gray to greenish gray, pebbly, quartzose graywacke and graywacke conglomerate interbedded with dark-colored phyllites. Pebbles mostly subangular, blue and gray quartz, and flattened, grayish purple and dusky blue phyllite. These rocks usually have dark blue and purplish thin bands and irregularly spaced streaks parallel to bedding. Upper two-thirds is dominated by medium gray to bluish gray weathering, fine to medium grained, quartz phyllite, interbedded with light greenish gray to greenish gray, pebbly quartzose graywacke and protoquartzite. Cross-laminated in places. Estimated thickness is 250-275 feet. |
COMPONENTS OF THE STUDY

Check 3 - Auburn Dam (18 FR 320)

Background

Portions of the Auburn Dam presently identifiable include nearly orthogonal earthen embankments that extend approximately 100 feet northwest and 150 feet northeast from a common junction. These embankments, about seven feet in height, are situated at the south end of a basin which provided water to power the earliest forge located at the Catoctin Ironworks (Orr and Orr, 1977, pp. 4-17; John Milner Associates, in Orr, 1979, pp. 7-8).

Data and Observations

The substrate within the basin north of the Auburn Dam was sampled using an array of six borings. The configuration of the borings and nature of the strata penetrated by them is graphically presented in Plate 1.

Brown-colored clay and sand with an aggregate thickness of 1.5-3.5 feet mark the uppermost section of all borings from Auburn Dam (Plate 1). Bits of charcoal, distinguished by its reflectance, softness, and structure, are abundant and distributed throughout much of the clay and sand. Glassy slag, in contrast, is restricted to the thin bands of fine-grained sand. Grains of slag are distinguished from quartz because glassy slag is isotropic under the polarizing microscope and quartz is not. The greenish color, numerous dark (iron?) inclusions, and the presence of tiny vesicles in some grains also aid in identifying the slag.

A succession of red-colored silt and clay occurs beneath the uppermost interval of sand and clay, and extends to bedrock at
 depths of 12-40 feet below the land surface. The contact between the brown and red sections is generally sharp and clear, although some interlayering is present in Borings 33 and 37. With the exception of a charcoal-bearing zone about 0.15 feet below the brown-red contact in Boring 37 (Plate 1), charcoal and slag are not observed in the red strata.

The bedrock in the area nearest the embankments at Auburn Dam (Plate 1, Borings 32, 36, 37) is primarily red mudstone and siltstone of the Newark Group of Triassic age. However, limestone, which is present in limited thickness in Boring 32, becomes progressively more abundant away from the dam (Borings 32-35). The limestone is probably part of the Frederick formation of Cambrian age.

**Evaluation**

The red silt and clay are strata derived from the underlying bedrock and formed essentially in situ as a result of weathering and soil-forming processes. The abrupt contact between these materials and brown, fine-grained sand near the top of the section is believed to mark the original bottom of the pond behind the Auburn Dam.

The sequence of sand and clay above the base of the pond which contains fragments of charcoal and slag, as well as small, rounded granules of iron, clearly has been derived from an off-site source and transported to the pond site. Visual comparison of these strata and sand samples obtained from trenches incising the raceway at Check 17 suggests that they are similar not only in grain size and mineralogy, but also in the occurrence of charcoal
and glassy slag. As a result of this similarity in character, a question arises --- is the sand in the raceway and Auburn Dam the result of progressive filling of both features, or does the sand behind Auburn Dam represent accumulated sediment derived from the erosion and subsequent down-channel transport of material used to construct and maintain the raceway?

Check 9 - Limestone Quarry (18 FR 325)

Background

This feature, a box-like depression approximately 40 x 50 feet at the base and 7-10 feet deep, was uncovered and identified during the Intensive Survey as a probable limestone quarry (Orr and Orr, 1977, p. 40).

A rock exposure forms most of the west face of the quarry(?). This outcrop was examined by this consultant during the 1977 study. Based upon field study, and petrographic and chemical analyses performed by the Maryland State Highway Authority (SHA) and reported to Orr and Son, Consulting Archaeologists (Orr and Orr, 1977, Table 1 and 3), this rock was termed a siliceous limestone - a carbonate rock which contained fairly abundant sand and silt-size quartz plus nearly four percent iron. As a result, this consultant concluded that the rock in the quarry(?) probably was unsuitable for flux owing to the amount and nature of the impurities, although it may have been prospected and tested for such purpose (Fauth, 1977, p. 7).
Data and Observations

Limited trenching and excavating increased the amount of rock exposure within the quarry(?) by uncovering bedrock at various places on the floor of the feature, and near the base of the north wall. Nonetheless, the outcrop which comprises the west end of the quarry remains as the most extensive exposure of rock.

In general, the bedrock at this site is a dense, massive, very finely crystalline carbonate. The typical, medium light gray to medium gray color of the rock is altered to pale yellow orange or grayish brown on poorly exposed fracture surfaces; on well-exposed joint faces more thorough weathering yields a yellowish gray to grayish orange color. A mantle of moderate brown to red-brown silt loam of variable thickness overlies bedrock at this locality. Incorporated in the silt loam are chips of lustrous gray phyllite, and fragments of charcoal. Most of the charcoal is concentrated in the eastern portion of this feature.

Samples obtained from the base, middle, and top of the west wall of the quarry(?) were prepared and stained to determine the mineral composition of the rock. Using procedures outlined by Friedman (in Carver, 1971, pp. 511-552), stains capable of distinguishing between calcite \([\text{CaCO}_3]\) and dolomite \([\text{Ca,Mg (CO}_3\text{)}_2]\) were applied. In all cases positive results were obtained when using the dolomite-sensitive stain, and only a negative reaction occurred where the calcium-sensitive stain was used. Based on the results, the rock exposed in the quarry(?) is a dolomite - a rock consisting of more than 50 percent carbonate material of which more than half is the mineral dolomite.
Evaluation

Based on earlier field work and a review of the chemical analysis of one sample from this locality (Orr and Orr, 1977, Table 1), the rock was identified as limestone (Fauth, 1977, p. 7). However, staining unequivocally demonstrates that the rock is dolomite, a rock type common in the Lower member of the Frederick formation (Reinhardt, 1974, pp. 1-18) which locally crops out along the foot of Catoctin Mountain.

What is the origin and nature of the feature at Check 9, and for what purpose(s) was the stone quarried? Root (1971, p. 62, Table 1) summarizes the general chemical characteristics of rocks suitable for flux as follows:

Limestone and magnesium limestone
for steel flux (blast furnaces)

<table>
<thead>
<tr>
<th>Component</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silica (SiO₂)</td>
<td>5%</td>
</tr>
<tr>
<td>Alumina (Al₂O₃)</td>
<td>2%</td>
</tr>
<tr>
<td>Magnesium carbonate</td>
<td>8.32%</td>
</tr>
<tr>
<td>Phosphorous</td>
<td>0.01%</td>
</tr>
</tbody>
</table>

Limestone for steel flux
(open hearth)
Calcium carbonate (CaCO₃) 98%

Although the product of the blast furnaces at Catoctin Furnace was iron and not steel, the limits cited above provide an approximation of the requisite chemical characteristics of limestone and dolomite suitable for flux. To this extent, the chemical analysis of one sample from Check 9 (Orr and Orr, 1977, Table 1) indicates that the dolomite is acceptable. However, other characteristics of the rock may detract from its suitability or make it unsuitable.
One is the relatively high percentage of insoluble residue in the rock; mainly quartz (SiO₂) (Orr and Orr, 1977, Table 3). Another is the presence of small crystals and grains of pyrite (FeS₂) disseminated throughout the rock. Both the quartz (silica) and the sulfur derived from the pyrite are impurities in the blast furnace charge, and as such are removed by combination with the bases provided by the flux. Utilizing an impure carbonate rock for flux increases the quantity of impurities that must ultimately be removed. Thus, "the percentage of iron per ton of material put into the furnace is decreased, and the yield of the furnace per unit of capacity reduced" (Singewald, 1911, p. 125).

Based on available data, the dolomite exposed at Check 9 could be used as a flux, although its quality would likely be marginal. However, the limited dimensions of the quarry(?) at this site suggest that although the rock may have been prospected and tested for fluxing properties, it was not extensively used for that purpose in the blast furnaces at Catoctin Furnace.

Check 11 - Race Pond (18FR327)

Background

"Several factors determined the locations of the ironworks. An adequate supply of ore, an abundance of wood, sufficient water power, . . . , were essential for the successful operations of these early industrial plants." (Bining, 1938, p. 49). Race ponds, raceways, and sluices were integral components of eighteenth and nineteenth century iron furnace complexes because water power was the energy form used to turn the large waterwheels which operated
the bellows, and thus provided blast to the furnace. An earlier study concluded that prior to 1876, Furnace Stacks 1 and 2 at Catoctin Furnace were totally dependent upon a system of watercourses, races, and ponds located northwest of the furnace site (Contract Archaeology, 1971, p. 56). By 1876, the introduction and use of steam power for blast radically altered the need for water power, and made race ponds less important.

The pond situated within the Check 11 area is the surviving remnant of a larger race pond that stretched eastward to a discharge point under a portion of the present highway. Construction of the existing alignment of U. S. Route 15 placed an overlayment of fill, 8-10 feet thick, over approximately the eastern two-thirds of the original water body. This race pond was a major source of water power for "the water wheels of most of the known iron-working structures and a grist mill" at Catoctin Furnace (Orr, 1979, p. 29). Perhaps this pond was first utilized for water when furnace operations began in about 1775. Oral history is not consistent on this point; instead, some elements suggest that the site was originally an iron ore mine, and/or an ore-washing pond before it functioned as a race pond.

Data and Observations

A double line of continuous sample borings oriented approximately 030° and sited between the existing pond and the adjacent shoulder of U. S. Route 15 was used to obtain subsurface information at this locality. In addition, the driller's log for a 1977 boring located within the pond provided data to a depth of
50 feet below the sediment-water interface. Basic characteristics of the bedrock and its overburden observed in these borings are summarized in Plate 2.

Hand-dug trenches and shallow test pits were completed in the area north of the present Race Pond. A number of these excavations yielded abundant slag, and at least one trench produced assorted cultural material. A backhoe trench incised fill probably emplaced during the construction of the present roadway. Unfortunately, material exposed by the backhoe could not be examined in any detail because infiltration of ground water caused continuous sloughing of the trench walls creating hazardous working conditions. This excavation was located in the vicinity of Boring 11 (Plate 2).

Seven of the ten borings taken at this site penetrated bedrock (Table 2; Plate 2). Rock is encountered 32-54 feet below land surface, and consists of quartzite and phyllite intervals of various thickness; nowhere in these borings is carbonate rock present. A mineral commonly associated with both rock types is pyrite; an iron sulfide (FeS₂). It occurs as single cubic crystals or as a fine, granular aggregate filling small fractures.

In general, the bedrock surface is deepest toward the northeast and rises in a gradual, ramp-like fashion toward the southwest. A pair of borings at the south end (14 and 15), and another set at the north end (11 and 19) show there is little change in the depth to bedrock transverse to the double-line of borings (Plate 2).

As noted in earlier reports (Mentzer, 1974, p. 3; Orr and Orr, 1977, pp. 48-49, Figures 16 and 17), the original race pond extended
eastward a considerable distance. However, the eastern two-thirds of the pond was impacted by the construction of the present U. S. Route 15, and an overlayment of fill, 8-10 feet deep, reduced the pond to approximately its present size. In the borings, this fill is generally characterized by deep red or grayish red silt and clay, or by coarse quartzite and phyllite rubble (Plate 2). Another, deeper fill occurs below the "red-colored" material. This deposit is recognized and differentiated on the basis of its non-red color and the presence of charcoal, slag, or wood (construction lumber or timbers) fragments. Together these two fills have an aggregate thickness of 19 and 22 feet in borings 18 and 19 respectively.

A layered sequence dominated by light-colored clay and silt of uncertain origin generally overlies the bedrock at this locality. Scattered, small granules of iron are common in this clay-silt succession, but dark yellow-brown zones rich in iron oxide are thin and only developed locally. Typically this clay-silt interval exhibits a sharp contact with the overlying fill material (Plate 2).

Evaluation

The quartzites and phyllites, which comprise the bedrock at the Race Pond locality, have physical characteristics most similar to rocks that occur in the uppermost Harpers formation of Cambrian(?) age. The existence of this rock unit in the immediate subsurface is consistent with geologic relationships established by recent bedrock mapping (Whitaker, 1955; Fauth, 1977a) which projects the Harpers formation across most of the lower eastern slope of Catoctin Mountain.
The pond which characterizes the Check 11 area is identified as a race pond because its former outlet to the east is a channel or raceway which runs southward to the furnace(s) and beyond. However oral history offers testimony to suggest that the site may have been an ore mine originally, and/or an ore washer pond at some time in Catoctin history (Orr, 1979, p. 29). Examination and interpretation of the boring profiles appear to offer some insight as to the nature and history of this feature as well as these alternate uses.

At an 18th and 19th century iron furnace complex, a race pond would provide a continuous, regulated flow of water by gravity via races to the water wheels located at the blast furnace(s) and associated operations. To function in this manner at Catoctin Furnace, the race pond at Check 11 would have to impound water at an elevation greater than its outlet to the race course and above the top of the overshot water wheel which operated the bellows at the furnace(s). A trench transecting the raceway immediately across the highway from the existing pond apparently exposed the base of the channel at a depth approximately 10-12 feet below the top of the adjacent embankments. Estimating the elevation of the embankment from the topographic base map (Map, Inc., 1978; scale: 1/600, contour interval two feet) as 522-523 feet, the bottom of the race should lie at 510-513 feet. Therefore, the bottom of the race pond should occur some 3-6 feet below the general water surface level of the existing pond. Deepening the pond by lowering its base would not significantly increase the effectiveness or capacity of the impoundment unless the water is pumped into the nearby race; an
unlikely possibility during the Colonial period since a furnace in blast operated around the clock for periods of one week or more, and would require water power throughout this time.

The data provided by the borings taken at this site establish that fill exists to a minimum depth of 18-22 feet below present land surface in at least two places within the limits of the original race pond (Plate 2). Thus the bottom of the depression occupied by the race pond, at least locally, is between 494 and 498 feet in elevation; some 12-19 feet below the level necessary to provide gravity flow into the nearby race. If the distinction between fill and indigenous unconsolidated material based on the rate of penetration of a split-barrel sampler is accepted, the drillers' logs for several borings at this locality indicate the base of the original depression may be at greater depths; between 25-30 feet below the present land surface, or at elevations of 486-491 feet. In either case, data seem to indicate that the base of the original pond lies at a depth measureably greater than is required for a simple race pond.

Perhaps the "over-deepened" pond occupies a natural depression? Examination and study of the Catoctin Furnace 7½-minute topographic map and selected aerial photographs reveal no evidence that natural depressions of similar size, shape, and depth exist anywhere in the general vicinity of the Catoctin Furnace area. Consequently, an alternative proposition must be evaluated - the race pond occupies a site either modified or constructed by human activity.
Figure 3 is a portion of the topographic base map for the project (Maps, Inc., 1978) centered about the Check 11 locality. The rectilinear line segments (A, B, and C) and the near-orthogonal bends (X, Y, and Z) in the contour pattern clearly contrast with the configuration of the contour lines elsewhere in the map area. The contour lines west of the existing pond at Check 11 define a boxlike form which, at a larger scale, is replicated at the ore mine one mile north of the Check 11 site (Singewald, 1911, p. 194, Figure 3), and at a similar scale is recognizable within the confines of Feature 1, Check 12; an ore mine immediately south of the Race Pond site.

Figure 3

Configuration of contour lines about existing pond at Check 11. Note rectilinear segments (A, B, and C), and almost right angle bends (X, Y, and Z).
On the basis of the "box-cut" character of the topography at the western margin of the existing pond at this check, the excessively thick fill and probable depth to the base of the original depression, and the documented existence of ore mines to the immediate south and east of this locality (Orr and Orr, 1977, p. 50), it appears probable that the Race Pond at Check 11 occupies the site of an earlier iron ore mine.

Examination of the cores obtained by the borings located east of the existing pond contributes little evidence as to whether or not the Race Pond served as an ore-washing site. The almost uninterrupted succession of yellow, orange, and brown clay and silt which overlie bedrock in this locality may represent sediment accumulated from an ore-washing process. However, no criteria have been identified to differentiate between "in situ" clay in the cores and that derived from washing iron ore or other processes. Consequently, one can only speculate on the origin and significance of these silts and clays.

The boring profiles presented in Plate 2 suggest that the thickness of the light-colored silt-clay sequence increases to the north and east. If an ore washer was located at this site, possible evidence of its existence might be found in the shallow subsurface just north of the pond and the greatest thickness of "accumulated" sediment. Ore washed at this locality would probably have its source north or east of the site and close to the washer pond.

If one accepts the interpretation that the Race Pond at Check 11 was originally the site of an ore mine, then several questions arise; such as: (1) when did the mine originate?, (2) when was the race
pond established(?); and (3) where was water obtained to power the water wheels if the Check 11 area was an active ore pit?

For the time period of active mining at the Race Pond site, some insight may be obtained by the description by Alexander (1840, in Singewald, 1911, p. 146) that the original Catoctin Furnace, built in 1774, was replaced in 1784 by a furnace stack (Stack #1) located "...about three-quarters of a mile further up Little Hunting Creek, and nearer the ore banks." The ore banks referred to in Alexander's work might be those astride the present alignment of U. S. Route 15 and north of Catoctin Hollow Road (Check 12, Features 1, 2, and 3), including one at the Race Pond site (Check 11). If the Deep Ore Mine (Check 12, Feature 4) or the Big Ore Bank (Check 13) were being referred to in this description a term indicating a closer proximity to the ore banks would have been used. Additionally, these larger ore banks "back of the furnace" probably weren't developed extensively until 1831 when Stack #1 was enlarged and its capacity increased from 600-900 tons per year to 1700 tons per year, or perhaps later, in 1856, when the Isabella furnace (Stack #2) was constructed and the output of the Catoctin Iron Works jumped to 5,000 tons of pig iron per year (Lesley, 1859, in Contract Archaeology, 1971, p. 37).

Undoubtedly a water source north of the furnace site provided water power to drive the water wheel for Stacks 1 and 2 (Isabella). If the Race Pond (Check 11) was an active ore mine during the Early Catoctin Period (1774-1787) and, perhaps, the first phase of the Middle Catoctin Period (1787-1873), a water supply may have been
acquired directly from Little Hunting Creek, or from an, as yet, unidentified race pond located nearby. Most likely, the Race Pond site was no longer an active mine after the early 19th century.

Check 12 - Iron Ore Mines (18 FR 328)

Background

The area encompassed by Check 12, located northwest and west of the furnace site, is dominated by a series of ore pits and ore banks. The existence of the ore mines, known to the older residence of the area and part of the oral history of Catoctin Furnace, generally was unreported in archaeological studies prior to the Intensive Survey (Orr and Orr, 1977, p. 50). Three ore mines lie wholly or partially within the expected area of impact by construction of Alignment 1. Collectively these features are thought to be representative of ore mines and mining methods that span most of the iron-working history at Catoctin (Orr, 1979, p. 32). In addition to ore mines (Features 1, 2, and 4), portions of the Raceway (Feature 5), and the Charcoal Road (Feature 6) lie within this Check.

Data and Observations

Feature 1: Shallow Ore Mine (West) - This feature is located west of center line stations 575-577. It is an "L-shaped" depression about six feet below present road level that extends westward about 160 feet, and then southward for an additional 90 feet (Figure 4).

The ore mine was explored mainly by trenching. Particularly significant data on the mine was obtained from a set of three backhoe trenches that formed a "Z-shaped" pattern and were located near the
entrance to the feature. This trench system partially coincides with a set of excavations developed during the Intensive Survey (Figure 4).

The array of backhoe trenches at this site exposed iron ore-bearing strata beneath the slopes immediately north and south of the entrance to the mine. These strata rest on an interval of banded clay of unknown thickness. The clay, probably a saprolite (residual material derived from rock directly beneath), and the superjacent ore zones are sharply truncated and overlain by a succession of "fills." The stratigraphy in the north-south trenches is diagrammed in Figures 5 and 6.
Figure 5

No vertical exaggeration.

CHECK 12 FEATURE 1A
ORE MINE

Profile East Wall
Trench 3

Scale 1:40
Based on field sketch and descriptions

Topsoil
Dark yellow orange to moderate brown clay; pale olive to medium gray laminations

Yellowish gray, dark yellow brown, and light olive gray silty clay (Fill)

Mottled gray, blackish red, and olive brown clay; nodules and granules iron ore

Saprolite
Dark gray, light olive gray, and moderate yellow orange, thinly banded clay

Poorly banded olive gray clay; fill

Approximate Interim Excavation Profile

Artificially cut slope

Trench fill

Poorly sorted sand; fill

Approximate location of timbers; possible cribbing

Ultimate Excavation Profile

(Feet)

(Feet)
Figure 6: CHECK 12 FEATURE 1: ORE MINE

Profile East Wall Trench 2
Scale 1:40
No vertical exaggeration

Intensive Survey Trench and Cut

Fill 1
Fill 2
Cut-slope of ore mine

Yellow silt loam
Mattled gray, red-brown and yellow brown clay;
some iron
Iron ore zone;
dark brown and red brown
Gray clay

20 15 10 5
FEET

Gray clay

15 10 5
FEET
Limited trenching to shallow depth in the southernmost part of this feature (Figure 4) revealed the occurrence of very plastic poorly banded, olive gray clay similar to material comprising part of the fill exposed in the excavations near the head of the mine.

Feature 2: Shallow Ore Mine (East) - The ore mine is a near-rectangular topographic feature about 300 feet long and 40-50 feet wide that is located just to the northeast of the junction of Catoctin Hollow Road and U. S. 15 (Figure 7). The northern end of this mine is directly opposite and widens toward the entranceway of Feature 1 (ore mine).

The recent history and use of this mined area is given in Orr and Orr (1977, p. 51). To probe into the nature and potential resources of this ore pit, two backhoe trenches were incised into

Figure 7

Topographic expression of Check 12, Feature 2: Shallow Ore Mine (East); location of 1979 trenches (stippled), borings, and interpretive cross-sections; AA', BB', CC'.
opposing slopes located near the southeast end of the feature. In addition, 10 continuous-sample borings were taken within and adjacent to the mine. The driller's log for another boring, part of an earlier study, was also available for examination. The approximate location of the trenches and specific position of each boring is displayed in Figure 7.

All but one boring (#24) at Feature 2 penetrate bedrock. Except for the western part of the feature where bedrock generally consists of quartzite and phyllite, the remainder of the area is underlain by dolomite associated with very local and limited thicknesses of limestone (Plate 3). Boring 6, an exception to this general pattern, encountered phyllite and minor amounts of quartzite near the southeast corner of the ore mine. Plate 3 presents the basic data on the bedrock and main characteristics of the overburden at this site.

The boring program and the backhoe trenches excavated at this Check clearly demonstrate that iron deposits still remain in portions of this site. The ore zone(s) and stratigraphy of Trench 1 are represented in Figure 8. This excavation yielded masses of nodular iron ore 10-15 inches in diameter and weighing up to a few tens of pounds. In Trench 2 (Figure 9), located on the opposite side of the mined area from Trench 1, only traces of iron ore occur.

The configuration of the bedrock surface at this locality is shown in a series of diagrams (Figure 10; A, B, C) and also on Plate 3. The extent of fill material, principally recognized on the occurrence of charcoal fragments in the overburden, is also identified in these diagrams.
CHECK 12 FEATURE 2
ORE MINE

Profile North Wall
Trench 1

Scale 1:40
Based on field sketch and descriptions

Figure 8

No vertical exaggeration
CHECK 12 FEATURE 2
ORE MINE

Profile North Wall
Trench 2

Scale 1:40
Based on field sketch and descriptions

"Topsoil"
Mottled gray clay
Yellowish brown sandy loam
Red-brown clay
Saprolite
Iron
Approximate Excavation Profile

No vertical exaggeration

Figure 9
INTERPRETIVE SECTIONS
CHECK 12 FEATURE 2

FIGURE 10
scale: 1-200
No vertical exaggeration.
Feature 4: Deep Ore Mine - The construction of the present alignment of U. S. 15 almost completely destroyed the original form of this feature which Singewald (1911, p. 99) described as an opening located "...back of the furnace..." about 300 feet by 125 feet in size, and striking N20E. To supplement the information on the ore mine that Singewald (1911) provided, a brief surface reconnaissance of the site was undertaken which revealed:

(1) Nodular and irregular masses of iron ore of various sizes occur on the east slope of Catoctin Mountain at levels 20-40 feet or more above the existing roadbed.

(2) Two sections of iron rail, about 6-8 in length, partially imbedded in the "fill" now covering the bottom of the depression near Boring 27 (Maps, Inc., 1978, as revised 1/80).

(3) A small exposure of Harpers formation (gray phyllite) in the drainage channel which exits from the mine at its south end.

To establish the stratigraphy of the ore mine and its immediate surroundings, seven continuous-sample borings were taken. The basic characteristics of the bedrock and overburden are summarized in Plate 4. In general, the bedrock in and about the mined area consists of quartzite and phyllite. The overlying mantle includes one or more iron-bearing horizons, and at the top of the section, abundant charcoal and slag fragments. Based on the subsurface data, interpretive cross-sections have been constructed (Figure 11).

Feature 5: Raceway - There exists a portion of the raceway complex immediately adjacent to the east side of existing U. S. 15 and the north end of the depression marking Feature 2 (Shallow Ore Mine) of this check. A transverse profile through the race channel
and its embankments appeared to reveal the original base of the channel at an elevation of 510-512 feet. In addition, the trench also exposed 30-34 inches of very fine grained sand atop the embankment to the south, and to a much lesser depth on the north side. This sand was observed to have a fine stratification that sloped at a low angle down the embankment toward the channel. Examination under the binocular microscope showed that very fine charcoal fragments are very abundant constituents of this material.

Feature 6: Charcoal Road - This road is reported to be the route by which charcoal from the mountains was delivered to the blast furnaces during the Middle Period of iron-making at Catoctin (Orr, 1979, p. 34). Based on the evaluation of an earlier series of borings and auger holes, it was conjectured that the site of the charcoal road may overlie a complete geologic section of ore-bearing strata owing to its location between known iron mines to the north and south (Greene, 1977). After examining the appropriate borings and driller's logs, Fauth (1978, pp. 4-6) suggested an alternative interpretation - that the charcoal road was located in a position known to be without ore-bearing strata. In an attempt to secure additional information on the possible relationship(s) between the charcoal road and the adjacent mined areas, Boring 26 (Plate 4) was located just beyond the present terminus of the charcoal road on the south side of U. S. 15. The boring, which penetrated bedrock at a depth of 36 feet, extended to a total depth of 66.5 feet. Only two iron-rich intervals were encountered; one, 0.8 feet thick at a depth of 29.5 feet, and the other, 0.3 feet thick at a depth of 32.0 feet.
Evaluation

Feature 1: Shallow Ore Mine (West) - The topography and subsurface strata at this site demonstrate that this feature is an iron ore mine; probably a westward-driven extension from the larger ore pit located east of existing U. S. 15 and labelled Check 12, Feature 2. Considering the relative placement of the two ore mines and the surrounding topography, it appears that a connection between them probably existed at one time in the vicinity of Boring 20 (opposite station 576+50; Maps, Inc., 1978, revised).

In the narrow "entrance way" to Feature 1 ore mine, backhoe trenches 2 and 3 incised definite ore-bearing strata on opposing banks. These strata and the subjacent banded clay are truncated on both sides of the corridor by a distinct, steeply inclined surface (Figure 5 and 6). On the north side, the truncating surface persists with nearly uniform dip until the horizontal base of the corridor is reached at a depth of almost 10 feet below present land surface. On the opposite bank, "timbers" uncovered during the course of backhoe excavation suggest that the south wall of passageway probably assumed a near-vertical attitude in its lower portions. These relations are sketched in Figure 12.

Above the banded clay and partially overlapping the ore-bearing intervals are a series of "fills". Under the binocular microscope no trace of charcoal, glassy slag, or other evidence is present to indicate that these materials were derived from an off-site source. In fact, some of the constituents of the fill, notably the olive gray clay (Figure 5), was observed to occur in other trenches within this site and in adjoining areas.
Considering the level of the ore zones in the existing banks and its low slope, an excavation to the depth documented to exist at this site was not needed to expose the ore-bearing strata. Then what was the purpose of the excavation, and why was it subsequently filled by material of apparent on-site origin? One interpretation: consistent with Colonial and early, post-Colonial period iron ore mining practices, and evidence present at this site, follows:

In order to facilitate the loading of iron ore into ore carts, they are run into the mine at a level below the ore-bearing strata where shoveling or prying will loosen the ore and cause it to fall
into the waiting cart. As the mining progressed farther into the hillside (west at Check 12, Feature 1), the overburden stripped to expose the iron ore was used to regrade the earlier mined portions of the ore mine to provide adequate drainage of surface and ground water, and/or provide a uniform, gentle grade on which to move the heavy, ore-laden carts.

Feature 2: Shallow Ore Mine (East) - Bedrock at this site consists of two different rock types. The quartzites and phyllites are part of the Harpers formation, and they comprise the entire rock section penetrated by borings situated in the western portion of the area, or occur below carbonate rocks in some of the other borings. These carbonate rocks, almost exclusively dolomite, occur in the lower part of the Frederick formation. In borings taken from the eastern section of the area, they make up the entire bedrock sequence sampled (Plate 3).

Interpretive sections through this ore mine are presented in Figure 10. Data from borings located off the section line were projected into the profile by lines approximately parallel to the apparent trend of the feature in constructing the transverse sections rather than by orthogonals. This procedure was also used in compiling the interpretive sections for Feature 4. These diagrams attempt to integrate several types or sources of data; including: (1) subsurface data from borings, trenches, and impact profiles (Orr and Orr, 1977), (2) the geologic setting of the area, and (3) the probable mining methods and constraints of the early and middle Catoctin periods.
Using data on ground water levels obtained from the boring program, the approximate water table for the ore pit is identified. This ground water level is considered representative of past conditions for several reasons:

(1) The marked and sudden decline of the water table at the south end of the pit (Figure 10, Section C) is consistent with the fact that the furnace site, 300 feet to the southeast, is at an elevation of 490 feet, yet must have been situated above the water table throughout the iron-making history of Catoctin Furnace.

(2) The water table rises toward the north end of the depression as it more closely approaches a surface stream, Little Hunting Creek.

(3) Ground water at the north end of this ore mine lies slightly below the base of the ore pit on the opposite side of U.S. 15 (Feature 1); a relationship necessary to maintain proper drainage and mining operations at both sites.

(4) A lower water table in the past would have placed the pyrite ($\text{FeS}_2$) present in the bedrock and mantle of the immediate subsurface in a chemical environment characterized by oxidation, thus causing the mineral to alter or partial decompose. There is no evidence of the alteration of pyrite in the core samples examined from this pit.

Cross-section C (Figure 10) is a longitudinal profile through the ore bank. The position of the water table and the base of the fill, nearly identical in all borings, is interpreted as defining the base of the ore mine. At this site, mining was not conducted much more than 30 feet below the highest surface elevation on the existing perimeter of the pit. In regard to depth and relationship
to water table, this feature is similar to 18th century ore pits which Thompson reports (1976, p. 6) were seldom more than 50 feet deep and rarely extended below the water table.

Based upon the thickness of fill and the depth of the water table, the ore mine appears to be divisible into two sections; a deep, forward (south) section, and a shallower rear section. There is some evidence to suspect that ore was "hauling" from the more northerly portions of the mine along a grade maintained near the east bank of the excavation. This interpretation stems from the existence of the unusually deep fill in Boring 24 which brings that site even with the level of bedrock in Boring 24A and into "grade" with the floor of the mine at adjacent boring sites near the east side of the pit. This configuration of the mine is portrayed in transverse section A (Figure 10). Inspection of boring profiles presented in Plate 3 shows that a number of ore-bearing zones remain below the level of past mining in the northern sector of the pit, and exist in the banks along the east and west margins of the depression. The thickest and "richest" concentration of ore seems to occur in the vicinity of Borings 25 and 39, and was probably incised by Trench 1 (see Figure 8).

Feature 4: Deep Ore Mine - Singewald (1911, p. 199) reports on the dimensions and orientation of the ore pit. Using those data, the impact profiles (Orr and Orr, 1979, p. 59), and the boring profiles, two interpretive cross-sections were constructed in an attempt to portray the approximate form of the original working, and to assess the potential ore resources remaining at this site.
Because the present highway is located over much of the mined area, boring sites were restricted to the eastern and southwestern portions of the feature. This factor limited the placement of a transverse profile across the ore mine (Figure 11, Section A), and increased the speculative character of the cross-section. In the case of Section B (Figure 11), four borings spaced at subsequent distances along the profile line exercised a greater amount of control on the construction and form of the cross-section.

What deductions and interpretations are warranted based upon the available data base for this feature?

(1) If Singewald's description of the depth of the ore mine is reasonably correct (1911, p. 119), then projection of ground water levels measured in the borings located near the ends of Section A (Figure 11) across the ore pit indicate that portions of mine extended below the water table. If such a condition existed, mining would have been practical only because of the availability of steam pumps to discharge the ground water. Use of pumps to extend mining below the water table is typically associated with the latter half of the nineteenth century.

The possible impact of the present highway alignment on present water levels has been evaluated. If the fill on which U.S. 15 is situated acts as a barrier to ground water flow, it would tend to increase the height of the water table west of the roadway and reduce it to the east. On the other hand, if potential infiltration is reduced by the capture and diversion of surface drainage and shallow ground water by the highway surface and the
concrete "flume" to the west, one would expect a general lowering of the water table. In either case, the probable effect of the present highway location on current ground water level in the mined area is likely a lowering of the water table below previous levels. Thus, the interpretation that some mining at this site occurred below prevailing ground water levels is not invalidated, at least in respect to this factor.

(2) The longitudinal section (Figure 11, B), located near the eastern margin of the mined area shows a thin veneer of fill covering an appreciable thickness of residuum that contains several iron-rich intervals. These deposits are inferred to lie below the limits of past mining based on the thickness of the fill, and the interpretation of impact profiles. In general, the level selected as the probable bottom of the pit in this section is about 15 feet below the adjacent bank, a depth cited by Singewald (1911, p. 199) for this part of the ore pit.

(3) Two lengths of iron rails were discovered partially buried in fill in the vicinity of Borings 27 and 29. This evidence suggests that the shallow grade shown in Section B (Figure 11) was purposely isolated from mining operations or constructed to facilitate the transport of ore from the mine via an ore cart rail line.

(4) Boring 26 is sited below the present terminus of the Charcoal Road (Feature 6), immediately east of U. S. 15. The subsurface profile at the locality, which extends to a depth of 66.5 feet below land surface, includes only two iron-bearing intervals. These zones, located 29 and 32 feet deep, are about 0.9 and
0.3 feet thick respectively (Plate 4). In contrast, ore-bearing strata are more common and more extensively developed short distances north and south of this location. Was the location of the Charcoal Road chosen to avoid ore-bearing or ore-producing "ground"? If so, what is the age of the Charcoal Road at its present location?

(5) Definite fill occurs in Boring 28 to a minimum depth of 8.3 feet (Plate 4). Continuous samples obtained from the fill demonstrate that glassy slag fragments are an important constituent of the material, at least to a depth of 6.5 feet. This Boring provides an accurate measurement of the thickness of the "slag-fill" plateau at its western margin.

(6) Bedrock in the area of this mine consists of quartzites and phyllites that are part of the Harpers formation.

Feature 5: Raceway - The well-sorted, very fine-grained atop the raceway embankment has the character of molding or casting sand. The abundance of fine charcoal that it contains suggests that its source was a site nearer the furnace(s) than its present location. Other than to increase the height of the raceway embankment, no other explanation can be offered as to why this sand was deposited at this site, seemingly in preference to other materials closer at hand and in greater supply.

Feature 6: Charcoal Road - Consideration of subsurface data pertinent to this feature was given previously (Feature 4 - Deep Ore Mine).
Check 17 - Raceway (18 FR 331)

Background

Within the Check 17 area, about 150 feet of raceway is discernable north of the Bathhouse and Spring (Check 4). This feature is an integral part of the raceway system that starts at the Race Pond (Check 11) and ends at the Auburn Dam (Check 3) (Orr, 1979, p. 40).

Data and Observations

Several trenches were excavated by backhoe to expose a vertical profile through the raceway. One trench located approximately east of station 546 was expanded and modified by shovel and shaving trowel to the form and internal structure shown in Figure 13. This diagram compiled from a field sketch and related field measurement, illustrates the complexity of raceway profile, and the numerous strata that comprise and fill it.

The raceway at this location appears to be buttressed on the west by a stone wall which rests on residuum. On the east, only the arcuate surface truncating units 8a and 12 (Figure 13) resembles a channel form. However, this curved surface lies above and is terminated by another stratum (8a), suggesting that two or more channels may be superposed or entwined.

Samples collected from all portions and strata exposed in this trench profile were examined under the binocular microscope in an attempt to determine the source of the material. The basic characteristics of strata are compiled in Columns A, B, and C (Figure 13). Fragments of charcoal and glassy slag are common in even the lowest units of the profile (e.g.; Units 9, 10, and 11), indicating that
Check 17
Raceway
Profile north wall
Trench S

Scale 1:40
No vertical exaggeration

For explanation of symbols see Figure 1
most, if not all, of the strata comprising and occupying the channel(s) were obtained from an off-site source some time after the beginning of the iron furnace industry at Catoctin.

Similarity of strata at this site with the initial sediment deposited on the substrate at the Auburn Dam (Check 3) suggests that the in-filling of the Auburn Pond also began after one or more blast furnaces at Catoctin had begun to operate. These observations raise some question as to when the raceway at this site originated and the time at which the Auburn Dam began to impound the water channelled through this race system.
GEOL OGY OF THE CATOCTIN IRON ORE DEPOSITS

Introduction

Deposits of iron ore similar to that mined at and about Catoctin Furnace occur along both eastern and western margins of the Blue Ridge in Pennsylvania (Frazer, 1877), Maryland (Singewald, 1911) and adjacent states. Seemingly, the deposits are preferentially developed wherever the sandstones and phyllites of the adjacent mountains are in contact with limestones in the adjoining valley areas. On this basis, these iron ore deposits are termed limestone contact deposits by Singewald (1911, p. 190).

In contrast with the western border of the Blue Ridge geologic province where limestone and sandstone formations are almost continuously in contact at the eastern margin, the rocks of Catoctin Mountain abut carbonate rocks only locally. Thus "limestone contact" iron deposits are common and extensively developed along the western edge of the Blue Ridge; whereas, they have a more restricted development and distribution adjacent to Catoctin Mountain. In fact, the only significant iron ore deposit of this type identified to date along the eastern margin of the Blue Ridge in Maryland has been "the large and important occurrences on what is known as the Catoctin property" (Singewald, 1911, p. 193).

Although most of the ore from these iron deposits was exploited during the nineteenth century, the Catoctin Furnace complex is rather unique in that ore production began in the late 1700's and extended into the early 1900's.
Bedrock Geology

The classic report on the Iron Ores of Maryland by Singewald (1911) described the geologic relationships along Catoctin Mountain near Catoctin Furnace based on the best information available at that time (Keith, 1894). Consequently he described the bedrock geology associated with the Catoctin iron deposits in terms of an overthrust fault which juxtaposed the Loudoun formation and the Shenandoah (Frederick) limestone. Singewald reported that the ore body occurs in the zone of the fault plane (1911, p. 198).

At a later date, Anna J. and George W. Stose studied and mapped the bedrock geology of Frederick County, and recognized that what had earlier been reported as the Loudoun formation was, instead, the Harpers formation (1946). Although Stose and Stose corrected a major error in stratigraphy and eliminated the principal justification for placing a fault between the rocks of Catoctin Mountain and the carbonates of the adjacent valley, they reiterated Singewald's description of ore deposits and the relationship these deposits had to a major fault along the foot of Catoctin Mountain (1946, pp. 151-152).

In 1955, Whitaker and more recently Fauth (1977a) established on the basis of detailed bedrock geologic mapping that a fault between the Harpers and Frederick formation was unsupported by evidence in the area of the Catoctin Furnace site.

Examination of the bedrock cores from the area of Check 12, Feature 2, which contain portions of both the Harpers formation and the Frederick formation, provides no evidence to support a
fault contact between these two rock units. The Catoctin iron ore is not, therefore, a fault contact mineral deposit. Localization of these deposits along the Harpers-Frederick contact is considered by most geologists to reflect geomorphic and geochemical processes that characterize the Blue Ridge (and Catoctin Mountain) wherever quartz-rich rock abut carbonates (Hack, 1965).

Origin and Nature of the Iron Ore

The early investigators of the geology of the region had the opportunity to examine newly exposed sections in the extensive and active open cuts and drifts, or those only recently abandoned. In them they could examine the nature of the ore and its relationship to the bedrock and overlying mantle (Frazer, 1877; Singewald, 1911). At present, these openings primarily exist as water-filled holes with slumped clay banks, or as debris-laden dumping sites. In addition, a dense cover of underbrush effectively camouflages other possible openings and prospects. Consequently, little new data has been acquired on which to base a more detailed description and understanding of these iron deposits and their possible origin. Our understanding of the ore and its geology has been, therefore, almost wholly derived from the reports and studies presented in the early literature (Frazer, 1877; d'Invilliers, 1887; Stose, 1909, 1929, 1932; Singewald, 1911).

During the course of this project, numerous excavations of various types plus a series of continuous sample borings were placed
within sections of the Catoctin Furnace complex. The borings, all of which probed twenty or more feet into the subsurface, provide samples of the bedrock and overlying mantle not available since the close of active mining and iron-making activities on this site. From this data bank much information has been obtained (and much can yet be analyzed) with regard to the geology of these ore deposits, mining methods and operations, and the progressive evolution of iron production at Catoctin Furnace.

The ore deposits in the vicinity of Catoctin Furnace, Maryland are similar to those elsewhere along the margins of the Blue Ridge. The ore is basically brown iron ore (limonite and other hydrous oxides of iron) that occurs as nodules, seams, or irregular masses that range from fine grains to bodies weighing several tens of pounds or more. In general, the ore has a rough or pitted surface although smooth-surfaced masses are not uncommon. Internally the iron masses may be solid or cavernous.

The main ore bodies or zones seem to occur where the alluvial-colluvial deposits and the residual clay mantle the foot of the mountain slopes and effectively cover the contact between the quartz-rich rocks of the mountains and the carbonate rocks of the adjacent valley areas. 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 (Singewald, 1911; Stose, 1929).
Based upon the available evidence, it is generally accepted that: (1) the iron ore deposits are secondary deposits formed in the residual clay and overlying surficial material of alluvial and colluvial origin, and (2) the iron was segregated from the nearby sedimentary and metasedimentary rocks, or was concentrated "in situ" by the weathering of the carbonate rock themselves.

Stose (1929, p. 17-18) summarized the two most commonly held views on the origin of the iron ore as follows: (1) some investigators assign the source of the iron ore to the carbonate rocks, which upon weathering and decomposing, yield a residual deposit dominated by clay and iron oxides; (2) others suggest that surface waters dissolved the iron from the adjacent sandstones and phyllites, some of which are heavily impregnated with iron-bearing minerals, and transported the iron in solution downslope until the surface water began to percolate through the porous debris at the foot of the steep mountain slopes where, due to a change in water chemistry or chemical environment, the iron was precipitated as hydrated iron oxides.

As a result of a more recent investigation, Hack (1965) proposed a theory or model for the origin of the iron and manganese deposits that occur at the base of the western foothills of the Blue Ridge in West Virginia and Virginia in a geologic and physiographic setting similar to those at the Catoctin Furnace site. The following is largely extracted from Hack's excellent paper but it does include some modification so as to maintain consistency in that narrative and the stratigraphy of the Catoctin Furnace area and other known aspects of the local geomorphology, hydrogeology, and regional geology.
The question of origin of these deposits may be considered as two problems: (1) The original source of the iron, and (2) The processes that have concentrated or preserved it in deposits of minable grade. Two ideas have been held in the recent past. Most geologists believe that the iron is syngenetic and that below the zone of weathering it occurs in the basal beds of the Frederick formation in the form of iron carbonate disseminated through the rock in very low concentrations. Other geologists have thought that the iron, although syngenetic, was either in beds either stratigraphically above or below the present position of the deposits.

Hack points out (1965, p. 70) that the iron deposits occur in residuum on carbonate rocks; usually the basal beds of the first carbonate rock unit encountered at the foot of the Blue Ridge province. In the case of this study area, the ore does occur in residuum overlying quartzites and phyllites. However detailed knowledge of the stratigraphic sequence at Catoctin Furnace makes it impossible to determine whether or not the beds are at the very top of the Harpers formation. In general, it seems justifiable to say that the base of the Frederick formation is probably the principal control on the localization and distribution of the iron deposits. According to Hack (1965, pp. 70-76):

The essential element in his theory on the origin of iron and manganese deposits at the foot of the Blue Ridge is that the physiographic setting constitutes a mechanical and chemical trap from which the supergene oxides of manganese and iron do not escape immediately, but are preserved while other constituents of the rock are carried away. The mechanical trap is provided by the gravel cover over the residuum in the colluvial-alluvial aprons; the chemical trap is provided by the reactions that take place as the carbonate rock is dissolved and the acidity (pH) of ground water and surface water rises.

The geochemistry of iron at low temperatures is fairly well understood (Hack, 1965, p. 70; also Figure 14). Based on this factor,
and the observed geologic relationships existent at Catoctin Furnace, the following scenario (mainly adapted from Hack, 1965) can be constructed.

Water enters the outcrop area of the Frederick formation either as rainwater or as runoff in the streams drawing adjacent Catoctin Mountain or areas to the immediate west. Both rainwater and surface
waters that drain the Loudoun, Weverton, and Harpers formations, predominately quartz-rich rocks, will be acidic (pH 7.0). These waters dissolve the calcium and magnesium carbonate of the Frederick formation, and ultimately discharge them through percolation and/or surface flow.

As the waters react with the carbonate rocks, the pH is increased. Under the prevailed Eh conditions (slightly oxidizing), increased pH causes precipitation of the iron oxides or hydroxides and they remain in the residuum with other insoluble impurities (e.g., clay, quartz) although some local transport may occur. Basically, water whose pH has been raised to 7 or greater and whose Eh (oxidation potential) has been lowered slightly because of reaction with carbonate rocks or with constituents of the residuum is unable to effectively transport iron in solution (p. 72).

Although water chemistry data are meager for the Catoctin Furnace area, Godfrey (1975, p. 25) reports pH readings of about 6.0 for Fishing Creek near Lewistown, Maryland, a few miles south of the furnace site. In discussing ground water quality and characteristics, Meyer (1958; pp. 49-51, 73-74) states that the pH of ground water in the Weverton and Harpers formations are low (pH about 6.0), and comments about the corrosive nature of the water. In contrast, published data on ground water chemistry for the Frederick formation indicates a range in pH between 7.0 - 8.0 with measurements of 7.7 and 7.8 most common (Meyer, 1958, p. 82). The data, consistent with those obtained elsewhere under similar geologic and climatic conditions, are sufficient to endorse Hack's concept regarding the origin of the iron ore deposits at Catoctin Furnace. Although this explanation does not necessarily identify the source of the iron, the prominence of pyrite (FeS2) in both the carbonate and non-carbonate rocks obtained in the borings taken at the Catoctin Furnace site certainly identifies portions of the upper Harpers and lower Frederick formations as potential source beds.
SUMMARY AND CONCLUSIONS

The Catoctin Furnace Archaeological Mitigation Project has focused the energy, interests, and professional expertise of a number of investigators on the physical and cultural history of the iron industry at Catoctin Furnace. This report primarily treats the geologic and environmental factors that bear on the origin, development, and finally, the cessation of iron production at this Maryland locality. The report addresses a number of issues and questions. It provides answers to some questions and others remain unanswered. More importantly, perhaps, the report adds substantially to the data base on the Catoctin Furnace complex and it challenges some of the conclusions formulated earlier.

At the Auburn Dam and Pond (Check 3), new data provided by a series of continuous-sample borings clearly define the original base of the pond. Sediment that has accumulated in the pond characteristically contains fragments of charcoal and glassy slag. These particles suggest that the enclosing sediment originated off-site, and some time following the establishment and operation of blast furnaces at Catoctin.

The rock exposed at the Limestone Quarry (Check 9) is a calcium-magnesium carbonate - a dolomite. This aspect of the rock, itself, does not preclude its use as a flux in blast furnaces. However, the percentage and nature of the insoluble residue reported in this rock, and the limited size of the quarry(?) establish that this site did not produce significant flux for the Catoctin furnaces.
The character of the landscape surrounding the Race Pond (Check 11), as depicted by the project's topographic base map, is probably sufficient justification to suggest that the site was originally an ore pit. When subsurface data indicate that the base of the pond lies much below its principal outlet, the proposition that the race pond site originally served some other purpose is reinforced. If it did, then some important questions must be raised relative to the age of the raceway complex, its role in providing water power to the furnaces, and the source of water power to the furnace complex prior to the conversion of this site to a race pond.

As a result of this project, much new data are available to identify and describe the nature and significance of several depressions located astride U. S. 15 north of Catoctin Hollow Road. Without doubt, available evidence substantiates the existence of ore banks at the sites of Feature 1, 2, and 4 of Check 12. Although the identity of Feature 4 is of some considerable historic record, the ore banks at Feature 1 and 2 were only more recently recognized (Orr and Orr, 1977). Additional evidence from this study supports the proposition that these ore banks were shallow mines developed above the general water table level, and that they supplied the Catoctin furnace(s) at an early stage in the iron-making history of this furnace complex.

In addition, this investigation has established that iron-rich strata still remain in many sections of Check 12. Although the
implementation of the Alignment 1 construction corridor may impact on some of these sites, others of equal quality and accessibility will remain essentially unaffected and secure for future examination.

The character of the strata which appear to define and fill the raceway channel(s) at Check 17 suggests that iron furnaces "in blast" preceded the construction and use of this section of the raceway complex. Taken in conjunction with nature of the sediment first deposited in the Auburn Pond, it seems that this segment of the raceway complex was established some time following the on-set of furnace operations at Catoctin.

A Colonial iron industry was established at Catoctin Furnace in the late eighteenth century because this site possessed the four necessary attributes; iron ore, timber for charcoal, limestone for flux, and water power. It developed and expanded with time, only to decline and expire in the late nineteenth and early twentieth centuries when advances in technology and improvements in transportation joined with the discovery of new mineral resources and the new "industrial" economics.

Even with completion of the planned dualization of U. S. Route 15 along the Alignment 1 corridor, this site will still retain in accessible locations the essential components that sponsored the establishment and development of the early iron industry at Catoctin Furnace. Proper management and development of this site can offer Marylanders and others a unique historic and educational experience.
REFERENCES


Fauth, J. L. (1977a) Geologic map of the Catoctin Furnace and Blue Ridge Summit quadrangles; Maryland Geological Survey.


Greene, W. B. (1977a) Memorandum to E. T. Camponeschi of September 8 re. description and interpretation of data obtained from boring survey and probings in the vicinity of the Catoctin Furnace site.

REFERENCES


Greene, W. B. (1977a) Memorandum to E. T. Camponeschi of September 8 re. description and interpretation of data obtained from boring survey and probings in the vicinity of the Catoctin Furnace site.

REFERENCES (Cont'd)


A PRELIMINARY PALYNLOGICAL ANALYSIS
OF BORINGS AT CATOCTIN FURNACE, MARYLAND

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390 Clark Street Extension
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Date: August 12, 1980
CONCLUSIONS AND RECOMMENDATIONS

Muck lithologies suitable for recovery of palynomorphs were lacking in the cores from the Auburn Dam site. Of the 19 samples processed from the Race Pond cores, the majority contained very sparse floras. The processing of larger size samples might provide more information. Each channel cut covered a two inch interval of core. These could be divided into two or three separate samples. However, even with these proposed modifications, there would still be too few points to establish a meaningful chronological profile.

An additional problem which has recently come to my attention is the probable presence of fill below most of the pollen samples. Analyses of any material not definitely in situ must be suspect. Further study would have to be keyed to the petrographic descriptions being reported by Dr. Fauth.

Given the available data, there is no evidence that selective cutting of timber was employed. Kaylor (1946) states that this was usually the case in Frederick County. As the more valuable species were removed, the percentage of inferior species would progressively increase. On the other hand, Kaylor (1946) also suggests that the timber in the vicinity of Catoctin Furnace was clear-cut approximately every twenty-five to thirty-five years. The presence of oak and chestnut in most samples seems to confirm this. Clear-cutting would result in sprout forests rather than a clearly developed plant succession. Chestnut and oak are the common trees with greatest sprouting capacity. Presence of chestnut would predate the arrival of the chestnut blight in approximately 1912.
INTRODUCTION

Initiation - This investigation was undertaken at the request of Dr. Kenneth Orr, Archaeological Consultant. Results are ancillary to the Catoctin Furnace Archaeological Mitigation Project.

Purpose of Study - The primary objective of this study was to attempt establishment of chronological profiles for Auburn Dam and Race Pond based on dominant trees. It was hoped that this would clarify lumbering practices for charcoal fuel during the period of iron production from 1760 to 1903.

Scope and Conditions of Study - Core samples from 6 borings at Auburn Dam and 9 borings at the Race Pond were made available for study. Muck lithologies suitable for palynological recovery were present only at the Race Pond. Forty hours of laboratory investigation were contracted.

PROCEDURES

Core samples were examined completely and two-inch channel cuts were obtained from suitable lithologies. Initial physical disaggregation was accomplished by ultrasonic cleaning in acetone, followed by boiling in 10% NaOH to flocculate shale particles.

Following centrifuging and decanting in distilled water, acid maceration was undertaken following the method of Wilson (1949). Samples were digested in 60% HF for 12 hours, centrifuged and stained with safranin yellow.
Strew slides of each sample were examined randomly in each of four runs. Resulting identifications were then compared and combined. In this way, operator error or identification biases were minimized. All samples have been retained for possible future investigation.

RESULTS

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<td>6-8</td>
<td>sparse, <em>Carya</em></td>
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<tr>
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<td>10</td>
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<td>4</td>
<td>6-8</td>
<td>barren</td>
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<td>18-20</td>
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<td>13 (Shelby tube)</td>
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<td>abundant flora, <em>Pinus</em>, <em>Quercus</em>, <em>Carya</em>, <em>Sphagnum</em>, <em>Lycopodium</em>, <em>Castanea</em>, <em>Fagus</em>, <em>Rumex</em>, <em>Alnus</em></td>
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<td>6-8</td>
<td>abundant, Pinus</td>
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</tbody>
</table>

Palynomorph Identifications:

**Acer, Maple (?? Striped Maple)**

Size: Polar and equatorial axes 22-25μ
Range: Quebec to Manitoba south to Michigan, Tennessee, Georgia
Shape approximately spherical (P/E Index about 1.0), Columellae arranged in striations, often clustered in patches of various orientations; intectate. Furrows long (Extend to about 3μ from poles).

**Alnus, Alder**

Size: equatorial diameter about 30μ
Range: Northeastern United States and adjacent Canada
Five pored pollen, shape angular. P/E Index about 0.7. Pores aspidate, ektexine separates from endexine at pore to form pore cavity.

**Carya, Hickory**

Size: 40-45μ, equatorial diameter.
Range: Coastal Plains, Florida to Texas, north to Virginia
Pollen slightly heteropolar
Castanea, Chestnut

Size: Polar axis about 18\(\mu\), equatorial about 13\(\mu\).
Range: Georgia to Mississippi, north to southern Maine.
Shape prolate (P/E Index 1.35 to 1.4). Trilobate in polar view. Furrows narrow and slender, transverse furrows are elliptical with pointed ends.

Fagus, Beech

Size: Polar axis about 46\(\mu\), equatorial diameter 49\(\mu\).
Range: Prince Edward Island to eastern Wisconsin southward in Great Lakes region to Virginia.
Shape oblate spherical (P/E Index 0.9). Furrow of intermediate length and very slender, pore round, considerably exceeding the furrow. Exine indistinctly tectate; fine granular appearance apparently due to columellae.

Pinus, Pine

Size: Body width 35 to 40\(\mu\), length 40 to 48\(\mu\), overall 80\(\mu\).
Range: Northeastern U.S. and southern Canada
Size frequency statistics may be of some value in identification of pine pollen if large populations of grains are available and measurements can be made of several dimensions. However, the variation in both bladder morphology and size, and overlapping characteristics, make separation of species difficult.

Quercus (?Q. bicolor). White Swamp Oak?

Size: Polar axis about 40\(\mu\). Equatorial diameter 35\(\mu\).
Range: Southern Maine to southern Minnesota south to Nebraska and upland Georgia.
Shape subprolate (P/E Index 1.15) Surface with fine granular structure with larger scattered verrucae, typical of oaks. Furrows constricted at the equator.
**Sphagnum sp., Peat Moss**

Size: about 30μ.
Range: North Temperate and Boreal areas.
Smooth subtriangular spore wall, sometimes with a distinct exosporium and endosporium. Arms of the trilete scar may only extend one-third the distance proximal pole to the equator.

---

**Lycopodium, Club Moss**

Size: 40-50μ
Range: Widespread in U.S., Canada, Eurasia.
Reticulum irregular, sometimes nearly rugulate; proximal face smooth.

---

**Rumex, Sheep Sorrel**

Size: Polar axis about 19μ; equatorial about 24μ.
Range: widespread, almost cosmopolitan.
Shape suboblate (P/E Index about 0.8). Apertures three or four, furrows slender, pore round and much exceeding the furrow margins. Exine coarsely reticulate.

---

**Solidago, Goldenrod**

Size: Polar axis about 34μ, equatorial about 30μ.
Range: North Carolina to Louisiana and Oklahoma north to Michigan and Massachusetts.
Shape spherical to prolate spherical (P/E Index about 1.1). Furrows of intermediate length, ends rounded, transverse furrows pointed, exine about 4.5μ thick, including 2.5 to 3.5μ long spines.

---

**Aster, Aster**

Size: greater than 35μ.
Range: Cosmopolitan
Protuberances greater than 1.5μ in height, echinae, no columellae visible underneath tectum.
INTREPTATION OF DATA

Pollen samples indicate the presence of a typical mixed mesophytic forest, with a beech-maple association in areas of better soils and an oak-hickory association characterizing drier and more exposed sites (Gleason and Cronquist, 1964). The latter association would have replace an oak-chestnut precursor about 1912.

The presence of pine in most samples is probably deceptive, as this may not have been a dominant species in the immediate vicinity of Catoctin Furnace. Pine does occur in the Catoctin Mountains west of Thurmont where it is mixed with hardwoods (Kaylor, 1946). However, it should be noted that pine is a very prolific pollen producer. The pollen grains are highly motile and attain a wide distribution. The presence of this species could be sustained by periodic forest fires.

A bog association of Sphagnum, club moss and alder is present in sediments recovered by Shelby tubes from the center of Race Pond.

In samples 13-1 and 16-3, the occurrence of goldenrod, aster and sheep sorrel suggest the presence of open areas, perhaps subsequent to periods of clear-cutting. Species indicative exclusively of open field environments (such as yarrow), were not identified. Definite pioneer species like raspberry, black cherry or aspen were also absent from the samples processed.

ACKNOWLEDGMENTS

Extensive discussions with Dr. John Fauth, Geology Department, SUNY Cortland, on geological aspects of the Catoctin Furnace Area have been invaluable
in the preparation of this report. Drs. Larry Klotz and Eugene Waldbauer, of
the Biology Department, SUNY Cortland have clarified floristic problems.
Laboratory assistance was provided by Mr. Stuart Holtzclaw.


Kaylor, J.F., 1946. *Forests of Carroll County and Frederick Counties*, IN: The Physical Features of Carroll County and Frederick County, State of Maryland, Board of Natural Resources, pp. 219-230.


APPENDIX C

CHECK 6 (18FR323)

LABORATORY ANALYSIS OF 1979 EXCAVATION

SKELETAL MATERIAL

J. Lawrence Angel, Ph.D.
Curator of Physical Anthropology
Department of Anthropology
National Museum of Natural History
Smithsonian Institution
Dr. Kenneth Orr  
115 West Main Street  
Thurmont, Maryland 21788  

Ref: Site 18 FR 323 at Catoctin Furnace, Md.

Dear Dr. Orr:

In reply to your telephone call of this morning I send the following outline of the 25 skeletons excavated by your team under Dr. Ron Thomas, and Sharon Burnstom this past season. One feature, #25, produced no bone.

There are 3 new born infants, 8 children, 7 female and 6 male adults, a 2 : 6 : 10 ratio of infants: children: adults quite expectable at this late 18th - early 19th century date. Age at death is 33.1 for females and 36.7 for males, also expectable.

In every case where we have a skull adequately preserved (N = 14) race is Black apparently.

Stature seems about average and there is a big range in degree of muscularity.

There is an apparent lower leg fracture with fusion (#26), a severe and probably crippling fusion of lower lumbars to sacrum (#4), frequent arthritic breakdown of neck vertebrae, signs of rickets, poor teeth, and an apparent large trephination through left parietal (#26). Premature fusion of sutures is common.

The skeletons need some repair still, but our volunteers (largely Karen Kahn taking a GWU museum course) have finished the basic cleaning, stabilizing and preservation of the skeletons, using Butvar solution. We will start to study them soon. There are interesting questions of nutrition, disease, and family relations in the cemetery.

I hope that this brief report is helpful.

I look forward to seeing you, hopefully at a lunch, when you come to Washington.

Very sincerely,

J. Lawrence Angel
Curator of Physical Anthropology
Department of Anthropology
Table 1. Check 6 (18FR323) Laboratory Analysis of Skeletal Material, 1979

<table>
<thead>
<tr>
<th>Grave</th>
<th>Sex</th>
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Notes:
- Excavation dates: 1/2/79 - 2/2/80
- Pathology: various bone and joint conditions
- Notes: various observations on skeletal material
The Catoctin Furnace archaeological mitigation project
Maryland

Report on
Industrial Archaeological Oversight

by
Edward F. Heite
SOPA
Consultant

Prepared for the use of Kenneth Orr, Ph.D, Principal Investigator

May 1980
The author's role in the project

The author first became involved with Catoctin Furnace about ten years ago, when the State of Maryland first began planning its Bicentennial. Several scholars interested in the iron industry met at Annapolis to discuss the Revolutionary period furnaces in the state, and the preservation potentials of each. At that time, the author was studying the later Nassawango Furnace on the Eastern Shore.

A few years later, as the mitigation project began, Dr. Kenneth Orr asked the author to assist in the preliminary investigations.

In August of 1979, as fieldwork began on a more intensive phase of the investigation, the author and his wife Heite paid several visits to the site and produced several interim reports for the use of the principal investigator.

The present document is a summary of investigations conducted since August of 1979, including the following research trips:

August 12, 1979:
Visit to the site to review excavation strategy.

August 25-27, 1979:
Meeting at the site, field investigations, interviews with informants, and review of artifacts.

September 15-16, 1979:
Field investigation and on-site consultation.

November 9-11, 1979:
Field investigation, review of land records, and on-site consultation.

January 12, 1980:
Library research at Eleutherian Mills Historical Library.

February 1-2, 1980:
Review of findings with Principal Investigator.
Outline history of Catoctin

In spite of considerable effort expended in that direction, there exists no history of Catoctin Furnace. Indeed, this author recommends that no further development take place until there is an effort to compile a comprehensive historical summary.

The Principal Investigator has asked for a skeletal outline of Catoctin's history. Based on the information available from printed sources, we have attempted to provide such a framework. Because of the time constraints, it was not possible to double check the sources cited here.

1754: Goodwill tract was patented to Charles Carroll (Little 1971).

1770: Mountain Tract patented to Benedict Calvert and Thomas Johnson for the purpose of erecting and building an ironworks (Milner 1975).

1774: The first Catoctin Furnace was constructed (Swank 1892).

1776: Nicholas Carroll conveyed Goodwill tract to Thomas and James Johnson. Johnson paid Nicholas Carroll, legatee of Charles Carroll, 100 tons of iron for Stony Park and Goodwill. The deed stated that James Johnson and Company had erected the furnace (Little 1971).

1780: Catoctin shipped artillery shells (Milner 1975).

1787: Catoctin Furnace was rebuilt, three miles up the creek, nearer to the ore bank (Swank 1892). Another source says that the new furnace was three-fourths of a mile up the creek (Alexander 1840).

c. 1792: Roger Johnson built Bloomsbury Forge, on Big Bennett's Creek about five miles above its junction with the Monocacy, where he had a finery and a chafery, producing four or five tons weekly, using "stamp-stuff" from the cinder heaps at Catoctin (Alexander 1840, p. 81). The site is near the present village of Lily Pons.

1794: Roger Johnson was residing at Bloomsbury Forge. (Maryland Gazette, January 2, 1794).

1803: Baker Johnson bought out his brother (Little 1971).

1804: The warrant for resurvey of the Mill Place tract mentions an iron roller "formerly planted as a boundary for the beginning of that tract of land" patented in 1742 (Patents 1C #Q, p. 499). The iron roller in question still is visible a few miles below the present furnace.
1808: Map shows gristmill and furnace at the site (Milner 1975)

1811: Baker Johnson died and the property was advertised for sale; a division of the estate was prescribed in the will (Milner 1975). This division of the property clearly separated the ironmaking portion from the Auburn lands. A plot of the dividing line, on a modern base map, would locate several important sites and define the limits of the ironworks as they existed in 1811.

1812: Catoctin Furnace was sold to Willoughby and Thomas Mayberry of Philadelphia (Little 1971)

1820: John Brien bought the furnace (Little 1971).

1827: Moravian missionaries from Graceham were invited to preach to the Negroes at the furnace, who supposedly had no other source of religious instruction (Milner 1975). This passage has considerable importance in relation to the cemetery excavations.

1831: Catoctin Furnace was again rebuilt (Swank 1892). The capacity was 1,700 tons a year (Lesley 1859). We cannot determine, from the secondary sources, exactly what constituted a rebuilding. Later directories continued to refer to the earlier stack as having been built in 1775.

1835: Hearth stoves were purchased (Letter, Brien to McPherson, February 2, 1835).


1848: The warehouse plot and other land was purchased by the Auburn owners. The eastern boundary of this tract was drawn to exclude the stream, the pond, and the forge site from Auburn. The warehouse was on the left of the driveway near the gate. There is reference to a gate near the "forge where castings were made". (MacPherson 1957) If this transaction can be plotted on our modern base map, many factors in the 1979 excavations will be clarified.

1853: The bellows house was improved. Here again, we need to examine the original source. How many bellows houses existed?

1856: According to later accounts, a furnace was built at this time (see 1874, below). In the same year, Fitzhugh took Jacob Kunkel as a partner (Little 1971).
1858: Isaac Bond's map shows an old forge. Kunkei became sole owner (Little 1971). The Milner and Little reports do not agree on the first name of Mr. Kunkei; such rudimentary historical facts should not be left in doubt at such a late date in the project.

1859: Lesley listed two charcoal furnaces, one hot blast and one cold blast (Milner 1975).

1860: The census of manufactures listed a steam driven foundry, a smith shop, a wheelwright, a saw mill, a steam flour mill, and a post and rail plant. Steam is mentioned in connection with the furnace (Milner 1975).

1873: Deborah Furnace, a steam and water powered hot blast anthracite furnace, was built by Kunkei, according to Little (1971). Curiously enough, the anthracite furnace does not appear in the later directory entries cited below. There is a picture of an anthracite furnace, but its date of construction remains unclear.

1874: Catoctin was listed in a directory as having two charcoal stacks, one 32' by 8½', and the other 32' by 9', built in 1775 and 1856, employing warm blast and both steam and water power (American Iron and Steel Association 1874, p. 26). This entry fails to mention the 1831 rebuilding, and mentions the 1856 furnace as if it were the newest structure.

1876: J. B. Kunkel was taxed for three furnaces (Little 1971).

1884: Catoctin was listed in a directory as having two charcoal stacks, one 32' by 8½', and the other 32' by 9', built in 1775 and 1856, employing warm blast and both steam and water power (American Iron and Steel Association 1884, p. 35). The Deborah Furnace still has not appeared in the directory.

1885: Kunkei's heirs reorganized the furnace company (Little 1971).

1886: Monocacy Valley Railroad built (Little 1971).


1887-1892: Catoctin Mountain Iron Company operated furnace (Little 1971).

1890: One of the older stacks was dismantled (Little 1971).

1892-1899: Furnaces idle (Little 1971)

1899: Blue Mountain Iron Company bought the property (Little 1971).
1900: Anthracite stack enlarged (Little 1971).
1903: End of furnace operations (Little 1971).
1906: Joseph Thropp bought the furnace and began dismantling it (Little 1971).
1912: Ore mining operations ceased (Little 1971).

Note on the Chronology

A cursory scanning of this chronology will reveal a number of discrepancies; they have been included, without comment, to point up the need for further documentary research. Since this list is derived primarily from secondary sources, errors in interpretation have necessarily crept in. The extremely important reference to hearth "stoves" was transcribed in one place as "stones". If the word is indeed "stoves," Catoctin could have been a very early example of warm blast ironmaking.

It is evident that each new operator brought new technology and new ideas about business arrangements to the furnace; whenever the property changed hands, there was a spurt of construction activity. It is therefore logical to tie the archaeological interpretation to phases congruent with changes in ownership. Little's chronological chart is therefore the framework upon which to build future interpretation.
Catoctin in perspective

If we are to consider Catoctin in the light of ironmaking history and in the context of Frederick County, it is necessary to make a few projections and conjectures. Some of these suggestions may seem irrelevant, but they are presented as avenues for future research and ideas for departure from the present line of work.

During the pre-revolutionary era, iron ore at Catoctin may have been worked in bloomery forges, which could refine small quantities of wrought iron from surface-mined ores. Remains of such bloomeries should be found along streams near farmsteads, possibly on sites later occupied by gristmills and sawmills. Because of their scale, bloomeries would not involve large raceways or elaborate ranges of service structures.

J. H. Alexander, in his 1840 report on Maryland iron, reported that Roger Johnson had run a forge with a finery and chafery, refining "stamp-stuff" from the cinder heaps at Catoctin. This was Bloomsbury, on the other side of Frederick. James Johnson, Alexander’s informant, said that the Bloomsbury forge operated only a year or two but produced four or five tons of iron a week. Roger Johnson was at Bloomsbury in 1794, when he placed an advertisement in the newspaper, attempting to sell some of his interests.

Recovery of iron from furnace waste was not a new idea; Peter Hasenclever had tried the same thing in New Jersey.

Catoctin interests operated a rolling and slitting mill at Reel’s Mill and a forge on Bush Creek before the end of the eighteenth century. Where was Reel’s? Was it the Mill Tract where a roller was sunk in the ground before 1804? The Mill Tract should be plotted and carefully surveyed.

Rolling and slitting mills were important during the eighteenth century, since all our processed sheet materials had been coming from England under the terms of the Navigation Acts. Clandestine mills operated before the Revolution, but during and after the war they were sorely needed. Elk Forge, near the modern Elkton, used rolls made at Hagley on the Brandywine nearby. It is therefore possible that the rolling and slitting operation was a few miles down the creek.

Vertical integration was typical of the larger American iron companies; Alexander Spotswood operated an "air furnace" or cupola at Massaponax in Virginia to recast pigs from his Tubal Works, about 1730. The large Principio Company operated furnaces and foundries in several colonies.
Every iron furnace was part of a network of itinerant ironmakers, who quickly spread new ideas throughout the iron-making community. Several of the men who ran Catoctin were interested in other furnaces, or had been born to the trade. The reference to stoves, less than five years after warm blast was introduced, is therefore not surprising.

Since primary ironmaking at a blast furnace is a seasonal occupation, it is not surprising to see other seasonal industries using the same head of water. Gristmills, for example, will need the water at a different time of year. However, at Catoctin, the gristmill used steam, possibly as an auxiliary power source. By 1848, the hydraulic system had begun to shrink.

Excavations at the "old forge" site to date have been inconclusive, primarily because only a small portion of the site was excavated. There are clearly three phases present. Near the "niche" in the dam is a large body of glassy slag fill, apparently covering a deep pit; tradition places a large ruined building on this location late in the nineteenth century.

Nearby is a complex of superimposed roadways, sealing another site that was not filled with glassy slag; slag is almost completely missing from the roadways and the site beneath them.

The site under the roadways is apparently a water-powered forge, built in several phases, and abandoned before the middle of the nineteenth century. On the west side of this structure, many vents from castings were found. On the floor of the structure, a thin film of iron oxides indicates hammering or remelting activity.

If the site is ever excavated, it probably will reveal a small foundry, chafery, and finery built when the property was part of the furnace lands. This structure was demolished and covered by the road leading to Auburn. Then, at a later date, a large cupola was built nearby, and the dam was raised to provide a better source of power for its bellows. Such a scenario can be confirmed only by complete excavation of both sites.
The introduction of anthracite before the coming of the railroad is another interesting phenomenon. Anthracite is heavy, and must have been shipped by wagon from the railhead. The economics of an isolated anthracite furnace would be an intriguing story. Perhaps this situation explains in part why the company collapsed the year before the railroad reached the site.

Did the owners of Catoctin Furnace try to get a railroad to their property before the Monocacy Valley line was built? In other areas, ironmakers were among the biggest backers of railroad projects. Surely there were many railroad proposals during the half-century after the rails reached Frederick. This subject deserves considerable thought and research.

Catoctin's end products remain a mystery. While iron castings often bear makers' marks, many cast iron items and all wrought iron pieces are unmarked. The presence of a secondary refining process indicates that more than pig iron came from Catoctin. Milner's 1975 report contained illustrations of fancy goods, which generally were signed; such illustrations, presented uncritically, tend to give the wrong impression about what an ironworks produced.

The number of furnaces at Catoctin is a continuing mystery. If all three blast furnaces were operating at one time, the need for steam power can be readily explained. Even two furnaces would tax the resources of a water power system. However, it is possible that the assessment record refers to one or two blast furnaces and one or two cupolas, for a total of three. At this point in our research, we are unable to determine when each furnace was operating, and where the original furnace stood. In the chronology given above, construction or reconstruction dates of 1774, 1775, 1787, 1831, 1856, and 1873 appear. The furnaces are variously reported to have been dismantled in 1787, 1890, and 1906. Someone must review the evidence critically. We cannot continue to use six construction dates, three destruction dates, and one surviving furnace stack. It simply does not compute.

Pig iron is a useless product. It must be converted into something else before it can be sold to the end user. The isolation of Catoctin suggests that the refining processes were conducted nearby, perchance at Frederick, at Bloomsbury, or at installations along the Monocacy and its tributaries. A study of the industrial history of the region would shed some light on the relationship of Catoctin with the rest of the iron industry in Frederick County.
Interpretative Proposal

Only a small part of the industrial history of Catoctin remains above ground. The bare stack, a few earthen berms, the remnant of the village, a magnificent ruined mansion, and a few relics are all that exist in visible condition. Documentary remains are similarly scanty. For many important historical points, the evidence is utterly lacking.

The best summary to date, the Little study of 1971, has been eclipsed by new findings, but it remains the only reliable source on the history of the furnace. There is a definite need for a new study, to include:

A complete search of the available documentary sources on land use and ownership, in the form of an historical atlas.

A reconnaissance of all the related sites in the neighborhood, regardless of their present ownership. Such a study is essential to the interpretation of the sites in public hands.

A technological interpretation of the history of Catoctin in the light of surviving relics and structures.

A solid, scholarly, summary history of the area.

Catoctin could be used to interpret the history of the iron industry in America. It was once considered for that mission, when the decision was made to develop Hopewell Village instead.

Like Hopewell, Catoctin illustrates a series of technological events in the history of American ironmaking. It had a role in the Revolution, and possibly in every war from then until the end of the nineteenth century.

Unlike Hopewell, Catoctin has lost certain important illustrative features, such as the ironmaster's house, the records, the anthracite furnace, and various support buildings.

In the overall inventory of ironmaking sites, there are better properties in the region. Cornwall in Pennsylvania has extensive surviving ancillary buildings. Principio retains some of the flavor of an ironworks, with much greater antiquity. Nassawango still has its pioneer warm blast heater. These other sites must be considered while planning for Catoctin's interpretative role.
Recommendations

Catoctin Furnace, as a tourist attraction and teaching facility, cannot be developed through a series of non-resident contract studies. This piecemeal approach has to date produced a vast amount of information and artifacts, filed away in many different places.

Mitigation and development of parts of the site have been treated as objectives, rather than as parts of a whole program. The time has come to synthesize the knowledge to date, and to establish long-range development goals.

While mitigation is an admirable objective, it contributes little to the sum of knowledge until the mitigation studies are incorporated into a broader effort. Such an effort must be planned, with precisely-defined objectives and purposes. Without such long-range statements of purpose, it is difficult at this point to recommend further expenditure on research and development.

The fragmented contract approach has clearly reached the limits of its utility at Catoctin. What we need now, is synthesis.
APPENDIX E

THE FEASIBILITY OF THE MONITORIZATION OF BURIED SITES
BY INSTRUMENTATION AT THE CATOCTIN FURNACE HISTORIC DISTRICT

Kenneth G. Orr, Ph.D.
Consultant
THE FEASIBILITY OF THE MONITORIZATION OF BURIED SITES
BY INSTRUMENTATION AT THE CATOCTIN FURNACE HISTORIC DISTRICT

Background:

Two types of potential impact on archaeological resources by impending road construction were identified by the intensive survey (Orr and Orr, 1977, Table 1, p. 89): (1) incising, and (2) overlay. The road construction requirements in incising impacts necessitated the removal of some or all of the archaeological materials. In the overlay impacts, however, the road bed required fills ranging from a few feet to a dozen feet or more to raise the ground level and hence to bury more deeply the archaeological resources. Of the forty-two features identified in 19 check locations in that survey only two were seen to be threatened by impending incising impacts involving only 20% and 10% respectively of the features to be affected. The report concludes: "The remainder (of the sites) will be sealed-off by a layer of construction fill. Some of these (overlay) impacted sites may be available to continuous archaeological work, such as those in easement areas with slight or no overburden. Others may be available for archaeological research after a number of years (when the road ceases to be). All sites will continue to be archaeological resources subject to protection and utilization as the occasion allows." (Ibid, p.93). Check 3, iron-working site (18FR320) is a good illustration of a site consisting of a thin stratum of house foundations protected by several layers of fill from previous road constructions.

These challenging statements were met with some skepticism and a great deal of interest in what actually happened to buried sites. In the Memorandum of Agreement between the Advisory Council on Historic Preservation and the Maryland State Highway Administration (May 24, 1978) it was specified that the SHA would provide a "Design of a monitoring program to assess the effect of site excavation and burial on sites within the District" (Advisory Council of Historic Preservation, 1978, p.2). The Consultant was required, in conjunction with the Advisory Panel, to consider the feasibility of a monitoring program and to recommend specific areas to serve as test sites to assess the nature of the road construction overlay impact on archaeological resources (Technical Proposal paper, p. 3 in Supplemental Agreement between Orr and Son and SHA dated May 13, 1979).

A series of meetings with Advisory Council, SHA and Advisory Panel during 1979-80 raised the following questions about monitorization: What is the good of it? How is monitorization achieved? How and who will benefit? What is the end product? Is direct monitorization at all times necessary? Who will do it? How much will it cost? Is there a model? Some of the answers to these questions were forthcoming as a result of considering the Catoctin Furnace
sites, in talking with interested specialists and in consulting some of the literature.

The Practicality of Monitorization

If it could be demonstrated that road construction over an archaeological site actually protected it rather than destroying it, much of the costly "mitigation and salvage" operations now being undertaken would not be needed. Instead of extensive and expensive excavations only surveys would be necessary to identify the nature and extent of the site being temporarily put in "storage" under the road. This situation would result in contributions to the science of archaeology in two ways: (1) such sites would be marked as resources for future investigations to be undertaken as the need for the data they contained became imperative scientifically, and (2) the currently overtaxed laboratory facilities used to stored an increasingly burdensome mass of excavated materials would be relieved. This would result in a saving of money for more precisely considered research and the saving of priceless in situ data for future archaeological investigations with improved techniques of analysis and sense of problem. The result would be a management of archaeological resources rather than the present haphazard and often confused collection of duplicate data and information. The archaeological data banks could be tapped when needed with the bulk of the "pages of the past remaining in its pristine in situ state. Thus the American heritage of archaeological resources would be conserved and wisely used, the highway administration would correctly be seen as a benefactor of the science, and archaeology could increasingly pursue its fieldwork from a sense of problem rather than as an emergency salvage operation.

The end product of monitorization therefore is a knowledge of the exact effect produced by overlay impacts on a site. Is the overlay protective or destructive? Whereas this question is clear in the case of an incising impact in which the archaeological resources are to be destroyed - we don't know the effect of the overlay impact. Does the fill and concrete overburden compress, and distort archaeological stratigraphy? Does vibration from the traffic pulverize artifacts? Does the chemistry of the site change for the worse? and similar questions.

Site Development

Archaeological sites may be considered as systems composed of two components: (1) the cultural component, and (2) the natural component. Each system has its inputs and processes. Cultural inputs include stone, iron, ceramics, glass, human, animal and plant remains, and cultural features. Cultural processes include depositio and alteration of sediment and cultural materials by man-made forces. Natural inputs include sediment, stone, plant and animal remains. Natural processes include deposition and disturbance of sediment, alteration of cultural materials, weathering (decay), burial,
transfer, etc. Outputs of these subsystems are composed of altered cultural and natural materials as well as the depletion of categories of cultural materials. The site development process is an overall trajectory of the total site system through time. The end result of the continual attrition of destructive process in site development is the eventual disappearance of most of the cultural material. Archaeologists are universally concerned and interested in understanding site development since each is obliged to attempt to reconstruct the original cultural subsystem of the site from its remains.

Pedology, the soils science, along with geology as a whole provides the functional factors in the natural component of our study. These factors are: climate, relief, organisms, parent material, and time (Jenny, 1941, 1946, 1961 in Wildesen, 1973). Wildesen believe that by adding the factor "culture" to Jenny's five soil forming factors, it is possible to explain the observed archaeological data qualitatively, but more accurately than has been possible heretofore (Wildesen, 1973, p. v). I am grateful to Dr. Wildesen for sending her Ph.D. dissertation which proved invaluable in providing an important part of our monitorization model. She kindly professed as interest in our monitorization plans inferring that the idea was an excellent one which everyone talked about but no one got around to doing.

Archaeological Site Development at Catoctin Furnace

The dualization of U.S. Route 15 through the construction of the Alignment 1 road bed is one more cultural input in a long line of such inputs which have modified the site throughout its nearly 150 years of occupation. Others have been the construction of the existing U.S. 15 route in 1960, land promotional changes (deer park and lakes) undertaken by Lanceolot Jacques in the 1920's, the fish pond industry which started in the 1920's and continues in the neighborhood to the present time, and a series of successive developments of the iron industry seen in the remains of water power systems (raceways), mines, ore washings and slag piles, furnaces, founderies and forges, and associated buildings of many functions. Each cultural input of materials and processes has had a greater or lesser effect on preceding stages in the Catoctin Site development. The archaeologists of the future (say 1000 years hence) may well find the dualization remains of equal importance to the iron industry features. They may also ponder, as we now do, in trying to figure out the effect this overburden had on the iron industry features and materials beneath it.

We know that fill in the form of local earth will be placed over the site features in a blanket ranging from a few to a dozen or more feet. We also know that new channels will be provided for covered over springs. The road will be used by high speed traffic for many years - a potential source of destructive vibrations. We want to know the nature of the processes which will affect for better
or for worse, 95% of the sites in the heart of the site complex.

A Site for Monitorization

Check 4, Feature 1 (18FR 321)
The Spring-Bathhouse Site

The Spring-Bathhouse Site was selected by the consultant with the assistance of the Advisory Panel because in addition to containing a majority of the types of features encountered in the site as a whole, it occupied a median position in regard to chronology and depth of fill anticipated in the dualization construction (see p. ). In addition to site has the problem of springwater drainage, a common problem at Catoctin Furnace site. Approximately 7 feet of overlay fill may be anticipated.

The changes to be anticipated in the buried site as a result of road construction include: water-control problems, chemical content, torque-strain, compression, and vibration. These changes could result in differentially skewing the archaeological features, compressing the stratigraphy, accelerating decay and oxidation of cultural material and shattering or shredding such material by vibrations conveyed from the road surface to the buried archaeological resources. On the other hand a euphoric situation might obtain for any or all of the conditions of features and cultural material which would be an improvement over the present situation in regard to the conservation of archaeological resources. Again, it is possible that the presence of the road above the site would have caused no significant change in any of the anticipated areas.

Specific equipment or adaptable items for identifying and recording changes due to the overlay impact on the site are believed to be now in use by highway soils and foundations engineers for similar purposes in monitoring strata and features under newly constructed road beds (communications with David Martin, Soils and Foundations engineer, Maryland SHA, Spring, 1980). Such instruments include: piezometers for measuring pore water, iseimic geophone for measuring torque-strain, PH probe for measuring acidity and other instruments for measuring vibration and chemical content. It is understood that such equipment may be read by remote control of electrical cables, can be wired to graph recorders. They are described as readily available, relatively cheap, and easy to install. It is visualized that a cement bunker erected near the buried site on the right of way or easement land controlled by SHA, could function as a vandal-proof data collecting center.

The site shall be prepared for burial and monitorization by fixing instrument terminals and cables in position, setting up concrete bunker, digging standard ditches for stabilizing flow of spring water, and covering the site with concrete-making sand to specifications of SHA soils and foundations engineers (e.g. fill foundation and cover site walls to prescribed height). Data required on "before change" should be gathered prior to fill-in.
The data gathering, assisted by SHA soils and foundations engineers in regard to reading instruments and research archaeologists in regard to interpreting the results archaeologically, should start before site fillin and construction and continue to a given period during final construction and use of the road. The analyst-in-charge will determine when significant change ceases or a trajectory of change has been established. It is believed that a 2 year period of data gathering by graphs on bi-weekly settings with monthly evaluation of data will be adequate. With the cooperation of the SHA Bureau of Soils and Foundations, the monitorization program, the first such program to be attempted in archaeology, can be completed for under $20,000.

Summary

A monitorization program based on cooperation between the SHA Bureau of Soils and Foundations and archaeologists at Catoctin Furnace site is feasible and may be successfully carried out for a modest amount of money and effort. The program challenges the current belief that any kind of impact on archaeological resources by road construction is necessarily deleterious and must be mitigated by salvage excavation as if the resources were to be destroyed or forever lost by the action of the road construction. There is strong evidence to indicate that a high proportion of impacts (95% at Catoctin Furnace site) actually are overlay impacts wherein the road fill has been known to protect rather than harm the deposits.

The monitorization program suggested for the Spring-Bathhouse site would, on the one hand, work with SHA soils and foundation engineers, using their implements for measuring the same factors that are involved in subsurface road monitorization. On the other hand, the program would work with site development archaeologists whose current contributions to the science are recognized as vital for archaeological interpretations.

The effort is a pioneer one and if successful, as we believe it will be, will show for the first time the precise effect of overlay impacts on archaeological resources. Since the road builders are, by law, liable only for the harmful effect of such impacts, they will save large sums of money now spent on removing resources which are erroneously believed to be threatened by road construction overlay impacts. Archaeology stands to gain immense reservoirs of resources which remain in situ for future research, instead of the present situation of overcrowded labs and warehouses filled with often unused collections of duplicate material.
REFERENCES

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