ARCHAEOLOGICAL INVESTIGATIONS
AND MONITORING
MOUNTAIN LAKES DAM REHABILITATION
AND DREDGING
PRINCETON TOWNSHIP, MERCER COUNTY
NEW JERSEY

Prepared for:
Princeton Township

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MANAGEMENT SUMMARY

The following technical report presents the results of archaeological investigations and monitoring performed in connection with the rehabilitation of structures associated with the Princeton Ice Company Historic District at the Mountain Lakes Preserve in Princeton Township, Mercer County, New Jersey. The restored upper dam, enlarged lower dam and spillway, restored stream channel and dredged lakes are the centerpiece of a well-used, wooded nature preserve that is owned by Princeton Township and managed in partnership with the Friends of Princeton Open Space. The project site lies in its entirety within the district’s State and National Register designated boundaries. On account of its location within a National Register and New Jersey designated historic property, the need for environmental permits, its use of public funding, and its ownership by a municipality in New Jersey, the project is required to be in compliance with the New Jersey Register of Historic Places Act (N.J.A.C. 7:4).

The archaeological investigations and monitoring described here entailed three principal work tasks: 1). documentation by survey, measured drawings, and large-format photography; 2). archaeological monitoring, involving the observation and recordation by an archaeologist of all ground-disturbing construction activities; and 3). analysis and reporting of the results of the monitoring and documentation. For a more detailed historical and archaeological analysis of the Mountain Lakes Preserve and its vicinity, readers are referred to the earlier report completed for the combined Phase I and II archaeological survey (Hunter Research, Inc. 1991). Large-format photography was conducted in August 2010 and January 2011 and measured drawings were created in July and August of 2011. Archaeological monitoring was conducted during the period of construction from July 2010 to October 2011. Analysis and reporting were carried out between April and June 2012.

Archaeological monitoring of the rehabilitation of the various structural elements at Mountain Lakes identified several significant features, provided in-field consultation regarding cultural resource-related design decisions and ensured that the rehabilitation effort was performed in keeping with the approved rehabilitation design. In particular, the disassembly that preceded the rehabilitation of the upper dam and the lower dam spillway made allowance for a detailed examination of the fabric of the structures, which contributed greatly to their interpretation and allowed for a comparison of changing building techniques. The most significant finding of the monitoring activities was the water box for the ice elevator. The survival of this feature in the lake bed silts, likely installed circa 1906, provided valuable information regarding the ice harvesting technology used at Mountain Lakes.
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An archival box is included containing full-sized plans, original negatives and prints of large-format photo-
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Overall direction for this project was provided by Richard Hunter and James Lee. The field survey was completed by Joshua Butchko and James Lee with help from Andrew Martin, Eric Woodruff and Katie Rettinger. Laboratory processing of artifacts was completed by Joshua Butchko. The report graphics were drafted by Katie Rettinger and Lindsay Lee. Final report layout, production and assembly were undertaken by Lindsay Lee under the supervision of James Lee. This report was authored by James Lee and Joshua Butchko, and edited by Richard Hunter.
Chapter 1

INTRODUCTION

A. PROJECT DESCRIPTION AND SCOPE OF WORK

The following technical report presents the results of archaeological investigations and monitoring performed in connection with the rehabilitation of structures associated with the Princeton Ice Company Historic District at the Mountain Lakes Preserve in Princeton Township, Mercer County, New Jersey (Figure 1.1). The restored upper dam, enlarged lower dam and spillway, restored stream channel and dredged lakes are the centerpiece of a well-used, wooded nature preserve that is owned by Princeton Township and managed in partnership with the Friends of Princeton Open Space.

The project site lies within the Princeton Ice Company Historic District, a property that was placed on the State and National Registers of Historic Places in 2007. The project site lies in its entirety within the district’s State and National Register designated boundaries. On account of its location within a National Register and New Jersey designated historic property, the need for environmental permits, and its use of public funding, the project is required to be in compliance with the New Jersey Register of Historic Places Act (N.J.A.C. 7:4).

All work described in this report was conducted by Hunter Research, Inc. under contract to Princeton Township. Hunter Research, in providing these services, has complied with all applicable federal, state and municipal laws, rules and regulations, including the current guidelines for archaeological survey issued by the New Jersey Historic Preservation Office. Senior Hunter Research personnel who were responsible for undertaking these investigations met the federal standards for qualified professional architectural historians and archaeologists as specified in 36 CFR 66.3(b)(2) and 36 CFR 61. Senior field personnel had also received 40-hour OSHA hazmat certification. All documentation and artifacts generated by this survey will be stored at the Hunter Research offices in Trenton, New Jersey until acceptance of the final report by the client and appropriate review agencies. At this point, these materials and data will be dispatched to Princeton Township, Princeton, New Jersey for permanent curation.

The archaeological investigations and monitoring described here entailed three principal work tasks: 1). documentation by survey, measured drawings, and large-format photography; 2). archaeological monitoring, involving the observation and recordation by an archaeologist of all ground-disturbing construction activities; and 3). analysis and reporting of the results of the monitoring and documentation. For a more detailed historical and archaeological analysis of the Mountain Lakes Preserve and its vicinity, readers are referred to the earlier report completed for the combined Phase I and II archaeological survey (Hunter Research, Inc. 1991). Large-format photography was conducted in August 2010 and January 2011 and measured drawings were created in July and August of 2011. Archaeological monitoring was conducted during the period of construction from July 2010 to October 2011. Analysis and reporting were carried out between April and June 2012.
Figure 1.1. Detailed Location of the Project Area (outlined). Source: 7.5’ Princeton, N.J. USGS Quadrangle (1954 [photorevised 1981]). Scale: 1 inch = 1000 feet.
B. PREVIOUS WORK AND PRINCIPAL SOURCES OF INFORMATION

A combined Phase I and II archaeological survey of Mountain Lakes Preserve was completed in 1991 by Hunter Research, Inc. after the property was acquired by Princeton Township (Hunter Research, Inc. 1991). This report has formed the basis for the current investigations. In 2006 a National Register of Historic Places nomination was prepared for the Princeton Ice Company property, a task that included additional historical research (Hunter Research, Inc. 2006). More general information regarding the ice industry in the late 19th and early 20th centuries was derived from a series of publications and period catalogs found at the Hagley Museum and Library. These include catalogs from the Branchville Ice Tool Works (1884-85), Gifford Brothers (1904), Gifford-Wood Company (1915, 1922, 1924), H.F. Dernell & Company (1877), the Knickerbocker Ice Company (1876) and the William T. Wood Company (1903-04). A few general surveys of the ice industry were also consulted, including Siegel’s “Ice from Nature to Consumer – Tools and Methods” (1971), Jones’s America's Icemen: An Illustrative History of the United States Natural Ice Industry, 1665-1925 (1984), and Lamere’s Ice Harvesting on the Hudson River (2010).
Chapter 2

DOCUMENTATION

A. LARGE-FORMAT PHOTOGRAPHY

Following established HABS/HAER Level I standards for documentation, 4-by-5-inch, large-format photographic negatives were produced of the upper dam and lower dam spillway using a large-format view camera with perspective correction. Photographic prints were produced utilizing archival processes and materials. The prints show context, detail, construction and oblique views as per the HABS/HAER standards for engineering and industrial structures. Each photograph is labeled with a unique number and is accompanied by an index with a corresponding number and descriptive caption and a photographic directions plan (Figures 2.1 and 2.2; Appendix A - HAER Photographs 1-21). This documentation is provided, along with the measured drawings, in Appendix A in HAER format. The printed photographs have been appropriately labeled and are included in sleeves in an archival box. The photographs have also been scanned at a high resolution and are included with this report on an attached CD.

B. MEASURED DRAWINGS

Measured drawings were produced to HAER Level II standards using a combination of field notes and plans, rectified digital photographic images taken with photographic scales and rectified large-format photographic images. Drawings were then drafted in Adobe Illustrator CS 5.5 as vector images at scale (Figures 2.3 and 2.4). These drawings reproduce portions of the upper dam and the lower dam spillway in plan and elevation. This documentation is provided, along with the photographs, in Appendix A in HAER format. The drawings are printed at full scale and included with the photographs and negatives in an archival box. Original Adobe Illustrator CS 5.5. files, PDFs and .tiffs are also included with this report on an attached CD.
Figure 2.1. Plan of the Upper Dam Showing the Directions of HAER Photographs.
Figure 2.2. Plan of the Lower Dam Spillway Showing the Directions of HAER Photographs.
Figure 2.3. Plan View and Partial North and South Elevations of the Upper Dam

Mountain Lakes Dam Rehabilitation and Dredging Project
Princeton Township, Mercer County, New Jersey

Upper Dam Spillway
Princeton Ice Company Historic District
Princeton Township, Mercer County, New Jersey

Sheet 1 of 2

Drafted by Katie Rettinger, Hunter Research Inc.
Figure 2.4. Plan View and Elevation of the Lower Dam Spillway

Frozen Soil
Roots and Frozen Soil
Large Boulders and Riprap Removed

Boulders
Gravel
Iron Rebar
Concrete
Tumble

Drafted by Katie Rettinger, Hunter Research Inc.

Mountain Lakes Dam Rehabilitation and Dredging Project
Princeton Township, Mercer County, New Jersey
Chapter 3

ARCHAEOLOGICAL FIELDWORK

A. CONSTRUCTION MONITORING

1. Upper Dam (Figures 3.1 and 3.2; Photographs 3.1 through 3.5)

The contractors’ efforts to rebuild the upper dam began in July 2010 (Photograph 3.1). Archaeologists monitored the initial machine removal of trees, brush and rocks along the eastern shore of both the upper and lower lake immediately north and south of the upper dam. This was done to create a staging area for dewatering, excavation and additional construction equipment for work along the dam. In order to safely and efficiently work on both the upper and lower dam areas, the contractors used several large pumps to dewater the upper and lower lakes. A narrow channel was excavated through the center of both the upper and lower lakebeds to keep water running continuously through the area without impeding construction efforts. Soils and debris that had accumulated against the upper dam were then carefully removed by machine under supervision of archaeologists both along the upstream and downstream face of the upper dam (Photographs 3.2-3.4).

In August 2010, after the initial clearing and site preparation work was completed, Hunter Research conducted the HAER documentation for the upper dam as detailed in Chapter 2. After the documentation had been completed, the bulk of the contractors’ work concentrated on removing concrete elements of the dam. Archaeological monitoring of this process allowed for extended observation of the dam’s internal foundation elements. The upstream half of the dam was recreated with new concrete while the downstream stone and masonry face was largely preserved and rehabilitated across the face of the dam (Photograph 3.5).

The upper dam is approximately 268 feet long and 6.5 feet wide at its crest. The dam has a 1.2-foot thick stone and mortar face on the downstream side, fronting a 3.8-foot wide concrete slab that forms the upstream surface. A spillway approximately 175 feet long is centrally located on the dam and is depressed about 1.2 feet below the crest of the dam at either end. This spillway begins 80.7 feet from the eastern end of the dam. The dam was reputedly constructed by James Margerum in 1902 to augment the original lower dam. It was probably built both as a silt trap and as a way to calm the waters of the lower lake, creating an optimal environment for ice production in the lower lake. A bypass channel runs from this dam for approximately 930 feet, parallel to the eastern shore of the lower lake to a point somewhere to the southeast of the lower dam. It would have taken excess water from the upper lake around the lower lake in order to keep the water of the ice pond (lower lake) still. No stone lining is currently visible within this channel. Construction crossed this channel in two locations. Both of these were covered in geotextile matting and filled with gravel to protect them from traffic. This material was removed at the end of the project and the areas were carefully cleaned. No other significant archaeological deposits or additional structural features were observed during the clearing, excavation and reconstruction of the upper dam.

A limited number of artifacts were identified during this phase of work, all of which were recovered from displaced spoil piles. Subsequently, these items were added to the general catalog of materials with no further specific provenience (Appendix B). At the conclusion of the upper dam rehabilitation effort waters were allowed to refill the upper lake, and all pumping equipment was removed. The initial staging area was
Photograph 3.1. View from the east bank of the lower lake looking west towards the downstream face of the upper dam and upper lake prior to construction activities (Photographer: James Lee, March 2009) [HRI Neg. #09008/D1:038].
Figure 3.1. Plan of the Mountain Lakes Project Area Showing the Location of Figures.
Figure 3.2. Plan of the Upper Dam Showing the Directions of Field Photographs.
Photograph 3.2. View looking southwest towards the upper dam after clearing, dewatering and excavation (Photographer: Joshua Butchko, July 2010) [HRI Neg. #09008/D8:001].
Photograph 3.3. View looking north along the downstream face of the upper dam during documentation by Hunter Research archeologists. Pictured are Eric Woodruff and Katie Rettinger (Photographer: Joshua Butchko, July 2010) [HRI Neg. #09008/D8.015].
Photograph 3.4. View looking northeast along the downstream face of the upper dam during reconstruction and renovation (Photographer: Joshua Butchko, November 2010) [HRI Neg. #09008/D12:72].
Photograph 3.5. View looking west along the downstream face of the upper dam towards the upper lake after completion of construction activities (Photographer: Joshua Butchko, May 2011) [HRI Neg. #09008/D22:12].
Figure 3.3. Plan of the Lower Dam Spillway Showing the Directions of Field Photographs.
then graded and reseeded and by the fall of 2010 focus shifted to construction activities at the south end of the lower lake.

2. Lower Dam (Figures 3.1 and 3.3)

a. Basin (Photographs 3.6-3.8)

Efforts to excavate and evaluate the integrity of partially exposed elements of the lower basin, centrally located along the downstream face of the earthen dam, began prior to all other construction activities in October 2009.

At that time, over the course of several days, archaeologists monitored extensive machine and hand removal of trees, brush, rocks and soil along the full extent of the lower basin from east to west along the earthen dam. This work was conducted in part to examine the surviving historic structural elements of the lower basin, in order to finalize the design of the toe wall and toe drain excavation done in June 2011.

The basin comprises a mortared stone wall approximately 50 feet long centrally located on the downstream side of the lower dam (Figure 3.4; Photographs 3.6-3.9). The basin is 15 feet wide and generally 2 feet deep with a mortared stone floor. The western wall of the basin runs roughly north-south, slightly askew to the headwall, while the eastern wall curves into the west to meet the outlet culvert. Two flow control pipes project out of the stone wall and into a stone and mortar-lined basin. One outlet pipe is located close to the bottom of the basin and has a plastic valve and pipe on it, the latter held in place with a concrete thrust block. The other pipe projects approximately 5 feet above the basin bottom. The lower outlet was used to drain the lower lake while the upper outlet was likely used to lower the water level slightly, perhaps to facilitate ice harvesting. The basin empties into a box culvert that runs southward just under the ground surface for 140 feet where it discharges into the stream (Photograph 3.8). The culvert is approximately 3 feet wide and 1.5 feet tall. The floor and sides are built of mortared stone and the roof of the culvert is made up of large flat shale or slate stones that span its width. It is not clear if this basin area would have been exposed during the period the ice company was operating. Historic photographs do not appear to show a building in this area. If exposed the valve bodies would have frozen during the winter. A small square pier identified just northeast of the basin may have supported a structure that sheltered this feature (Figure 3.4).

After the additional documentation was completed in October 2009, additional re-cleaning and photography of the area were conducted by archaeologists when they returned for the excavation of the toe drain in the summer of 2011. Contractors then began removing elements of the basin at the very base of the historic headwall to make room for the installation of a toe wall to anchor the headwall and conduct water into the basin from the newly installed toe drains. No archaeological deposits, artifacts or additional structural features were observed during the clearing, excavation and limited intrusion of the lower basin.

b. Spillway (Photographs 3.10-3.18)

Archaeological monitoring of the excavation and construction at the lower spillway started in August 2010 and continued episodically through into the summer of 2011. After dewatering the lower lake, contractors removed the large amounts of loose boulders being used to reinforce the downstream face of the existing stone and concrete masonry of the lower spillway. Trees, brush and roots were also carefully removed and pulled away from the masonry. Debris and soil were also removed by machine, under supervision of Hunter Research archaeologists, exposing the deepest portions of both the upstream and downstream faces of the spillway.
Figure 3.4. Plan View of Lower Dam Basin
Photograph 3.6. View looking north towards the downstream face of the lower dam during preliminary excavations of the lower dam basin (Photographer: Joshua Butchko, October 2009) [HRI Neg. #09008/D5:8].
Photograph 3.7. View looking northwest towards the downstream face of the lower dam after excavation and cleanup of the lower dam basin (Photographer: Joshua Butchko, October 2009) [HRI Neg. #09008/D5:64].
Photograph 3.8. View looking south towards the culvert inlet of the lower dam basin (Photographer: Joshua Butchko, October 2009) [HRI Neg. #09008/D5:41].
Photograph 3.9. View looking west towards the downstream face of the lower dam at the lower dam basin after the restoration had been completed (Photographer: James Lee, August 2012) [HRI Neg. #09008/D32:57].
Photograph 3.10. View looking east of lower dam spillway prior to construction activities (Photographer: Joshua Butchko, August 2010) [HRI Neg. #09008/D7:149].
Photograph 3.11. View looking northwest towards lower dam spillway prior to construction activities (Photographer: Joshua Butchko, August 2010) [HRI Neg. #09008/D7:161].
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Photograph 3.13. View looking southeast towards the upstream face of the lower dam spillway after clearing, dewatering and excavation into lake bed sediments (Photographer: Joshua Butchko, January 2011) [HRI Neg. #09008/D16:24].
Photograph 3.14. View looking southeast towards the lower dam spillway during documentation by Hunter Research archaeologists. Pictured is Katie Rettinger (Photographer: Joshua Butchko, January 2011) [HRI Neg. #09008/D16:13].
Photograph 3.15. View looking west during the demolition of concrete elements of the lower dam spillway (Photographer: Joshua Butchko, February 2011) [HRI Neg. #09008/D19:26].
Photograph 3.16. View looking east towards the southern section of the lower dam spillway after excavation (Photographer: Joshua Butchko, March 2011) [HRI Neg. #09008/D20:11].
Photograph 3.17. View looking northeast during the reconstruction of the lower dam spillway (Photographer: Joshua Butchko, May 2011) [HRI Neg. #09008/D22:4].
Photograph 3.18. View looking north during the dismantling of the existing lower dam spillway showing the wide stone foundation of the structure (Photographer: Joshua Butchko, February 2011) [HRI Neg. #09008/D18:67].
The spillway is approximately 116 feet long and varies in width from 5 feet at its northern end to 10 feet at the southern end (Figure 3.4). Two concrete caps, broken in places, cover the spillway crest. The first covers the downstream face and is from the initial construction of the spillway. The second was probably put in place during a repair episode as it overlaps the first and also covers the concrete poured in behind the original spillway wall. Approximately 27 feet from its northern end is a 2.5-foot wide channel that appears to have been completely filled in with concrete and stones. This channel looks as if it was installed in a low spot or breach in the original spillway during a repair episode. Two vertical angle irons are set in the concrete that abuts the upstream face of the original spillway cap. These irons would likely have held boards and the channel was probably used for lowering the water level in the lower lake. The spillway is built on a wider foundation of large flat stones that project out approximately 2 feet from the downstream face of the spillway wall (Photograph 3.18). At its southern end, the spillway has a seven-foot long concrete and mortared-stone abutment where it joins the eastern end of the lower dam. This abutment is L-shaped with a north-south aligned face meeting a southern face. This abutment appears to have been added to the front of the main north-south wall of the spillway, suggesting it was the result of a separate “build” added to the structure during a repair episode (Photograph 3.19).

After HAER-level documentation and photography, from the fall of 2010 into the winter of 2010-2011, the bulk of the contractors’ work involved disassembling the spillway stone, concrete and masonry. This allowed for continued archaeological observation of the spillway’s internal components and the eventual reconstruction of the entire structure. The southernmost section of the lower spillway was ultimately restored and preserved to be incorporated into the design of the new spillway foundations. Stones were roughly marked as to their location in the masonry and most of them were placed or jacked back into their original position. A softer historic masonry mortar was used.

Few cultural materials were recovered during this phase of the work, all of which were collected from displaced spoil piles. Subsequently, these items were added to the general catalog of materials with no further specific provenience. By June 2011, the concrete foundation and the core wall of the newly reconstructed lower spillway was finished. A masonry subcontractor then set out to recreate the stone façade along the downstream length of the new spillway (Photograph 3.20).

c. Toe Slope Drain (Photographs 3.21-3.24)

In June 2011, excavation for the installation of a toe slope drain was conducted along the downstream base of the lower lake’s earthen dam. The toe slope drain consisted of a perforated PVC pipe placed in a gravel-filled trench. This feature runs along the base of the lower dam and empties into the lower dam basin. This machine-excavated trench was generally 7 feet wide and extended east and west from the basin the full length of the earthen dam (Photograph 3.21).

The stratigraphy of the trench consisted of a dark brown organic clay loam underlying a lighter brown silty clay loam. This inverted profile was likely created when the dam was built and consisted of topsoils, likely from the area of the lower lake, being overlain by deeper, less organic subsoils. The profile was capped by a thin layer of topsoil that has accumulated since the dam’s construction. Excavation reached a maximum depth of 10 feet below the dam crest. No evidence of breaches or repair episodes was observed in these trenches.
Photograph 3.19. View looking south during the dismantling of the lower dam spillway showing the interface between the southern abutment masonry (left), spillway masonry (center) and concrete repair (right) (Photographer: Joshua Butchko, March 2011) [HRI Neg. #09008/D20:32].
Photograph 3.20. View looking northeast showing the restored lower dam spillway (Photographer: James Lee, August 2012) [HRI Neg. #09008/D32:12].
Photograph 3.21. View looking east along the downstream face of the lower dam towards the lower basin showing trench excavations for toe slope drain installation (Photographer: James Lee, June 2011) [HRI Neg. #09008/D28:18].
Photograph 3.22. View looking northwest along the downstream face of the lower dam (west of the lower basin) showing stone foundations identified during trench excavations for toe slope drain installation (Photographer: James Lee, June 2011) [HRI Neg. #09008/D28:22].
Photograph 3.23. View looking southwest along the downstream face of the lower dam (east of the lower basin) showing stone foundations identified during trench excavations for toe slope drain excavation (Photographer: Joshua Butchko, June 2011) [HRI Neg. #09008/D29:30].
Photograph 3.24. View looking east along the lower dam prior to excavation and construction activities (Photographer: James Lee, October 2010) [HRI Neg. #09008/D11:4].
During monitoring of these excavations, two separate stone features were identified. The first of these was found to the west of the lower basin area where a two-foot thick, cut-stone foundation running parallel to the earthen dam was exposed in the northern profile at the western end of the excavation (Photograph 3.22). The highest intact section of this footing was approximately 6 feet below the crest of the dam. This 2-foot high wall extended only 1 to 2 courses below the limit of excavation. It is probably either the western end of the basin headwall or a small fragment of the foundation of the large ice house that stood in this location when the ice company was in operation. No cultural materials were recovered from the vicinity of this feature. This wall was left in place when the trench was backfilled.

The second feature was found due east of the lower basin area. It was encountered during the course of machine excavation near the surface of the lower earthen dam slope. Upon its discovery, machine excavation was halted for a brief period of time to give archaeological monitors an opportunity for further excavation by hand, documentation and photography. This feature is composed of three walls, each approximately 1.5-feet thick, built of yellow-mortared, rough-cut, medium to large stones (Photograph 3.23). This rectangular structure measured approximately 8 feet (exterior dimension) east-west and has two intact walls running parallel to the earthen dam connected at their western end by a third wall running north-south for a distance of 5 feet (exterior dimension). The interior of the structure appeared to be filled with demolition rubble from the surrounding walls. No cultural materials were recovered from within or near this feature. Limited probing and hand excavation suggested that the structure’s eastern end was left open intentionally. This feature is the foundation for a storage shed that would have been connected with activities related to the ice harvesting company’s facilities south of the lower dam.

d. Ice Wall (Figures 3.5 and 3.6; Photographs 3.24-3.26)

Also in June 2011, excavation for the reconstruction of the ice wall was conducted along the upstream base of the lower lake’s earthen dam (Figure 3.5). This machine-excavated trench was generally 7 feet wide and extended the full length of the earthen dam continuing on from the contractors’ excavation for the lower spillway near the southeast corner of the lower lake. Excavated soils up to a depth of approximately 8 feet below the top of the dam revealed the same inverted profile as observed in the toe drain trench. Excavations reached a maximum depth of 10 feet below the crest of the dam at which point was found an odorous, wet humic clay loam indicative of wetland soils, possibly predating the lower lake’s construction.

During monitoring of these excavations, trace remnants of what was the lowest and last course of the ice wall were identified in profile (Figure 3.6; Photograph 3.25). This remnant of the ice wall was left intact and buried beneath the new, much larger lower dam (Photograph 3.26). Again, only a few cultural materials were identified during this phase of work, all of which were recovered from displaced spoil piles. Subsequently, these items were added to the general catalog of materials with no further specific provenience.

e. Ice Elevator (Figure 3.7; Photographs 3.27-3.33)

In mid-June 2011, as machine excavation along the upstream face of the earthen lower dam neared a close, archaeological monitors observed intact structural elements of what proved to be the chain-driven underwater portion, or “water box,” of an ice elevator dating from around 1906 (Photographs 3.27 and 3.28). This structural feature was located approximately 30
Figure 3.5. Partial Plan View of Continued Lower Dam/Ice Wall Excavation Monitoring

<table>
<thead>
<tr>
<th>Context</th>
<th>Description/Interpretation</th>
<th>Munsell</th>
</tr>
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<tbody>
<tr>
<td>3</td>
<td>Stone foundation ice wall</td>
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</tr>
<tr>
<td>5</td>
<td>Wet compact sily clay</td>
<td>10 YR 3/1</td>
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Figure 3.6. Partial Profile of Continued Lower Dam/Ice Wall Excavation Monitoring

**Context List**

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<th>Description [Interpretation]</th>
<th>Munsell</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>Silty loam with gravel</td>
<td>7.5 YR 3/2</td>
</tr>
<tr>
<td>2</td>
<td>Mottled silty clay loam with gravel</td>
<td>7.5 YR 3/2, 7.5 YR 5/6</td>
</tr>
<tr>
<td>3</td>
<td>Dry-laid stone ice wall</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>Mottled loose sandy clay with pebbles</td>
<td>10 YR 3/3, 2.5 YR 5/6</td>
</tr>
<tr>
<td>5</td>
<td>Wet compact silty clay</td>
<td>10 YR 3/1</td>
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Photograph 3.25. View looking south along the upstream face of the lower dam during excavations for construction of the new ice wall. Single course of dry-laid stone at center of photograph is the remains of the 19th-century ice wall (Photographer: Joshua Butchko, June 2011) [HRI Neg. #09008/D24:16].
Photograph 3.26. View looking southwest showing lower dam after excavations along the upstream face during the construction of new dam and ice wall foundations (Photographer: Joshua Butchko, May 2011) [HRI Neg. #09008/D23:33].
Photograph 3.27. View looking northwest showing southwest corner of the lower lake and lower dam in the approximate area of the ice elevator prior to its discovery (Photographer: James Lee, October 2010) [HRI Neg. #09008/D11:5].
Figure 3.7. Plan View of Ice Elevator

Ice Elevator
Plan View

- Metal Spike
- Metal Bolt
- Upright Post
- Limit of Excavation
- Chain
- Concrete
- Metal
- Wood

Sew in Concrete
Wheels

Figure 3.7. Plan View of Ice Elevator
Photograph 3.28. View looking north showing the ice elevator discovered in the southwest corner of the lower lake during documentation by Hunter Research archeologists. Pictured is Katie Rettinger (Photographer: Joshua Butchko, June 2011) [HRI Neg. #09008/D27:1].
Photograph 3.29. View looking southwest showing the extent of ice elevator elements discovered during excavations along the upstream face of the lower dam (Photographer: Joshua Butchko, June 2011) [HRI Neg. #09008/D26:60].
Photograph 3.30. View looking south showing the extent of ice elevator elements discovered during excavations along the upstream face of the lower dam (Photographer: Joshua Butchko, June 2011) [HRI Neg. #09008/D26:81].
Photograph 3.31. View looking southeast showing the southern extent of ice elevator elements discovered during excavations along the upstream face of the lower dam (Photographer: James Lee, July 2011) [HRI Neg. #09008/D28:63].
feet east of the southwest corner of the lower lake where the lower earthen dam met the west bank and protruded north-northwest into the lower lake from the upstream face of the lower earthen dam. The extent of this feature was delimited through machine excavation under the careful supervision and direct guidance of archaeological monitors. After establishing the boundaries of this discovery, machine excavation was halted for several days to allow for further manual excavation by the archeological monitors and for in-field documentation and photography.

This feature comprises a 28-foot long section of an elevator that has survived primarily because it would have been submerged (Figure 3.7; Photographs 3.29-3.31). Large flat planks run parallel along the length of the feature, held together every three feet by cross-bracing timbers and parallel side-running planks approximately 4-feet apart. The cross-bracing timbers would have been elevated above the flat planks to allow for the passage of ice blocks underneath but years of burial have flattened these elements of the elevator. These timbers are held in place with vertical, square-cut timber posts set in concrete (two remain intact) and at least two vertical round timbers. A concrete apron or ramp extends 2.6 feet from the northern end of the timber structure and approximately 1.5 feet from the southern end. At the southern end this concrete caps a concrete-filled trench that, with the soil removed from around it, is recognizable as a wall. Within this wall is a cast iron pipe that runs north-south from the trench into the concrete foundation under the timber structure. Another section of pipe was found amongst the timbers of the structure above the concrete. These pipes probably carried hot water or steam from the boiler house on the south of the lower dam to the elevator to keep it from freezing. Excavation on the southern side of the lower dam was unable to confirm this supposed connection. Sections of chain were found within the timber structure running parallel to its sides both above and below the cross-bracing timbers. While they are now heavily rusted these were likely part of the drive chains of the elevator and would have had wooden posts, or hold bars, projecting from them at regular intervals to grab the ice blocks being slid into the structure by the harvesters. An axle with two large sheave wheels lies atop the timbers at the northern end of the feature. This, along with another smaller axle and set of wheels would have carried the chains around the end of the water box. A cast iron wheel was also found in the vicinity of this structure and may have been used as part of a screw lift mechanism that raised parts of the water box.

These remains are a fragment of a much larger device. The only other element of this feature that survives is the concrete tower foundation immediately to the south of the lower dam. This concrete foundation, shaped in plan like the Roman numeral “II,” lies on the opposite side of the lower dam from the elevator water box (Figure 3.3). This foundation is 13 feet wide and 18 feet long with metal anchor bolts protruding from its upper surface. It would have supported the timbers of the elevator tower. The northeast corner of this foundation had broken off and was found lying next to the foundation at the start of the project. Concrete fill was placed under this corner of the foundation and the piece was restored to its correct location.

This elevator was built circa 1906 and conforms in many of its details with the plans for a chain-driven, overshot, incline elevator illustrated in the William T. Wood & Company and Gifford-Wood Company catalogs published from 1904 to 1919 (Figures 3.8 through 3.11). The elevator has the characteristic “endless” chain-link drive (similar to a bicycle chain) that enabled ice blocks to be floated head-on into the elevator. These were more typical of pre-1900 arrangements. Ice companies could order the elevator components from the manufacturer by specifying the length of the incline and the width of the elevator, dimensions that were dependent on the number and size of the ice blocks being lifted by each holding bar.
Figure 3.8. Historic photograph of the area of the Lower Dam, looking southeasterly from the west side of the lower lake. The elevator tower is under construction in the background, suggesting the photograph was taken in the winter of 1906-07. It shows that the tower’s gallery was designed as a three-level arrangement with chutes that could deliver the ice blocks to the desired level of the three-gabled icehouse. The machinery house at the top of the elevator has yet to be completed. The men on the ice appear to be readying to remove snow prior to ice cutting. They are standing on a temporary wood walkway along one side of the canal, which has yet to be freed of ice. The loaders would have worked along this walkway, freeing the individual blocks of ice from the rafts and guiding them toward the elevator (Collections of the Historical Society of Princeton).
Figure 3.9. Historic photograph of the area of the Lower Dam. Reversed caption (from negative) reads “Princeton Ice Co. 1910.” The view is to the southwest from the east side of the lower lake. From left to right the visible structures are the icehouse, the tower and elevators, a shed at the edge of the dam, and hay barn on the hill. In Hunter Research’s 1991 report, the shed at the edge of the dam was identified as a possible planing shed. Planing shaved loose the crusty or dirty ice on the top of ice blocks and was an activity that usually took place using a horse-pulled planer before the pond was cut. Sometimes mechanical planers were also attached to elevators but the planing took place on the inclined portion of the elevator so that the shavings could pile up beneath it. It seems unlikely that planing would have happened in a shed at the foot of the elevator. Another possibility is that the shed is a basin saw. These saws floated under sheds on the ice and were used to cut up rafts of ice, replacing the old method of breaking the blocks apart using hand tools. Basin saws were introduced in the early 1910s and some ice harvesting operations adopted them in an effort to become more efficient and reduce labor costs (Collections of the Historical Society of Princeton).
Figure 3.10. Elevation of a typical undershot ice elevator (Gifford Brothers, 1904).
Figure 3.11. This elevator illustration from the 1904 Gifford Brothers catalogue has many similarities to the elevator at Mountain Lakes. The Mountain Lakes elevator had a slightly different arrangement of galleries for delivering the ice blocks from the top of the tower to the icehouse doors (Gifford Brothers, 1904).
Figure 3.12. Ice blocks are guided through a channel to the timber-frame base of an elevator on Sandusky Bay, Ohio, circa 1900 (Hayes Presidential Center. Reproduced in Jones, America’s Icemen, 1984).
Photograph 3.32. View looking northwest showing the location of the ice elevator after final reburial. Wooden posts were added to mark the location of the ice elevator and will remain visible when the water level is restored. (Photographer: Andrew Martin, September 2011) [HRI Neg. #09008/D31:48].
Photograph 3.33. View looking east showing the completed lower dam. Note the posts representing the location of the ice elevator water box (Photographer: James Lee, August 2012) [HRI Neg. #09008/D32:40].
Excavation Unit 1 at Lower Dam

Plan View

Context List

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<thead>
<tr>
<th>Context</th>
<th>Description/Interpretation</th>
<th>Munsell</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Silty loam with gravel</td>
<td>7.5YR 3/2</td>
</tr>
<tr>
<td>2</td>
<td>Compact mottled silty clay</td>
<td>7.5YR 3/2, 7.5YR 4/6</td>
</tr>
<tr>
<td>3</td>
<td>Mottled loose sandy clay with pebbles</td>
<td>10 W 3/3, 2.5 YR 3/6</td>
</tr>
<tr>
<td>4</td>
<td>Wet compact silt clay</td>
<td>10 YR 3/1</td>
</tr>
<tr>
<td>5</td>
<td>Dry-laid stone wall (ice wall)</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>Yellow mortared stone wall</td>
<td>--</td>
</tr>
</tbody>
</table>

Figure 3.13. Plan View of Excavation Unit 1 at Lower Dam
(Figures 3.11 and 3.12). The spacing of the holding bars on this elevator suggests it was designed to hold ice blocks up to 32 inches long.

After documentation of the structure was concluded, Hunter Research, at the request of Princeton Township, removed the majority of the ferrous-based elements from the ice elevator area, dry-brushed and photographed them on-site, and deposited them at the Mountain Lakes House where they now await conservation and re-use in the interpretation of the site.

The wooden elements of the elevator were watered and temporarily covered with plastic as deliberation over its potential restoration or replication took place. By September 2011, a decision had been made to bury the remaining intact and in-situ elements of the ice elevator under a protective covering and layers of soil. An archaeological monitor returned to the site at this time to oversee this reburial procedure and to observe the contractors’ installation of upright timbers arranged to extend the existing posts from the ice elevator above the new water level to aid in its interpretation (Photograph 3.33).

B. ARCHAEOLOGICAL EXCAVATION OF THE LOWER DAM (Figures 3.13 and 3.14; Photograph 3.34)

On October 21, 2010, limited hand-excavation was conducted at the lower dam by archaeologists from Hunter Research. Excavation Unit 1 was placed along the northern slope of the lower dam and positioned on the upstream face with the intent of articulating what, if any, evidence of the ice wall might remain (Figure 3.13 and 3.14). This 5-by-8-foot unit was also designed to examine an anomaly identified during the Pedestrian and Metal Detector Survey (see Section C below).

The stratigraphy in this excavation was highlighted by two stone wall features [Contexts 5 and 6]. Context 5 was a one-course, dry-laid dressed-stone footing interpreted as the ice wall. Context 6 was a yellow-mortared cut-stone foundation wall with a metal bolt protruding from its current surface (this bolt was the anomaly identified by the metal detector). It is unclear what the function of this wall was. No buildings appear in this location in historic photographs. The wall does appear similar in size to the headwall on the southern side of the lower dam, which also has bolts protruding from its top (Figure 3.13). Excavation was conducted between these two walls to further clarify their dimensions. Context 4 was a wet compact silty clay, indicative of marshy, odoriferous lake bed sediment; it was encountered 3.6 feet below the top of the lower dam and extended to the full 4.6-foot depth of the excavation unit. Context 6 cut through this layer and extended to an unknown depth. Between Contexts 5 and 6, Context 4 was overlain by compact mottled silty clay [2]. Upstream (north) of Context 5, Context 4 was overlain by a mottled loose sandy clay with pebbles [3] (Figure 3.14).

The interface between Contexts 2 and 3 occurred somewhere underneath the remnant ice wall [5], which was documented and preserved in place. It is likely that Context 2 was a fill layer put down intentionally as a support base between the two walls [5 and 6] over the top of the pre-existing and relatively unstable lake bed sediment [4]. Contexts 2, 3, 5 and 6 were all overlain by silty loam with gravel [1] indicative of the surface material that sloped downstream from the top of the lower earthen dam to the bottom of the lake bed. The excavation provided useable information regarding the archaeological integrity of the ice wall. No cultural materials were recovered from this part of the investigation.
Figure 3.14. East Profile of Excavation Unit 1 at Lower Dam

Excavation Unit 1 at Lower Dam
East Profile

<table>
<thead>
<tr>
<th>Context</th>
<th>Description [Interpretation]</th>
<th>Munsell</th>
</tr>
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<tr>
<td>1</td>
<td>Silty loam with gravel</td>
<td>7.5 YR 3/2</td>
</tr>
<tr>
<td>2</td>
<td>Compact mottled silty clay</td>
<td>7.5 YR 3/2, 7.5 YR 4/6</td>
</tr>
<tr>
<td>3</td>
<td>Mottled loose sandy clay with pebbles</td>
<td>10 YR 3/3, 2.5 YR 3/6</td>
</tr>
<tr>
<td>4</td>
<td>Wet compact silty clay</td>
<td>10 YR 3/1</td>
</tr>
<tr>
<td>5</td>
<td>Ice wall [dry laid]</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>Yellow mortared stone wall</td>
<td>--</td>
</tr>
</tbody>
</table>
Photograph 3.34. View looking east showing stone foundations identified in HRI Excavation Unit 1 along the upstream face of the lower dam (north east of the lower dam basin). The masonry wall to the left is the original ice wall. (Photographer: Joshua Butchko, November 2010) [HRI Neg. #09008/D12:65].
C. SHORELINE PEDESTRIAN AND METAL DETECTOR SURVEY

1. Methodology (Figure 3.15; Photographs 3.35 through 3.38)

On October 18, 2010, archaeologists conducted a thorough pedestrian and metal detector survey of the shoreline and much of the lower lake bed. This unique opportunity was provided because the lower lake had been dewatered to facilitate the safe and stable reconstruction and rehabilitation of the upper and lower dam features. Executed in two stages, the intent of the survey was to identify archaeological resources and artifacts within areas typically covered or at least partially covered by water.

The survey began with a surface collection of the entire perimeter of the lower lake shoreline marking with orange pin flags any metal, glass, or timber anomalies seen during this process. Each person did one perimeter walk alone followed by a joint endeavor where they spaced themselves at arm’s length. A total of 18 anomalies were identified during the pedestrian survey (Figure 3.15). It was during the last perimeter survey that a bolt was identified protruding from the ground along the lower dam. Some rapid hand-excavation was conducted to remove it which led to the identification of a stone wall. Subsequently, this led to the organized investigation via Excavation Unit 1 as described above in Section B.

After the surface collection was completed, an archaeologist walked the entirety of the lower lake bed in a gridded pattern using a metal detector set with no discrimination to identify any additional resources that might lie within the silty lake bed deposits. A second archaeologist followed behind to examine and if necessary hand-excavate any anomalies. A total of 20 anomalies were flagged (Figure 3.15). All of these anomalies consisted of artifacts and are discussed below.

2. Artifacts Recovered

In total, 38 artifacts were recovered during this survey. Included among them were several items directly related to ice production at the site including: 3 metal swing guides [Catalog #s 1.6, 1.14, and 1.32]; one metal ice plow or saw [1.1]; one metal chisel bar [1.60]; and a part of an ice block hook or tong [1.29].

The metal swing guides recovered at Mountain Lakes would have been attached to saw-toothed markers and plows to keep them parallel with the previously cut groove when marking out the grid on the ice. They would have been used as part of the first step in the horse-drawn scoring and cutting operations. Each of the guides recovered has two arms that were fitted to hinges that bolted to the upper edge of the marker or plow. At the arm’s opposite end are “I”-shaped runners with flanges for following the groove of the previous cut. One of the guides (Catalog #1.6) found at Mountain Lakes retains a handle for swinging the guide over to the opposite side of the plow using the attached handle (Photograph 3.36). This swing guide type was used when the operator reversed directions. Several trade catalogs point out that swing guides were preferred for most commercial operations and a stationary guide attached to a plow was typically used by smaller ice-harvesting operations. Two of the guides were fixed for the standard 22-inch cut while the third was likely to have been adjustable between a 30 and 32-inch cut. The ice elevator discussed above was set for 32-inch blocks.

The ice plow or saw that was retained is missing the wooden handle but is otherwise nearly complete (Photograph 3.37). It is a 7-inch, 7-tooth plow (7 cutting teeth, 1 clearing tooth at front). It includes the front angle and loop through which the horse’s trace was attached. It also has the U-bolts for attaching a swing guide. The connection for attaching the
Figure 3.15. Aerial Photograph Showing the Location of Artifacts Recovered During the Investigation of the Lake Bed. Source: New Jersey Department of Environmental Protection 2007.
Figure 3.16. Ice plows were chosen for the number of teeth and depth of the cut, dependent on the characteristics and depth of the ice field. (William T. Wood Company, 1903-04)
Figure 3.17. A display of common ice tools from a suppliers catalogue. Tools similar to these were developed in the 1820s and remained in use for more than a century. (Gifford-Wood Company, 1915).
Photograph 3.35. View looking north showing pedestrian and metal detector survey of lower lake in progress. Pictured is Joshua Butchko (Photographer: Eric Woodruff, November 2010) [HRI Neg. #09008/D13:3].
Photograph 3.36. Swing guide with handle recovered during pedestrian reconnaissance (GPS #6) (Photographer: Joshua Butchko, November 2010) [HRI Neg. #09008/D12:30].
Photograph 3.37. Ice plow recovered during pedestrian reconnaissance (GPS #32) (Photographer: Joshua Butchko, November 2010) [HRI Neg. #09008/D13:78].
Y-shaped wood plow handle has snapped off just above the bend in the plow’s rail. Short pieces of the two iron rods that braced the handle remain attached.

An approximately 6-foot long iron bar recovered from within the lake bed appears to have been a tool used in separating, guiding and clearing ice blocks in the channel. Evidence from trade catalogs indicates that the hand tools used for ice harvesting at the pond came in varying lengths and shapes (Figure 3.16 and Figure 3.17). Tools of 6 feet or longer were normally used by the loaders who, from their position alongside the channel, usually on a raised wooden platform, were responsible for moving the ice blocks from the pond to the elevator. Cutters used similar-looking tools, but theirs were usually less than 6 feet long because they did not require the extra length needed by the loaders. The flat head of the bar is at right angles to the handle. Another possibility is that the 90-degree head was found useful for some other purpose such as clearing jams at the elevator. The recovered tool’s head has the shape of a chisel, but none of the catalogs reviewed during this research illustrated a tool with a 90-degree head, so it is possible that this tool is bent.

Other items recovered from the lake bed include a ferrous metal ice hook (Photograph 3.38), several modern, yellow-painted metal trail posts, unidentified timber fragments, modern macadam debris and assorted modern metal debris. All items identified during the survey were photographed in situ and marked using GPS. Afterwards, they were recovered from their respective locations, photographed on-site and left at the Mountain Lakes House for temporary safekeeping, before eventually being taken to off-site storage by the Township.
Archeological monitoring of the rehabilitation of the various structural elements at Mountain Lakes identified several significant features, provided in-field consultation regarding cultural resource-related design decisions and ensured that the rehabilitation effort was performed in keeping with the approved rehabilitation design.

The disassembly that preceded the rehabilitation of the upper dam and the lower dam spillway made allowance for a detailed examination of the fabric of the structures. The lower dam comprised a simple earthen berm with a short, stone ice wall and a mortared stone masonry spillway in one corner, all built around 1884 when the Riverside Ice Company first moved to this location. By the time the upper dam was built circa 1902 construction technologies were changing and it was constructed largely in concrete with a non-functional mortared stone facing that made it appear as if the structure was entirely of stone construction. Judging by the similarity of the aggregate used, the lower dam spillway was also reinforced and partially capped with concrete at the same time that the upper dam was built and it is possible that the southern end of the spillway and the stone masonry abutment were rebuilt during this same construction episode around 1902. The southern end of the spillway masonry has concrete behind it, while approximately midway along its length the collapsing masonry face reveals a core of mortared cobbles. The reason for the use of stone facing on the upper dam and lower dam spillway, likely an extra expense, is not clear. It may have simply been an aesthetic choice by the company owners who appreciated the natural beauty of the locale, or it could represent some subtle marketing.

The owners may not have wanted to associate their pure “Mountain Lake” ice with a modern, industrial building material.

As mentioned in the cultural resource survey of the property (Hunter Research, Inc. 1991), the upper pond was installed after the lower ice pond had been in use for approximately 18 years to reduce the amount of silt in the lower pond. This modification appears to have been effective as shown by the limited extent of the recently completed dredging operation. It is not known if the upper dam replaced any earlier structures. None were identified during the course of this monitoring. If the existing dam required a bypass channel (also referred to as a “spillway”) to keep the water of the lower pond as still as possible, was there a mechanism that would have served this purpose prior to the upper dam’s construction? No sign of a gate for the spillway was identified in the fabric of the upper dam. Could this channel have predated the upper dam and worked in conjunction with a structure that has not been identified? Unfortunately the relationship between the bypass channel and the upper dam is unclear; 20th-century activity at the junction of this channel and the upper dam appears to have removed any archaeological evidence of their association.

Also regarding the bypass channel, an inspection of this feature at several points along its length failed to identify any formal stone lining or riprap. If this feature was built at the same time as the large upper dam to carry excess water around the lower pond to keep it still, one might expect a gate structure to be incorporated into the upper dam. Looking at historic aerial photographs of the lakes, the bypass channel does line up well with the southeastern corner of the upper pond, as if an intake once existed in the upper...
dam at the head of the channel. This feature may have been removed during the post-ice company era or else the channel may have originated as part of a water management system that pre-dates the upper dam.

The most significant finding of the monitoring activities was the water box for the ice elevator. The survival of this feature in the lake bed silts provided valuable information regarding the ice harvesting technology used at Mountain Lakes. The remains suggest that an overshot incline elevator was built on site, likely *circa* 1906 when the property changed hands. This mechanized system would have replaced a simpler setup where ice cakes would have been pushed up lesser inclines by laborers. The documentation of this feature and the materials recovered during the investigation will greatly aid in the site's interpretation, as will the ice harvesting tools recovered during the pedestrian and metal detector survey of the lake bed. These latter items were scattered around the edges of the lower pond as if they were accidentally dropped in the water during harvesting, not intentionally discarded in a single location near to shore. Their random distribution into the silts of the lakebed probably helped to ensure their preservation.
REFERENCES

Branchville Ice Tool Works

Gifford Brothers

Gifford-Wood Company


H.F. Dernell & Company

Historical Society of Princeton

Hunter Research, Inc.


Jones, Joseph C., Jr.
Knickerbocker Ice Company


Lamere, Cliff.

Siegel, Bob, Jr.

William T. Wood Company
Appendix  A

HAER DOCUMENTATION
PRINCETON ICE COMPANY UPPER DAM AND LOWER DAM SPILLWAY
Princeton Township
Mercer County
New Jersey

HISTORICAL AND PHYSICAL DOCUMENTATION
AND
INDEX TO LARGE-FORMAT
DOCUMENTATION PHOTOS

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
Natural and Historic Resources
Historic Preservation Office
P.O. Box 404
Trenton, New Jersey 08625-0404
HISTORICAL AND PHYSICAL DOCUMENTATION

Historical Background

Ice was being sold commercially in Princeton long before the formation of the Mountain Lake Ice Company. James Vandeventer and Joseph Priest were advertising ice for sale in the 1860s and 1870s, and ice was also shipped via the Delaware and Raritan Canal to an ice house at the Princeton basin. Stephen Margerum was advertising ice for sale by his Riverside Ice Company in 1879 ("Still in the lead and ready to receive orders"). The company name was derived from the fact that he harvested ice from the Millstone River, "a stream of pure running water."1

In 1880 a typhoid epidemic broke out as a result of the installation of a new sewage system at the College of New Jersey (now Princeton University) which contaminated wells and groundwater. The epidemic attracted national attention. The town responded by forming a health board and a water supply system, but all surface waters were considered suspect.2

Iceman Stephen Margerum responded by purchasing a small farm from the estate of Edward Kinney in 1883, near the corner of Bayard Lane and Mountain Avenue (Illustrations 1 and 2). With improvements, this would become the Mountain Lake Ice Company (successor to the Riverside Ice Company) and finally the Princeton Ice Company. In announcing Margerum’s undertaking in 1884, the local newspaper pointedly observed that, “The water comes from two small streams flowing from the hills on the north, and from numberless springs on the ground itself. The water is very clear and free from any possible contamination.”3

The property was probably settled by Peter Stryker who acquired it as part of a larger parcel in 1796. A map drawn in 1840 (Illustration 3), when it was owned by Samuel Updike, shows buildings and fields. The present property boundaries largely date from an 1868 sale by Charles Hendrickson. It had changed little when it was mapped again in 1875 (Illustration 4), then in possession of Edward Kinney. Kinney died intestate in 1883.4 The 1875 map is of interest for another reason: there was an icehouse south of Mountain Avenue, virtually opposite Kinney’s property.

Stephen Margerum, then 62 years old, built the lower dam on two nameless tributaries of Stony Brook, creating the larger of the two ponds. He was taking orders—still as the Riverside Ice Company—in June of 1884 (Illustration 5). Deliveries were offered from eight to 40 pounds daily, at $0.50 to $1.58 per week. The order card also offered

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2 Ibid.
3 Ibid.
4 Somerset County Deeds D 621; Mercer County Deeds 93 262, 137 492, 137 494.
deliveries of stone, and informed customers (and employees) of “Rule 4.-Drivers must be polite and obliging to their customers, and treat them fairly and honestly in all cases. Honest weight must be given. Throwing Ice in gutters, sliding it up alleys, cutting in improper shapes, &c., will not be allowed.” Exactly when the Riverside company became Mountain Lake is not known, but a handbill probably dating from 1887 (based on its similarity to that year’s order card) advertises “The Mountain Lake Ice Co.” and notes the company was “formerly Riverside” (Illustration 6). The 1887 order card, perhaps mindful of the ice famines of 1870 and 1880, notes that “The Lake and House, at foot of Bayard Avenue; the House containing at present, twenty-two hundred tons, enough to last Princeton for three years.”

Stephen Margerum (1822-1901) was a member of a prominent and long-established family from Bucks County, across the Delaware River from Mercer County (in which the property is located). Apprenticed as a boy to a farmer in Tullytown (Pennsylvania), he reportedly ran away and came to live with his maternal grandfather in the section of Princeton known as Jugtown (or Queenston), near the corner of Nassau and Harrison Streets. How and when he entered the ice trade is unknown, but he was also in the coal and quarrying businesses; reportedly much of the stone used to construct Princeton University buildings came from Margerum’s quarries. He married in 1843 and was the father of three sons and a daughter. When Stephen Margerum died in 1901 he left the “Hendrickson Farm,” where the ice business was located, to his son James C. Margerum. His obituary noted that his Mountain Lake Ice Company furnished “the main portion of Princeton’s ice supply.”

James C. Margerum, the son, had more than a passing acquaintance with frozen water. Born in Princeton in 1854, he entered the ice, stone and general contracting businesses at 17 (or in 1871, 30 years before his father left him the Mountain Lake Ice Company).

The property was mapped again in 1903 (Illustration 7). For the first time the pond is shown, behind two buildings labeled “J. Margerum” on Mountain Avenue. Although not indicated on the map, James Margerum had built the upper dam in 1902, probably to create a larger area from which ice could be harvested.

Five years after he inherited the business, James Margerum was one of five founders of the Princeton Ice Company, which purchased the business from him for $50,000. According to the company’s Certificate of Incorporation, dated December 7, 1906, the other directors were William R. Matthews, H. C. Bunn, John B. Renwick, and Joseph Hoff. Each owned 100 shares. A month later the Annual Report for 1907 listed Albert S. Leigh as President and William R. Matthews as Vice President. Thornton Conover, A.

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5 Margerum Family Papers.
6 Gunning.
7 Mercer County Wills S 233; Mercer County Deeds O 524.
D. Cook and William H. Lyons had joined the board. James C. Margerum was listed as President in 1916.

The deed resulting from the 1906 sale by Margerum to the Princeton Ice Company provides an inventory of the facilities at that time. Included in the sale were two ponds, one brick house, one double frame house, one eight room icehouse with a capacity of at least 9,000 tons, three wagon houses, a corn crib, barns, horse barn, five open wagon houses, two hay barns, a scale house with scales, 10 horses, nine ice wagons, and five markers and ice plows. The deed also stipulated that Margerum was to “…complete the tower, the boiler house, road and bridge and all other improvements now underway…” The Princeton Ice Company, for its part, would complete “the small ice-house” Margerum was about to build.

Another ice famine in 1908-1909 shaped the appearance of the property. That winter the thickness of the ice was never sufficient to harvest, never exceeding six inches, and the company had attempted (and failed) to obtain ice from New York and Maine. In April 1909 the company therefore installed a plant to manufacture “artificial ice” at its property. Although the precise size and location of this equipment is unknown. Ice independence was short lived, however. The plant burned in December of the same year, a total loss.9

Two historic photographs of the ice company survive. Illustration 8 is believed to be the earlier of the two; based on the state of structures visible it may date from around the time of the 1906 sale. The view is south-southeast, from the western shore of the lower pond, with a group of men standing on the frozen pond. Prominent in the background, below the dam and parallel to it, is a three-part icehouse, very nearly fitting the Scientific American description published in 1868. To the right (west) can be seen the ramps for lifting the ice into the icehouse.

The second historic photo is inscribed “Princeton Ice Co. 1910” on the back of the negative (Illustration 9). Taken during warm weather from the east side of the lower pond, the icehouse again dominates, but behind (west of) it can be seen a chimney. This is believed to be the location of the boiler house Margerum agreed to complete in 1906. Next to it is a frame tower with ramps apparently leading from the pond up to a shelter, then down to the icehouse. The shelter may have housed machinery associated with the conveyor. Near the bottom of the conveyor is a small frame structure of unknown purpose; it may have housed a planer used to create blocks of uniform size for more efficient storage. Finally, a tall barn can be seen west of the pond, at a site where no

8 In all likelihood this is 73 Mountain Avenue, already listed in the National Register as part of the Mountain Avenue Historic District. It had been the morphological laboratory on the campus of the College of New Jersey and sold to Margerum for $900 with the proviso that it be removed. In 1888 he tore it down, intending to “build a house with the material at his farm at the foot of Bayard Avenue” (Gunning).

9 Gunning.
barns appear on pre-Margerum maps. Although its relationship to the ice business is unknown, its site yielded the remains of early-20th century hay handling equipment during a 1990 survey.

In 1915 the company purchased a lot in downtown Princeton, ironically near the site of Vandeventer’s pond, for the purpose of constructing a 20-ton ice plant. This plan never materialized, and the land was sold in 1923.10

James C. Margerum died in January of 1925. The company had ceased harvesting ice from the lake several years earlier and the company permitted its use as a community beach that summer, but apparently this only lasted one year. The Princeton Ice Company was dissolved on December 16, 1929, marking the end of commercial ice operations at the site nearly a half-century after Stephen Margerum first dammed the stream. At about the same time the property was photographed from the air (Illustration 10). This view, although partly obstructed by smoke from a neighboring farm, shows both dams and the tree-lined watercourses converging on and passing through the property. It is noteworthy that except for the field boundaries, the site was mostly open and possibly under cultivation.

The property was sold in 1929 to Edgar Palmer, who would later develop Palmer Square in downtown Princeton. In 1958 the next owner, J. Dudley Clark, commissioned Rolf W. Bauhan to build a house near the upper dam. Bauhan was the first Princeton graduate to receive the degree of M.F.A. from the School of Architecture. He lived and worked in Princeton for most of his productive life, designing more than 70 houses in the town and contributing to the restoration or renovation of more than 150 others. A firm believer that the 18th century was the high water mark of American design, Bauhan favored the Colonial Revival style, often designing houses that appeared to have evolved through several construction periods. The Clark House has six distinct blocks.11

Princeton Township acquired the property as open space in 1987. As modern photographs show, today little is visible to the casual observer to indicate the level of activity around the turn of the century. Aside from the upper and lower ponds, the ruins of the powerhouse chimney can be found in the woods, near the concrete foundations of the conveyor tower, both near the western end of the lower dam. A cultural resources survey in 1990 succeeded in locating a number of other features related to the ice company. The piers revealed it to have been about 48 feet by 18 feet. Within it were found a swivel carrier for a track-mounted hay-handling system and 46 feet of steel track. Also found was a double harpoon hayfork which would have been used with the swivel carrier. Both appeared in Sears Roebuck catalogs around the turn of the century.

10 Ibid.
11 Croll.
A number of other features were located on the site, including concrete foundations below the lower dam that was likely the foundation for the ice elevator’s tower.

The dams themselves are of some interest and are discussed in more detail below. The 1884 lower dam is an earthen embankment about 350 feet long, about 30 feet wide and 13 feet high. Two flow control pipes project from a stone wall near the center of the dam, into a stone and concrete basin which has an outlet to the south. The 1902 upper dam is a random-coursed stone-faced concrete structure. It is approximately 268 feet long and about six feet wide at its crest. There is a central spillway, about 175 feet wide and about 1.2 feet lower than the crest of the dam.

Archaeological investigations carried out in 1990 also located the remains of several ice-related buildings, particularly near the lower dam.

As part of the 2010-2011 Mountain Lakes rehabilitation and dredging project, archaeological monitoring was conducted that located additional ice harvesting tools and the water box of the ice elevator in the southwest corner of the lower lake. This feature was recorded and, after removing several iron elements for conservation and interpretation, the feature was buried below a protective textile layer and clean fill before the lake water re-watered. Documentation of the Upper Dam and Lower Dam Spillway were also produced at this time.

Physical Description of the Upper Dam and Lower Dam Spillway

The Princeton Ice Company/Mountain Lakes Preserve occupies nearly 77 acres in Princeton Township, New Jersey. Now principally functioning as a municipal open space and passive recreation tract, it is nearly devoid of buildings, although it contains the remains of a locally-owned and operated ice business dating from the last quarter of the 19th century and the first quarter of the 20th. The property also includes a Colonial Revival style house that was built in 1958.

The property is north of Mountain Avenue and is north and east of the Mountain Avenue Historic District, entered in the National Register on February 2, 1995, which it abuts.

All significant features on the property relate to the production, storage and distribution of ice, the sole source of domestic refrigeration until after World War I. The principal features described below were inventoried during a 1991 cultural resources survey that included above-ground and subsurface investigations. These findings were confirmed during subsequent inspections in 2004 and 2005 and archaeological monitoring in 2010 and 2011. This monitoring also identified the water box of an ice elevator in the southwest corner of the lower lake. This HAER-like documentation centers on the Upper Dam and the Lower Dam Spillway. All accompanying photographic documentation was
taken in 2010 and 2011 by David Haas with a 4-by-5-inch, large-format camera with perspective correction. Photographic prints were produced utilizing archival processes and materials. The prints show context, detail, construction and oblique views as per the HABS/HAER standards for engineering and industrial structures.

The most visible component of the property is the large lower dam, and to a lesser extent the upper dam. By impounding two unnamed tributaries of Mountain Brook (a tributary of Stony Brook not named on USGS maps, but shown on Township tax maps), they create two lakes (shown as a single lake, Mountain Lake, on USGS and Township tax maps) that were at the heart of the ice business (Illustration 1). The dams are aligned generally east-west (and the long axes of the lakes north-south).

The upper dam, built in 1902 to create another water body from which ice could be cut, is a random-coursed stone-faced structure (Illustration 11; Photographs 1 through 13). The upper dam is approximately 268 feet long and 6.5 feet wide at its crest. The dam has a 1.2-foot thick stone and mortar face on the downstream side, fronting a 3.8-foot wide concrete slab that forms the upstream surface. A spillway approximately 175 feet long is centrally located on the dam and is depressed about 1.2 feet below the crest of the dam at either end. This spillway begins 80.7 feet from the eastern end of the dam. A cast-iron valve is located centrally on the downstream face of the dam near its base. A measured plan and sample elevations were prepared to document this feature and are included with this documentation. The dam was reputedly constructed by James Margerum in 1902 to augment the original lower dam. It was probably built both as a silt trap and as a way to calm the waters of the lower lake, creating an optimal environment for ice production in the lower lake.

The lower (southern) lake, created in 1884, is about 1,000 feet long (from the upper dam to the lower) and approximately 200 feet wide for most of its length, widening at its downstream end. The lower dam is an earthen embankment about 350 feet long, about 30 feet wide and 13 feet high. There is a mortared stone wall centrally located on the downstream side of the dam, from which two cast iron flow control pipes project toward a stone and concrete basin. The ice house stood just below this dam, near its western end.

There is a stone-faced concrete spillway at the eastern end of the lower dam (Illustration 12; Photographs 14 through 21). The spillway is approximately 116 feet long and varies in width from 5 feet at its northern end to 10 feet at the southern end. Two concrete caps, broken in places, cover the spillway crest. The first covers the downstream face and is from the initial construction of the spillway. The second was probably put in place during a repair episode as it overlaps the first and also covers the concrete poured in behind the original spillway wall. Approximately 27 feet from its northern end is a 2.5-foot wide channel that appears to have been completely filled in with concrete and stones. This channel looks as if it was installed in a low spot or breach in the original spillway during a repair episode. Two vertical angle irons are set in the concrete that abuts the
upstream face of the original spillway cap. These irons would likely have held boards and the channel was probably used for lowering the water level in the lower lake. The spillway is built on a wider foundation of large flat stones that project out approximately 2 feet from the downstream face of the spillway wall. At its southern end, the spillway has a seven-foot long concrete and mortared-stone abutment where it joins the eastern end of the lower dam. This abutment is L-shaped with a north-south aligned face meeting a southern face. This abutment appears to have been added to the front of the main north-south wall of the spillway, suggesting it was the result of a separate “build” added to the structure during a repair episode. A measured plan and sample elevations were prepared to document this feature and are included with this documentation.
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UPPER DAM

Photographer: David Haas                  Date: August 2010

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Photographer: David Haas         Date: January 2011

Neg./Photo No.

14  PRINCETON ICE COMPANY LOWER DAM. FRONT ELEVATION VIEW, NORTHERN END FACING NORTHWEST.

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Appendix B

ARTIFACT INVENTORY
# APPENDIX B

## ARTIFACT INVENTORY

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<td>Historic Building Materials, Ferrous metal, framing, fragment, corroded, L 1ft, W 0.2ft, T 0.05ft, from lower spillway deconstruction, two small rectangular cross-frame sections attached to main body with perforations on each end</td>
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<tr>
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<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Historic Building Materials, Wood, timber, fragment, GPS 12, L 3ft, W 0.2ft, T 0.4ft</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Historic Building Materials, Wood, timber, fragment, GPS 13, L 3.5ft</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Historic Building Materials, Wood, timber, fragment, GPS 14, L 3ft, W 0.2ft, T 0.2ft</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Historic Building Materials, Wood, timber, fragment, GPS 16, L 6ft</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Historic Ceramic Vessel Sherds, Refined Earthenware, Ironstone, cup, rim and body fragment, 1840-Present</td>
<td>1</td>
<td>43</td>
</tr>
<tr>
<td>Historic Glass Vessel, Glass, bottle, beverage, whole, crown finish, light aqua, mold seam, embossed coat of arms &quot;R &amp; H / CONTENTS / 12 FL OZ / REGISTERED / RUBSAM &amp; HORRMANN BREWING CO NEW YORK&quot;, 1865-1963</td>
<td>1</td>
<td>39</td>
</tr>
<tr>
<td>Historic Glass Vessel, Glass, bottle, beverage, whole, crown finish, clear/uncolored, mold seam, embossed &quot;REGISTERED / B.S. FEATHERSTONE / BOTTLER / PRINCETON NJ / THIS BOTTLE NOT TO BE SOLD&quot;, late 19th/ early 20th century</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>Historic Glass Vessel, Glass, bottle, beverage, whole, crown finish, clear/uncolored, mold seam, embossed &quot;JOS. CATELLI / J.C./ KINGSTON NJ / REGISTERED / 101 l / MINIMUM CONTENTS / 3 FLUID OUNCES&quot;, early 20th century</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>Historic Glass Vessel, Glass, bottle, beverage, whole, crown finish, clear/uncolored, mold seam, remnant enamelled label with image of deer &quot;KERN / BEVERAGES / E.L. Kerns, Trenton NJ&quot;, 1889-1974</td>
<td>1</td>
<td>36</td>
</tr>
<tr>
<td>Historic Glass Vessel, Glass, bottle, beverage, whole, crown finish, clear/uncolored, mold seam, embossed &quot;Cantrell Cochrane / Cantrell Cochrane&quot;, Ireland, late 19th/early 20th century</td>
<td>1</td>
<td>37</td>
</tr>
<tr>
<td>Historic Glass Vessel, Glass, bottle, beverage, whole, crown finish, clear/uncolored, mold seam, embossed &quot;TRADE / CLICOUOT CLUB / MARK&quot;, Millis, Massachusetts, 1881-1950</td>
<td>1</td>
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</tr>
<tr>
<td>Historic Glass Vessel, Glass, bottle, beverage, whole, crown finish, clear/uncolored, mold seam, embossed &quot;KERNS / BEVERAGES / E.L. Kerns, Trenton NJ&quot;, 1889-1974</td>
<td>1</td>
<td>41</td>
</tr>
<tr>
<td>Historic Glass Vessel, Glass, bottle, beverage, whole, crown finish, amber, mold seam</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Historic Glass Vessel, Glass, jar, condiment, whole, threaded, clear/uncolored, mold seam</td>
<td>1</td>
<td>38</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, bar, fragment, GPS 7, corroded, L 1.3ft, W 0.4ft, T 0.05ft, oval perforation on one end</td>
<td>1</td>
<td>52</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, brace, whole, GPS 30, corroded, L 2ft, large staple-shaped</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, frame/track, fragment, corroded, L 1.5ft</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, bar with chain link attachments, fragment, corroded, L 5ft, 2 in</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, brace/bracket, whole, corroded</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, brace/fitting, whole, corroded, rectangular with 8 bolts</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, brace/fitting, whole, corroded, V-shaped with 7 bolts</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, chain, fragment, corroded, L 3ft</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, chain, fragment, corroded, L 5.5ft</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, chain, fragment, corroded</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, chain, part, whole, L 0.5ft, wrench-shaped link with perforation on each side</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, chain spool/whole, whole, corroded, L 3ft, 2 ft</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, large wheel, whole, corroded, six spoke</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, pole/post, fragment, corroded, with washers and chain link attachments</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, thread wheel gear, fragment, corroded</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, ice elevator part, turnkey/handle, whole, L 3.5ft, T-shaped</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>Historic Manufacturing, Ferrous metal, wrought, turnkey/handle, whole, GPS 38, corroded, L 0.8ft, looped on one end. Bent right angle on the other</td>
<td>1</td>
<td>51</td>
</tr>
<tr>
<td>Historic Personal Items, Gold, ring, wedding band, whole</td>
<td>1</td>
<td>46</td>
</tr>
</tbody>
</table>

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B-1
## APPENDIX B (Cont.)

### ARTIFACT INVENTORY

<table>
<thead>
<tr>
<th>Row #</th>
<th>Historic Recreation/Activities, Ball Clay, smoking pipe, bowl, whole, &quot;T D&quot; marked, generic style</th>
<th>45</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Historic Recreation/Activities, Cork and metal, smoking pipe, bowl, whole, metal threading for stem attachment</td>
<td>44</td>
</tr>
<tr>
<td>1</td>
<td>Historic Recreation/Activities, Ferrous metal, small animal trap, whole, corroded, coil-sprung muskrat trap, Oneida Victor, Lititz, PA, late 19th century/early 20th century</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>Historic Recreation/Activities, White Metal, chain, bike chain, fragment, corroded, triangle shaped links</td>
<td>47</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, file/rasp, whole, L 1 ft</td>
<td>31</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, hoop, whole, GPS 37, corroded, .8 ft</td>
<td>49</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, ice hook, whole, L 3 ft</td>
<td>29</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, ice production tool, chisel, whole, GPS 39, corroded, L 6 ft, 19th century</td>
<td>60</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, ice production tool, ice saw, whole, GPS 32, corroded, horse-drawn, 19th century</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, ice production tool, swing guide, whole, GPS 6, corroded, for standard 22 inch ice block cut, 19th century</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, ice production tool, swing guide, fragment, GPS 8, corroded, for standard 22 inch ice block cut, handle missing, 19th century</td>
<td>14</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, ice production tool, swing guide, fragment, GPS 33, corroded, for 30-32 inch ice block cut, handle missing, cross-bar bent, 19th century</td>
<td>32</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, pick axe, whole, corroded, L 1.5 ft, no handle</td>
<td>48</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Ferrous metal, spike, square cut, whole, GPS 18, corroded, L 0.7 ft</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>Historic Tools/Hardware, Wood and ferrous metal, ice pick, handle and head fragment, corroded</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>Historic Unidentified, Ferrous metal, unidentified, fragment, GPS 45, corroded</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Modern Arms and Armor, Brass, bullet, casing, fragment, GPS 46, shotgun shell</td>
<td>57</td>
</tr>
<tr>
<td>1</td>
<td>Modern Arms and Armor, Metal and Plastic, pocket knife, fragment, green, GPS 29, corroded, &quot;National Rifle Association&quot;</td>
<td>56</td>
</tr>
<tr>
<td>3</td>
<td>Modern Building Materials, Macadam, fragment, GPS 11</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>Modern Glass Vessel, Glass, bottle, beer, whole, green, mold seam, GPS 9, &quot;Grolsch&quot;</td>
<td>54</td>
</tr>
<tr>
<td>6</td>
<td>Modern Recreation/Activities, Ferrous metal, trail posts, whole, yellow painted, GPS 15, 25, 26, 27, 28, 40, corroded, L 5 ft, 1.5 in</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>Modern Stone, Unidentified, block, fragment, gray, GPS 31, drill marks</td>
<td>55</td>
</tr>
<tr>
<td>1</td>
<td>Modern Tools/Hardware, Ferrous metal, wire, fragment, GPS 35, corroded</td>
<td>58</td>
</tr>
<tr>
<td>1</td>
<td>Modern Tools/Hardware, Metal and wood, nail, fragment, GPS 36, corroded</td>
<td>59</td>
</tr>
</tbody>
</table>

* **Total Artifacts in Surface Collection:** 78
* **Total Artifacts in General Provenience:** 78

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**Total Number of Artifacts:** 78

* **Item Discarded in Laboratory**

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Appendix C

RESUMES
EDUCATION

M.A., Archaeology, University of Durham, Durham, United Kingdom, 1996

B.A., Anthropology and History, Rutgers University, New Brunswick, New Jersey, 1995

EXPERIENCE

2001-present Principal Investigator/Report Manager
Hunter Research, Inc., Trenton, NJ

Technical and managerial responsibilities for survey, evaluation and mitigation of selected archaeological projects. Technical and managerial responsibility for report production. Participation in:
• overall site direction and day-to-day management
• development and implementation of research, excavation and analysis strategies for prehistoric and historic archaeological sites
• report and proposal preparation
• supervision of cartographic and GIS product, graphic design and report layout
• hiring and supervision of personnel

2001 Crew Chief
Kittatinny Archaeological Research, Stroudsburg, Pennsylvania
• survey and excavation
• supervision of field personnel
• stratigraphic and artifact analysis

1997-2001 Principal Investigator/Project Manager
Cultural Resource Consulting Group, Highland Park, New Jersey
• overall site direction and day-to-day management
• development and implementation of research, excavation and analysis strategies for prehistoric and historic archaeological sites
• report and proposal preparation
• hiring and supervision of personnel

1997-2000 Laboratory Supervisor
Cultural Resource Consulting Group, Highland Park, New Jersey

Technical and managerial responsibilities for laboratory components of archaeological projects. Participation in:
• management of laboratory operations
• supervision of laboratory personnel
• computerization of artifact data
• prehistoric and historic ceramic analysis
• preparation of artifact inventories and writing of artifact sections of reports
1996-1997  Field Technician
          Cultural Resource Consulting Group, Highland Park, New Jersey

PROFESSIONAL AFFILIATIONS

Society for Industrial Archaeology
Archaeological Society of New Jersey, Recording Secretary
Society for Pennsylvania Archaeology
New York State Archaeological Association
Canal Society of New Jersey
Warren County Morris Canal Committee
Society for Industrial Archeology
Eastern States Archaeological Federation
JOSHUA J. BUTCHKO  
Lab Director & Senior Archaeologist, M.A.  

EDUCATION

M.A. Public History, Rutgers-The State University of New Jersey, Camden, NJ, 2012

B.A. Anthropology and Classics, Drew University, Madison, NJ, 2003

EXPERIENCE

2008-present Laboratory Supervisor and Senior Archaeologist  
Hunter Research, Inc., Trenton, NJ

Technical and managerial responsibilities for laboratory components of archaeological projects. Participation in:
- management of laboratory operations
- supervision of personnel
- computerization of artifact data
- historic ceramic analysis
- preparation of artifact inventories
- writing artifact section of reports
- assistance in artifact display assembly

2006-2008 Senior Archaeologist  
Hunter Research, Inc., Trenton, NJ

Technical and supervisory responsibilities for selected field, laboratory, drafting operations and report preparation. Participation in:
- on-site project management
- survey and excavation
- stratigraphic and artifact analysis
- supervision of personnel
- field photography
- report preparation
- supervision of mechanically assisted excavation
- guidance and instruction at on-site public archaeology service days

2003-2006 Field Assistant  
Hunter Research, Inc., Trenton, NJ

Worked on various archaeological field projects in New Jersey, Delaware, New York, Pennsylvania, and Washington, DC. Participation in:
- excavation and survey
- field recording
- laboratory processing of artifacts
2004  Field Assistant
Monmouth University Archaeological Field School

Technical and supervisory responsibilities for selected field operations at the Merchants and Drovers Tavern in Rahway, NJ. Participation in:
  • survey and excavation
  • stratigraphic and artifact analysis
  • supervision of personnel

2003  Volunteer
Monmouth University Archaeological Field School

Technical and supervisory responsibilities for selected field operations at the Abraham Staats House in Bound Brook, NJ. Participation in:
  • survey and excavation
  • stratigraphic and artifact analysis

2002  Field Assistant
Drew University Archaeological Field School in Ecuador

Worked at multiple sites in the Los Congrejitos area. Participation in:
  • survey and excavation
  • stratigraphic and artifact analysis
  • field photography
  • artifact processing and analysis

2001  Drew University International Seminar in Eritrea

CURRENT CERTIFICATIONS

HAZWOPER 40 Hour Certification
HAZWOPER 8 Hour Confined Space Entrant Certification
NJ DEP SHPO 7 Hour CRM Essentials Training Program

CURRENT AFFILIATIONS

Archaeological Society of New Jersey (ASNJ)
Appendix D

NEW JERSEY HISTORIC PRESERVATION OFFICE
BIBLIOGRAPHIC ABSTRACT
APPENDIX D
New Jersey Historic Preservation Office
Bibliographic Abstract

HUNTER RESEARCH, INC.

Location: Mountain Lakes Preserve, Princeton Township, Mercer County, NJ

Drainage Basin: Millstone River

U.S.G.S. Quadrangle: Princeton, N.J.

Project: Archaeological Investigations and Monitoring
         Mountain Lakes Dam Rehabilitation and Dredging
         Princeton Township, Mercer County, New Jersey

Level of Survey: III

Cultural Resources: Princeton Ice Company Historic District
Appendix E

PROJECT ADMINISTRATIVE DATA
APPENDIX E
Project Administrative Data

HUNTER RESEARCH, INC.
PROJECT SUMMARY

Project Name: Archaeological Investigations and Monitoring Mountain Lakes Dam Rehabilitation and Dredging Princeton Township, Mercer County, New Jersey

Level of Survey: III
HRI Project Reference: 09008
Date of Report: August 2012 (Revised January 2013)
Client: Township of Princeton
Prime: 
Review Agency: New Jersey Historic Preservation Office
Agency Reference: 
Artifacts/Records Deposited: 

PROJECT CHRONOLOGY

Date of Contract Award: 3/23/2009
Notice to Proceed: 3/23/2009
Background Research: n/a
Fieldwork: July 2010-October 2011
Analysis: July 2010-November 2011
Report Written: April-August 2012

PROJECT PERSONNEL

Principal Investigator(s): Richard Hunter, James Lee
Background Researcher(s): Patrick Harshbarger
Field Supervisor(s): Joshua Butchko
Field Assistant(s): Andrew Martin, Eric Woodruff
Analyst(s): Joshua Butchko
Draftperson(s): Katie Rettinger
Report Author(s): James Lee, Joshua Butchko