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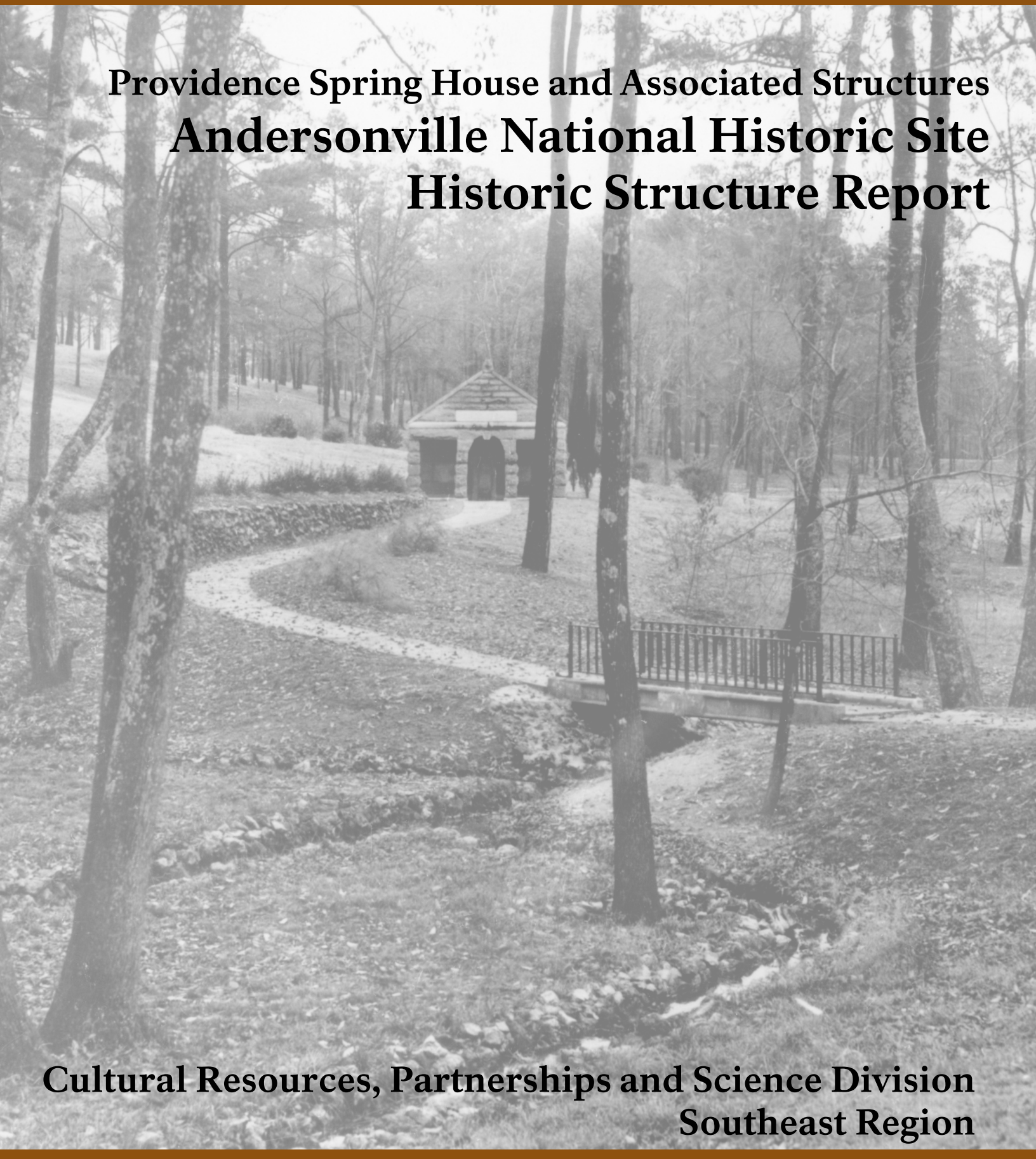
Andersonville, Georgia



Providence Spring House and Associated Structures
Andersonville National Historic Site
Historic Structure Report

Cultural Resources, Partnerships and Science Division
Southeast Region

Andersonville National Historic Site

Providence Spring House and Associated Structures Historic Structure Report

July 2022

Prepared by:
WLA Studio

Under the direction of
National Park Service
Interior Region 2, South Atlantic - Gulf
Cultural Resources, Partnerships and Science Division

The report presented here exists in two formats. A printed version is available for study at the park, the Interior Region 2 office of the National Park Service, and at a variety of other repositories. For more widespread access, this report also exists in a web-based format through ParkNet, the website of the National Park Service. Please visit www.nps.gov for more information.

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About the cover: 1936 photograph of Providence Spring House (Source: Open Parks Network)

Andersonville National Historic Site

Providence Spring House and Associated Structures Historic Structure Report

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Table of Contents

Foreword xvii

Project Team xix

Management Summary 1

Purpose and Scope 1
Historical Overview 4
Statement of Significance 6
National Register Significance 7
Cultural Resource Management 10
Project Methodology 10
Project Initiation 10
Building Materials Conservation Consultation 11
Historical Research and Subsequent Site Investigation 11
Summary of Findings 12
Recommended Treatment and Use 13
Administrative Data 14
Locational Data 14
Real Property Information 14
Cultural Resource Data 14
Size Information 14
Proposed Treatment 14
Related NPS Studies 14

1.A Historical Background & Context 15

Introduction 15
Andersonville National Historic Site 15
The Prison's Only Water Source Becomes Polluted 15
A Fresh Water Source, Providence Spring, Emerges 17
Providence Spring After the Civil War 19
Commemoration and the Role of Veterans' Organizations 21
The Former Prison Site Changes Hands 23
The WRC's National Influence 24
The WRC Takes Charge 25
The WRC Erects Providence Spring House 26
The Success of the WRC 32
Architectural Context: Providence Spring House Pavilion 34
Romanesque Revival in Georgia 35
Springhouse Pavilions 36

Design-Builders Miller & Clark 40
National Register Eligibility – Criterion C for Architecture 42
United States Army Ownership 43
Civilian Conservation Corps Additions 49
United States Army Administration, Post CCC Involvement 50
Andersonville National Historic Site 54

1.B Chronology of Development & Use 61

Introduction 61
Early Land Use and the Civil War 61
The Post War Era (1865-1890) 62
Grand Army of the Republic Developments (1891-1896) 63
The Women's Relief Corps Administration (1896-1910) 64
United States Army Administration (1910-1934) 66
The Civilian Conservation Corps at Andersonville (1934-1937) 66
United States Army Administration Post-CCC (1937-1970) 69
National Park Service Administration (1970-present) 72

Timeline of Human Activity at Andersonville 76

1.C Physical Description and Existing Conditions 83

General Description 83
Memorial Landscape of Andersonville National Historic Site 83
Site Features 84
Resilience to Natural Hazards 90
Architectural Description 91
Construction Characteristics 104
Character-Defining Features 120
Site-Wide Character 120
Architectural Form, Features, and Materials 121
Summary of Existing Conditions 122
Providence Spring House – Conditions 122
Lower Fountain 126
Brick Runnel and Reflecting Pool 129
Swales 130
Subterranean Site Features 131
Circulation Features 131
Retaining Walls 132
Vegetation 133
Small-Scale Features 133

Treatment and Use 135

Introduction 135

Requirements for Treatment 136
Ultimate Treatment and Use 136
Recommendations for Preservation by Feature 137
Providence Spring House 137
Treatment Alternatives to Address Advanced Deterioration of the Interior Fountain 140
Lower Fountain 142
Brick Runnel and Reflecting Pool 142
Swales 143
Subterranean Site Features 143
Circulation Features 143
Retaining Walls 144
Vegetation 144
Recommended Use 147
Implementation Projects 147
Resilience to Natural Hazards and Climate Change 150

Bibliography 153

Appendix A: Project Correspondence, Memorandum, and Previous Drawings 151

Appendix B: Documentation Drawings 215

Appendix C: Resources for Treatment 251

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List of Figures

Cover. 1936 photograph of Providence Spring House ii

Management Summary 1

Figure M1. Map of Andersonville National Historic Site with site of Providence Spring House and associated structures indicated by the red arrow 2
Figure M2. Providence Spring House site. 3
Figure M3. Map indicating location of Andersonville National Historic Site 4

1.A Historical Background & Context 15

Figure A1. August 1864 illustration of Andersonville Prison at its most crowded 16
Figure A2. Undated illustration of the water course of Stockade Branch at Andersonville Prison 16
Figure A3. Undated illustration of Andersonville prisoners reaching over the deadline to scoop fresh water from Providence Spring 18
Figure A4. Tree stump and wooden curb around Providence Spring circa 1890s 19
Figure A5. Providence Spring covered in a small wooden shed 19
Figure A6. Decoration Day visitors at Providence Spring circa 1897 22
Figure A7. The GAR-built wooden structure covering Providence Spring circa 1899 23
Figure A8. Individuals gathered around Providence Spring House construction, circa 1900-1901 26
Figure A9. Professionally photographed Providence Spring House soon after construction, circa 1901 27
Figure A10. The marble fountain dedicated by an association of Union ex-prisoners of war, circa 1917; image not from the time of construction 27
Figure A11. The Providence Spring House with bracken, circa 1901-1907 27
Figure A12. The Providence Spring House circa 1907 with wooden sign visible in background 29
Figure A13. Postcard of the finished Providence Spring House with original fountain configuration visible, circa 1901 30
Figure A14. Cropped close-up of Spring House fountain as it appeared circa 1907 30
Figure A15. Engraving of Providence Spring House, circa 1907 31
Figure A16. Visitors to Providence Spring House on December 7, 1905 33
Figure A17. Hamilton Springs, Harrogate, TN, circa 2009 39
Figure A18. Rose Well House, Bloomington, IN, circa 2012 40
Figure A19. Circa 1910 postcard featuring Providence Spring House 43
Figure A20. "Existing Springhouse" blueprints, 1914 45
Figure A21. Plan and section views of proposed changes to the Spring House, circa 1914 46
Figure A22. Women drinking from a curved pipe that extends from the marble fountain 48
Figure A23. 1954 Image of fountain with removed pipe 48

Figure A24. The CCC-constructed Providence Spring parking area, with surrounding rubble wall, a retaining wall, and tour road 51
Figure A25. Postcard, circa 1938, depicting ornamental trees outside Spring House 51
Figure A26. This 1941 sketch accompanied the communication between Quartermasters..... 53
Figure A27. Providence Spring House and lower fountain landscape in 1948..... 53
Figure A28. Photograph, circa mid-1950s, showing the trees flanking the Spring House entrance 54
Figure A29. Lower fountain faucet close-up taken from 1960 photograph 55
Figure A30. Lower fountain close-up from 1980s French drain installation project documentation..... 55
Figure A31. Lower fountain close-up from March 2016 55
Figure A32. The CCC-constructed swale that was partially filled by staff during reconstruction of the north gate 59

1.B Chronology of Development & Use 61

Figure B1. A sign mounted to Providence Spring's tree stump, 1893..... 63
Figure B2. WRC Period Plan 65
Figure B3. An image taken post-CCC additions to the landscape that does not appear to show the walk or stairs associated with the lower fountain, circa 1937 67
Figure B4. Photographs comparing the parking area as it appeared soon after construction by the CCC circa 1937 (top) and with the addition of the metal barrier circa 1980s (bottom) 68
Figure B5. CCC Period Plan 69
Figure B6. U. S. Army Period Plan. 71
Figure B7. "Stockade" and "Deadline" printed on small signs affixed to concrete posts, circa 1950s 73
Figure B8. NPS Period Plan 75

1.C Physical Description 83

Figure C1. View of the west side of the Andersonville Memorial Landscape facing north from the hilltop south of Providence Spring House site..... 83
Figure C2. View of the valley of Stockade Branch east of Providence Spring House facing northwest from the east side of the former stockade line..... 83
Figure C3. The Providence Spring House and its associated features are situated on the hillside north of Stockade Branch 84
Figure C4. View of Providence Spring House site from the north approximately halfway up the surrounding hillside; photographer facing southeast..... 84
Figure C5. View of the boggy area that drains into the south swale; photographer facing northwest from south side of swale..... 85
Figure C6. South swale; photographer facing east..... 85
Figure C7. East swale; photographer facing south 86
Figure C8. Brick swale; photographer facing southeast 86

Figure C9. Diagram of theoretical groundwater seepage at the Providence Spring House site; rendered by WLA Studio, 2021 87
Figure C10. Providence Spring House parking lot accessible from Prison Site Road; photographer facing north from top of hill near southwest corner of the former prison stockade. 87
Figure C11. Concrete walkway connecting parking lot and Providence Spring House and lower fountain area; photographer facing east 88
Figure C12. Concrete stairs and walkway south of Spring House; photographer facing north 88
Figure C13. View approaching the Providence Spring House along the main pedestrian access route, which runs adjacent to a curvilinear rubble-stone retaining wall; photographer facing east. 88
Figure C14. View of the primary focal points of the Providence Spring House site (from upper left to lower right) Providence Spring House, the lower fountain and patio, and the brick runnel and reflecting pool; photographer facing northeast 89
Figure C15. View of the three sugar maple trees planted by NPS in 2018; photographer facing east 90
Figure C16. West (front) façade of Providence Spring House; photographer facing east 92
Figure C17. North façade of Providence Spring House; photographer facing south 92
Figure C18. East (rear) façade of Providence Spring House; photographer facing west 92
Figure C19. South façade of Providence Spring House; photographer north 92
Figure C20. South and west façades of Providence Spring House; photographer facing northeast 92
Figure C21. North and west façades of Providence Spring House; photographer facing southeast 92
Figure C22. Detail views of the carved stone final that adorns the top of the Spring House's front wall; photographer facing east in left photograph and south in right photograph. 93
Figure C23. Interior view of entry stair at front of Providence Spring House; photographer facing west 93
Figure C24. View of interior north wall and Providence Spring House floor; photographer facing north 93
Figure C25. View of the interior rear wall of Providence Spring House with fountain and flanking engraved tablets; photographer facing east 94
Figure C26. View of interior south wall and floor of Providence Spring House; photographer facing south 94
Figure C27. View of lower fountain, patio, and retaining walls looking north 95
Figure C28. View of west side of lower fountain, patio, and retaining walls facing east from adjacent concrete walkway 95
Figure C29. View of south façade of lower fountain basin and concrete base; photographer facing north 95
Figure C30. View of lower fountain basin and outlet; note how the retaining wall forms a part of the basin; photographer facing north 95
Figure C31. View of the brick runnel and reflecting pool; photographer facing north 96
Figure C32. Top section of the brick runnel with semicircular basin at the head and two circular basins below; photographer facing east 96

Figure C33. Upper portion of brick runnel and reflecting pool; photographer facing north 96
Figure C34. Two views of upper cistern top with door open; photographer facing south 97
Figure C35. Two views of lower cistern top; photographer facing north 97
Figure C36. The main water vault with concrete cap, located at the rear of the Spring House; photographer facing southwest 98
Figure C37. Interior of main water vault; photograph oriented with west up 99
Figure C38. View of the main pedestrian walkway connecting the parking lot to the Spring House; photographer facing east from parking lot 100
Figure C39. South façade of the concrete footbridge; photographer facing north 100
Figure C40. The lower fountain is accessible via two sets of concrete steps south of the Spring House; photographer facing northwest from southeast of the lower fountain 101
Figure C41. There are no formal pedestrian circulation features in the south portion of the site; therefore, circulation is informal in this area and occurs on the turf grass; photographer facing north 101
Figure C42. View of the south end of the rubble-stone retaining wall at the Providence Spring House parking lot; photographer facing north 102
Figure C43. View of the north end of the rubble-stone retaining wall at the Providence Spring House parking lot; photographer facing west 102
Figure C44. This curvilinear, rubble-stone retaining wall supports the soil adjacent to the main concrete walkway to the Spring House; photographer facing west from the east end of the wall 102
Figure C45. This series of concrete retaining walls support the terraced area where the lower fountain and patio are located; photographer facing north 102
Figure C46. There are three waysides at the Providence Spring House site, all of which are located adjacent to the main concrete walkway (from left to right) at the parking lot, at the west end of the rubble-stone retaining wall, and at the Spring House 103
Figure C47. These engraved marble tablets are inset into the interior face of the rear wall of the Spring House on either side of the central fountain; photographer facing east 103
Figure C48. (Left) This metal land survey marker is attached to the south concrete cheek wall of the Spring House entry stair. (Right) This ½" bored hole in the concrete retaining wall west of the lower fountain likely once held an additional metal survey marker 104
Figure C49. These two waste receptacles are located at the west end of the main concrete walkway near the parking lot; photographer facing northeast 104
Figure C50. Two signs located adjacent to the main concrete walkway to the Spring House warn visitors that the spring water is non-potable; photographer facing southeast 104
Figure C51. This sign at the southeast boundary of the site warns visitors of the common presence of venomous snakes in the area; photographer facing east 104
Figure C52. The lower portions of the Spring House's walls are situated below grade and rest on a stone foundation not visible in this photograph; likewise, the foundation of the ceramic-tile floor is also not visible; photographer facing east 105
Figure C53. The Providence Spring House's front and side walls are formed by vertical piers of granite blocks resting directly on the building's marble water table; photographer facing northwest looking at the base of the south wall 106

Figure C54. Detail view of the beaded mortar joints on the north end of the rear wall of the Providence Spring House, representative of all exposed exterior mortar joints of the building; photographer facing west 106
Figure C55. Eight of the Providence Spring House's nine open bays are formed by flat granite lintel stones; the center bay of the front wall (right) has a carved lintel with decorative faux mortar 107
Figure C56. The interior surface of both the Providence Spring House's gables have a coat of masonry stucco; note that the front central lintel stone (left photograph) does not include faux beaded mortar like on its' outside face; note the absence of stucco coating on the bottom-center stone of the rear gable (right photograph) 107
Figure C57. View of north side of the Providence Spring House's slate-tile roof; photographer facing southeast 107
Figure C58. Interior view of front gable and roof structure of Providence Spring House; photographer facing west 108
Figure C59. Interior view of south side of Providence Spring House roof structure; photographer facing south 108
Figure C60. Detail view of rafter ends resting directly on marble top plate/cornice course; photographer facing west 108
Figure C61. Detail of marble cornice, bull-nose trim, rake, drip edge, and roof overhang; photographer facing west at southeast corner of Providence Spring House 108
Figure C62. The floor gutters on the perimeter of the Providence Spring House interior transfer any water collected inside of the building to one of two drain outlets located below the finished floor level on either side (north and south) of the fountain; photographer facing east at southeast corner of the building 109
Figure C63. The Providence Spring House's interior fountain includes a blue marble base, brown granite main basin, and white marble tablet; photographer facing east 109
Figure C64. The marble tablet component of the Providence Spring House's interior fountain is attached to the rear wall of the building with three iron pins; the arrows indicate the location of the pins in the left photograph. The right photograph is of the pin at the top of the tablet 110
Figure C65. Spring water cascades from an outlet in the lower portion of the marble tablet into the granite basin below; photographer facing east 110
Figure C66. Detail view of the fountain's supply outlet with copper ring, the PVC drain pipe, and existing condition of lower portion of the marble tablet; the dashed line outlines what is suspected to be the former shape of an upper basin; the blue arrows indicate where water may have once cascaded out of the upper basin 110
Figure C67. Diagram indicating components of the lower fountain; photographer facing northeast 111
Figure C68. Excerpt of the 1986 NPS measured drawing set; these are the only known historic measured drawings of the two on-site cisterns 112
Figure C69. View from the open top of the upper cistern; photograph oriented with north up; note the PVC outlet pipe visible near the cistern's bottom 113
Figure C70. Interior views of the lower cistern; photographs oriented north at top 113

Figure C71. Upper concrete stair set with retaining walls; photographer facing north 114
Figure C72. Lower concrete stair set with adjacent retaining wall to the north; photographer facing west 114
Figure C73. View of south side of the concrete footbridge; photographer facing north 115
Figure C74. The red arrow indicates the concrete footing at west side of footbridge 115
Figure C75. South end of stone retaining wall in parking lot 116
Figure C76. Cheek wall on south side of main concrete walkway; photographer facing southeast 116
Figure C77. View of the north portion of east wall at the parking lot; photographer facing northeast 116
Figure C78. View of the west portion of the retaining wall at the parking lot; photographer facing south 117
Figure C79. Two views of the uncoursed stonework of the retaining wall north of the Providence Spring House walkway; photographer facing northeast in left photograph and north in right 117
Figure C80. View of the brick swale from east of the Spring House; photographer facing west ... 118
Figure C81. View of earthen swales of the Providence Spring House Site; photographer facing southeast 118
Figure C82. South earthen swale at Providence Spring House site; note the moderately-steep and short banks; photographer facing east 119
Figure C83. View of excavated French drain at north foundation of Providence Spring House during repair work performed on December 3rd, 2020; red arrow indicates the clean-out fitting 119
Figure C84. A French drain carries water from the west end of the rubble-stone retaining wall to an earthen swale north of the concrete footbridge; dashed line indicates approximate location of perforated pipe; photographer facing east 119
Figure C85. Mortar repair and graffiti are low-level concerns for the Spring House 123
Figure C86. Soiling caused by backsplash at and above the building's water table is most obvious at mortar joints 123
Figure C87. Air gaps behind the rake molding and drip edge trim allow animals and insects to infiltrate the exterior envelope and occupy the cavity above the building's cornice; evidence of bats and wasps utilizing the space was noted during field visits..... 123
Figure C88. View of cracked corner of marble water-table stone at southwest interior corner of the Providence Spring House; photographer facing west 124
Figure C89. Failing mortar with cracks on interior of the Providence Spring House's south wall; photographer facing south 124
Figure C90. Efflorescence and evidence of moisture retention is most pronounced on the interior of the north (in view above) and east walls of the Providence Spiring House; photographer facing north 124
Figure C91. View of biological growth, efflorescence, and moisture retention at interior northeast corner of Providence Spring House; water is actively flowing through the floor gutter in this photograph as indicated 125

Figure C92. Biological growth and evidence of chemical erosion and material loss are visible at the lower end of the fountain tablet 125
Figure C93. The marble tablet has several minor cracks, with those at the vertical center (indicated with red arrow) being the most pronounced 126
Figure C94. Hairline cracks are visible at the carved dove near the base of marble tablet 126
Figure C95. View of north side of the fountain base; note evidence of moisture retention and localized failing mortar as indicated by the red arrows 127
Figure C96. View of lower fountain with conditions markup based on field notes from December 3rd, 2020; dashed blue line indicates area with most extensive moisture retention; red arrows indicate cracks and failing joint compound 127
Figure C97. Point of localized soil erosion occurring under the southwest corner of the lower fountain's concrete patio 128
Figure C98. Efflorescence and evidence of moisture retention and failing mortar are visible on all three sides of the fountain but are most significant on the west and south sides below the top granite course; the red arrows indicate where water actively leaks from the basin through failing exterior mortar joints 128
Figure C99. View of biological growth and evidence of moisture retention in the fountain basin. 128
Figure C100. Left: view of unlevel soil surrounding the brick runnel and reflecting pool. Right: the unlevel areas are most obvious surrounding the top portion of the runnel, at the three small pools 129
Figure C101. Failing mortar and biological growth are present almost everywhere that spring water comes in contact with surfaces of the brick runnel and reflecting pool 129
Figure C102. In addition to the presence of biological growth and localized areas with failing mortar, at least one brick in the spill way below the reflecting pool has become dislodged 129
Figure C103. Sediment in the ground water that enters the reflecting pool collects near the pour-over from the runnel and the outlet of a PVC drain at the northwest corner. This photograph was taken during excavation of the French drain at the north foundation of the Spring House (December 3rd, 2020) and shows a higher-than-normal amount of sediment entering the pool 130
Figure C104. Typical amount of sediment at the northwest corner of the reflecting pool 130
Figure C105. Two views of vegetation in the deepest portion of the brick swale; photographer facing southeast for both photographs 131
Figure C106. Soil erosion on the bank of the earthen swale adjacent to the concrete footbridge has resulted in undermining of the concrete walkway; the extensive erosion is at the southwest corner of the bridge as indicated by the red arrow 131
Figure C107. A thin layer of stucco on the top side of the north portion of the parking lot's retaining wall is failing in many places; photographer facing west 132
Figure C108. View of the northwest corner of the parking lot retaining wall; note the historic mortar and different sizes of stone remain intact and exposed without a stucco coating or presence of Portland-rich cement repairs 132
Figure C109. View of the south end of the parking lot retaining wall with a thin layer of stucco and areas that have been repointed with Portland-rich cement 133

Figure C110. View of crack in concrete retaining wall on north side of the stairs leading from the main concrete walkway down to the lower fountain patio; photographer facing east 133

Treatment and Use 135

Figure D1. Historic photograph of Providence Spring House's Southeast corner, showing the ground plane's historic location, two-and-a-half to three granite courses below the level of the marble course 143

Foreword

We are pleased to make available this historic structure report, part of our ongoing effort to provide comprehensive documentation for the landscapes and historic structures of National Park Service units in Interior Region 2. A number of individuals and institutions contributed to the successful completion of this work. We would particularly like to thank the staff at Andersonville National Historic Site for their assistance throughout the process. We hope this study will be a useful tool for park management in continuing efforts to preserve the historic structure and to others interested in the significance of the park's many cultural resources.

Barbara Judy, Program Manager

Park Historic Architecture and Cultural Landscapes Stewardship

National Park Service

Interior Region 2, South Atlantic - Gulf

April 2022

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Management Summary

Purpose and Scope

This Historic Structure Report (HSR) documents the development, use, and current condition of the Providence Spring House and associated structures located on the west edge of the Prison Site at Andersonville National Historic Site (ANDE) (Figure M1 and Figure M2) in Andersonville, Georgia (Figure M3). Included in the study are: the Providence Spring House with interior marble fountain, two brick cisterns and their piping, the lower stone fountain with base and concrete patio, a brick runnel and reflecting pool, circulation features, retaining walls, drainage features, natural systems and features, and vegetation. The HSR examines options for potential treatment and use of the building and structures. The National Park Service (NPS) will use this report to inform and guide its stewardship of the historic resources.

The HSR includes two parts, Part I: Developmental History and Part II: Treatment and Use. Part I includes three sections that describe the historical background and context for the structures, the site's chronology of development and use, and the existing conditions.

The Ultimate Treatment and Use chapter is divided into several sections that present the recommended ultimate treatment and use for the resource, evaluate alternative treatment options, and outline the requirements for treatment.

A bibliography follows Part II. The appendices follow the bibliography. Appendix A contains historic drawings and documents referenced in Parts I and II. Appendix B contains scaled documentation drawings of the existing site and structures. Appendix C contains resources for treatment.

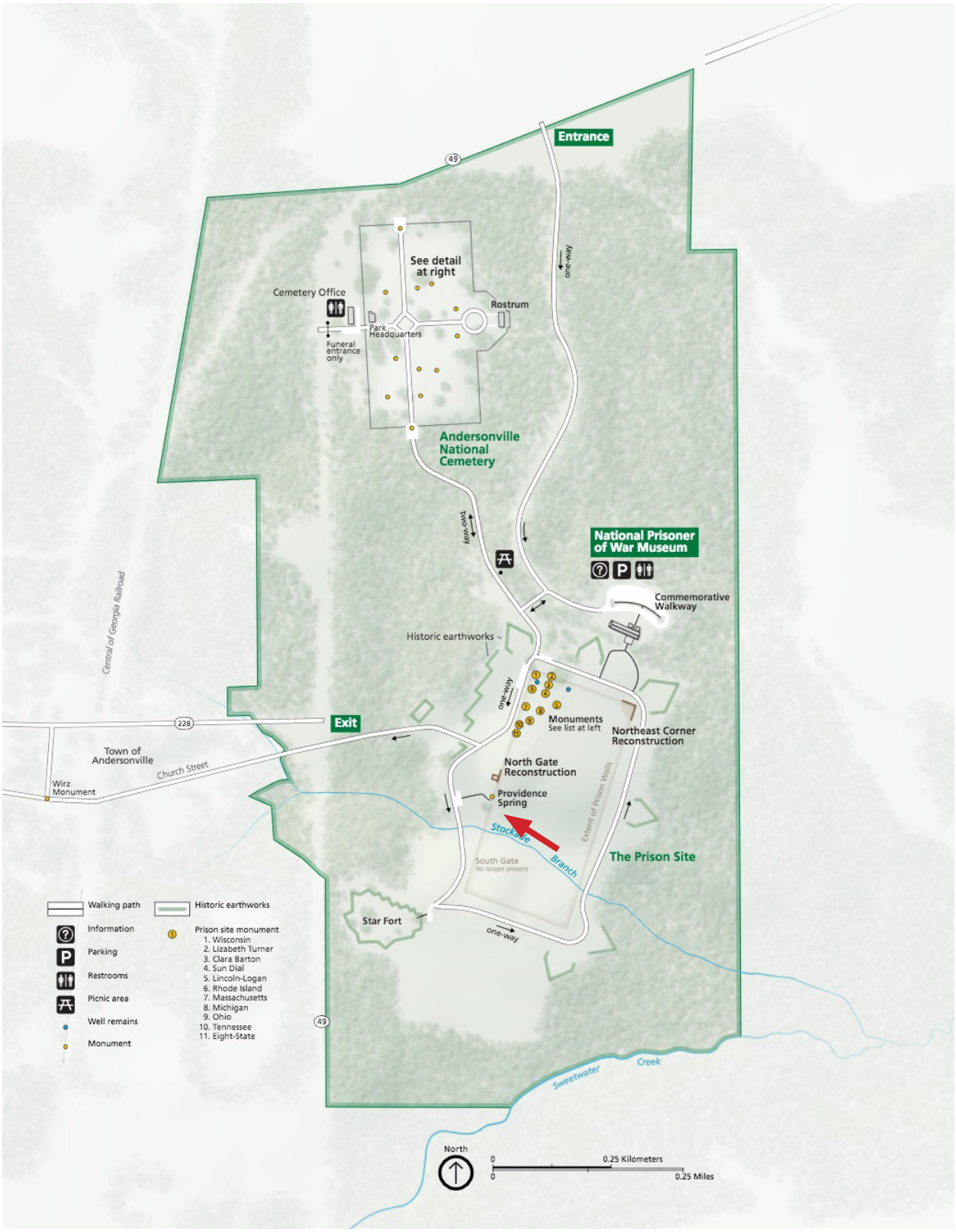

Figure M1. Map of Andersonville National Historic Site with site of Providence Spring House and associated structures indicated by the red arrow (Source: NPS Harpers Ferry Center, NPS, 2014).

Figure M2. Providence Spring House site (Source: WLA Studio, 2021).

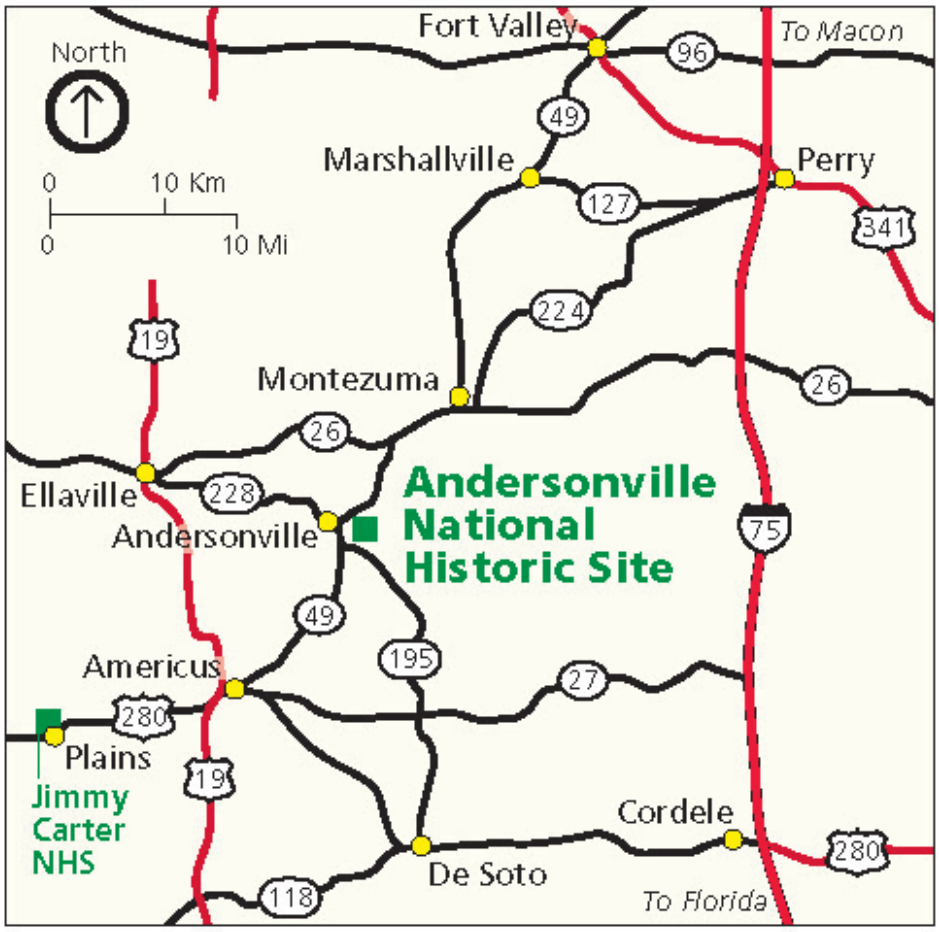

Figure M3. Map indicating location of Andersonville National Historic Site (Source: Harpers Ferry Center, NPS, 2010).

Historical Overview

In late December 1863, Confederate Captain W. Sidney Winder selected a site in Sumter County (now Macon County), Georgia, to hold captured Union prisoners of war. Known formally as Camp Sumter, the prison camp was established near Andersonville in January of 1864. The first five hundred prisoners arrived in late February of that year. The prisoners were initially housed in an approximately 16-acre, unfinished stockade. Prison population increased rapidly during the summer to exceed twenty thousand men by June and thirty-three thousand men by August. By the beginning of June, the Confederate Army had begun expanding the stockade significantly to provide much-needed space. A single stream, which became known as Stockade Branch, ran through the stockade and provided the only source of drinking water. Overcrowding, combined with the fact that the stream passed through a Confederate camp site and bakehouse prior to entering the stockade, resulted in pollution of the prisons' lone source of drinking water. Ultimately, the contaminated water, contagious diseases, inadequate hospital facilities, exposure, poor sanitation, short and deficient rations, and overcrowding led to illness and death of thousands of prisoners. The heat of the summer in 1864, a notable drought year in Georgia, exacerbated the inadequacy of Stockade Branch and profoundly impacted the prisoners' health.

Although precise details vary, Providence Spring, as it came to be known, appeared during a violent storm in August 1864. As its name suggests, the spring appeared at a time when the prison's only water source had become unbearably polluted and unsafe and the human population was in desperate need. As the large storm swept through the camp, a portion of the northern stockade wall collapsed under pressure from the swelling of Stockade Branch. Near the collapsed portion of the stockade wall, Providence Spring appeared.

In September, the Confederates moved many of the healthiest prisoners to other sites in the region hoping to avoid attack by Union General William T. Sherman, who had recently occupied Atlanta. After Sherman's March to the Sea ended in December 1864, however, the prison's population increased again. By the end of the year, there were approximately five thousand prisoners held on the site, and the population remained steady through the end of the war. The last known prisoner death at Camp Sumter occurred on April 28, 1865. Less than two weeks later, the last twenty-two Union prisoners held at Andersonville were released.[1]

Following the war, the United States established Andersonville National Cemetery to the north of the prison camp site, where many of those who died as prisoners were buried. By 1875, the United States had acquired the prison and burial ground. During the late 19th century, the U. S. War Department built a few buildings and structures in the vicinity to support the needs of maintenance and administrative personnel for cemetery operations. By the 1880s, the prison site had become overgrown, except in limited areas that were under cultivation; and the stockade had all but completely fallen.[2]

In 1891, the Grand Army of the Republic (GAR), a national Union Army veterans' organization, acquired a 73.5-acre tract of land including a significant portion of the prison stockade. Over the course of five years, the GAR made various improvements to rehabilitate the former prison site into a memorial park. The rehabilitation included clearing of undergrowth while retaining larger trees, grading of a roadway along the property's perimeter, constructing two bridges, channelizing Stockade Branch, and creating a central paved avenue to form a formal entrance to the site. The entrance avenue connected to the site of Providence Spring, which was a particularly significant point of interest for those who visited the former prison camp and associated cemetery.[3]

In 1896, the GAR gifted the property to the National Woman's Relief Corps (WRC), an affiliated organization comprised of patriotic women concerned about honoring war veterans. The following year, the WRC purchased the remaining 14.5 acres that made up the full extent of the former prison camp. Between 1897 and 1910, the WRC continued development of the prison park by enclosing the property with a wire fence; constructing an entrance gate, caretaker's residence, and stable; establishing a lawn of Bermuda grass (*Cynodon dactylon*) in the former stockade area; and erecting a number of memorial features on the site—including the granite pavilion known as the Providence Spring House.[4]

Workers commissioned by the WRC completed construction of the Providence Spring House in 1901. The modest granite structure with a front-gabled slate roof sits partially below grade and engages directly with the flow of Providence Spring and groundwater in the vicinity. While the structure has functional infrastructure--pipes conveying water, drains and valves connected to the fountain-- the Providence Spring House is primarily a commemorative structure. Although various alterations have been made since its original construction, the Providence Spring House has served as a landmark for those visiting Andersonville since its construction.

In 1910, the WRC donated the prison site and all commemorative features to the United States Army. Under the direction of the Quartermaster Department of the United States Army, two Civilian Conservation Corp (CCC) camps occupied and made major improvements to the cemetery and Prison Park at Andersonville during the 1930s. Company 1411 occupied the site from September 1934 to December 1935, and Company 4455 from January 1936 to January 1937. In the roughly two and a half years of CCC occupation, the workers improved the park road system, constructed a new entrance gate, built stone fences and vehicular bridges, erected stone marker posts indicating the former stockade and deadline, and developed new pathways, landscaping, and erosion

1. John L. Maile, *Prison Life in Andersonville With Special Reference to the Opening of Providence Spring*, E book (Los Angeles, California: Grafton Publishing Company, 1912), 79, https://www.gutenberg.org/files/39584/39584-h/39584-h.htm; William Marvel, *Andersonville: The Last Depot* (Chapel Hill, NC: University of North Carolina Press, 1994), 240; National Park Service, *Andersonville National Historic Site Historic Resource Study* (Southeast Regional Office, National Park Service, 2018), 7–8.
2. James P. Averill, "Andersonville Prison Park. Report of Its Purchase and Improvement," n.d., 10.
3. Ibid.
4. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 9.

control ditches.[5] At the Providence Spring House site, CCC workers installed new clay tile flooring, placed a slate roof on the Providence Spring House, added cisterns, built a dedicated parking area for visitors to the Providence Spring House, erected freestanding and retaining rubble walls, paved the access trail to the spring, constructed a bridge along the trail, added a stone and brick drainage feature north of the Providence Spring House, and constructed a series of brick-edged drains and pools forming a runnel feature to the south of the Providence Spring House.

During the 1940s, after the period of CCC occupation, the U. S. War Department made other improvements to the Providence Spring House site, including new underground piping to redirect groundwater flow, and construction of a fountain north of the brick runnel.[6]

For more than seventy years after the construction of the Providence Spring House, the Providence Spring site featured ornamental vegetation such as hedges and specimen trees. During that period, the surrounding site was a part of a successional forested environment.

In 1970, the NPS acquired Andersonville National Cemetery and the nearby site of the historic prison, commonly referred to by many as "Prison Park," and formally established Andersonville National Historic Site (ANDE). For the first decade of NPS ownership, the park maintained the various ornamental landscape features on site. During the 1980s, however, park management began the process of rehabilitating the prison-site landscape at Andersonville. To accomplish this, staff cleared nearly all of the vegetation at the former prison camp, including the areas surrounding the Providence Spring House and Stockade Branch. The rehabilitation of the prison camp area resulted in major changes to the functions of site runoff and created various new views and vistas. Alongside the larger prison camp restoration, the NPS removed much of the ornamental vegetation at the Providence Spring House site and performed various repairs and alterations to subsurface water runoff features directly related to the flow of groundwater associated with the Providence Spring House, lower fountain, and brick runnel and reflecting pool.

The Providence Spring House and the associated fountain, runnel, reflecting pool, underground and aboveground water management infrastructure, site circulation features, retaining walls, and vegetation at the site are significant resources of the park, and the NPS manages them as such.

Statement of Significance

Andersonville National Cemetery and the former "Prison Park," including the Providence Spring House site, were listed in the National Register of Historic Places (NRHP) on October 16, 1970 when ANDE was established. On November 27, 1978, the Keeper of the National Register accepted a National Register nomination form for Andersonville National Cemetery and Andersonville Prison Park, which documented additional information for the resources within the park's boundaries, including the Providence Spring House and associated features discussed in this HSR.

The 1978 National Register nomination form lists Providence Spring House as structure #107 and includes the following description:

> A stone structure approximately 15' x 15' constructed in 1900 at the site of a natural spring in the prison site. The structure has no historical significance however, the spring itself does. The structure has undergone no structural changes. Significance: Third order. Recommended Treatment: Preservation.[7]

5. National Park Service, "Andersonville: Preserving the Prison; Saving a Nation. The Civilian Conservation Corps at Andersonville." (National Park Service, May 2012).
6. William Coates, "Repairs to Providence Spring-Prison Park," April 11, 1941, National Archives; C.D. Edmondson, "Attention Invited to Communication from the Superintendent of Andersonville National Cemetery with Reference to the Discovery of What Is Believed to Be the Original 'Providence Spring.,'" April 16, 1941, National Archives.
7. Staff of Andersonville National Historic Site, "National Register Nomination for Andersonville National Cemetery and Andersonville Prison Park" (National Register of Historic Places Inventory/Nomination Form, November 27, 1978), Section 7, Continuation Sheet Page 3.

Despite the statement that the Providence Spring House itself is not a significant structure, the nomination's Statement of Significance includes the following language:

> Andersonville National Historic Site was created to provide an understanding of the overall Prisoner of War story in the Civil War, to interpret the role of Prisoner of War camps in history and commemorate the sacrifice of Americans who lost their lives in such camps. . . . To the National Park Service and to the country [Andersonville National Historic Site] has become a place to memorialize all prisoners of war throughout our country's history.[8]

Therefore, Providence Spring House is a significant commemorative resource in the designed public memorial landscape of ANDE. The Providence Spring House and associated features commemorate the emergence of a spring that appeared within the deadline of Andersonville Prison during the height of summer when the prisons' lone source of drinking water had become polluted and unsafe. In 1901, when the WRC commissioned the construction of the partially sunken granite pavilion, they initiated a period of time during which commemoration became the principal land use at the site. At the time of the Providence Spring House's construction, other site features were added to support such use, including a granite block retaining wall north of the pavilion, a circular spring-supplied cistern, and the carved marble fountain within the pavilion. The National Association of Union Ex-Prisoners of War, also a veteran's group, funded the addition of the interior marble fountain.

Several organizations have owned and maintained the Providence Spring House site since 1901, and each has altered the site in specific ways—adding and changing physical aspects such as circulation features, retaining walls, swales, French drains, commemorative constructed features, and vegetation. Despite such alterations, the site has remained, in general, a public commemorative landscape. As such, the earliest constructed features and many of the altered and/or added features contribute to the overall significance in association with its use as a commemorative site.

8. Staff of Andersonville National Historic Site, Section 8, Continuation Sheet Page 2.

The preserved features of the site are a rare and unique representation of a period in American history when patriotic organizations (like the WRC and others) as well as entities associated with the United States Federal Government (such as the CCC and War Department) focused efforts on honoring the memory of those who died during the Civil War, specifically at Andersonville Prison. The features added or altered by the CCC and the United States Army in the 1930s to 1960s contribute to the significance.

As a stand-alone building, the Providence Spring House pavilion is a significant architectural resource with distinctive characteristics of the Romanesque Revival style as interpreted by a regionally prominent designer-builder who specialized in Civil War monuments.[9]

The location of the spring's natural outflow has altered course several times since construction of the Providence Spring House in 1901, and there is evidence to suggest that the spring may continue to do so. To accommodate the flow of ground water at the spring site and preserve the functionality of the commemorative features of the site, the various site managers (WRC, United States Army, and the NPS) have made significant alterations both above and below ground. As new features such as cisterns, drain pipes, French drains, drainage ditches, retaining walls, and vegetation have been added and altered, some have achieved significance it their own right. Likewise, the features of the Providence Spring House site that enable visitor access and interpretation/education about the commemorative landscape of the prison site are potentially significant in association with the NPS's development of ANDE beginning in the 1970s.

National Register Significance

The National Register nomination form for ANDE does not include documentation of the Providence Spring House site's significance related to the historic contexts of commemoration or architectural history. The nomination does, however, describe the spring water itself as a significant historic resource. Three formal reports produced since 2010 by the NPS document the site's significance as it relates to commemoration

9. A discussion of the Providence Spring House's architectural significance within this context is included in *Part I.A Historical Background and Context* of this HSR.

at ANDE, including *Andersonville Memorial Landscape Cultural Landscape Inventory* (2010), *Andersonville National Historic Site Cultural Landscape Report* (2015), and *Andersonville National Historic Site Historic Resource Study* (2018). No formal reports produced prior to this HSR include documentation of the Providence Spring House's potential architectural significance.

Because the National Register nomination for ANDE inadequately documents the Providence Spring House site's significance as established in later documentation, the Ultimate Treatment and Use chapter of this HSR provides recommendations related to a future National Register amendment. Such an amendment will confirm the significant historic themes that apply to the Providence Spring House site and enable evaluation of its character-defining features and historic integrity.

National Register Criteria and Areas of Significance

Because the National Register nomination for ANDE does not expressly reference evaluation criteria, the HSR's analysis of the Providence Spring House site is based on guidance in *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. That document states that a property must possess significance under at least one of four criteria to be eligible for inclusion in the NRHP, detailed as follows:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> B. That are associated with the lives of persons significant in our past; or
>
> C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> D. That have yielded, or may be likely to yield, information important in prehistory or history.

While not specifically stated, the 1978 National Register nomination's narrative places Andersonville National Historic Site, including the features of the Providence Spring House site, within historic contexts associated with the Civil War, postwar commemoration, and activities of the CCC (Criterion A). It also establishes associations with individuals significant in our collective American past (Criterion B), the site's landscape architecture (Criterion C), and its known and anticipated potential for archeological resources relating to the prison's history (Criterion D). The defined areas of significance are military and social/humanitarian.

NPS-Determined Significance

Later NPS documentation is unanimous in its classification of the Providence Spring House and its associated landscape as significant under Criterion A for its association with events that made a significant contribution to the broad patterns of our nation's history.

Andersonville Memorial Landscape Cultural Landscape Inventory (2010 CLI), produced in 2010, is the earliest NPS report that suggests such significance. Likewise, the analysis and evaluation provided in *Andersonville National Historic Site Cultural Landscape Report,* produced in 2015 (2015 CLR), reflects the earlier CLI. These documents also formally differentiate the Providence Spring House site as a cohesive component landscape within ANDE—enabling the resources at the site to be analyzed more effectively in terms of significance and historic integrity.

Andersonville National Historic Site Historic Resource Study (2018 HRS), completed in 2018, states that ANDE is significant under Criterion A within the historic context of Civil War Commemoration and Interpretation (1861-2017). Regarding the Providence Spring House site, the HRS states that:

> Providence Spring Landscape retains a high degree of integrity as enhanced by the CCC and contributes to the significance of the park.[10]

10. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 178.

The HRS further explains that, as a historic military site, ANDE is a physical expression of the nation's collective memory and postwar reconciliation, with aspects of the park clearly conveying some of the earliest efforts to mark, commemorate, and honor the contributions of American military personnel while simultaneously serving as commemorative sites which mark, honor, and revere the contributions of the many groups and individuals that worked on their behalf.

The 2015 CLR states that,

> The primary land use associated with the Prison Site character area is commemoration while the secondary land use is interpretation/education/museum. Commemorative use of the site began with the preservation of the prison site and associated earthworks by the Grand Army of the Republic of Georgia, which managed the site beginning in 1891. Commemoration continued with the installation of the springhouse over Providence Spring and memorials in the northwest corner of the prison site that remain today.[11]

The report continues with a note that, although the National Register Nomination from 1978 does not include the Providence Spring House as a significantly contributing resource, park staff have commented that the Providence Spring House should be categorized as a "monument" within the prison site due to its memorial and commemorative purpose.[12]

The 2010 Andersonville National Historic Site Cultural Landscape Inventory describes the historical development and significance of the Providence Spring House site by placing it in the context of the larger memorial landscape at ANDE. The 2010 CLI lists the following features of the Providence Spring House site as contributing to the overall significance of ANDE within their respective landscape characteristics:

- Circulation—concrete walk to Providence Spring
- Buildings and Structures—Providence Spring House, the associated parking lot, and the footbridge
- Natural Systems and Features—Providence Spring
- Constructed Water Features—Providence Spring and the CCC-constructed earthen drainage swales

The 2010 CLI considers a period of significance of 1863-1941 and explains that the entirety of the Andersonville Memorial Landscape meets the criteria for Management Category A, "Must be Preserved and Maintained."[13]

The 2010 CLI proposes several additional areas of significance for the park, other than the two noted in the National Register nomination, including politics/government, commemoration, conservation, landscape architecture, and archeology.[14] The 2010 CLI states that the entirety of ANDE meets significance Criteria A and D for association with events significant to broad patterns of our history and as a cemetery. The document proposes that the park's significance be reviewed in terms of Criteria Consideration F because it is primarily a commemorative landscape.[15]

Likewise, the 2015 CLR also lists the site as significant under Criterion A, but provides a slightly more-defined historical association with efforts conducted to honor, memorialize, and commemorate the contributions of Union soldiers to the Civil War.[16] The 2015 CLR expressly states that significance is also derived from commemorative features, such as the monuments within the prison park (Providence Spring House and associated features included) and notes that the WRC continued the process of site interpretation and park development with the construction of the Providence Spring House.[17]

Regarding the spring's emergence, the geologic conditions that led to its initial appearance on the stockade line and use during the war potentially

11. National Park Service, "Andersonville National Historic Site Cultural Landscape Report" (National Park Service, Cultural Resources Division, Southeast Regional Office, 2015), 82.
12. Ibid., 160.
13. National Park Service, *Andersonville Memorial Landscape Cultural Landscape Inventory*, 2010, 17.
14. Ibid., 19.
15. Ibid., 23.
16. National Park Service, "Andersonville National Historic Site Cultural Landscape Report," 163.
17. Ibid.

contribute to its history of unpredictability. Because the spring emerged from various points during the period of significance, a definitive identification of the original spring location is impossible. The instability of Providence Spring further necessitates a revision of the status of the Providence Spring House and associated features by the NPS.

Period of Significance

The National Register nomination broadly defines the period of significance for ANDE as "1800-1899" and "1900—," per the nomination form in use at the time of the National Register nomination's submittal. The Providence Spring House was constructed during that stated period of significance, as were most associated features.

A future National Register Amendment addressing the Providence Spring House site specifically will confirm the appropriate period of significance for the site. This HSR recommends a period of significance to extend from construction of the Providence Spring House in 1901 to the end of the ownership by the United States Army in 1970.

Cultural Resource Management

The changes that have occurred at the Providence Spring House site primarily have been made to address how ground water is supplied to, and removed from, the series of fountains, runnel, and reflecting pool, as well as on the surface via various constructed and natural drainage features. The Management Category for the Providence Spring House site is "Must Be Preserved and Maintained" and the Ultimate Treatment is "Preservation," as characterized in *The Secretary of the Interior's Standards for Treatment of Historic Properties*.

According to the Scope of Work for this HSR, the Cultural Resources Inventory System (CRIS) record for Providence Spring House (HS-107; CRIS-ID 006104) states that it:

> Contributes to the national significance of the site under NR Criterion A because erected by the Woman's Relief Corps and the National Assoc. of Union Ex-Prisoners of War as part of the national effort to commemorate the Andersonville prisoners.

The following planning documents describe cultural resources within ANDE, including the Providence Spring House and the associated features. The documents provide plans for the park's management and preservation.

- General Management Plan, Development Concept Plan, Environmental Assessment, Andersonville National Historic Site, Georgia, NPS, June 1988.
- Resource Management Plan, Andersonville National Historic Site, NPS, 1993.
- Statement for Management and Basic Operations Statement, Andersonville National Historic Site, Andersonville, Georgia, NPS, 1993.
- Cultural Landscapes Inventory, Andersonville National Cemetery Component Landscape, Andersonville National Historic Site, NPS, 2010.
- Foundation Document, Andersonville National Historic Site, Georgia, NPS, 2014.
- Cultural Landscape Report, Andersonville National Historic Site, NPS, 2015.
- Historic Resource Study, Andersonville National Historic Site, NPS, 2018.

Project Methodology

The required level of historical research, building investigation, and documentation defined in the Scope of Work for this HSR included documentary research and building investigation in readily available published sources that are easily accessible and known to be of high yield; brief interviews of readily available persons; historical documentation; various studies; local and state historical societies and agencies; the National Archives; and the Library of Congress. Building investigation was directed to be non-destructive.

Project Initiation

Two members of the consulting team for the HSR, Keyes Williamson and Chris Jackson of WLA Studio, Athens, Georgia, performed an initial site visit in June 2020. Due to park restrictions related to the COVID-19 pandemic, a formal in-person kick-off meeting with park staff was not planned for 2020. The purpose of the initial site visit was to perform a reconnaissance survey of the Providence Spring House, associated constructed features,

and surroundings. WLA Studio's team met with Bridget Beers (ANDE Museum Curator) and James Taylor (ANDE Maintenance Supervisor) to discuss known chronology of the site's development and discuss issues associated with existing conditions.

Building documentation began with field measurements and drawings of the existing floor plan and elevations. Field notes about exterior and interior features, materials, and building construction were also made, and digital photographs were taken.

An additional purpose of the initial site visit was to investigate the presence of chemical erosion of certain stone and metal components of the inner fountain at the Providence Spring House and portions of other site features. The erosion is evident at several locations and appeared to be active at the time of the site visit. Marble components that have direct contact with the spring water exhibit the most extensive evidence of erosion. Prior to initiation of this HSR, park managers had begun the process of designing a filtration system that could reduce the rate of active erosion by raising the pH of the natural spring water. The park planned to engage with a team from the NPS Historic Preservation Training Center (HPTC) to install the filtration system in the Fall of 2020; however, the HSR project team agreed that the proposed project should be postponed until the HSR was complete and approved.

Two memoranda, dated June 11 and July 8, 2020 (Appendix A-2 and A-3 respectively), summarize WLA Studio's initial investigations of the Providence Spring House and site.

Building Materials Conservation Consultation

Following the initial site visit, WLA Studio provided field notes, photographs, and a description of the site features to a project subconsultant, Building Conservation Associates, Inc. (BCA) of Philadelphia, PA, and requested a detailed review of the conditions of the Providence Spring House. The scope of BCA's assessment involved evaluation of the current masonry issues identified by the park and WLA Studio and preliminary treatment recommendations. See Appendix A-4, BCA's report of findings and preliminary recommendations.

Historical Research and Subsequent Site Investigation

Due to closures of libraries and repositories during the COVID-19 pandemic, research was limited to online resources and those that could be retrieved with the help of staff archivists. Historic records that inform the HSR include those located at the archives at ANDE, the National Archives in Morrow, Georgia, the Historic Preservation Division of the Georgia Department of Community Affairs, and the Hargrett Special Collections Library at the University of Georgia. Additional repositories and organizations were contacted by telephone and/or email, including the National Archives in College Park, Maryland; the Georgia Archives in Morrow, Georgia; the NPS Southeast Regional Office Archives; the Ladies of the Grand Army of the Republic; and the Fitzgerald *Herald-Leader* newspaper office. Records accessed online included the National Register of Historic Places, the Digital Library of Georgia, and websites for the GAR, WRC, CCC Legacy, and Public Works Administration (PWA).

Chris Jackson of WLA Studio visited the Providence Spring House site a second time on December 2, 2020, during an HPTC work project to update the French drains around the structure. With the north side of the Providence Spring House exposed for repair of the French drains, the project team was able to inspect the north foundation. Additional site investigation focused on slope at various places around the building related to analysis of the flow of ground water. Digital photographs and field notes were collected to document exterior and interior features, materials, and building construction.

Summary of Findings

NPS archival research, field investigations, and personal interviews brought us to a clearer understanding of the evolution of the Providence Spring House, its associated features, and current condition. The Providence Spring House exterior appears much as it did when constructed in 1901. Alterations to the interior of the Providence Spring House were mostly confined to the floor, although these changes were made early in the lifespan of the Providence Spring House (between 1909 and 1914). The interior fountain has experienced the most visually dramatic transformation from construction, with significant loss of relief and features occurring on the marble tablet. Historic documentation suggests most of this deterioration was already in place by 1917.

Significant human interventions also shaped the evolution of the Providence Spring House's subterranean systems, mostly regarding the volume and directional flow of Providence Spring's water, the development of associated features like the retaining and freestanding walls, swales, lower fountain, runnel, pools, walks, and parking area, and significant changes to the vegetated landscape setting.

The Woman's Relief Corps was indisputably the most important force behind the development of the Providence Spring House. Their significance in this period of American history has, however, largely been either overlooked or lost in the annals of time. Most of the details regarding their role in the developmental history of the Providence Spring House was gleaned from journals which they produced following their annual, national conventions, and which have been archived through various organizations and made available on the internet. Furthermore, examinations of historic newspapers illuminated the fervent cultural context within which the WRC conceived of the Providence Spring House. The Providence Spring House, it seems, held an outsized philosophical meaning in the mind of the American public, one that helped to encourage a national debate which ultimately led to the development of the Cemetery, Prison Site, and the Providence Spring House as culturally and economically important tourist attractions, and further necessitated the legislation that led to its subsequent designation as a National Historic Site and overall preservation.

The CCC and United States Army also held critical roles in the site's evolution. Although, most of the visually discernible evidence of modifications made by the CCC and United States Army was lost during the NPS logging operation of the 1970s. Lost alterations include dozens of trees, shrubs, ornamental plantings, and a rubble retaining wall, planting area, and several rubble swales. We suspect that some of these features remain on site in their original locations but buried slightly below-grade or obscured by vegetation. NPS documentation was valuable in understanding the roles played by the CCC and United States Army in the evolution of the Providence Spring House site. Synthetization of combined research and findings guided our recommendations for treatment.

Providence Spring House and its associated features hold untapped potential to interpret the role of the WRC, CCC, and United States Army in the evolutionary history of ANDE. The unique story of Providence Spring and its significance as a commemorative element are currently overshadowed by the purposefully desolate interpretive landscape of the prison site. The WRC conceived of the Providence Spring House as a majestic pavilion built to commemorate a bountiful spring that saved the lives of soldiers dying of thirst in Camp Sumter. They took efforts to beautify the landscape surrounding the Providence Spring House, efforts which continued while under administration of the United States Army and CCC. Historic findings suggest these efforts may have served dual functions, one of which was in service of the commemoration of what was viewed as the Spring's divine providence. They also functioned to manage the wooded, and oftentimes excessively wet, landscape setting. Reestablishing the historic landscape character of the Providence Spring House, and investigating extant archaeological resources can help educate visitors about the different groups that participated in the development of the Providence Spring House and its associated features, while helping them to understand the site evolution which unfolded during the period of significance.

Recommended Treatment and Use

The recommended treatment and use for the Providence Spring House and the associated features is *preservation*, with the addition of required maintenance work and pre-approved rehabilitation as needed to continue use as a commemorative site within ANDE.

Specific actions to support the recommended treatment and use include:

General Recommendations:

- Use NPS' Planning for a Changing Climate to inform management policies and decisions.[18]

Recommendations for the Site:

- Prepare and maintain a site drainage field report that can be updated following storm events.
  Use a reduced size existing site plan (Appendix B) to mark the direction of runoff and approximate size and location of pooling. Store field reports for comparison with future field observations.

Recommendations for Providence Spring House exterior and structural components:

- Inspect structural systems annually, ideally in the spring.
- Inspect stone cracks annually and monitor for any changes.

Recommendations for Providence Spring House fountain and aesthetic features:

- Consolidate interior fountain using a patch-tested chemical consolidant
- Document and monitor horizontal cracking on the marble columns
- Replace deteriorated copper medallion with in-kind replica
- PH test Providence Spring's water at least three times annually

Recommendations for exposed drainage features:

- Repair brick swale and associated granite curb north of Providence Spring House
- Continue cyclical maintenance of earthen swales
- Investigate the location and condition of CCC-era rubble swales

Recommendations for the lower fountain, brick runnel, and reflecting pool:

- Investigate and repair the source of leaks in lower area of the lower fountain
- Clean rusted cast iron faucet and coat with corrosion-inhibiting primer
- Fill sunken areas adjacent to the brick runnel
- Perform annual inspections of all mortar and repoint as needed
- Replace and repoint the dislodged brick from the base of the reflecting pool's spillway
- Clear sediment and debris from basins as needed
- Clear the connecting joint of the concrete patio and concrete retaining wall of existing filler compound and debris. Refill with new cementitious filler, monitor the connection and refill as necessary

Recommendations for subsurface features:

- Monitor sediment infiltration and functionality of the Providence Spring House French drains
- Regrade the south elevation of the Providence Spring House so that the grade is no longer in contact with marble course

Recommendations for circulation features:

- Document and monitor the condition of all circulation features
- Correct the erosion at the connection between the concrete walk at either end of the footbridge
- Expand ADA compliant interpretive elements.

Recommendations for vegetation:

- Continue routine maintenance of grass in proximity to constructed features as NPS Turf Class B1, Functional Short
- Remove sugar maple trees and replace with river birch (*Betula nigra*) in same approximate locations
- Research historic vegetation for possible future re vegetation initiatives.

18. National Park Service, *Planning for a Changing Climate: Climate-Smart Planning and Management in the National Park Service* (Fort Collins, Colorado: NPS Climate Change Response Program, 2021).

Administrative Data

Locational Data

Building Name: Providence Spring House

Location: Andersonville National Historic Site

County: Macon County

State: Georgia

Real Property Information

Acquisition Date: July 1, 1971

Cultural Resource Data

CRIS/LCS ID: 006104

Structure ID: HS-107

National Register Status: Contributing resource in Andersonville National Cemetery and Andersonville Prison Park, November 27, 1978

Management Category: Must be Preserved and Maintained

Size Information

General Site Area: 9,000 square feet ±

Providence Spring House Covered Area: 225 square feet ±

Proposed Treatment

The Recommended Ultimate Treatment is preservation with the addition of required maintenance work and pre-approved rehabilitation as needed to continue use as a commemorative site within ANDE.

The Recommended Ultimate Use is public commemoration and interpretation.

Related NPS Studies

Cultural Landscapes Inventory, Andersonville National Cemetery Component Landscape, Andersonville National Historic Site, NPS, 2010.

Cultural Landscape Report, Andersonville National Historic Site, NPS, 2015.

Historic Resource Study, Andersonville National Historic Site, NPS, 2018.

1.A Historical Background & Context

Introduction

The Woman's Relief Corps (WRC), a women's organization auxiliary to the Grand Army of the Republic (GAR), a fraternal organization composed of veterans of the Union Army, constructed the Providence Spring House at in 1901. The corps constructed building and associated structures to memorialize the natural spring that is said to have miraculously appeared on site during the time soldiers were held in the Confederate prisoner of war camp. The structure commemorates the spring's provision of clean drinking water that saved soldiers' lives at Andersonville Prison during the Civil War. Andersonville Prison later became Andersonville National Historic Site (ANDE), a unit of the National Park Service (NPS).

Andersonville National Historic Site

Andersonville National Historic Site was the site of a Confederate prisoner of war camp during the Civil War from February 1864 to April 1865. Established as Camp Sumter when Confederate forces became overburdened with prisoners due to a dispute in their prisoner exchange program, the Confederate Army chose this prison site due to its proximity to the Southwestern Railroad line, access to water, and a small local population (of less than 20 people) unlikely to resist the development of a prison in the area.[19] Andersonville, as it became commonly known, was built to accommodate roughly 10,000 people, but by August 1864, as many as 33,000 prisoners were crammed into the camp (Figure A1). Starvation and disease were rampant, and prisoner deaths averaged 958 per month for all thirteen months of operation.[20]

The Prison's Only Water Source Becomes Polluted

The prison stockade consisted of a double-wall of 22-foot-high pine logs, squared and set 5 feet into the ground. The enclosed area was approximately 750 feet wide and 1,540 feet long, but the total enclosed space was reduced to 15 acres by the inner wall of the stockade. By June of 1864, the Confederate Army had enlarged the prison stockade to the north by 610 feet, for a total of 26.5 enclosed acres.[21] Workers constructed barracks near the end of 1864. Previously, prisoners lived in makeshift shelters built from blankets or cloth, which were spread across the site in no particular order. A branch of Sweetwater Creek, which became known as Stockade Branch, cut across the middle of the prison enclosure from west to east and supplied the only source of drinking and bathing water to the prisoners. The bakery, cookhouse, and the Confederate guard were all located upstream of the prison, thereby polluting Stockade Branch before it reached the interior of the stockade. An undated sketch of the prison site shows the general course of area streams in relation to the Confederate camps, the stockade, and other constructed resources (Figure A2).[22]

Desperation and Georgia's intense summer heat drove prisoners to drink from the polluted stream, which sometimes led to illness or death. Prisoners also used their hands or any small tools they could find to dig wells, some as deep as 40 feet. In a memoir, John McElroy, a Union prisoner held at

19. National Park Service, *Andersonville National Historic Site Historic Resource Study* (Southeast Regional Office, National Park Service, 2018).

20. Francis M. Le May, "Andersonville Cemetery To Get General Cleanup by CCC Unit," *The Atlanta Constitution*, July 12, 1934, Newspapers.com.

21. National Park Service, *Andersonville National Historic Site Cultural Landscape Report* (National Park Service, Cultural Resources Division, Southeast Regional Office, 2015), 27.

22. United States Sanitary Commission, Prison at Andersonville, Ga., Sanitary Commission Bulletin (N.Y., Waters & Son SC., 1864), Library of Congress, https://www.loc.gov/item/99447300/.

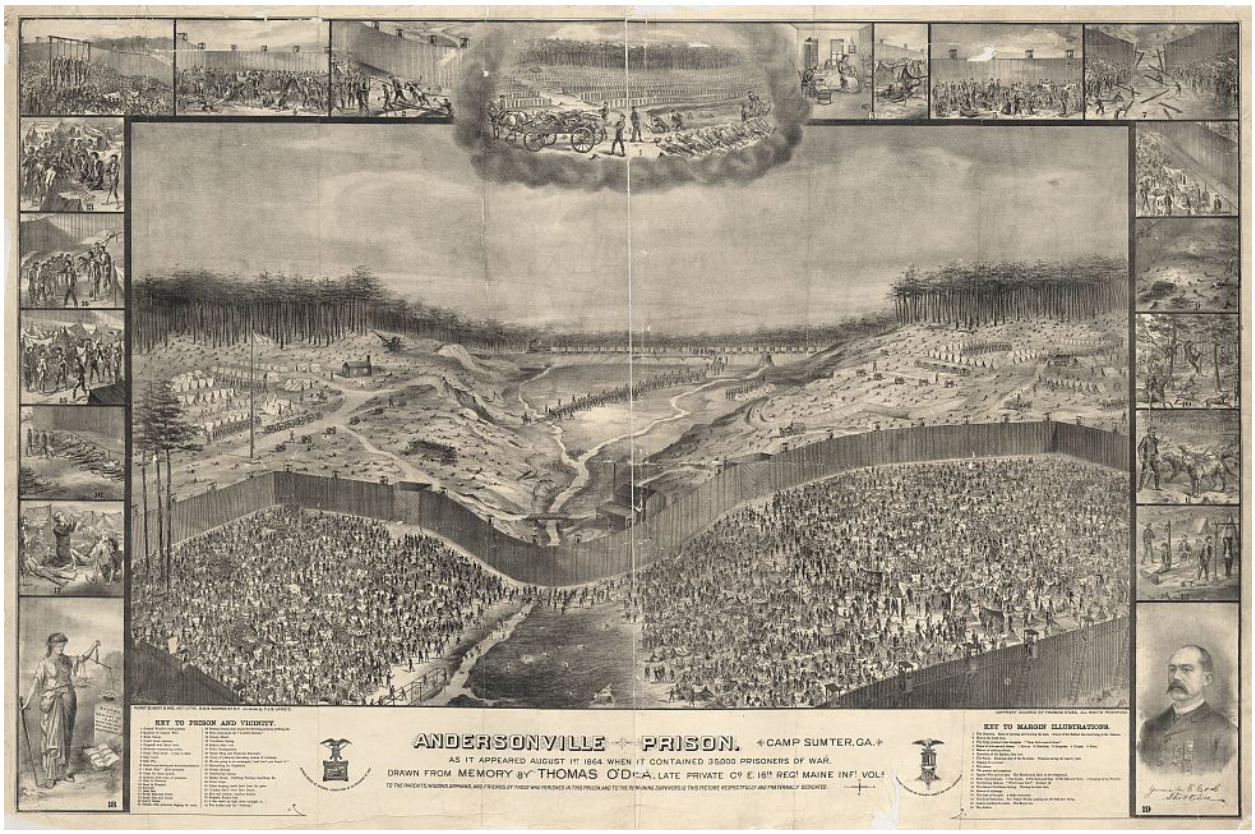

Figure A1. August 1864 illustration of Andersonville Prison at its most crowded (Source: Library of Congress).

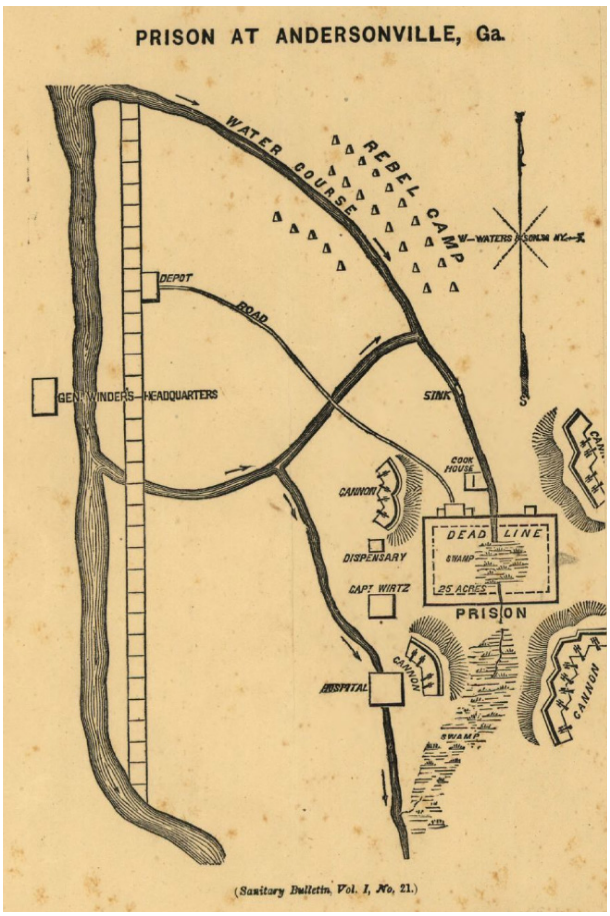

Figure A2. Undated illustration of the water course of Stockade Branch at Andersonville Prison (Source: Library of Congress).

Andersonville from February to October 1864, describes the prison's water resources stating:

> … every mouthful of [water] was a blood poison, and helped promote disease and death. Even before reaching the Stockade it was so polluted by the drainage of the Rebel camps as to be utterly unfit for human use. In our part of the prison we sank several wells—some as deep as forty feet—to procure water. We had no other tools for this than our ever-faithful half canteens, and nothing wherewith to wall the wells. But a firm clay was reached a few feet below the surface, which afforded tolerable strong sides for the lower part, and furnished material to make adobe bricks for curbs to keep out the sand of the upper part. The sides were continually giving away, however, and fellows were perpetually falling down the holes, to the great damage of their legs and arms. The water, which was drawn up in little cans, or boot leg buckets, by strings made of strips of cloth, was much better than that of the creek, but was still far from pure, as it contained the seepage from the filthy ground.[23]

Civil War diaries, published following the war's end, vividly describe the horrific conditions experienced by Andersonville's prisoners of war. The prospect of ending up at Andersonville so frightened the Union soldiers that it "nerved many a man to one more effort to escape capture," as noted in the diary of Lieutenant Thomas Galwey.[24] Regardless, the Confederate Army inevitably captured and detained thousands of soldiers. Bureaucratic failings and disorganization led to intense overcrowding at Andersonville. This overcrowding, in combination with the course of Stockade Branch as it passed through the Confederate camp and bakehouse before entering the stockade, inevitably resulted in pollution of the prison's lone source of drinking water, which was described as, "one seething mass of maggots."[25] Thus was the unfortunate state of prisoner life at Andersonville.

23. John McElroy, *Andersonville: A Story of Rebel Military Prisons* (The Avalon Project, Yale Law School, 1879), https://avalon.law.yale.edu/19th_century/ander.asp.
24. As quoted in Benjamin Gregory Cloyd, "Civil War Prisons in American Memory" (Dissertation, Baton Rouge, Louisiana, Louisiana State University, 2005), https://digitalcommons.lsu.edu/cgi/viewcontent.cgi?article=1120&context=gradschool_dissertations.
25. Cloyd, 29.

The story of Providence Spring suggests that divine intervention opened a bountiful, fresh spring of crystal-clear water, nourishing the imprisoned men right when they were at their most desperate and the prison was at its most crowded.

A Fresh Water Source, Providence Spring, Emerges

Although precise details vary, contemporary reports claim that Providence Spring, as it came to be known, appeared during a powerful thunderstorm in August 1864, a notoriously dry year, when the prison's only water source had become polluted and unsafe. As the large storm swept through the camp, a portion of the northern stockade wall collapsed under pressure from the swelling stream. Near this collapsed part of the stockade, Providence Spring first appeared to the imprisoned men. An account published by John L. Maile, a veteran of Company F, Eighth Regiment Michigan Volunteer Infantry and afterward assigned as Lieutenant in the Twenty-eighth United States Colored Troops, who was imprisoned in Andersonville during the time of Providence Spring's miraculous emergence, describes the event:

> …a voice was heard from the north gate, ringing out in clear tones the thrilling words, "A spring! A spring! A spring has broken out!" "Where, where?" was the eager inquiry which arose at once from many lips. The writer tried to press his way towards the north gate, but the crowd was so dense that no progress could be made. The excitement of the moment was indescribable. During a lull someone sang out, "You fellows over by the north gate, tell us, has a spring broken out?" "Yes," was the reply, an emphatic "Yes." Then was further shouted the explanation, "Where the trench was dug the flood has torn up the earth and a spring has gushed out. [26]

26. John L. Maile, *Prison Life in Andersonville With Special Reference to the Opening of Providence Spring*, E book (Los Angeles, California: Grafton Publishing Company, 1912), 68–69, https://www.gutenberg.org/files/39584/39584-h/39584-h.htm.

Figure A3. Undated illustration of Andersonville prisoners reaching over the deadline to scoop fresh water from Providence Spring (Source: Library of Congress).

Prisoners named the new, fresh source of water Providence Spring in homage to the apparently divine circumstances surrounding its appearance.

> The famished prisoners had reached that moment when they realized that they could no longer endure with naught but the contaminated waters of the creek to sustain them, during a severe electrical storm, this living stream broke forth, bright, pure and sparkling, bringing renewed life and hope. Skeptics and philosophers may easily explain its appearance from natural causes, yet it will always be recognized as an especial evidence of the infinite power and mercy of Divine Providence.[27]

Providence Spring emerged within 6 to 8 feet of the deadline, a marked line that prisoners would be killed for crossing, and approximately 100 feet north of Stockade Branch, barely within reach of the prisoners. Had the spring appeared farther past the deadline, Confederate guards would have shot any prisoners trying to step foot over the line to reach it. Deadlines were a common method of crowd control at military prisons during the Civil War, particularly open stockade prisons. At Andersonville, the deadline was indicated by a low rail fence that ran parallel to the stockade walls, offset to the prison interior by 20 feet. An illustration shows the prisoners scooping up the fresh water in canteens which they had tied to sticks, in an attempt to reach over the deadline without being shot (Figure A3).

27. James P. Averill, "Andersonville Prison Park. Report of Its Purchase and Improvement," n.d., 19.

Testimony from the trial of Henry Wirz, commander of Andersonville's prison camp, recounted in *Vaughter's Prison Life in Dixie*, describes how prisoners fashioned a "V" trough at the spring, bringing between eight and ten gallons of "pure, sweet water" a minute over the deadline.[28] The fortuitous timing, as well as Providence Spring's location within reach of the deadline, intersected to spur the divine title.

The Union Army advanced near Atlanta in September of 1864, one month after the spring's emergence, spurring Andersonville to relocate some 5,000 of its healthier prisoners to camps in Millen, Georgia and Florence, South Carolina. Only sick and dying prisoners remained, and by the end of the month, Andersonville received no more prisoners as it transitioned to a prison hospital. Soil and water conditions slowly improved as overcrowding eased. Records show that 1,500 prisoners remained in mid-November, but by December, the population grew once again after prisoners from the camp near Millen, Georgia, were relocated to Andersonville in response to Union troop movements. The war ended with the surrender of Confederate General Robert E. Lee to Union General Ulysses S. Grant on April 9, 1865. Records show that 12,920 prisoners perished during the fourteen months of Camp Sumter's operation.[29]

Providence Spring After the Civil War

After the war, the Confederates quickly abandoned the prison, leaving behind bodies of perished prisoners and a partially completed third wall of stockade. Correspondence from Clara Barton, who later founded the American Red Cross, described the state of the prison grounds as she found it in July 1865 as a member of the first group of visitors to visit the prison site. She wrote, "Truly it looks like the city of the dead."[30] On her return from Andersonville, Clara Barton wrote to the US Secretary of War. Her letter included the following passage, one of the first historical records referencing Providence Spring:

> Under the most favorable circumstances and best possible management the supply of water would have been insufficient for half the number of persons who to use it. The sole establishment for cooking and baking were placed on the back of the stream immediately above, between the two inner lines of palisade. The grease and refuse from them were found adhering to the banks at the time of our visit. The guards, to the number of about 3600 were principally encamped on the upper part of the stream, and when the heavy rained washed down the hill sides covered with 30,000 human beings, and the outlet below failed to discharge the flood which backed and filled the valley, the water must have become so foul and loathsome, that every statement I have seen of its offensiveness must be considered as falling short of the reality… During the occupation, a beautiful spring broke out like the waters of Miribah from the solid ground, near the foot of the northern slope just under the western dead line. It is still there, cool and clear, the only pleasing object in this horrid place.[31]

News of the miraculous spring spread throughout the country and mention of Providence Spring soon appeared in an 1873 travel journal. Traveling spouses, Mr. and Mrs. Albert Webster, toured the grounds of Andersonville Prison and nearby burial grounds. Albert Webster documented their trip in "A Jaunt in the South," which appeared in Appleton's Journal. Webster noted that Providence Spring was cared for, albeit haphazardly. There was a wooden basin, built to protect the spring (Figure A4). He elaborated that,

> Providence spring had been cared for in a haphazard fashion. Upon a forked stick beside it hung a gourd, and a wooden basin had been sunk to shield the spring. A curtain of plants had grown out from the bank above.[32]

28. John B. Vaughter, *Prison Life in Dixie* (Chicago: Central Book Concern, 1880).
29. National Park Service, "Andersonville National Historic Site Cultural Landscape Report," 30.
30. Clara Barton, "Letter to Mr. Edward H. Clement," n.d., Manuscript Division, Library of Congress, http://hdl.loc.gov/loc.mss/ms005010.mss11973.0426.
31. Clara Barton, "Letter to Secretary of War, E.M. Stanton," n.d., Manuscript Division, Library of Congress, http://hdl.loc.gov/loc.mss/ms005010.mss11973.0426.
32. Albert Webster, "A Jaunt in the South," *Appleton's Journal* 10, no. 234 (September 13, 1873): 323.

Figure A4. Tree stump and wooden curb around Providence Spring circa 1870s (Source: ANDE Archives).

A small shed also shielded Providence Spring and its wooden basin during this time (Figure A5).

Providence Spring's maintenance following the war was haphazard; the interior of the principal prison stockade was neglected and became grown over with underbrush and dotted with crude barriers meant to prevent cattle from falling into the burrowed wells of former prisoners. Documents describe a landscape strewn with broken and half-decayed bones, remnants from tin vessels, straps, buttons, and old buckles.[33] The farmers who cultivated the former grounds of Andersonville Prison recognized the popular reverence for Providence Spring and protected it from destruction during the period of after the Civil War.

By 1881, when J. L. Ball of Iowa visited the prison site, the stockade had fallen into a "rotten mess," with most of the area north of Stockade Branch grown up into woods, whilst the area below was cultivated in cotton. While the journals describing Ball's visit made no mention of Providence Spring, it would have been in the area to the north of Stockade Branch, which he described as grown up in "trees and underbrush." Despite being overlooked by some visitors during this period, newspaper clippings suggest an ongoing debate between those who wholeheartedly believed in the divine story of Providence Spring's appearance and those who purported to have known of the spring well before the war.

Figure A5. Providence Spring covered in a small wooden shed circa 1890s (Source: ANDE Archives).

One article claims the same spring now known as Providence Spring was a widely visited deer stand, where hunters awaited game and drank of its waters as early as 1840. The author further emphasized that "God created the spring when he made the earth."[34]

The story of Providence Spring continued to stir controversy through the years. An 1883 southern newspaper article discusses a visit to the site by Private Frank W. Smith, a former prisoner of war at Andersonville. He visited the site to place 14,000 small flags on the graves of his comrades and give talks on the influence of "Christian character" in the camp and in life. One such talk would take place at the site of Providence Spring. The newspaper article begins by describing the original appearance of the spring:

> It happens that in the far-away north and east and west there is a story to the effect that once upon a time when the rebels had some of the federals within the confines of the Andersonville stockade the soldiers were in the fix that Moses was in when he smote the rock—they were out of water. Also, that while they thirsted beneath the perspiring weather of August, there burst from the arid earth a stream of cool, bright water, clear as crystal and pure as the snow. The spring was immediately named "Providence spring," and

33. Edwin C. Bearss, *Andersonville National Historic Site Historic Resource Study* (Washington, D.C.: National Park Service, Eastern Service Center, 1970), 168.

34. J.B. Pelsbury, "Providence Spring Fake Ventilated. A Veteran Who Was There Tells It Straight.," 1900.

> religious services were held at regular intervals around the spot where it bubbled forth.[35]

The article goes on to reference a disagreement about the emergence of the spring between two sides of the Mason-Dixon line. Private Smith is said to have experienced this disagreement firsthand when confronted by a Providence Spring skeptic during his visit to the prison site. Several more newspaper articles, dating from the 1880s through the 1930s, paint a vivid portrait of the stark division the miraculous story of Providence Spring inspired in the two sides, each one including enthusiastic, albeit one-sided, discussion on the veracity of the story of Providence Spring's emergence.[36]

Furthermore, the topic of Providence Spring was seemingly of great interest to both northerners and southerners. After one of Smith's presentations, the guests joined together to drink from the spring. Two African American men, referred to as Stickney and Smith, "had taken great pains in cleaning a space about the spring, and were thoughtful enough to sink a curb into the sand, into which the beautiful clear and cool water rose nearly 3 feet."[37]

Commemoration and the Role of Veterans' Organizations

Concurrent to this ongoing debate, national sentiment on both sides of the conflict was growing that favored the preservation of Civil War memories and battle sites. Private citizens and veterans' associations began to organize in an effort to preserve the memory of the Civil War. The first of these groups was the Gettysburg Battlefield Memorial Association (GMBA), which incorporated as a group of non-veteran citizens with the following goal:

> To hold and preserve, the battlegrounds of Gettysburg…as they were at the time of said battle, and by such perpetuation, and such memorial structures as a generous and patriotic people may aid to erect, to commemorate the heroic deeds, the struggles, and the triumphs of their brave defenders. [38]

Inspired by the GBMA, veterans' associations assembled across the country, first in the North and later in the South. These veterans' groups were able to wield their influence into the creation of several military parks and monuments. The Grand Army of the Republic (GAR), organized in 1866 by Benjamin F. Stephenson, was one such organization of Union Army veterans.

The GAR commemorated the Civil War by founding soldiers' homes, supplying relief to veterans in need, and lobbying for pension legislation. They grew politically powerful, even helping to elect Ulysses S. Grant to the presidency. In total, five post-war presidents were GAR members, Ulysses S. Grant, Rutherford B. Hayes, James A. Garfield, Benjamin Harrison, and William McKinley.

Eventually, the GAR took over the GBMA when it surpassed them in memberships. Their mounting popularity inspired the creation of many auxiliary organizations. These organizations formed with the intention of supporting the GAR's commemorative efforts. It was during this time, in 1883, that the Woman's Relief Corps (WRC) organized in Massachusetts. Founding members formed the WRC to support the GAR with a community of mothers, sisters, wives, and daughters of Civil War veterans, "all working in the interest of the soldiers, rendering valuable assistance to the Comrades in their work of aiding the unfortunates reverently, in true fraternity."[39]

The GAR continued to spread its nationwide influence through the introduction of community-level posts. Organizers assigned each community

35. "Private Smith," *The Atlanta Constitution*, August 18, 1883, 7, Newspapers.com.
36. "A.F. Bellingrath, of Decatur...," *The Atlanta Constitution*, July 16, 1933, Newspapers.com; Warren Lee Goss, "The Last Word. Concluding Letters of the Controversy Concerning the Andersonville Spring.," *The National Tribune*, April 26, 1883, Newspapers.com; "Legend About Providence Spring Has Been Exploded.," *The Atlanta Constitution*, May 13, 1901, Newspapers.com.
37. "Private Smith."
38. Kinsel, "From These Honored Dead: Gettysburg in American Culture, 1863-1938," 159. As quoted in NPS, *Historic Resource Study*, 94.
39. Woman's Relief Corps, Woman's Relief Corps at Denver, CO July 25 and 26, 1883, and Proceedings of the Second National Convention Woman's Relief Corps, Minneapolis, MN, July 23, 24, and 25, 1884 (Boston, Mass.: Griffith-Stillings Press, 1903), 11.

Figure A6. Decoration Day visitors at Providence Spring circa 1897 (Source: ANDE Archives).

post a number that tied them with a particular state or regional GAR department. On January 25, 1889, former Union soldiers living in Georgia, many of whom were African American, met in Atlanta to form the Georgia department of the GAR.[40] In 1889, they organized a Memorial Day event that drew some 7,000 members to decorate graves at Andersonville.[41]

By 1889, visible indications of the prison site's dark history were almost nonexistent. S. Creelman, a former Andersonville prisoner of war, documented the landscape's condition when he visited Andersonville in September 1889. His writings reported that African American farmers were cultivating much of the former prison site in cotton, but they took care to protect Providence Spring, which Creelman found covered by a small shed.

This brief description of the visit appears in *Collections of a Coffee Cooler:*

> A negro guide was hired to take him and his party to the prison. The ground, they found, was now owned by two blacks, and a cotton field covered much of its "once repulsive surface." All surface remains of the prison had disappeared, except for a small shed covering Providence Spring. [42]

The outpouring of support for the commemorative efforts of Memorial Day 1889, in combination with rumors of investors looking into the property spurred the GAR to take the necessary steps to preserve the site. Two years later, in 1891, they had assembled the funds to purchase the vast majority of the land that was once Andersonville Prison with the assistance of their auxiliary, the WRC. The Journal of the 25th National Convention of the

40. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 97.
41. Ibid.
42. S. Creelman, *Collections of a Coffee Cooler*, as quoted in National Park Service, *Andersonville National Historic Site Historic Resource Study*, 37-38.

Woman's Relief Corps details the events leading up to the GAR's purchase:

> Later in the year, hearing that parties were negotiating for the purchase of Andersonville for speculative purchases, and feeling sure that the friends at the North would assist in any loyal effort to help the comrades of Georgia in preventing the sale, a meeting of the Council of Administration was called, together with other prominent comrades of Georgia, to consider the matter. There was in the treasury over $300 remaining from money received the previous year from the Woman's Relief Corps, with which to make an immediate payment, and so secure the land, and this was increased by personal checks from those present. Commander-in-Chief Veazey indorsed the project, as did most of the Department Commanders of that year, and in course of time the Grand Army of Georgia, with the help of other Departments of the G.A.R. and the W.R.C., were able to secure the property. [43]

In 1891, the GAR's Georgia department purchased a 72.5-acre parcel for $1,500 that included all of the former prison stockade except for the northwest corner and some surrounding earthworks, as they lay in a neighboring county. They bought the site from the original owner, George W. Kennedy, whose property it was before the war. The GAR immediately set to work removing undergrowth, planting hedges, and grading a roadway around the perimeter of the site. They also graded a central avenue from the entrance to the new prison park to Providence Spring. Improvements totaled $1,500, bringing their investment to $3,000.[44] A photograph from this time, circa 1897, shows African American and white men and women, gathered around Providence Spring and the adjacent tree stump, some with canteens in hand, ready to drink from its waters (Figure A6).

Sometime after March 1896, Lizabeth A. Turner visited the site and drank from the spring. She later recalled its "fresh, pure and sweet" waters in her diary. Turner's diary also documented that the GAR had built a wooden structure over Providence Spring and erected posts at the site to outline the location of the former stockade wall (Figure A7).[45]

Figure A7. The GAR-built wooden structure covering Providence Spring circa 1899 (Source: ANDE Archives).

The Former Prison Site Changes Hands

In 1896, it became clear to the members of the GAR that they lacked sufficient funds to appropriately develop the former prison site because of declining memberships and funds. The WRC stepped in to express their interest in improving the prison property. Thus, the Georgia branch of the GAR chose to pass their ownership of the site to the WRC as an unencumbered gift.

Speaking during the 14th National Convention of the WRC, national president Lizabeth A. Turner expressed the desire to visit and care for the Andersonville Prison site:

> According to instructions from the Thirteenth National Convention, I tried to find out something definite about Andersonville, its location and surroundings. After writing many letters—the answers all conflicting—I concluded to visit the place; going from my nearest point, Savannah, Ga., while visiting Corps in the South—and find out for myself. I am satisfied that the Grand Army of Georgia would be willing to give the Woman's Relief Corps this property if we would improve and care for it hereafter.[46]

43. "Journal of the Twenty-Fifth National Convention of the Woman's Relief Corps," September 12, 1907, 58, ANDE Archives.
44. "A Journal of the 27th National Convention of the Woman's Relief Corps," August 12, 1909, 188.
45. "Journal of the Fourteenth National Convention of the Woman's Relief Corps," 1896, 206, HathiTrust Library, https://catalog.hathitrust.org/Record/008990711.
46. "Journal of the Fourteenth National Convention of the Woman's Relief Corps."

The decision of the WRC to accept the offer of the GAR was the result of their belief that allowing the sacred soil of Andersonville Prison, "baptized and hallowed by the blood and tears of patriotic Union soldiers," to be used for anything other than patriotic services would be "sacrilegious." The Journal of the 14th National Convention of the WRC further explains their decision to accept the gift as a way to commemorate the miracle of Providence Spring:

> And we must not forget that this place has also been made doubly sacred by a divine miracle. In the darkest days of Andersonville Prison life, when men were perishing from thirst, because their supply of water had been befouled, and were trying to dig wells with their hands and bits of tin and bones without success,--deep pits that still remain, one of them thirty-five feet deep, --and a bitter cry went up to God from that suffering multitude, the Lord veiled himself in a black cloud and passed over Andersonville Prison, and sent down one of His thunderbolts and cleft the earth and the rocks, and a spring was opened up. It is justly called Providence Spring, and those who have had the privilege of drinking from its flowing tide say there is no sweeter, purer water on the face of the earth than the water of Providence Spring.[47]

She further expressed her desire to see an arch built over Providence Spring. Other envisioned improvements included a new stockade constructed in the location of the now-missing prison stockade and improvements to the road network, including culverts to prevent the road from washing out.[48]

The WRC passed a resolution officially accepting ownership of the site at their 14th annual convention, and subsequently purchased the remaining 14.5 acres of the original site from James Russell and Charles Catledge for $326.25 on August 19, 1897.[49] This purchase completed the acquisition of the main visible features of the former prison landscape.

The WRC's National Influence

The WRC's influence extended beyond their work at the Andersonville Prison site. They led the movement to adopt the country's Pledge of Allegiance and Memorial Day. They also fought for pensions for nurses who served during the American Civil War. Local WRC units or corps existed in every state and continental territory except Alabama by 1894.[50] Even though the WRC was the most consequential proponent behind the creation of Memorial Day, contemporary reports often gave the GAR most of the credit for creating the national holiday.[51]

The WRC was indisputably the most important force behind the development of Providence Spring House. Their significance in this period of American history has, however, largely been either overlooked or lost in the annals of time. To date, academic scholars have not thoroughly examined the WRC. Any existing literature most often discusses the WRC in relation to the GAR. *Yankee Women*, by Elizabeth Leonard, argues that women-led organizations like the WRC paved the way for broader access for future generations of women. She argues that,

> Generations of women after the [Civil War] would grow up in the context of a revised gender system that reflected the impact of the Civil War by assuming their capacity for and allowing them broader access to professional labor in nursing and institutional charity.[52]

Further, the work of the WRC may have also contributed, in some small part, to increased access for African American women after the war:

> Despite segregation and white paternalism, the WRC provided an environment where black women could hold leadership positions and contribute to the social uplift within their communities in part by reminding the nation of

47. "Journal of the Fourteenth National Convention of the Woman's Relief Corps," 205–205.
48. Ibid., 250–51.
49. Bearss, *Andersonville National Historic Site Historic Resource Study*, 173.
50. Stephanie Marie Schulze, "The Woman's Relief Corps: 'Missionaries of the Flag,' 1893-1918" (Master of Arts, Bloomington, Indiana, Indiana University, 2016).
51. Ibid.
52. Elizabeth D. Leonard, *Yankee Women: Gender Battles in the Civil War* (W.W. Norton & Company, 1995), xxi–xxii.

> the heroic legacy of African Americans during the Civil War. [53]

The organization was founded in 1883 and remains active today under a 501c3 charity identification. Current mandate states that the WRC will work to preserve and make available records regarding the WRC and GAR, perpetuate the memory of those that served in the American Civil War, and provide assistance to veterans and family of veterans that served in all wars.

Eligibility requirements for WRC membership changed over time. Proof of familial ties to Civil War veterans is no longer a requirement for eligibility, which is one reason the WRC persists today when so many other organizations have experienced waning memberships and influence.

The WRC Takes Charge

Once the WRC obtained ownership of the landscape of what was formerly the Andersonville Prison site, they initiated improvement projects including the erection of a caretaker's residence, a stable, wire fencing, and the clearing of undergrowth and planting Bermuda grass within the stockade enclosure area. They also made plans for Providence Spring. An 1898 newspaper article discussed their plans to erect a pavilion and a monument at the site of Providence Spring:

> The committee is anxious to make improvements as fast as the means can be secured. Among others of importance, they contemplate the erection of a fine pavilion over "Providence Spring," and a magnificent bronze monument, to be erected by appropriations from Congress and various State Legislatures.[54]

A pamphlet from 1899, titled "Andersonville Prison Park," promoted the following, with the caveat that "proper protection and preservation of the premises" be dealt with first:

> It has been suggested that this historic spring should be covered by a marble pavilion [*sic*], with tile roof, tiled flooring and marble basin, with appropriate inscription, and constructed in a substantial and elaborate a manner, and of as beautiful a design as possible. It is now protected by a temporary wooden building, which is anything but ornamental. It is understood that the National Prisoners of War Association intend making a liberal appropriation for this purpose. It is hoped that other kindred organizations will join them, and that the object will be accomplished within the coming year.[55]

The WRC solicited appropriations for the proposed memorial from members attending their 17th National Convention in Philadelphia. A newspaper article reported the details of the decision to commit $500 from the Andersonville Prison fund in order to finance a memorial arch over Providence Spring. During the meeting, they voted to instruct the WRC's Andersonville Prison Board to "procure designs and estimates for an arch over the Providence Spring in memory of the men who died there in prison."[56]

Another article describes the events of the 17th convention further, including the protests of some WRC members who were disappointed that the GAR continued to be miscredited with their work done on the prison grounds by "people of the neighborhood and neighboring cities."

The article also discusses a plan to turn the property over to the government, which was met with approval by the advisory board of the prison property:

> It seems to us the WRC have done the right thing in rescuing this hallowed ground from profane hands, but we believe it would be wiser and better for us to ask the Government to take it and care for it. For in our opinion much more money will be required to maintain than we now dream of.
>
> We believe Providence Spring should be in closed [*sic*] and covered, and it would seem proper that the Woman's Relief Corps should erect a monument to the memory of those who starved in Andersonville.[57]

53. Francesca Morgan, *Women and Patriotism in Jim Crow America* (University of North Carolina Press, 2005), 37–39.
54. "Boston Gates at Andersonville," *National Tribune*, April 28, 1898. Referenced in HRS, 2018, 98.
55. Averill, "Andersonville Prison Park. Report of Its Purchase and Improvement," 19.
56. "Woman's Relief Corps," *The Morning Journal Courier*, October 23, 1899.
57. "The Relief Corps. The Seventeenth National Convention at Philadelphia.," *The National Tribune*, September 14, 1899, Newspapers.com.

Figure A8. Individuals gathered around Providence Spring House construction, circa 1900-1901 (Source: ANDE Archives).

In a year's time, the WRC reversed course. An article from November 1, 1900 discusses the decisions of the 18th National Convention. There, the WRC voted to rescind the offer of their previous convention to turn over the prison property to the federal government. Instead, they assembled a three-person committee to lobby the federal government for a yearly allowance of $400 to care for the prison site. They elaborated that:

> Six hundred dollars be taken from the General Fund, if needed, to help defray expense of canopy over "Providence Spring;" the balance of money used for the erection of the canopy to be taken from the Andersonville Fund, the amount not to exceed nine hundred dollars. The two hundred dollars contributed by the Ex-Prisoners of War Association, and all they may contribute to be used to erect the bowl for the water to flow into, they to add inscription to the bowl.[58]

Lizabeth A. Turner, speaking at the 18th National Convention of the WRC, further details that:

> The Board have received several designs for the canopy over Providence Spring. Some of the designs are too expensive, some not appropriate for the locality. The one that seems nearest correct will be presented to National Convention for approval. The cost is about fourteen hundred dollars. I think it strong, substantial and dignified.[59]

The WRC Erects Providence Spring House

Following the 18th National Convention in 1900, plans began to take shape and construction of the Providence Spring House pavilion got underway. An image dated from that year shows several women, children, and men assembled around the excavation site for what would become the Providence Spring House's original water-supply cistern. A partially constructed portion of the Providence Spring House's north granite block

58. "Women's Relief Corps," The Western Veteran, November 1, 1900, Newspapers.com.

59. "Journal of the Eighteenth National Convention of the Woman's Relief Corps," 1900, 179, Google.com, https://play.google.com/books/reader?id=f_USAAAAYAAJ&pg=GBS.PP1.

Figure A9. Professionally photographed Providence Spring House soon after construction, circa 1901 (Source: ANDE Archives).

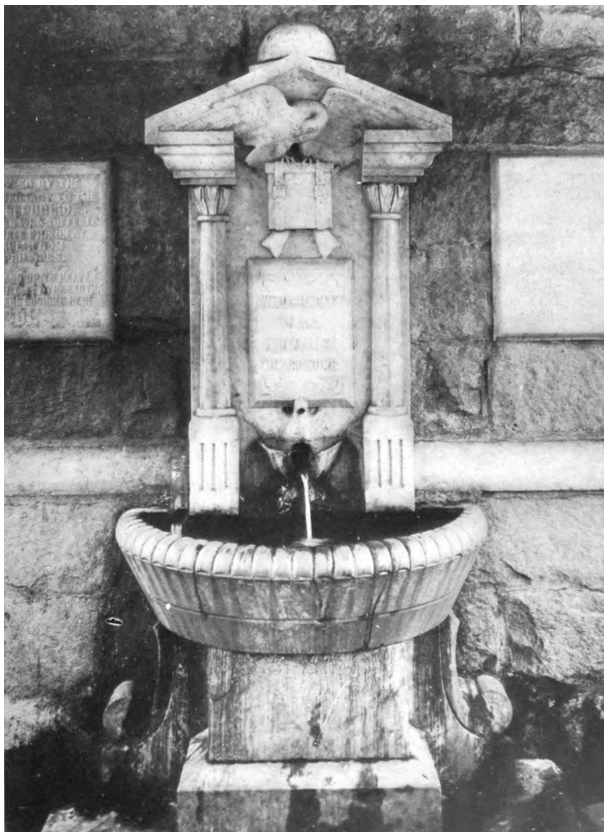

Figure A10. The marble fountain dedicated by an association of Union former prisoners of war, circa 1917; image not from the time of construction (Source: WRC Journals).

and marble wall can be seen in the far right of the image. The granite block retaining wall is also visible, as well as the brick cistern (Figure A8).

Workers completed the Providence Spring House in time for a Memorial Day dedication event held in 1901 (Figures A9, A10, and A11). The event hosted former prisoners of war at Andersonville, some of whom made speeches in honor of the memorial. A 1901 newspaper article details the event and the Providence Spring House:

Figure A11. The Providence Spring House with bracken, circa 1901-1907 (Source: ANDE Archives).

> The memorial fountain over the famous Providence Spring in the Andersonville prison stockade was dedicated yesterday and attracted a large crowd. National Commander James Atwell of the National Association of Union Ex-Prisoners of War, unveiled the tablet which has this inscription: This fountain erected by the National Association of Union Ex-Prisoners of War in memory of the 52,345 Union Soldiers who were confined here as prisoners of war, and of the 13,910 comrades who died, and whose remains are buried in the adjoining National Cemetery: dedicated Memorial Day, May 30, 1901. James Atwell, National Commander, S.M. Long, Adjutant General, J.D. Walker, Chairman Ex. Committee. Commander Atwell spoke of the message of the Union Prisoners of President Lincoln, whose great heart was full of charity, and therefore they had inscribed his memorable words on the fountain: "With charity to all and malice toward none." He then introduced Comrade W.C. McKelvy, who was a prisoner in Andersonville. Mr. McKelvy made a few remarks. Speeches were made by Adjutant-

> General Long, J.D. Walker and others. The fountain is a beautiful piece of work carved in Italian marble about twelve feet high.[60]

The dedication event also included the following remarks, which were reprinted in the Journal of the 19th National Convention of the WRC:

> On this Memorial Day, over Providence Spring, open, as the name indicates, in response to the cries of famished thousands, we dedicate a pavilion, upon which will be found inscribed the tribute of affection from the women whose hearts beat loyally and strong for unity, freedom and the perpetuation of the deeds in camp and field and prison of those who saved the nation…In the name of the 150,000 women of the Relief Corps; in the name of the founders who have passed over and of those who will take up our work when we are gone; in the name of truth and righteousness, of mercy and love, as exemplified by woman since in the early dawn the Marys sought the sepulchre of the blessed Master, I unveil this pavilion. Pure as the crystal waters which flow beneath are the sentiments which have controlled our work. And may the sweet influences going hence bear no measure of malice or discord; but instead, let this be a reminder to our children and our children's children, South as well as North, that a Union saved means memory consecrated to justice, gentleness, peace and love.[61]

Within the Providence Spring House, the tablet bearing the inscription of the National Association of Union Ex-Prisoners of War is mounted to the right of the marble fountain. The WRC inscribed a tablet mounted to the left of the fountain. The tablet reads:

> This pavilion was erected by the Woman's Relief Corps, auxiliary to the Grand Army of the Republic, in grateful memory of the men who suffered and died in the confederate prison at Andersonville, Georgia, from February 1864 to April 1865. The prisoner's cry of thirst rang up to heaven. God heard, and with his thunder cleft the earth and poured his sweetest waters gushing here.[62]

Before the event was turned over to General Atwell, National Commander of Union Ex-Prisoners of War Association, a poem, entitled "Providence Spring," by T.C. Harbaugh was recited. This poem is included in the program for the dedication event and reprinted below:

> PROVIDENCE SPRING
>
> For water the bravest agony cried,
> And parched were the lips of thousands who died
> Afar from their homes and the banners that flew
> Where marshaled and battled their comrades in blue;
> They lifted their hands to their Father on high,
> And weaker and weaker grew many a cry;
> They dreamed of the brook by the old meadow bars,
> They dreamed of the spring 'neath the Northland's bright stars.
> They perished athirst in the glare of the sun;
> They died not in battle, but here, one by one,
> The young and the tender, the brave and the true,
> The boys of the Northland, our Bayards in blue;
> And loud was the cry as the sun sank from sight
> And deep was the pray'r in the darkness of night;
> "Oh God! give us water!" and lo! ere the morn
> A fountain of crystal and beauty was born.
> Aye, born 'mid roll of the thunders on high
> Where the swords of God's wrath cut the gloom of the sky,
> And thousands whose spirits were almost a-wing,
> Thanked God for His gift of the Miracle Spring.
> came in the night and its heart is still clear
> As when it gushed forth in the tragical year;
> And over it waves, for the brave and the free,
> The ag [sic] that is fear d [sic] on the la d [sic] and the sea.

60. "Comrades Dedicate Memorial Fountain," 1901, ANDE.
61. "Journal of the 19th National Convention of the Woman's Relief Corps," 1901, 196, HathiTrust Library.
62. Historic photographs from ANDE Digital Files, still present on site.

Figure A12. The Providence Spring House circa 1907 with wooden sign visible in background (Source: ANDE Archives).

They sleep, the young gallants who perished athirst,
They slumber, who died in the priso [sic] accursed,
And where they once suffered the young robins sing,
And bathe in the waters of Providence Spring.
The marble we raise where the clear waters flow
Bring, back to us scenes of that dark "long ago,"
And we here thank the God of the tender and true
For the waters that nourished our brothers in blue.[63]

An *Atlanta Constitution* newspaper article from 1906 offers a description of the landscape of the Providence Spring House during the early years of its existence. It describes several signposts erected at and near the Providence Spring House. In addition to the WRC and National Association of Union Ex-Prisoners of War inscriptions within the Providence Spring House, other commemorative signs and monuments were placed near, below, and beyond the spring. These signs and monuments memorialized prisoners who died from gunshots while reaching over the deadline to drink from Providence Spring, as well as the events of the spring's emergence. They also included prisoners' statements about the horrifying conditions of the prison and marked the spot where "raiders" were hanged.[64] Historic photographs suggest that some of the signs were painted wooden boards, including one that was mounted to a nearby tree trunk. This sign read: "A thunderbolt fell with Omnipotent ring, and opened the fountain of Providence Spring." (Figure A12).

An Americus, Georgia-based partnership of stone workers, Miller & Clark, are credited with constructing the Providence Spring House structure.[65] Miller & Clark had developed a national reputation for the creation of memorials, particularly monuments. They are also responsible for the creation of the Pennsylvania and

63. "Journal of the 19th National Convention of the Woman's Relief Corps," 197.

64. William Riley Boyd, "Inscriptions at Andersonville," *The Atlanta Constitution*, May 13, 1906, 3, Newspapers.com.

65. Barr Ferree, *Year Book of the Pennsylvania Society* (New York: Pennsylvania Society, 1905), 199.

Massachusetts monuments at Andersonville.[66] Miller & Clark worked primarily with "Tennessee, Georgia, Italian and American marble and European and domestic granite."[67] A newspaper article reporting on the Providence Spring House dedication event claims that the fountain is crafted of Italian marble. [68]

The earliest available photographic documentation of the Providence Spring House fountain suggests that materials have remained unchanged during the building's lifespan. They show the fountain was originally constructed of three materials: a white marble tablet, a granite basin, and a grey marble base. The Providence Spring House fountain appears to have significantly changed in regard to the location of the spring water outlet and overall appearance and condition of the marble tablet. Historic photographic evidence (Figures A13, A14, and A15) suggests that the tablet originally featured a much more prominent dove carving (in relation to the dove's existing conditions), which featured the dove's entire body, wings fully extended and body outstretched, with its body positioned on the marble tablet as if being viewed from below while in flight. The dove's original condition had an integrated basin carved in the location of the dove's abdomen and lower wings, with fanned tail feathers carved below that reached down toward the granite basin. The dove and integrated basin appeared to protrude significantly from the face of the marble tablet. Hierarchically speaking, this dove and basin feature on the marble tablet appears to have been much more visually dominant than existing conditions would suggest. In theory, this historic configuration of the Providence Spring House fountain suggests that spring water originally entered the fountain by spilling out through the dove's beak, down into the marble basin in the area of the dove's abdomen, where it would then appear to cascade over the dove's shoulders, into the granite basin below. Chemical erosion in the vicinity of the dove's beak supports evidence suggesting the dove's beak served as original spring water outlet. The copper medallion, and re-routed spring water outlet, was added at a later, unknown date.

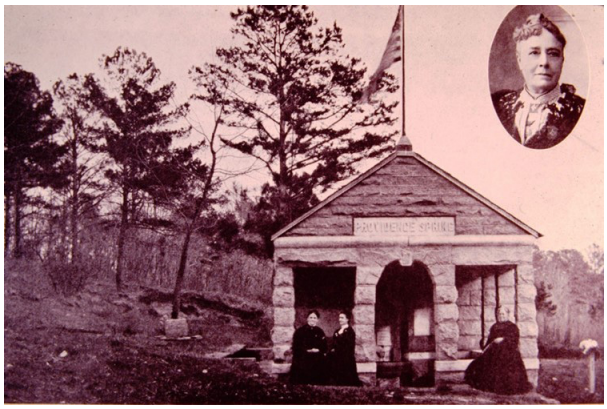

Figure A13. Postcard of the finished Providence Spring House with original fountain configuration visible, circa 1901 (Source: ANDE Archives).

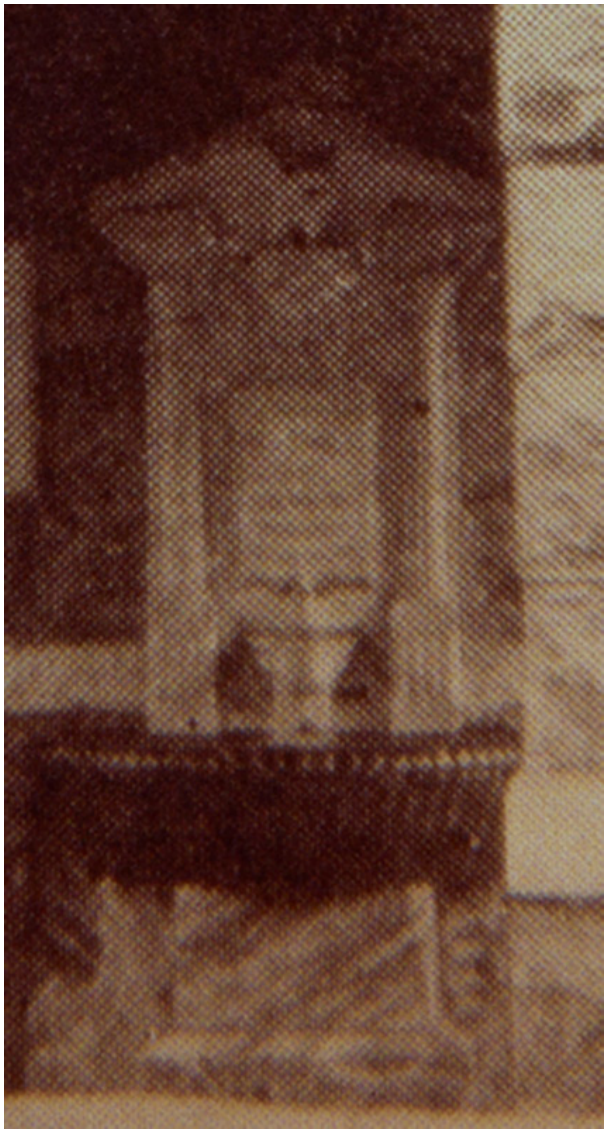

Figure A14. Cropped close-up of Spring House fountain as it appeared circa 1907 (Source: ANDE Archives).

66. "Beautiful Designs in Cemetery and Monumental Works. Miller and Clark.," *The Atlanta Constitution*, October 5, 1902, Newspapers.com.
67. Ibid.
68. "Comrades Dedicate Memorial Fountain."

Figure A15. Engraving of Providence Spring House, circa 1907 (Source: ANDE Archives).

There is conflicting information surrounding who is responsible for carving the marble fountain within the Providence Spring House. John D. Hambrick of Gainesville, Florida, wrote a letter in 1986 to ANDE claiming that his father, Paul Franklin Hambrick, who lived in Eastman, Georgia, sculpted the fountain.[69] However, a newspaper article from September of 1901 credits Miller & Clark, the builders of the Providence Spring House, with fabrication of the fountain.[70]

The erection of the Providence Spring House preceded eleven other commemorative monuments erected in the prison park while under management by the WRC. A resolution passed at the WRC's 18th National Convention stated that,

> The National Woman's Relief Corps shall, by deed of gift, signed by the Board of Control of Andersonville Prison Property and National officers of the Woman's Relief Corps, assign land enough inside the prison stockade for the erection of monuments or tablets, that any states or association may desire to erect in memory of the men who died for their country in Andersonville Prison Pen.[71]

The public did not meet the efforts of the WRC with uniform enthusiasm. The debate over the spring's miraculous appearance continued in the press, and a new rumor appeared later in 1901, claiming that the spring had dried up. This report claimed that the spring's disappearance was a direct result of the Providence Spring House's construction, purporting that removal of a nearby

69. Paul Franklin Hambrick, who lived in Eastman, Georgia, was born in 1889. He is listed as a "stone cutter" in city directories in 1917 and 1933. He would have been twelve years old at the time of the creation of the marble fountain inside the Providence Spring House. It is more likely, if he worked at Andersonville, it was for the CCC, though there is no documentation for this. John D. Hambrick passed away in 2012.

70. "Tourists Gone to Anderson.," *Americus Times-Recorder*, May 30, 1901, GaHistoricNewspapers.com, https://gahistoricnewspapers.galileo.usg.edu/lccn/sn89053204/1901-05-30/ed-1/seq-3/.Ga.

71. "Journal of the Eighteenth National Convention of the Woman's Relief Corps," 231.

tree stump diverted the water flow. The article stated:

> The little spring, the subject of hundreds of bitter articles from northern pens against the South, ceased to flow several days ago and is now a dust pile in its magnificent setting of costly marble… A few weeks ago, a splendid marble temple costing $5000 was erected above it. A pine-stump beside the spring was pulled out, and this in some way diverted the flow of water and effectually killed Providence (?) Spring. This announcement will be a sad blow to many Northern hearts where the belief obtains that this spring really gushed forth while the Federal prisoners were dying by hundreds beside is away back in '63.[72]

In response, Miller & Clark sent an investigator to check on the status of the spring and found its flow uninterrupted. A local newspaper reported:

> Several days ago the Times-Recorder, upon excellent information, stated that Providence Spring in Prison Park at Andersonville, near Americus, had ceased flow since the costly temple of marble and granite erected above it had been completed. Messrs. Miller and Clark, who erected the marble temple for the G.A.R. people, were concerned about the publication, and sent one of their men, Mr. Giddings, to Prison Park to investigate the matter. Mr. Giddings reports that the spring is still flowing, and that there has been no interruption of the flow since the costly fountain was erected over "Providence Spring."[73]

Reports from the 20th National Convention of the WRC in 1902, include a note about work to control an overabundance of water in the Providence Spring House:

> The floor of the Pavilion over Providence Spring [was] raised, new drainage around the floor put in so that now the cement floor is dry. How strange it seems that this place was dry, hard clay when our soldier boys imprisoned there were dying for water, and now has so much water that we can hardly control its flow.[74]

There is evidence that the Providence Spring House did experience issues regarding water flow at points during its period of management by the WRC, although records are incomplete. In 1909, Sarah Winans, chairman of the WRC committee in Andersonville, reported that the drainage system at the Providence Spring House had failed "yet again." She recommended the addition of a pool within the monument "in order to limit the need for making constant repairs."[75]

The Success of the WRC

While relatively isolated, the Providence Spring House was a popular site for tourists and memorial events during the administration of the WRC (Figure A16). Around this time, even without connection to a main highway, the site was still estimated to receive roughly 60,000 visitors annually.[76] A former prisoner of war at Andersonville visited the site in 1905. He wrote in praise of the work of the WRC and noted his unfamiliarity with the landscape which had changed significantly from his time there into a "wonderful landscape, beautiful, but not devoid of solemnity." He recalled:

> After visiting these grounds, I cannot refrain from praising the work of the government agents, and the taste and skill of planning and beautifying the grounds…In connection and in harmony with the efforts put forth by the government, to improve the surroundings, the Woman's Relief Corps has earned great credit.

Northern states continued to erect monuments to their war-dead at Andersonville at the encouragement of the WRC. Each dedication event seemed to further reconcile northern and southern countrymen and women, with one article claiming that "a fraternal good feeling was evidence upon

72. "The Spring Gone Glimmering. Fabled Hole at Andersonville Has Gone Dry.," 1901.
73. "Reports the Spring Flowing," *Americus Times-Recorder,* September 10, 1901, GaHistoricNewspapers.com, https://gahistoricnewspapers.galileo.usg.edu/lccn/sn89053204/1901-09-10/ed-1/seq-4/.Georgia.
74. "Journal of the 20th National Convention of the Woman's Relief Corps," 1902, 228, HathiTrust Library.
75. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 99.
76. Francis M. Le May, "Andersonville Cemetery to Get General Cleanup by CCC Unit," *The Atlanta Constitution*, July 12, 1934, 4, Newspapers.com.

Figure A16. Visitors to Providence Spring House on December 7, 1905 (Source: ANDE Archives).

every hand."[77] Former Union soldiers and their ex-Confederate hosts met repeatedly at Andersonville in mutual remembrance of the horrors of the past, helping to diffuse the animosity between the two sides. Furthermore, tales of goodwill experienced by returning delegations of northerners further popularized pilgrimages to Andersonville from across the country. A dissertation on Civil War prisons in American memory supports this idea and suggest that the site's popularity led to the WRC's eventual decision to entrust the site to the federal government. The author writes:

> By 1907, the attention paid to Andersonville extended past the periodic commemorations of the individual northern states. As each delegation returned, word spread of the gracious treatment encountered in Georgia and the beauty of the prison grounds, thanks to the dedicated efforts of the Women's [sic] Relief Corps in caring for the site. Visitors no longer waited for Memorial Day celebrations or monument dedications to plan excursions to see the old stockade and cemetery. That same year Sarah Winans, acting chairman of the WRC, remarked that maintaining Andersonville had become "arduous," primarily due to the constant job of "welcoming the increasing number of visitors, comrades especially" who traveled individually or in small groups to the prison to pay their own respects. With more state monuments planned for the future, the effort required of the WRC seemed likely to rise. Many members of the WRC realized that their organization had reached the limit of what it could accomplish at Andersonville.[78]

The WRC decided to donate the prison site to the federal government in 1908, which accepted it through an Act of Congress in 1910, and President William Howard Taft signed the act. This act gave the government possession of its first and only former Confederate prison site. The act promised the WRC "that the grounds will ever be held as a memorial to the heroism of the men who there proved themselves the highest type of patriots."[79]

It appears that it was always the intention of the WRC to pass the prison grounds to the federal government, who saw their role as temporary caretakers of the sacred ground:

> It is believed by many that the government should, ultimately, take over the Andersonville property; but until something is done let us never relax our efforts to make of this the most beautiful spot on earth; a place where we can revive the sweet and tender memories of heroic

77. As quoted in Cloyd, "Civil War Prisons in American Memory." (Dissertation, Baton Rouge, Louisiana, Louisiana State University, 2005), https://digitalcommons.lsu.edu/cgi/viewcontent.cgi?article=1120&context=gradschool_dissertations.

78. Cloyd, "Civil War Prisons in American Memory," 120.

79. As quoted in Cloyd, 121.

> sacrifice and patriotic devotion to duty and divine love—of home and country.[80]

In 1910, the WRC's chairwoman of the Andersonville Prison Board, Sarah D. Winans, went to Andersonville prior to the transfer of the property. She was to make any necessary repairs and "put everything in good order." She spent three weeks overseeing repairs to two wells and purchasing a new pump for the windmill, which had burst over the winter. She also oversaw work on the Providence Spring House during her trip. She reported back to the members of the WRC at their 28th National Convention that:

> Providence Spring was never in such fine condition as now. I had the floor of the pavilion newly cemented. The water is running through the fountain furnished by the Ex-Prisoners of War Association into a basin, and into a pool in the floor, and out through the pavilion, clear and sparkling as when it first burst forth to quench the thirst of the starving prisoners. The ground around is beautified by growing ferns.[81]

Architectural Context: Providence Spring House Pavilion

Stylistically, the Providence Spring House is a small and simple, yet representative example of a commemorative stone pavilion that expresses the influence of architect Henry Hobson Richardson (1838-1886), who developed a personal strain of the Romanesque Revival style in a series of projects between 1870 and his death.[82] This style included bold expression of masonry, typically including large semicircular arches, battered walls, and rounded turrets, almost always composed of large, rock-face stones. Richardson was perhaps the most influential American architect at the time of his death, and the Richardsonian Romanesque style was widely adopted for public buildings during the 1880s. Its bold, massive effect seemed well suited to civic and memorial architecture. The Richardsonian Romanesque style remained broadly popular through the 1890s but was soon displaced by the Beaux-Arts Neoclassicism that swept the country following the 1893 World's Columbian Exposition in Chicago.

The Richardsonian Romanesque style was a popular choice for Civil War memorial hall buildings built across the country during the 1880s and 1890s. These buildings, often combining shrine-type museums, meeting places for veterans' organizations and their affiliates, and public assembly spaces, were often major community landmarks. Some examples include Memorial Hall (1888-1891/1908, Thomas Sully & Albert Toledano) in New Orleans; Memorial Hall (1890, Frederick S. Newman) in Windsor Locks, Connecticut; GAR Memorial Hall (1892, Joseph W. Yost) in Ironton, Ohio; and the GAR Building (1896-1900, Julian Hess & Richard Raseman) in Detroit.

The style was widely used for monuments and memorial structures from the 1880s into the 1900s. Elaborate and eclectic adaptations of the style can be seen in George Keller's Soldiers and Sailors Memorial Arch (1884-1886) in Hartford, Connecticut, and his James A. Garfield Memorial (1885-1890, George Keller) in Cleveland, Ohio's Lake View Cemetery. While these retain the bold masonry expression popularized by Richardson, they also include an eclectic combination of precedents and a large quantity of exterior sculpture.

Richardson himself began to explore the style's potential to create monuments of sublime and massive simplicity. His design for the Ames Monument (1880-1882) in Wyoming, marking the highest point on the first Transcontinental Railroad, showed the power of a monumental object with a simple form composed of massive, rockface stone blocks with minimal sculpture. Among the many talented designers working in the Richardsonian style after Richardson's death, Minneapolis architect LeRoy S. Buffington (1847-1931) developed this approach on a larger scale in his unsuccessful entry to the 1887 international design competition for the Indiana Soldiers' and

80. "Journal of the Twenty-Fifth National Convention of the Woman's Relief Corps," 231.
81. "Journal of the 28th National Convention of the Woman's Relief Corps," 1910, 206, HathiTrust Library.
82. An earlier phase of the Romanesque Revival style—related to British and European movements including the Norman Revival style, the "Venetian" strain of the Italianate style, and the German *Rundbogenstil* ("round-arch style")—was popularized in the United States between the 1840s and the 1870s. The Smithsonian Institution Building (1847-1855, James Renwick Jr.) is a notable example of this earlier phase.

Sailors' Monument in Indianapolis.[83] His design was an organic, Richardsonian reinterpretation of the obelisk, rising from a base with a massive semicircular arch at each side leading to an interior memorial hall and rotunda. Buffington separated statuary from the structure and limited ornament to the interior, allowing the exterior to read as a pure expression of organic architectural form and rockface stone.[84] These designs by Richardson and Buffington identified the potential to use simple but massive elements to powerful effect in a memorial.

Following this lead, a variety of architects and monument designer-builders applied aspects of the Richardsonian Romanesque style to smaller monuments. Two monuments at Gettysburg Battlefield, Gettysburg, PA, reflect the application of the style at different scales. The monument to the 15th & 50th New York Engineers (1890) interprets the castle logo of the Army Corps of Engineers in a Richardsonian vocabulary. The much larger monument to the 12th & 44th New York Volunteer Infantry Regiments (1893, Daniel Butterfield) includes a pavilion with semicircular arched openings and a circular observation tower.

Adaptation of the Richardsonian Romanesque style for more modest monuments often included the use of large, rockface stones to form pedestals for statues. A slightly larger treatment, employing two piers of rockface stone blocks supporting an arch bearing a statue and pedestal, can be seen in the Confederate Soldier Memorial (1902) in the Camp Chase Confederate Cemetery in Columbus, Ohio, the Confederate Memorial (1902) at Fulton, Kentucky, and the Pennsylvania Monument (1902-1905, Miller & Clark) at Andersonville National Cemetery.

Romanesque Revival in Georgia

The Romanesque Revival style arrived in Georgia in the 1880s and remained popular into the first decades of the twentieth century. In contrast to the use of rockface stone for many high-style Romanesque buildings in other regions, Georgia architects worked primarily in brick. The Romanesque Revival in Georgia differs from that seen in other regions in the comparative lack of designs that closely follow Richardson's own works and the prominence of more eclectic adaptations. In his study of courthouses and depots in Georgia, Wilber W. Caldwell notes that Georgia architects showed a marked tendency to simplify Richardson's powerful style into "a Southern Romanesque Revival of a most fundamental nature."[85] As Caldwell notes, "Richardson's buildings seemed rooted, massive, primarily geometrical forms, and at the same time, fluid architectural statements of strange new mobility. Although none of the Romanesque Revival courthouses in Georgia begin to approach Richardson's inspirational standards, his influence is clear."[86]

In Georgia, as in other states, Richardsonian elements were often combined into the eclectic architectural mélange of the period. Although this freedom and experimentation would be condemned by later generations—influenced by the Beaux-Arts school and Modernism—it was a key aspect of the fertile period of American architectural development between 1865 and 1895. While Richardson's works could evoke simultaneously a sense of dynamism and repose and stone "softness" in broad strokes, Georgia's Romanesque landmarks tended toward a sharp-edged verticality, with lively rooflines and fastidiously delicate ornament.

Forty-seven Romanesque Revival courthouses were built in Georgia between 1882 and 1907.[87] Caldwell identifies William H. Parkins, the first professional architect to settle in Atlanta after the Civil War, as the designer of Georgia's most notable Romanesque courthouses. Parkins also served as a mentor to Alexander Bruce and Thomas Henry Morgan, whose Atlanta firm produced a large number of public buildings between 1882 and 1904, including thirteen Romanesque

83. Buffington is perhaps best remembered today for his 1887 project for a twenty-eight-story iron-frame skyscraper with a resolutely Richardsonian exterior; he used this design in his application for a patent on iron building construction, filed in November 1887 and granted in May 1888.
84. Benjamin L. Ross, "The Indiana State Soldiers' and Sailors' Monument: German Nationalism and Hoosier Commemoration of the Civil War," *Paper Presented at Twenty-Seventh Annual Meeting, Southeast Chapter of the Society of Architectural Historians, Jackson, Mississippi*, 2009.
85. Wilber W. Caldwell, *The Courthouse and Depot in Georgia, 1883-1910: The Architectural of Hope in an Age of Despair* (Macon, GA: Mercer University Press, 2001), 8.
86. Ibid.
87. Ibid.

courthouses.[88] James Wingfield Gloucke was second to Bruce and Morgan, designing eleven Romanesque courthouses.[89] Parkins' courthouse designs for Oglethorpe (1887) and Terrell (1892) Counties and Gloucke's designs for Henry (1896), Union (1899), and Jones (1905) Counties feature arches composed of large stones on otherwise brick-clad buildings. Caldwell describes Bruce and Morgan's many Romanesque courthouses as "only diluted imitations" lacking "the powerful sense of continuous mass and motion characteristic of Richardson's public buildings."[90]

These designs tended to include expressive semicircular arches of brick and rockface stone accents, but the weight and dynamism of the Richardsonian mode was subsumed in a profusion of delicate Colonial Revival, Queen Anne, Renaissance Revival, and neoclassical details and vertical proportions. This expression can be seen clearly in the courthouses for Randolph (1887, Gloucke) and Dooly (1892, Parkins) counties as well as Bruce and Morgan's designs for Paulding (1892), Talbot (1892), Monroe (1896), and Butts (1898) Counties. Brick courthouses like Bruce and Morgan's courthouses for Haralson (1892) and Paulding (1892) counties both incorporate Richardsonian elements into designs that evoke a sense of buoyant lightness through their picturesque outlines, unexpected voids, and the celebration of the planar wall surface.

Boston architect William G. Preston (1842-1910) designed several Richardsonian buildings in Savannah, including the Hotel DeSoto (1888-1890, demolished 1968), the Chatham County Courthouse (1889), and the Savannah Volunteer Guards Armory (1892-1893, now SCAD's Poetter Hall), all built of brick.[91] The employment of Romanesque Revival elements, including large, semicircular arched entrances and rows of small arched windows, on brick-clad buildings is evident in Atlanta landmarks including Bruce and Morgan's Academic Building (1887-1888, now the Lettie Pate Whitehead Evans Administration Building) for the Georgia Institute of Technology and Fire Station No. 6 (1894) and Gardner, Pyne & Gardner's Grady Memorial Hospital (1890-1892).[92]

Swedish-born Atlanta architect G. L. Norman (1848-1909) designed two key buildings with Romanesque Revival elements in nearby Americus, Georgia. Like Preston's Hotel DeSoto, Norman's Windsor Hotel (1891-1892) is an ebullient Queen Anne building with large, expressive brick arches.[93] Norman's Sumter County Jail and Sheriff's Residence (1892, demolished), adjacent to Bruce and Morgan's Sumter County Courthouse (1887, demolished 1959), featured semicircular arched windows, a large turret, an entry sheltered by a large semicircular brick arch, and battered chimneys.

Caldwell notes that, while the Romanesque Revival style was quickly displaced by a "national enthusiasm for an excessively flowery Beaux-Arts Classicism" after the 1893 Columbian Exposition, "the style died a lingering death in the South."[94] In Georgia's courthouses, the Romanesque Revival gradually faded into the Renaissance Revival and Neoclassical styles during the 1890s and 1900s. Some of the state's last Romanesque buildings were among the few to be clad in stone. Bruce and Morgan's North Avenue Presbyterian Church (1900) in Atlanta is clad entirely in rockface stone and applies a variety of Romanesque features, including an arcaded entrance porch, to an otherwise Gothic Revival form. The Atlanta mansion Rhodes Hall (1902-1904, Willis F. Denny), designed by a former employee of Bruce and Morgan, is also clad entirely in rockface stone and incorporates a variety of Romanesque elements.[95]

Springhouse Pavilions

The term springhouse (also spring house) refers to two distinct architectural types. The most common is a residential or agricultural outbuilding built over a spring, intended generally to protect the water source and to make use of the constant flow of cool water for the cold storage of perishable food

88. Ibid., 7–8.
89. Ibid., 9.
90. Ibid., 171.
91. Ibid., 64; David Gobel, "Poetter Hall, SCAD," *SAH Archipedia*, accessed March 17, 2021, http://sah-archipedia.org/buildings/GA-01-5A07.
92. Robert M. Craig, "Grady Memorial Hospital," *SAH Archipedia*, accessed March 17, 2021, https://sah-archipedia.org/buildings/GA-01-121-0074.
93. Caldwell, *The Courthouse and Depot in Georgia, 1883-1910: The Architectural of Hope in an Age of Despair*, 169.
94. Ibid., 9.
95. Robert M. Craig, "Rhodes Hall," *SAH Archipedia*, accessed March 17, 2021, https://sah-archipedia.org/buildings/GA-01-121-0045.

items. Springhouses were an essential outbuilding prior to the advent of readily available, year-round ice delivery and modern refrigeration. These buildings were often of vernacular character and might overlap with related building types including dairies, milk houses, pump houses, and well houses.

The second type of springhouse was a purpose-built structure to shelter a mineral spring, often an artesian sulfur water or chalybeate spring. These pavilions, related to the broader category of garden structures including summer houses or gazebos, might be part of a mineral springs resort or might be placed on an easily accessible public site. Mineral springs became destinations for those seeking the supposed health effects of the spring waters and the social and recreational amenities that developed around them. These destinations developed into an identifiable American type by the 1830s, with early examples in Greenbrier County, (now West) Virginia and Saratoga Springs, New York.

Springhouses could range from simple hipped roof canopies supported by four posts to elaborate, high-style pavilions. Pavilions of the 1830 to 1860 period could range from Grecian temples to wood-frame or cast-iron gazebos. Greenbrier County retains two early surviving springhouse pavilions. The Blue Sulphur Springs Pavilion (1834, George Washington Buster, builder) takes the form of a square Greek Revival pavilion with four vernacular Roman Doric columns on each side supporting a hipped roof.[96] Another 1830s example at White Sulphur Springs features a circle of twelve Doric columns supporting a dome that was originally capped by a statue of Hygeia, the Greek goddess of health, cleanliness, and hygiene.[97]

Later springhouse pavilions in mineral springs resort towns like Saratoga Springs, New York; Poland, Maine; French Lick Springs and West Baden Springs, Indiana; and Eureka Springs, Arkansas, reflected the range of architectural styles popular between the 1830s and the 1920s. Between the 1850s and the 1900s, designs might have included arches, extensive wooden fretwork, onion domes, or other elaborate elements. One example from this period is the Spring House Gazebo (1904, Cornelius M. Foster) in Cincinnati's Eden Park. The polygonal building features an "exotic" expression, with narrow columns supporting multi-lobed arches, a clay tile roof, and an onion dome cupola. Springhouses of the 1900s to 1920s often reflected high-style Beaux-Arts neoclassicism, various period revival styles, or the influence of the Arts and Crafts movement. Springhouses of this last period are exemplified by the West Baden Springs Hotel complex in Indiana, which included three spring pavilions built in the 1910s: the Apollo Spring (a circular Doric temple), the Hygeia Spring (an octagonal Beaux-Arts pavilion with flanking colonnades), and the Sprudel Spring (a Beaux-Arts building with a high-style Neoclassical interior providing access to the spring as well as marble counters with attendants serving glasses of water from the resort's various springs).

At the time of the Providence Spring House's design and construction, the mineral springs pavilion was a type of structure known to a wide swath of the American public. The structure also combined aspects of the public monument or memorial, the park or cemetery shelter house, and high-style funerary architecture including mausoleums. While springhouse pavilions were often high-style and exuberant symbols of health, public monuments and mausoleums were sites of memory, honor, and remembrance. The line between park and cemetery was still blurred in many American communities, with cemeteries associated with both death and mourning and outdoor recreational activities like picnics.

The following examples provide some context for stone springhouse pavilions built within a decade of the Providence Spring House:

Springhouse (circa 1889-1890), Woodlawn Memorial Park, Nashville, Tennessee

A Romanesque Revival springhouse in Nashville, Tennessee's Woodlawn Memorial Park offers a possible point of comparison. The spring was located on the grounds of "Melrose," a house built in 1836 and owned and remodeled by a series of prominent Nashville families over the subsequent

96. Amanda S. Cox, "Blue Sulphur Springs Pavilion, Greenbrier County, WV, National Register Nomination Form," 1992, http://www.wvculture.org/shpo/nr/pdf/greenbrier/92001481.pdf.
97. Druscilla J. Null, "White Sulphur Springs Spring House, Greenbrier County, WV, HABS Architectural Data Form," 1983, https://tile.loc.gov/storage-services/master/pnp/habshaer/wv/wv0200/wv0223/data/wv0223data.pdf.

decades. The Battle of Nashville took place around the property during December 1864 and its owner, Cynthia Pillow Saunders Brown, widow of former Tennessee Governor Aaron V. Brown, and her family reportedly "ministered to the distressed of both sides."[98]

A plaque near the springhouse, apparently dating from the 1950s or 1960s, reads, "HOSPITAL WATER SOURCE / Because of the generous pure water supply / available from this spring, the area surrounding / it was selected as a hospital site for treatment / of soldiers wounded in the Battle of Nashville / which took place during the war between the states." If this plaque's story is accurate, the spring may have served the treatment of soldiers on the grounds of "Melrose."[99]

The stone springhouse was probably built as a landscape feature by Godfrey Malbone Fogg, who purchased "Melrose" in November 1889.[100] Fogg remodeled the existing house as a summer residence and improved the property as a farm for his horses. Work began within weeks of the purchase; by December, Fogg had "a large force of workmen engaged at Melrose, constructing a half-mile [horse] track."[101] In January 1890, the Nashville Banner announced that Fogg had engaged architect George W. Thompson (1835-1910) to oversee the expansion and extensive remodeling of the existing house and the construction of "a handsome carriage-house, a picturesque gate-lodge, a [water] tank tower and a stable with twenty box stalls."[102] Work on the property proceeded through the summer of 1890. The barns were completed in February and the horse track in March.[103] In May, it was reported that "an experienced landscape gardener" had "recently planned and surveyed the carriage drives" and that construction on the property was to be complete within sixty days.[104]

Although the springhouse was not directly mentioned in period coverage, an article from May 1890 notes that "the house will be supplied with water from a spring a quarter of a mile distant by means of a hydraulic ram."[105] Water was pumped to a shingle-clad wood-frame water tower with an open pavilion top offering views of the estate. The spring water system remained in use "for everything except drinking" as of 1950.[106]

It is unclear whether Fogg intended the structure as a memorial to commemorate the spring's role during the Battle of Nashville or whether it was simply intended as a picturesque landscape feature. Its Richardsonian design, reflecting current trends in both high-style residential architecture and public monuments and memorials, is more suggestive of a memorial structure or grotto than a utilitarian piece of infrastructure.[107] Fogg may have been familiar with these trends—a period article reports that he was "one of the most cultured and scholarly men anywhere" and enjoyed an extensive private library—or the stylistic approach may have been determined entirely by architect George W. Thompson.[108] The wide, semicircular entrance arch and massive rockface stone walls of this relatively small structure recall the effects of H. H. Richardson's railroad stations at North Easton (1881-1884) and Chestnut Hill (1883-1886), Massachusetts, although these aspects of the Richardsonian Romanesque also were widely used by other American architects by the late 1880s.

98. Margaret Lindsley Warden, "More Change for Melrose," *The Tennessean*, November 12, 1950, Magazine Section, 7.
99. Two nearby houses were used as Union Army field hospitals during and after the battle: "Glen Leven," located approximately 1 mile south-southeast at 4000 Franklin Pike, and "Sunnyside," located approximately 2 miles west in what is now Sevier Park.
100. "Sale of Melrose," *The Daily American*, November 3, 1889, 7.
101. "Post and Paddock," *Nashville Banner*, December 13, 1889, 1.
102. "Will Cost Big Money," *Nashville Banner*, January 11, 1890, 4.
103. "Turf Talk," *Nashville Banner*, February 20, 1890, 4; "Sent at a Merry Clip," *Memphis Daily Avalanche*, March 23, 1890, 12.
104. "Beautiful Melrose," *Nashville Banner*, May 10, 1890, 4.
105. Ibid.
106. Warden, "More Change for Melrose," Magazine Section, 10.
107. For example, the 93 houses in George William Sheldon's Artistic Country-Seats (1886-1887) included projects by McKim, Mead & White, James W. McLaughlin, Bruce Price, W. D. & G. W. Hewitt, Theophilus P. Chandler Jr., and others, many including Richardsonian stone arches, often combined with Queen Anne, Shingle Style, or Colonial Revival elements. Arnold Lewis, American Country Houses of the Gilded Age (Sheldon's "Artistic Country-Seats") (New York: Dover Publications Inc., 1982), 2-3, 38, 52, 54, 62-64, 70, 81, 92.
108. "Matters of Interest," *Nashville Banner*, March 29, 1890, 6.

In 1950, "Melrose" was purchased by Woodlawn Memorial Park, a modern cemetery laid out to the south, in 1928.[109] The portion of the grounds around the springhouse were developed as the Gethsemane section of the cemetery in the 1960s. The springhouse is now surrounded by other small buildings, including the log Carper Homestead (moved and reassembled in 1969), and an ornamental lagoon.[110]

Hamilton Springs Springhouse (1892) Cumberland Gap Park, Harrogate, Tennessee

This springhouse (Figure A.17) was built in the 1890s for the Cumberland Gap Park Company as part of a health resort development including the 700-room Four Seasons Hotel and a 200-bed sanitorium run by Dr. Allan McLane Hamilton. Located in the Cumberland Mountains in Tennessee, just south of the border between Tennessee and Virginia, the resort was conveniently located near the Louisville and Nashville Railroad line and was marketed as a winter destination for northern tourists and health-seekers. The rambling, shingle-style hotel and sanitorium were designed by New York architect William B. Bigelow in 1890.[111] Advertisements of the resort's opening in March 1892 noted the presence of the sulphur-lithia and chalybeate springs.[112]

The resort was forced to close during the depression following the financial panic of 1893. The massive Four Seasons Hotel was dismantled by the Chicago Wrecking & Salvage Company

Figure A17. Hamilton Springs, Harrogate, TN, circa 2009 (Source: waymarking.com).

in 1895. Lincoln Memorial University was established in 1897 and acquired the former resort property, using the sanatorium as a dormitory known as Grant-Lee Hall.[113] In 1936, the senior class of Lincoln Memorial University moved the Hamilton Springs Springhouse from nearby Tiprell onto campus as a memorial to Madame Frances Eppinger, instructor in German from 1914-1936.[114] It is unclear whether any alterations were made during the relocation.

The Hamilton Springs Springhouse, presumably designed by William B. Bigelow, features a square stone pavilion at center flanked by apsidal porches. The form may have been inspired by central-plan Romanesque and Byzantine churches. Two sides of the square pavilion feature semicircular arched openings supported by freestanding stacked stone columns, giving the effect of a Palladian window. The arches, an associated belt course, and water table (a projection of lower masonry that deflects water running down the face of the building), are of large rockface stones, while the remainder of the walls are of smaller rockface stones laid in a random ashlar pattern. The square pavilion is topped by a conical roof. The roof's projections are supported by projecting wood corbels, while the corners of the stone walls rise up above the

109. Warden, "More Change for Melrose," Magazine Section, 6-8, 10; "Woodlawn Park Plans Announced," *Nashville Tennessean, Woman's Section*, August 19, 1928, 8.
110. "Melrose" was damaged by fire in 1975 and 1979 and was later demolished. Interstate 440 was built through the north part of the estate in the 1980s. George Zepp, "Melrose mansion barely avoided destruction in Civil War," The Tennessean (Nashville, TN), 26 July 2006, B5.
111. American Architect and Building News, 25 October 1890; Catalogue of the Sixth Annual Exhibition of the Architectural League of New York (New York: Robinson & Baker, 1890), 28. Grant-Lee Hall was destroyed by fire in 1909; a new dormitory was built on the surviving limestone foundation in 1917. It was gutted by fire in 1950 and has been remodeled several times since. Earl J. Hess, Lincoln Memorial University and the Shaping of Appalachia (Knoxville: University of Tennessee Press, 2011), 101; Frank W. Welch, Grant-Lee Hall, Lincoln Memorial University, National Register nomination, 1978, https://npgallery.nps.gov/NRHP/GetAsset/NRHP/78002575_text.
112. "Cumberland Gap Park," *Asheville Citizen-Times*, March 1, 1892, 2.
113. Earl J. Hess, *Lincoln Memorial University and the Shaping of Appalachia* (Knoxville: University of Tennessee Press, 2011), 19, 36.
114. Photographs of the springhouse and plaques describing the 1936 project can be found at "Hamilton Springs/Lincoln Memorial University Spring House - Harrogate, TN," accessed 17 March 2021, https://www.waymarking.com/waymarks/wm6694_Hamilton_Springs_Lincoln_Memorial_University_Spring_House__Harrogate_TN.

eave line and are capped by stone ball finials. This treatment is similar to that employed by McKim, Mead & White on the First Methodist Church of Baltimore (1884-1887), a precedent followed by several other American architects over the following decade. The side elevations feature projecting semicircular porches. Each porch features two stacked stone columns supporting a semi-conical roof that extends up to meet the roof of the center pavilion.

Rose Well House (1907-1908), Indiana University, Bloomington, Indiana

Physics professor Arthur L. Foley designed the Rose Well House (Figure A18), originally known as the Alumni Memorial House, on the campus of Indiana University in Bloomington, Indiana, in 1907. Construction was completed in 1908. Several alumni, the chief donor being Theodore F. Rose (class of 1875), funded its construction. The memorial pavilion was designed to incorporate the stone portals from the Old College Building (1855-1856, William Tinsley, altered 1900, demolished 1920s).[115]

While the pavilion was not a springhouse—it was built on top of a cistern used to supply the Indiana University campus—it followed the conventions of contemporary mineral spring pavilions. The square center block of the pavilion features triple arched limestone entrance portals and shaped gables from the Old College Building. The corners feature rockface limestone piers topped by ball finials. Red clay tile clads a convex hipped roof. Semi-octagonal apsidal side porches feature stacked stone columns supporting Tudor arches that carry art glass roofs. The center block contained a drinking fountain and the apsidal porches contained built-in stone benches.

Design-Builders Miller & Clark

Providence Spring House is a significant work of the prominent design-build firm Miller & Clark Monumental Marble Works, which specialized in design and construction of stone monuments and buildings. The firm operated out of Americus, Georgia from 1899 to 1904. Although only one known source confirms that the firm designed the

Figure A18. Rose Well House, Bloomington, IN, circa 2012 (Source: Benjamin L. Ross).

Providence Spring House, many other sources document that the firm constructed the pavilion.[116]

Carroll Johnson Clark (1868-1933) was born in Murfreesboro, Tennessee, to Carroll Clark and Margaret Johnson. He married Mae Biggers of St. Louis, Missouri, at Holly Springs, Mississippi, in January 1896. During the 1890s, Clark was the junior partner with J. S. Nugent in the firm of Nugent & Clark, stone dressers, of Murfreesboro.[117] In April 1899, Nugent & Clark dissolved, and Clark purchased a half interest in E. J. Miller's Marble Works of Americus, Georgia. Clark moved to Americus, and the firm was renamed Miller & Clark Monumental Marble Works.[118]

Edgar Jesse Miller (1859-1912) had been active as a marble and monument dealer since at least 1880. He operated Miller & McCall's Monumental Iron Works in partnership with C. Horace McCall from at least 1880 to 1897. In March 1880, Miller & McCall received the contract to supply tombstones for the 129 Confederate soldiers from Andersonville upon their transfer to Oak Grove Cemetery in Americus.

The firm of Miller & Clark operated from 1899 until December 31, 1904, when Clark assumed full ownership upon Miller's retirement. An announcement of this change in a trade journal noted, "Mr. Clark has erected a number of

115. "Big Time Due at Indiana University," Indianapolis Star, 17 May 1908, 4; "Well House Traditions," Blogging Hoosier History, Indiana University Archives, last updated 6 August 2014, https://blogs.libraries.indiana.edu/iubarchives/2014/08/06/well-house/.

116. Ferree, *Year Book of the Pennsylvania Society*, 199.

117. "Stone Trade Notes," *Stone* XVII, no. 5 (April 1899): 230.

118. "Made a Change in Business," *Americus Weekly-Times Recorder*, April 7, 1899, 8.

handsome monuments in the states of Tennessee, South Carolina, Georgia, Alabama, and Florida, and has completed a number of nice monuments for northern states at Andersonville, Ga."[119] The firm continued as Clark's Monumental Works from 1905. Clark served on the board of directors of the Georgia Marble Retail Dealers Association in 1908.[120]

The company designed and erected many public and private monuments, including a number of Civil War monuments built between 1899 and 1910. The company's proximity to Andersonville National Cemetery and the quality of its works led to several commissions in the cemetery and surrounding communities. C. J. Clark appears to have served as designer for several of these projects but also served as contractor for other people's designs. In 1912, Clark advertised that "some of the largest private monuments in the South and many public monuments at Andersonville" were "of his design and erection."[121]

The firm worked for Union organizations including the GAR and WRC as well as Confederate organizations including the Ladies' Memorial Association (LMA) and United Daughters of the Confederacy (UDC). Its work between 1899 and 1910 falls at a key point in Civil War memorialization, as Union monuments continued to be built at a steady pace and Confederate monuments saw a surge of construction, between the late 1890s and 1920, peaking in the early 1910s. The proliferation of Confederate monuments during this period was part of a larger movement associated with the promotion of the Lost Cause ideology.

The following monuments are known to have been designed or erected by Miller & Clark or C. J. Clark:

- Confederate Monument (1900), Americus, Georgia. Sponsored by the LMA and UDC, this statue and pedestal were installed at the intersection of Forsyth and Lee Streets in front of the Sumter County Courthouse. It was relocated to Reese Park in 1947 along with a World War I monument of similar size.[122] In April 1900, the Americus Recorder reported, "The design is indeed beautiful, and the designers, Messrs. Miller & Clarke [sic], are to be congratulated."[123]
- In 1900, Miller & Clark was one of five firms that submitted designs for the Massachusetts Monument at Andersonville. The design by John Thompson & Sons of Quincy, Massachusetts, was ultimately selected.[124]
- Providence Spring House (1900-1901), Andersonville, Georgia.
- Pennsylvania Monument (1902-1905), Andersonville National Cemetery. During a meeting in April 1902, the Pennsylvania commission reviewed designs submitted by the Eagle Granite Company of Reading, Pennsylvania; the Harrison Granite Company of New York City; Miller & Clark of Americus, Georgia; C. E. Taylor & Company of New York City; and Bauer Brothers of Philadelphia.[125] Miller & Clark's design was selected and was completed in 1905. It reflects a more substantial interpretation of a popular form involving a stone arch topped by a statue, with earlier examples including the Confederate Soldier Memorial (1902) in the Camp Chase Confederate Cemetery in Columbus, Ohio, and the Confederate Memorial (1902) at Fulton, Kentucky.
- Wisconsin Monument (1905-1907) Andersonville National Cemetery. Designed by C. A. Fink, with consulting artist Alexander Miller, this monument was built by Carroll J. Clark.[126]

119. "Tool Chest," *The Reporter* 38, no. 2 (February 1905): 31.
120. "Georgia Marble Dealers," *Rock Products* VI, no. 7 (March 5, 1907): 23.
121. "Clark's Monumental Works," *Daily Times-Recorder*, June 30, 1912, 38.
122. Alan Anderson, "A Chronology of Americus and Sumter County, Georgia, 1540-1914," accessed March 16, 2021, http://www.sumtercountyhistory.com/history/1540_1914.htm.
123. "Handsome Shaft Finished," *Americus Times-Recorder*, April 14, 1900, 3.
124. *Report of the Commission on Andersonville Monument* (Boston: Wright and Porter Printing Company, 1902), 5.
125. *Pennsylvania at Andersonville, Georgia: Ceremonies at the Dedication of the Memorial* (Harrisburg: C. E. Aughinbaugh, 1905), 8.
126. *Wisconsin Monument Commission* (Madison, WI: Democrat Printing Company, 1911), 43, 292.

- Dooly County Confederate Monument (1908), Vienna, Georgia. Commissioned by the UDC, this statue and pedestal was dedicated in November 1908.[127]
- Wirz Monument (1907-1909), Andersonville, Georgia. This obelisk was dedicated to Henry A. Wirz, the officer in charge of the Andersonville prison from 1864 to 1865, who was tried, convicted, and executed for war crimes leading to the deaths of nearly 13,000 Union soldiers from disease, starvation, and exposure. It was commissioned by the UDC as a "rebuttal to the State monuments"—dedicated to the prisoners who had suffered and died in the camp under Wirz's command—erected on the prison site and within Andersonville National Cemetery since 1899.[128] A 1908 trade magazine noted, "Mr. Clark has a number of skilled men now at work fashioning from a huge block of Georgia marble the monument to be reared at Andersonville by the U. D. C. of the South to the memory of the hero martyr, Captain Henry Wirtz."[129]
- Pennsylvania Monument (1910), Salisbury National Cemetery, Salisbury, North Carolina. Designed and built by Carroll J. Clark, this Romanesque Revival pavilion represents a larger and more elaborate iteration of Clark's earlier Pennsylvania Monument at Andersonville.[130]

Clark's Monumental Works moved to Macon in 1931. C. J. Clark died in 1933, the year after his son-in-law, Hamilton Holt, took over the company. The company remains (2021) in operation under the name Clark Memorials.[131]

127. "Chat About Retailers," *Rock Products* VII, no. 6 (January 5, 1908): 25.
128. L. G. Young, "Georgia U. D. C. to Honor Henry Wirz," Confederate Veteran 14 (April 1906): 181-182, quoted in Benjamin Gregory Cloyd, "Civil War Prisons in American Memory" (doctoral diss., Louisiana State University, 2005), 139.
129. "Chat About Retailers," 25.
130. *Pennsylvania at Salisbury, North Carolina: Ceremonies at the Dedication of the Memorial* (Harrisburg: C. E. Aughinbaugh, 1910), 9, 20, 44; "Pennsylvania Monument, Salisbury National Cemetery," Commemorative Landscapes, University of North Carolina, accessed March 16, 2021, https://docsouth.unc.edu/commland/monument/80/.
131. "About Us," Clark Memorials, accessed March 16, 2021, http://www.clarkga.com/about-us.

National Register Eligibility – Criterion C for Architecture

The Providence Spring House appears to be eligible for listing in the National Register of Historic Places for its significance in the area of Architecture under Criterion C as a building that embodies the distinctive characteristics of the Romanesque Revival style as interpreted by a regionally prominent designer-builder who specialized in Civil War monuments. The structure stands out within the body of Romanesque Revival works in Georgia, where there was a strong tendency toward brick construction and smooth exterior surfaces, employing key Richardsonian features including the use of large blocks of rockface stone and a sense of weighty shelter. It is a notable example of a high-style spring pavilion, an identifiable building type of the 1830 to 1920 period, while also serving its intended function as a memorial.

The building stands out within Miller & Clark's body of work, which mainly consisted of obelisks, statues and pedestals, and other object-type monuments. This pavilion meant to be experienced as both an object in the landscape and as an interior space with commemorative wall plaques and flowing water that were central to the memorial experience of the site. The Providence Spring House was designed during a highly productive period for the firm, when it was completing commissions for both Union and Confederate monuments in Georgia and in other states. Miller & Clark was a prominent design-build firm during the key period of Civil War commemoration between the 1890s and the 1910s, as American society sought to memorialize those who had died and honor those who had served but were now near the end of their lives. This period saw both an interest in North-South reconciliation and the rise of the negationist Lost Cause ideology, of which monument construction formed an integral part. The Providence Spring House project established a relationship between Miller & Clark and Pennsylvania representatives, possibly influencing the subsequent selection of their designs for the Pennsylvania Monuments at Andersonville and Salisbury National Cemeteries in North Carolina.

The Providence Spring House retains a high degree of integrity and the property itself possesses a

long period of significance. Specific alterations to the structure within the period of significance include: alterations to the fountain and the floor between 1901 and the 1930s; raising the grade around the perimeter of the structure by the 1930s; and the construction of additional site features during the 1930s. The 1930s work was completed by the Civilian Conservation Corps and retains significance in its own right. With the exception of the 1930s floor and minor changes to grade, the Providence Spring House remains largely intact to its appearance as completed in 1901.

While the Providence Spring House is a commemorative structure, its architectural significance under Criterion C, reflecting the aesthetic and memorial trends of the period 1880 to 1910 and the work of a regionally prominent designer-builder, addresses Criteria Consideration F.

United States Army Ownership

On November 25, 1865, the federal government officially established Andersonville as a national cemetery and permanent resting place for those who died in service to their country. In 1910, the WRC transferred the prison site to the federal government. The U. S. War Department assumed responsibility for operating and maintaining both the national cemetery and the prison site, in what became known as the "Prison Park."[132] Sarah Winans noted the bittersweet feeling she felt at turning the site over to new administration in 1910 when she spoke at the WRC's 28th National Convention,

> As this sacred place is about to pass into other hands, and I think of laying down the work so dear to my heart....I must confess a feeling of loneliness comes over me and I shall long to journey to that 'Mecca' once more and see it made more beautiful as the years go by. [133]

In 1911, the WRC presented Captain J.W. Bryant, new Superintendent to the Prison Park, with a sundial monument commemorating the WRC's time as stewards of the property. In addition to the sundial, the WRC continued to invest in the former prison site and erected three more monuments. New York, Illinois, Tennessee, and Minnesota also all erected monuments in the Prison Park and National Cemetery during the 1910s.

A postcard, illustrated circa 1910, depicts Providence Spring House as it appeared at the time. It shows a retaining wall north of the foundation of Providence Spring House and an access cap to the below-ground cistern. In the image, a person stands inside the building between the interior fountain and basin (Figure A19).

In 1912, a newspaper article documented that the Providence Spring House fountain was still flowing. J.W. Elarton wrote that he drank the water and filled a bottle as souvenir. Despite the continued popularity of the site, the WRC grew unhappy with the condition of the park. In 1913, Sarah Winans, past national president of the WRC, spoke at its 31st national convention. She expressed her disapproval of the declining condition of Andersonville since it was put in the care of the United States Army. The WRC then resolved to:

> …call the attention of the Secretary of War to the rundown appearance of the Andersonville Prison grounds, and respectfully request him to enquire why the promises of Secretary of War to keep these grounds in good condition, as turned over to the Government, had not been kept.

Winans stated that the current Superintendent, Bryant, was "not in sympathy with the preservation and perpetuation of Andersonville Prison Park," and that the WRC wished to have him transferred to "more congenial surroundings."[134]

The issues with Andersonville's upkeep seemed to extend to the Providence Spring House. In March of 1914, documentation shows that the Providence Spring House's fountain no longer had running water. The Office of the Depot Quartermaster issued blueprints for repairs that provide details about the fountain's condition. Blueprints for the "Existing Spring House" suggest that the two springs, one of which supplied the

132. Record Group 77, NARA, 1910 deed, WRC to U.S. Army, Atlanta.

133. "Journal of the 28th National Convention of the Woman's Relief Corps." As quoted in NPS, HRS, 2018. 145.

134. "Journal of 31st National Convention of the Woman's Relief Corps," 1913, HathiTrust Library. As quoted in NPS, HRS 2018, 145.

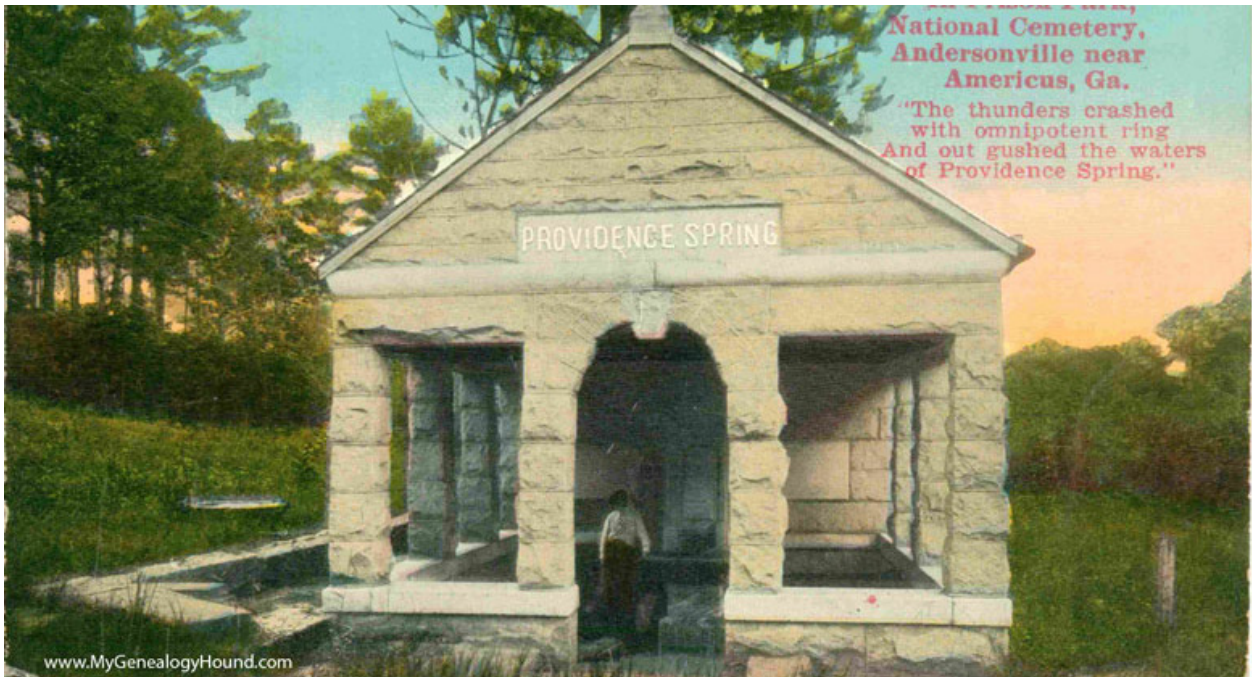

Figure A19. Circa 1910 postcard featuring Providence Spring House (Source: Genealogy Hound).

fountain through an "old pipe" that ran directly to the fountain and another which was piped into the Providence Spring House's interior basin, had relocated and were now both flowing beneath the building and reappearing at ground level near the south foundation wall's outside edge (Figure A20). A note added to the blueprints marks the location of a "new spring." The drawing shows the spring near the northeast corner of the Providence Spring House wall along the path of the "old pipe." The note proposes that a concrete basin be built around the new spring, with an illustration of a small pipe pointed in the direction of Stockade Branch labeled "tile pipes carry to water." It is presumed that the "tile pipes" would be an overflow mechanism for the new spring and that the proposed concrete basin would tie into the "old pipe" in order to bring a fresh supply of water to the Providence Spring House fountain.

This blueprint offers the most detailed documentation available of the Providence Spring House and its supporting infrastructure at this time. Analysis of the blueprints suggests that builders intended water from one spring to fill a cylindrical cistern and flow through a pipe to a ground-level basin within the Providence Spring House. A gutter within the building would direct overflow around the interior fountain and out of the south side of the building. The blueprint indicates that spring water flowed in and around the cistern as well as underneath the building's foundation and interior floor to eventually rise to the surface south of the foundation next to the gutter outlet. This configuration suggests that the existing cistern did not capture and contain all the flow of water from the spring. Water flowing underneath the building, in the amount suggested by these blueprints, would likely produce rapid erosion of the ground underneath and around the building's foundation.

In section, the cylindrical basin is shown next to a retaining wall north of the Providence Spring House. The retaining wall is a similar thickness to the building's foundation and is likely constructed of the same material. The cylindrical basin has a cap at grade level. The top of the retaining wall is also at grade. The retaining wall was, however, lower in elevation than the cylindrical basin since the grade sloped toward the Providence Spring House. The space between the retaining wall and the Providence Spring House is capped with an unknown solid material, possibly the same material that makes up the building foundation and retaining wall. This cap was at a lower elevation than the top of the retaining wall, meeting the Providence Spring House at its foundation. South of the building, the natural grade continues with half of the foundation exposed.

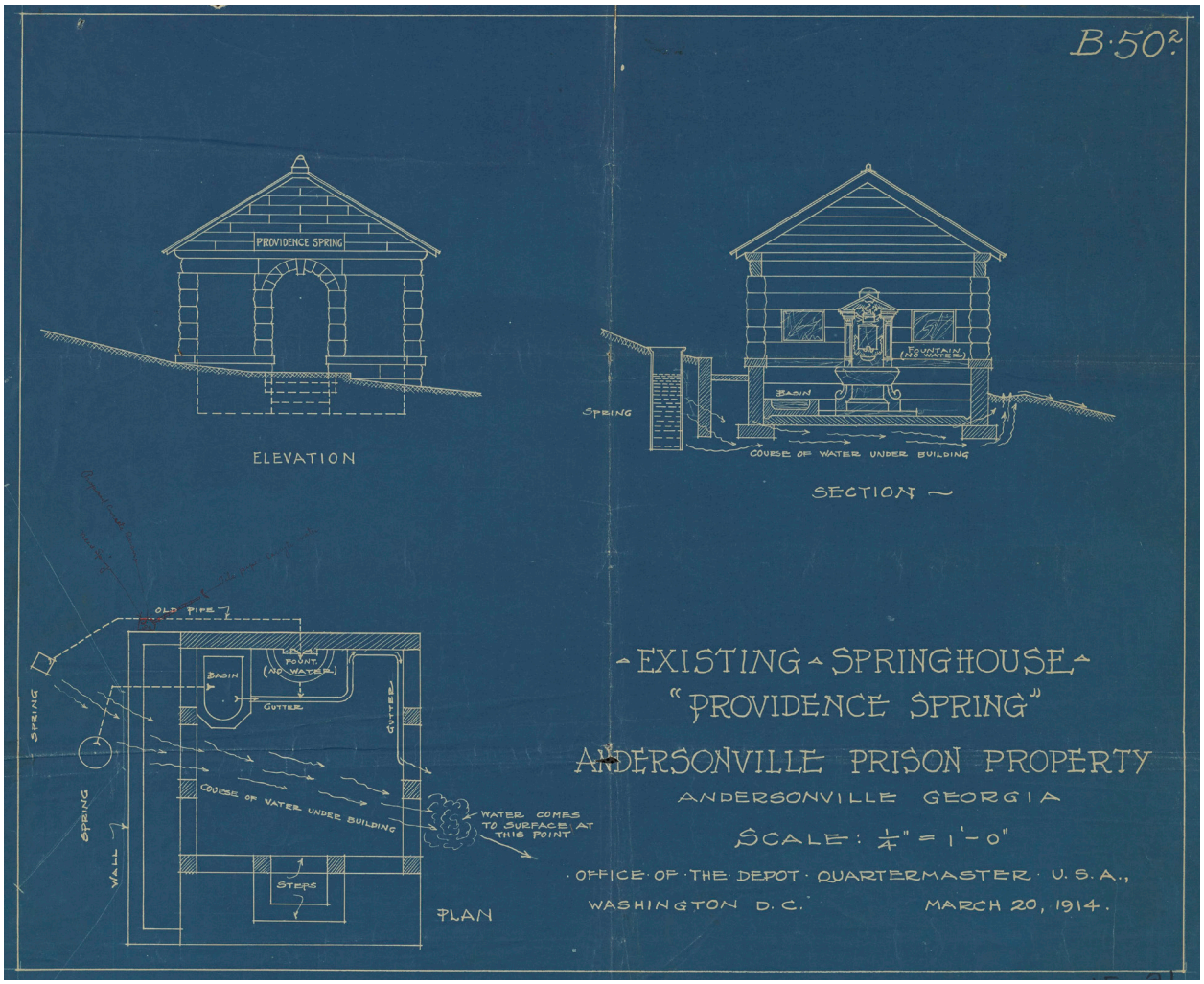

Figure A20. "Existing Springhouse" blueprints, 1914 (Source: ANDE Archives).

A second page of blueprints (Figure A21) is likely to be from this same period circa 1914, although it is undated. Similar handwriting, drawing style, and paper all suggest that these blueprints were drafted as proposed changes to correct some of the issues detailed in the previous-discussed blueprints, namely collecting water from the uphill (north) side of the Providence Spring House and funneling it into a new cistern, basin, and set of overflow pipes.

The blueprints propose a large "plate-steel type Lackawanna steel piling" located immediately outside the existing retaining wall. The structure was to be wider than the entire width of the Providence Spring House and 12 feet deep, beginning a few inches below grade. The steel piling formed a large funnel, capturing diffuse sources of ground water and directing them to a new cistern. The piling also shielded the building foundation from water flowing from the springs. This configuration suggests that the source of spring water was not stable.

This plan proposes replacing the previous cistern with a new brick cistern of 2 foot interior diameter with a reinforced concrete access cover. The plans propose the brick be laid with cement mortar joints for the upper third of the structure, then dry stacked for the remaining depth in order to create a permeable wall where water could enter and be captured within the basin.

According to the blueprint, water entered the permeable brick cistern and filled to one-third of its depth before flowing through a 4 inch terra cotta pipe to a new basin located inside the Providence Spring House. The existing basin was to be removed. The proposed terra cotta pipe was surrounded by a sheath of 4 inch-thick concrete on all sides. The pipe was to be outfitted with a bronze screen at the point where it emptied into the

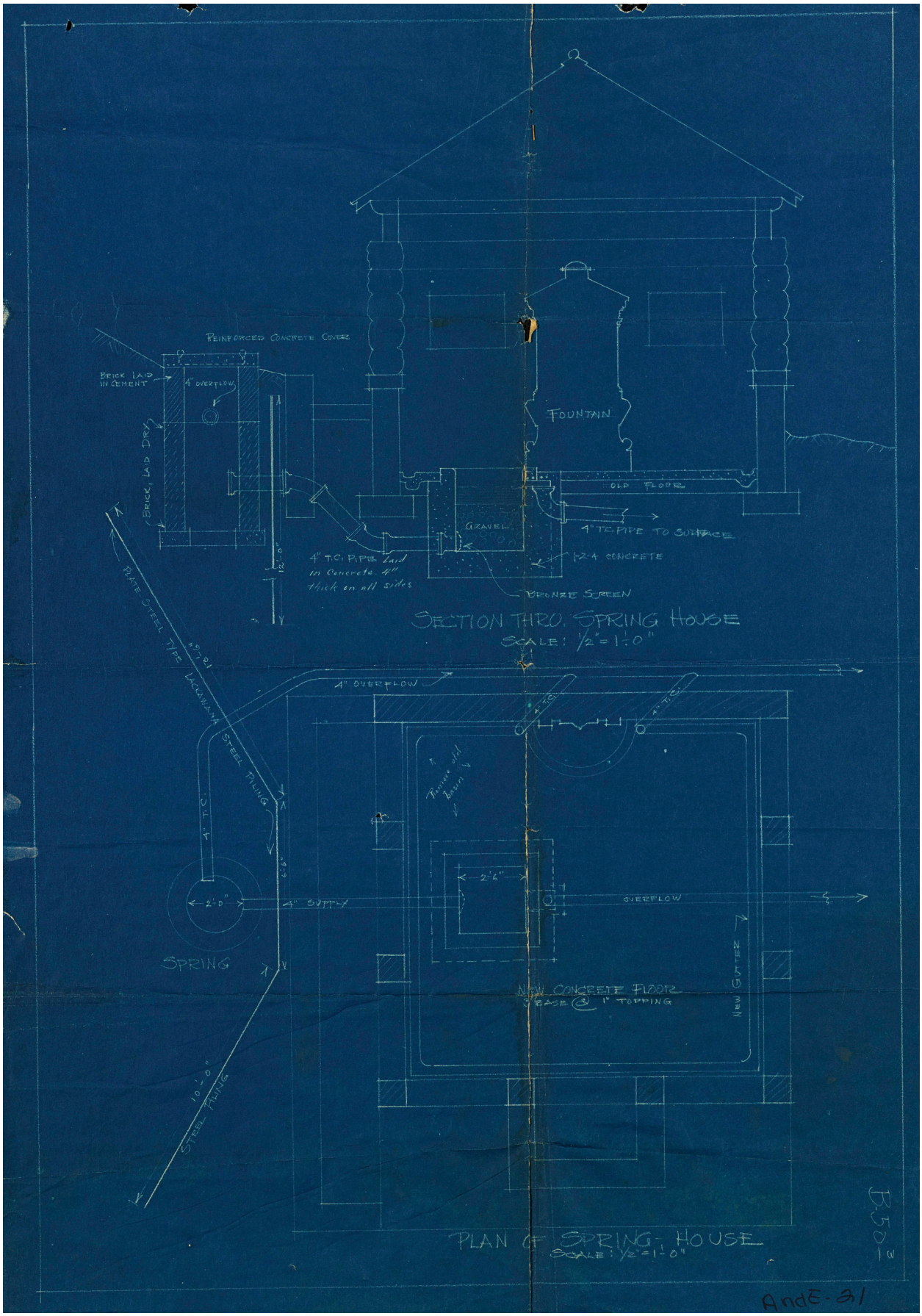

Figure A21. Plan and section views of proposed changes to the Spring House, circa 1914 (Source: ANDE Archives).

interior basin. Another 4 inch terracotta overflow pipe was to be outfitted a third of the depth of the cistern, below grade within the cistern, at the point where the mortared brick met the dry laid brick. When the cistern filled to two-thirds of its depth, the overflow pipe would direct water out and around the building to an undetermined location downhill beyond the building. A new gutter, proposed for the interior of the Providence Spring House, collected water around the perimeter of the interior walls and had two proposed terracotta pipes that funneled water from the gutter on either side of the fountain to the new terra cotta overflow pipe. A new concrete floor with a 3 inch-thick base and 1 inch-thick topping was specified for inside the structure. The perimeter gutter was to be built into the formwork on all sides.

The new basin inside the Providence Spring House was square with a 2 foot, 5 inch interior width. The basin met the terracotta pipe extending from the brick cistern and running below the building's foundation. The basin contained several inches of gravel. The water would fill the basin and be visible as a pool within the interior of the Providence Spring House. Water overflow from the basin and pool was then directed via a second 4 inch terracotta pipe beneath the floor of the Providence Spring House to emerge at ground level somewhere downgrade of the building. This blueprint does not show any attempt to return flow to the marble fountain. However, the Journal of the 35th National Convention of the WRC, which took place in 1917, states that, "Providence Spring still flows clear and sparkling after fifty years, teaching the WRC of God's Omnipotent Power."[135] This statement suggests that site managers addressed the water flow in the interim years between the first page of 1914 blueprints, which note that there was no water in the fountain, and the convention three years later.

A Nebraska newspaper printed a letter detailing a trip to the former prison site, noting that an American flag was flying atop the Providence Spring House during the visit of Miss Ethel Hullihen on Decoration Day 1915. Several images also depicted a flag atop the Providence Spring House peak during this period.

The National Park Service completed a historic resource study (HRS) in 2018, which details a visit by John Gratz, a Confederate veteran, who visited Andersonville in 1918. He followed a gravel road to the pavilion at Providence Spring, and noted that the bridge beyond the Providence Spring House, at Stockade Branch, had collapsed and was used as a pig wallow. The HRS also recounts that the WRC had replaced the decayed remains of the stockade palisades with a row of pecan trees. The document suggests that the earthworks and the areas surrounding the monuments were in good condition during this period. In contrast, the entire hillside around the Star Fort was unmanaged: it was overgrown with underbrush and dotted with hand painted signs marking different locations around the historic fort, including, the former locations of Wirz's headquarters, the sally port (exit), and the fort's well. Markers that had been driven into the ground to mark the supposed locations of Confederate gun positions had been removed at order of the Quartermaster General, who asserted that these positions had not been verified.[136]

The legend of Providence Spring continued to resonate throughout the country. Numerous newspapers mentioned the "miracle" of the spring in articles and letters. Benjamin F. Dill wrote in a letter, which was reprinted by the Davey Mirror in Nebraska, that he was one of the first to quench his thirst with the waters of Providence Spring when he was imprisoned there in August of 1864. He drank from it again, in October of 1912, and again in May of 1921 on a later visit. The steady trickle of newspaper clippings referencing visitor pilgrimages to Providence Spring offers evidence that the fountain continued to flow for many years. In 1925, after an unprecedented drought hit the southern part of the United States, there was mention of Providence Spring in a newspaper in Fresno, California, which noted that "through it all, a cold stream of pure water continued to flow from the side of a beautifully foliaged hill."[137] *Ripley's Believe It or Not* published an illustration of the Providence Spring House in 1930 with a brief description of the tale of Providence Spring, suggesting that the legend continued to captivate the public's imagination some seventy years later.

135. "Journal of the 35th National Convention of the Woman's Relief Corps," 1917, 112, HathiTrust Library.

136. Bearss, *Andersonville National Historic Site Historic Resource Study*, 174.

137. "Spring of Civil War Fame Again Survives Drought," *The Fresno Morning Republican*, December 13, 1925, 10, Newspapers.com.

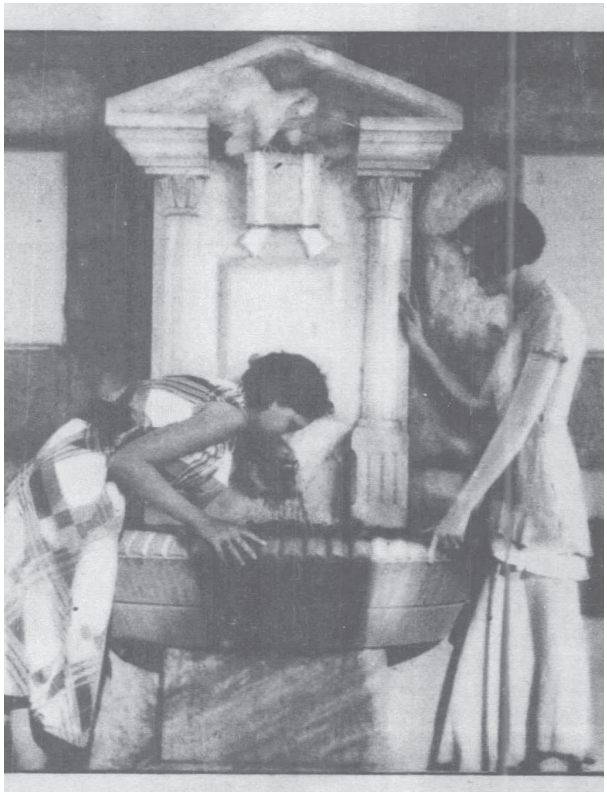

Figure A22. Women drinking from a curved pipe that extends from the marble fountain circa 1931 (Source: Atlanta Constitution).

Figure A23. 1954 Image of fountain with removed pipe (Source: ANDE Archives).

Survivors of Andersonville Prison also continued their pilgrimages to the former prison site. Records suggest that two hundred to three hundred survivors of the prison visited the site each year. During this period, the WRC contributed funds to make improvements to the caretaker's residence, but only after the removal of Superintendent Bryant.

In 1931, a photo published in the Atlanta Constitution appears to show a pipe extending from the fountain's copper, floral medallion spigot (Figure A22). While image quality is poor, a close inspection reveals that the pipe extends away from the fountain's medallion and face, curving horizontally to the right. Two young women are shown; one drinks from the pipe. Details of the pipe, or its disappearance, are not recorded; and water now flows directly from the medallion to the basin below. This flow has contributed to the erosion of marble surrounding the medallion. A photo taken in 1954 appears to show the pipe gone in that year (Figure A23).

In 1932, after the State of Georgia constructed State Route 49 just west of the cemetery, the Army constructed a new entrance into the park. Workers also constructed a connecting road between the new State Route and the prison park. Soon after, in 1933, President Franklin Delano Roosevelt signed an executive order meant to eliminate "overlapping and duplication of effort" on the part of the federal government. This order effectively transferred Andersonville Prison from the War Department to the Department of the Interior for administration by the National Park Service (NPS), but Horace Albright, director of the NPS at the time, successfully lobbied to postpone the transfer of active military cemeteries. This postponement delayed the transfer of Andersonville Prison to the NPS until 1970. In 1956, editors writing in the Ex-POW Bulletin called for a museum and national POW shrine at Andersonville, once again bringing the issue of Andersonville's management to the forefront of public discourse.[138]

138. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 78.

Civilian Conservation Corps Additions

The Providence Spring House forms the centerpiece of part of a larger landscape of commemorative features at the Andersonville Prison site. This landscape includes constructed water channels and pools, tree plantings, walls, walkways, a footbridge, and parking area. The Civilian Conservation Corps (CCC) Company 1411 added the majority of these features and plantings between 1934 and 1935. A second CCC company, 4455, completed several beautification projects at Andersonville between 1936 to 1937.

President Franklin D. Roosevelt's New Deal Program created the CCC in 1932. It aimed to reduce the staggering unemployment of the Great Depression while also conserving natural resources. Nicknamed "Roosevelt's Tree Army," the CCC initially focused on reforestation projects, but they eventually shifted to conservation and development of recreational parks and facilities. Unmarried men between the ages of eighteen and twenty-five who were on relief qualified for enrollment in the organization, where they earned $30 a month in wages. The program proved popular, and it later expanded to allow more enrollees, including African American and American Indian men, World War I veterans, and "local experienced men."[139] Once the United States entered World War II, CCC funding and manpower ran short, which sometimes left park staff to struggle with the preservation of parks under their care. All in all, the CCC left an enduring legacy on the landscape of the United States that includes aiding in the planting of three billion trees, the protection of 20,000,000 acres from soil erosion, and the establishment of eight hundred state parks.[140]

United States Army Quartermaster Corps officials recognized the opportunity the CCC provided in aiding in park improvements. They wanted to renovate the Star Fort at Andersonville and build access roads, drain swampy areas, replant trees, and clear undergrowth to improve the park. By this time, the park experienced roughly sixty thousand annual visitors.

Soon after the national CCC program began, the CCC established a temporary campsite, Army Camp No. 3, north of Providence Spring, while they built a permanent camp west of Highway 49. Col. Duncan Major, Jr. submitted a work request for a project at Andersonville National Prison Park in June of 1934. Robert Fechner, Director of Emergency Conservation Work, approved the project in August. Subsequently, CCC Company 1411 began arriving in September of 1934 to begin work at Andersonville Prison Park. Company 1411 made significant changes to the Prison Park during their fourteen months working at Andersonville. Once they ceased operations in December of 1935, Company 4455 from Fort Benning, Georgia took over, working for one year, until January of 1937.

Significant repairs and improvements to the Providence Spring House and its surrounding landscape, made by the 207 members of the Civilian Conservation Corps stationed at Andersonville, included a new tile floor and roof for the Providence Spring House, as well as a new parking area with a retaining wall constructed of local rubble. They also built a walkway and pedestrian bridge.[141] In addition, they undertook 32 acres of forest improvement projects, replanted 38 acres of fields in trees, graded and paved all park roads, built a new entrance gate, and constructed several rock walls throughout the site.

Civilian Conservation Corps Army Camp No. 3 closed after fifteen months of work at Andersonville. A re-designated Army Camp No. 4—with 50 men from Company 4455—worked in Andersonville throughout 1936. When CCC Director Robert Fechner visited Andersonville in 1935, he remarked that "I do not know of another Civilian Conservation Corps camp or project that has made a better showing for the time and money than has been made by Company 1411."[142]

Fechner held a dedication ceremony on November 26, 1935 at the site of two bridges built by CCC workers. His speech took place atop a grassy slope

139. National Park Service, "Andersonville: Preserving the Prison; Saving a Nation: The Civilian Conservation Corps at Andersonville" (National Park Service, May 2012), 1.
140. National Park Service, "Andersonville: Preserving the Prison; Saving a Nation."
141. National Park Service, *Andersonville Memorial Landscape Cultural Landscape Inventory*, 2010, 52.
142. As quoted in National Park Service, National Park Service, "Andersonville: Preserving the Prison; Saving a Nation."

leading to Providence Spring, and his remarks included a dedication to the, "future welfare and pleasure of those who will have the privilege to come here in years to come."[143]

The WRC also expressed their approval for improvements they witnessed in the Prison Park, with attendees to their 1934 National Convention noting the well-kept grounds. They did, however, mention their opinion of the need to replace the park's decaying bridges. Since the federal government had already set aside money to address the failing bridges, the WRC expressed their relief that the matter was set to remedied.[144] By 1936, Andersonville experienced the final efforts of patriotic groups, like the WRC, to commemorate those who died in Andersonville Prison. The WRC dedicated their final monument to eight states, honoring war dead from the only remaining states that had not yet erected their own monuments, in February of 1936.

Between 1934 and 1936, following the WRC's convention noting the need for bridge improvements in the Prison Park, the CCC constructed a footbridge to Providence Spring.[145] During this period, the CCC also built a stone gateway into the park, marked the corners of the stockade location with stone markers, built culverts, bridges, and a "tour road" around the park's perimeter.[146] From January 1936 through January 1937, CCC Company 4455 completed "landscaping work and constructed retaining and freestanding site walls, paved drainage channels, and culverts as well as [a] retaining 'well' near the Providence Springhouse."[147] Documentation is unclear as to the specific location of the referenced retaining "well." Further work undertaken by the CCC at Providence Spring House, circa 1936, included, "a new brick floor inside the springhouse, construction of a parking lot, a concrete walkway with a bridge, and a series of small brick edged pools to control the outflow from the spring."[148] The Providence Spring House's new brick floor appears to have been built atop the interior basin and pool which was proposed in 1914 and subsequently installed.

The "tour" road constructed by the CCC and the parking lot added for visitors to the Providence Spring House were photographed in 1934. In the photographs, hardwood trees grow across much of the site (Figure A24).

Efforts by the CCC during the 1930s both protected the site of the former prison and improved visitor access. Projects that addressed stormwater management and efforts to slow the general deterioration of the landscape were all part of this protection effort. The CCC expanded access to the site through the addition and improvement of roads and markers that afforded a means for visitors to visit and understand the site.

United States Army Administration, Post CCC Involvement

Management of the former prison site and national cemetery at Andersonville continued under War Department oversight following the dissolution of the Civilian Conservation Corps program and continued through WWII and the postwar period. Records pertaining to administrative actions during the years following the CCC's work at Andersonville are sparse. However, there is evidence that the United States Army performed regular inspections of the property in order to make judgments on the need for improvements and maintenance.

Although few written records exist, an illustration of Providence Spring House appears on a postcard from 1938 (Figure A25). This illustration is similar to previous postcards featuring the Providence Spring House from the early 1900s, with the notable difference of the addition of ornamental trees planted near the Providence Spring House foundation. Two columnar trees flank either side of the front entrance. A third tree, slightly

143. "Bridges at Famous Georgia Prison Built By CCC Workers," *The Atlanta Constitution*, November 26, 1935, 11, Newspapers.com.
144. As quoted in National Park Service, *Andersonville National Historic Site Historic Resource Study*, 100.
145. National Park Service, "Andersonville National Historic Site Cultural Landscape Report," 50.
146. National Park Service, *Andersonville Memorial Landscape Cultural Landscape Inventory*, 26.
147. National Park Service, "Andersonville National Historic Site Cultural Landscape Report," 42.
148. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 103.

Figure A24. The CCC-constructed Providence Spring parking area, with surrounding rubble wall, a retaining wall, and tour road (Source: ANDE Archives).

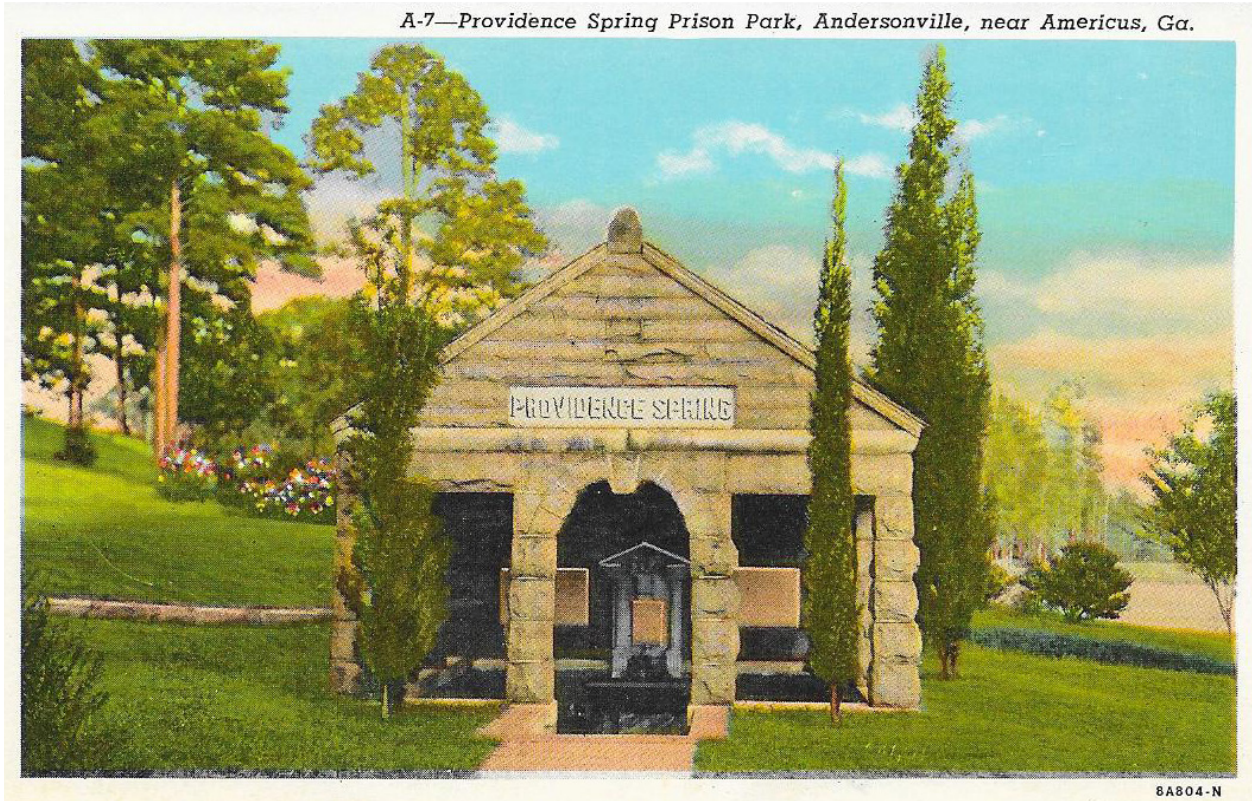

Figure A25. Postcard, circa 1938, depicting ornamental trees outside Spring House (Source: ANDE Archives).

larger, stands on the south side of the Providence Spring House. Notably absent from the illustrated postcard is the stockade marker that was visible in both postcards from the early 1900s. The retaining wall, previously attached to the left side of the Providence Spring House, is not depicted on the 1938 postcard. The wall depicted in the postcard further up the hillside from the Providence Spring House was likely constructed during the period of the CCC's involvement.

An internal Army memo from April 1941 sheds light on the functional state of the Providence Spring House during this period. The memo from Superintendent Coates is addressed to the Quartermaster of the Fourth Corps Area in Atlanta. It asserts that work on the entire water supply system of the Providence Spring House was nearing completion. All new materials replaced the old water supply system parts, and an "excellent supply" of water was now piped into the Providence Spring House fountain. Mr. M. C. Folks, Superintendent of Construction, oversaw the project. The memo explains that workers unearthed what they believed to be the original spring during excavation behind the building. Workers also uncovered another, larger, "boil" of water in this process; and while Superintendent Coates did not think it feasible to divert these water sources into the Providence Spring House fountain, he did propose the addition of a new concrete basin, steps, and a walk, in order to "preserve the old historic Spring as its history and origin is known over the entire nation."[149] Further improvements were estimated to cost $400 and a request was made for their speedy allocation.

The Atlanta Quartermaster composed a memo to the Quartermaster General in Washington, D.C. requesting financial support for the project as funding was unavailable under their current fiscal appropriation. Furthermore, the Quartermaster in Atlanta expressed some urgency in their request by explaining that the Providence Spring House foundation was in danger of being "undermined" if the flow of water from these newly unearthed springs was not controlled. The memo also noted that the Atlanta Quartermaster hoped to complete the project while a "competent superintendent of construction is available to oversee the work."[150]

A sketch that was described to show "the location of the original spring and the present source of water supply for the spring house" accompanied the memo addressed to the Quartermaster General (Figure A26). The accompanying sketch revealed the details of the proposed concrete basin, steps, and a walkway. The drawing shows the proposed basin enclosed on three sides by a retaining wall, with either an overflow pipe or a swale connecting it downhill to the CCC-constructed fountain below the Providence Spring House. According to the sketch, a new concrete walkway would extend from the current walk as it approached the building, wrapping around the south side of the building to the new basin area. Four steps would bring visitors down into the walled area that enclosed the basin and to what is suggested is the original spring. This work was not completed due to lack of funds.[151] The sketch also illustrated the CCC-constructed road, parking lot, and pools and runnel in the surrounding landscape. Notably, identification of the "present water supply" is shown in the sketch. The location of this water supply was uphill from the building and is consistent in location with the illustrated postcard from 1938 depicting a new wall in an uphill location from the attached retaining wall. The 1941 sketch also appears to show the two trees flanking the front entrance to the Providence Spring House that appear in the 1938 postcard. The sketch does not, however, illustrate any existing wall near the uphill side of the building, nor the lower fountain with its connecting sidewalk and steps. The construction of these features is often mis-attributed to the CCC.

The illustration's note of the "present water supply," which the memo described as not being the original source of the spring, is attributed to a rectangular cistern or well, which had a connecting pipe leading downhill into the back of the building directly behind the existing fountain. The suggested design and construction of the cistern is unclear from the sketch. The sketch shows a circle

149. William Coates, "Repairs to Providence Spring-Prison Park," April 11, 1941, National Archives.

150. C.D. Edmondson, "Attention Invited to Communication from the Superintendent of Andersonville National Cemetery with Reference to the Discovery of What Is Believed to Be the Original 'Providence Spring.,'" April 16, 1941, National Archives.

151. SHPO, "Improving Drainage on Prison Site, CCC Ditch Cleaning and Repairs," December 2017, 77.

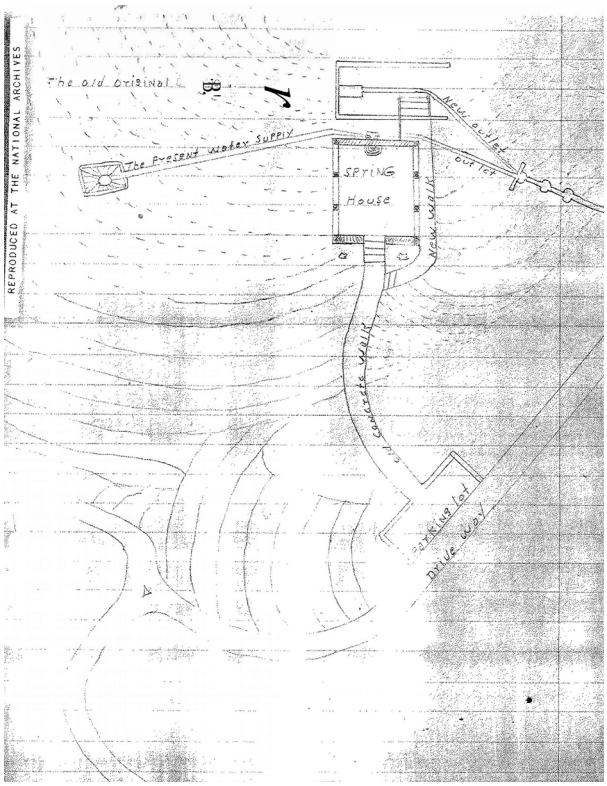

Figure A26. This 1941 sketch accompanied the communication between Quartermasters (Source: ANDE Archives).

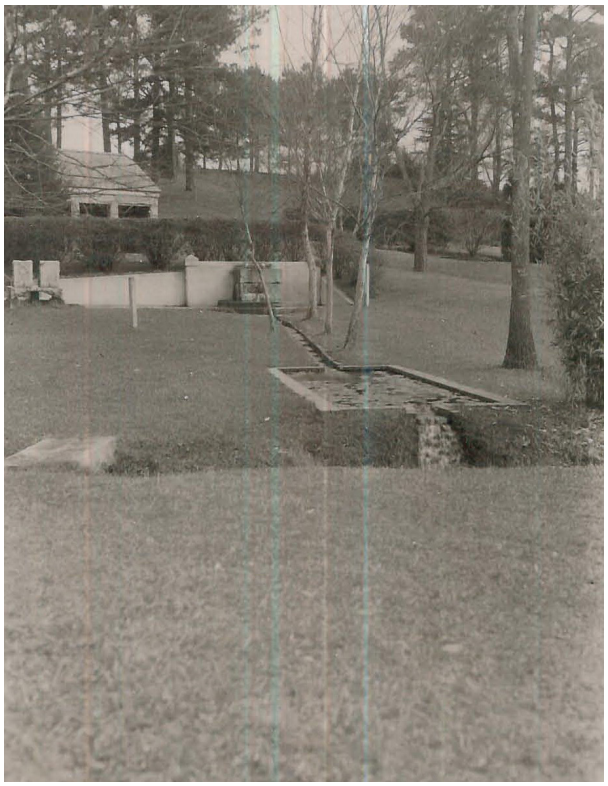

Figure A27. Providence Spring House and lower fountain landscape in 1948 (Source: ANDE Archives).

surrounded by radiating lines, which are enclosed in what appears to be a rectangular wall. Similarly, the connection point of the pipe into the back of the Providence Spring House lacks detail.

By 1948, vegetation surrounding the Providence Spring House and landscape had matured (Figure A27). A photograph shows large shrubs on the lower fountain's northern side. This image is the first photographic documentation of the completed lower fountain. Water flows through the fountain and four pieces of stacked granite stand nearby. These granite stone pieces may be recycled from construction of the Providence Spring House because they are a similar size and finish. There is a concrete walk and retaining wall. Brick pools and a runnel are also visible in the image.

The national bestselling novel, *Andersonville*, by MacKinlay Kantor, was published in 1955. Following the book's release, the Andersonville site experienced a sharp increase in visitors.[152] While the book release inspired many people to make the pilgrimage to Providence Spring, it also reignited the debate in the press concerning the spring's miraculous emergence.[153] The renewed debate did not appear to slow the flow of curious travelers to the site, however. In January of 1959, the park decided to design an updated sign informing visitors that the Providence Spring House water fountain was not suitable for drinking. The design specified the sign for two locations: in the parking lot and at the Providence Spring House. Details of the new sign's design also noted that they were replacing an old, similar sign.

The landscape surrounding the Providence Spring House also changed during this period, as it became increasingly wooded. This appearance contrasted with the previously open setting of the historic prison landscape. A photograph taken in the mid-1950s shows two trees flanking the entrance to the Providence Spring House (Figure A28). Based on their form and texture, the trees appear to be Eastern red cedar (*Juniperus virginiana*). Species identification is consistent with the earlier postcard's illustration of two smaller, ornamental trees from 1938. A rubble wall, topped by shrubs, a concrete walkway, and a hedge at

152. John Ricks, "Andersonville National Historic Site Administrative History (Draft)" (National Park Service, 1986), 33 (as quoted in NPS, HRS, 2018).

153. "Memories of Andersonville," The Montgomery Advertiser, December 7, 1955, 4, Newspapers.com.

Figure A28. Photograph, circa mid-1950s, showing the trees flanking the Spring House entrance (Source: ANDE Archives).

the rear of the Providence Spring House are also visible.

The shrubs struggled in the ensuing years, and, by the 1960s, appeared to be dying back along the rubble wall and behind the lower fountain. In contrast, the hedge behind the building and the trees flanking the Providence Spring House entrance appeared healthy. Four cottonwood trees, growing adjacent to the brick runnel below the lower fountain, further contribute to the wooded feel that characterized the Providence Spring House landscape at this time. Two benches stood near the reflecting pool in the shade of nearby trees. Water flowed through the Providence Spring House fountain and lower fountain, runnel, and pools at this time. The concrete walkway approaching the Providence Spring House and the stairs and walk to the lower fountain are also clearly visible around this time. Furthermore, the lower fountain's faucet is visible, and looks similar to the faucet seen in images from the NPS photo series documenting the French drainage installation project that took place in the 1980s (Figures A29 and A30). Site managers removed and replaced or partially disassembled this faucet. NPS photographic documentation from March of 2016 is the first evidence of the lower fountain's faucet disassembly (Figure A31).

Around this time, in 1968, an article appeared in the December issue of *Rural Georgia* that discussed a recommendation by the park's advisory board for Andersonville's inclusion in the National Park System.[154]

Andersonville National Historic Site

During the 1960s, interest developed in Andersonville Prison Park's potential designation as a national historic site. The United States Congress authorized the establishment of the national historic site as a unit of the National Park Service on October 16, 1970, formally incorporating the two areas previously administered by the United States Army—Andersonville Prison Park and Andersonville National Cemetery. On July 1, 1971, the NPS took over management of the property as Andersonville

154. "Andersonville Suggested For Inclusion in U.S. National Parks," *Rural Georgia*, December 1968, 10.

Figure A29. Lower fountain faucet close-up taken from 1960 photograph (Source: ANDE Archives).

Figure A30. Lower fountain close-up from 1980s French drain installation project documentation (Source: ANDE Archives).

Figure A31. Lower fountain close-up from March 2016 (Source: ANDE Archives).

National Historic Site (ANDE) and continues to operate the national historic site today. The NPS prepared a historic resource study in 1970 to provide a well-researched historic context to guide the NPS in its interpretation of the park.[155]

By 1972, the NPS removed the shrubs atop the rubble wall leading toward the Providence Spring House. They also removed the Eastern red cedar trees, which formerly flanked the Providence Spring House entrance and right side around this same time. Photographs from 1972 reveal a markedly different character to the Providence Spring House landscape, which reverted to the pastoral character cultivated during the administration of the WRC. Photographs taken from the Providence Spring House interior show that the fountain had visible erosion, particularly in the marble work surrounding the medallion, and there was significant algal growth. The NPS completed repairs to the connection point between the copper medallion and marble fountain during this period.

A 6-foot-wide brick patio, adjacent to the western edge of the lower reflecting pool, was added between 1960 and 1961. The NPS chose to remove the patio in 1986 during a French drain installation in the area. They also removed a hedge behind the Providence Spring House, while they retained the hedge behind the lower fountain and the cottonwood trees along the brick. Posts marking the location of the deadline and stockade are visible in photographs from this time period, although precise locations vary through the years. The CCC installed the original versions of these posts; photographs from the 1970s show that they were constructed of different materials but were similar in appearance. Earlier iterations of deadline and stockade markers are visible in photographs dating back to the original construction of the Providence Spring House.

The NPS added an interpretive sign on the uphill side of the Providence Spring House entrance, near the termination of the rubble wall. The NPS removed the "Water Not Approved for Human

155. Edwin Bearss, *Andersonville National Historic Site: Historic Resource Study and Historical Base Map*, Office of History and Historic Architecture, Eastern Service Center, Washington, D.C., July 31, 1970, ANDE Digital Files.

Consumption" sign, previously placed to the right of the Providence Spring House entrance.

In 1977, Jimmy Carter, a resident of nearby Plains, Georgia, was inaugurated as President of the United States of America. It has been suggested that this historic development reignited interest in the historic site and helped shift any residual attitudes of shame and anger among the local population toward one of healing and excitement at the possibility that the history of the area would revitalize the town.[156]

The NPS completed an environmental assessment (EA) of the historic site in 1979. This report referenced Providence Spring and the surrounding landscape, describing the geologic characteristics that contributed to the formation of the spring and surrounding landscape:

> The presence of abundant groundwater in the area is also displayed by springs, the famous of which is Providence Spring along Stockade Branch within the Andersonville NHS. Within the site, the lowland portion of the Stockade branch drainage is underlain by relatively impervious clay rocks of the upper strata of the Clayton formation. A few feet upland, the underlying geologic formation is the porous Tallahatta formation. Providence Spring and most other springs in the area exist because the contact between the porous Tallahatta rocks and the impervious strata of the underlying Clayton formation has been exposed at the earth's surface. Thus, water percolating down through the rocks of the Tallahatta formation ultimately encounters the impervious rocks of the underlying Clayton formation and the water flow changes from vertical to horizontal. If the contact surface between the two rock formations is exposed, the water emerges as a spring. If the contact is overlain by soil, the water emerges as a seep.
>
> Prior to the Civil War, Providence Spring probably flowed as a distinct spring from the earth (USDI, NPS, 1970), but during construction of the stockade, the spring was covered with a layer of dirt spoil. As a result, the area turned seepy and remained that way until a particularly heavy rainstorm when runoff from the denuded stockade area washed away the dirt spoil and allowed the groundwater to again flow as a distinct spring (USGS, 1963).[157]

ANDE staff placed 72,000 square feet of centipede grass sod over meticulously prepared soil in 1980. They hoped to prevent soil erosion and beautify the park. The project required many maintenance hours of soil preparation and care to avoid losing the grass to summer drought. NPS documentation from 2018 suggests that Providence Spring ceased flowing during this particular harsh summer drought, and the NPS took efforts to restart the spring's flow because "park officials felt that this treasured monument had to be saved."[158] In order to return the spring's flow to its normal level, ANDE staff cleared the reservoirs of "sand and root systems" and cleaned out and replaced some of the pipes from the spring and fountain. It was also at this time, following the naming of the new Superintendent, John Tucker, in November of 1970, that mature trees growing along Stockade Branch were logged. There was debate surrounding their removal as they were very large and old, but the argument that they obstructed views of the prison site, preventing visitors from understanding its full size and shape, eventually won out.[159]

ANDE records indicate that during a recurring project analysis in 1985, groundwater was accumulating in the area of the Providence Spring House. Staff were concerned that the building was in danger of collapse and noted deterioration of the foundation from groundwater. Proposed water and drainage sketches resulted from a staff investigation. The resulting drawings proposed adding waterproofing to the exterior of the north foundation wall; adding French and foundation drains to the north and east sides of the building, adding a concrete swale on the south side of the building, and constructing a linear drywell north of the proposed French drain. The

156. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 153.

157. National Park Service, "United States Department of the Interior Environmental Assessment for General Management Plan/Development Concept Plan, Andersonville National Historic Site, Georgia." (United States Department of the Interior, Denver Service Center, June 1979), 25.

158. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 154.

159. Fred Boyles, Minutes of March 26, 2021 Phone Interview with Fred Boyles, Superintendent of Andersonville National Historic Site from November 1989-May 2009, Phone, March 26, 2021.

drawings proposed PVC piping for water supply and polyethylene tubing for the north and east sides of the building. Drawing also proposed a French drain with backfill and a drainage inlet for the south side of the Providence Spring House. The drawings indicated a below-grade masonry retaining wall on the northwest corner of the building, the purpose of which is unclear. The drawings proposed no changes for the lower fountain.

In 1985, the NPS enlarged the parking area near the Providence Spring House to the south to alleviate congestion resulting from increased visitation. Photographs taken after this project reveal the disappearance of a portion of the parking lot's CCC-constructed rubble wall. The NPS documentation of the project did not reference the removal of the rubble wall (See Appendix A-10), so the exact date of the wall's removal is unknown.

In 1986, the NPS replaced all the pipes surrounding the Providence Spring House as part of the cyclic maintenance program. Justification for the work states that,

> Underground water is seeping through walls of providence spring house, water flow through the two fountains has decreased to the point where they cease to flow during extended periods without rain. We propose to remove and replace the water collection pipes into upper and lower springs, replace all associated piping, install a holding tank underground at a point that would insure (sic) continuous gravity feed to both fountains and to install an impervious fabric or other suitable substitute that would direct underground water around the building.

Post-repair blueprints detailed the water system for the Providence Spring House, including three spring sources, one of which escapes around existing Lackawanna piling (from 1914 modifications), two cisterns, and two concrete wall remnants intersecting the brick swale that runs behind the wall above the Providence Spring House. There is a rectangular fountain water source box shown on the rear of the Providence Spring House. Sheet #3 of the detail drawings shows drain lines. Three-inch PVC pipes drain from two of the springs to the back of fountain structure. Two-inch PVC pipe directs water from the third spring around the north side of the building to the back of the Providence Spring House; overflow goes to the lower fountain. There are also sketches of the lower fountain and reflecting pool showing the former brick patio, with an unusual railroad tie cistern structure. Details of the French drain are also included on sheet #3.

Sheet #4 depicts the lower fountain and inlet. It shows a 1 ¼ inch-wide PVC insert drain in the basin with a pipe leading underneath the concrete base. Otherwise, this sheet appears to document existing conditions.

Sheet #5 describes miscellaneous details and the reflecting pool. It shows a 2-inch PVC pipe from Spring 3 penetrating through the steel piling in order to bring water toward the north French drain along the building. It also notes that the reflecting pool patio was installed in 1960-61 and removed March 1986. A 4-inch terracotta pipe is shown running underneath the concrete walk and out towards the Providence Spring House. An unusual 9-foot-diameter log is also noted as being found in the area. Finally, it shows a 20-inch French drain following alongside the lower concrete sidewalk, brick runnel, and pools with a 4-inch drainpipe.

Sheet #6 illustrates details of the spring reservoirs. It shows Upper (#1) and lower (#2) spring cisterns of brick, concrete, and railroad tie construction. The upper spring has a circular top, while the lower spring has a rectangular top. It shows multiple pipes, including the locations of where previous pipe meet structures. Eighteen terracotta pipes flow in and out of the cisterns, delivering water.

Sheet #7 illustrates the plan of the Providence Spring House. It shows that the 1914 basin design was still intact with connection to the original cistern now unclear. The original floor—the "1914 floor"—and 1935 tile floor are all illustrated. Sheet #8 show footbridge details, while sheet #9 illustrates elevations.

In 1992, ANDE staff continued their work on ditch maintenance and swale clearing, and they cleaned out stream beds associated with the swales along Stockade Branch near Providence Springs.[160]

160. SHPO, "Improving Drainage on Prison Site, CCC Ditch Cleaning and Repairs."

In May of 2016, ANDE staff asked Bruce Wright, a mason familiar with historic preservation practices, to examine the features of the Providence Spring House area. There was concern among ANDE staff over visible cracks in the upper part of the marble fountain and leaking around its base, as well as leaks and other general issues facing other historic features in the vicinity. The mason found the Providence Spring House was not in good condition. It was suffering from leaks, leading to severe erosion of the marble work as well as growth of algae, mosses, and lichens. The leak around the base of the pedestal's left side was the most severe, and erosion below the exit of water through the copper medallion nearly completely cut through to the back of the feature. Mr. Wright found the bowl of the fountain to be in good condition as it is made of granite, a stone more able to withstand the erosive conditions. He found the upper cracking in the marble fountain to be a result of Portland cement mortar joints, creating a stress-point in the granite. Mr. Wright carefully sawed and chiseled away at this stress point and recommended joints be refilled with a special marble epoxy. He also recommended a strategy for troubleshooting the cause of leaks within the Providence Spring House and laid out a series of options for repairs.

Upon examination of the lower fountain, Mr. Wright found issues with leaks and algae build-up. He noted evidence that the head joints had been repaired before, although there is no documentation of these repairs. He recommended cleaning the interior of the basin and pedestal, waterproofing the inside of the basin to stop future leaking, tightening up and resetting mortar joints, replacing the fountain head, and performing comprehensive tuck pointing of the fountain. He also noted the need to clean and remove algae.

Mr. Wright further examined the brick runnel, pools, and reflecting pool. He noted that the water height was flush with the top of existing brick work and therefore recommended the addition of another course of bricks. He found invasive tree roots to be a major issue, as they posed the threat of increasing leaks by dislodging brick work. Recommendations for the reflecting pool included draining and cleaning it, as well as completing comprehensive tuck pointing, with plastering and waterproofing to all brickwork and flooring.[161]

161. Bruce Wright, "Site Visit and Inspection," n.d.

Ground disturbance in the vicinity of the Providence Spring House may have contributed to issues with water control. The swale leading down to the Providence Spring House was partially filled with dirt during reconstruction of the north gate (Figure A32). In 2017, park maintenance records suggest this decision led to subsequent issues with drainage on the prison site.

In 2017, the NPS decided that in order to determine the cause of ongoing problems with leaks and continuous moisture around the base of the interior fountain and lower fountain, the park staff would complete a ground penetrating radar study of the entire Providence Spring area in search of terracotta pipes. Recommendations said that any terracotta pipes should be replaced with new materials such a PVC because of issues with the terracotta pipes separating and clogging. The scope of work for this project also included tucking and repointing of the swale north and east of the Providence Spring House. The NPS did not complete this project done due to lack of funds.

In October of 2017, NPS planted three sugar maple (*Acer saccharum*) trees to replace the cottonwood (*Populus deltoides*) trees that they removed earlier that year. Their locations are parallel to the former tree configuration and the current location of the runnel. Their location differs slightly than that of the original trees in that they are farther away from the runnel to avoid issues with tree root encroachment into the built features. Further, the NPS planted the southernmost tree slightly east to accommodate an existing deadline marker.

In 2018, ANDE staff noted that the area north of the Providence Spring House was continually wet with water seeping into the structure. They recommended an investigation into the issue and the final scope of work included a directive to clean masonry, treat the marble fountain for protection, repoint the Providence Spring House, repair the French drains and brick gutter, repair the brick runnel, and clean and repair the lower fountain.

The NPS Historic Preservation Training Center (HPTC) completed repairs in 2019 with four weekly reports documenting the process. A memo stated that:

> In Spring 2019, the National Park Service Historic Preservation Training Center (HPTC)

Figure A32. The CCC-constructed swale that was partially filled by staff during reconstruction of the north gate (Source: ANDE Archives).

performed repairs to the Providence Spring House Channel and Reflecting Pool. The focus of this project was to address needed masonry repairs including pointing, stone cleaning, and construction of a new water channel. All masonry from the Spring House to the Reflecting Pool was power washed. A new roof was installed. The marble fountain in the Spring House was cleaned with D/2 Biological Solution and small scaling tools to remove biological growth, soiling and old mortar. Failed mortar joints in the Springhouse exterior granite stone units were removed and new mortar installed. Mortar was removed and replaced at the fountain marble base. Based upon the reports provided to BCA, the mortar that was reinstalled in the Providence Spring House consisted of 1 part Argos Brand Type N "Beige" color mortar and 2 parts Sakrete Playsand, bagged.[162]

Several projects are ongoing on the Providence Spring House and its surrounding features. These projects are documented in park administrative files and include the installation of a new slate roof on the Providence Spring House, foundation repairs, reflecting pool renovations, and lead abatement at Providence Spring. Repairs to the interior fountain are also ongoing. The national historic site also intends to continue investigations into the existence or condition of the original Providence Spring House cistern.

162. Kathryn Biddle and Dorothy Krotzer, "Memo From Kathryn Biddle and Dorothy Krotzer, Building Conservation Associates, Inc. to J. Keyes Williamson, WLA Studio," July 17, 2020.

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1.B Chronology of Development & Use

Introduction

The Providence Spring House at Andersonville Prison was constructed at the behest of the Women's Relief Corps (WRC) in 1901, although the general site of the spring had undergone prior phases of development. The pavilion was built to commemorate the site of a freshwater spring that emerged in a torrential storm during the high heat of summer and when Andersonville Prison suffered extreme overcrowding. Living conditions were dire as the prisoners' lone source of water had become extremely polluted.

Early Land Use and the Civil War

The Muskogees, American Indians who later became part of the Creek and Uchee tribes, are the earliest documented inhabitants of the area of southwest Georgia where Providence Spring is located. Muskogees were descendants of the Mississippian culture indigenous to the area of what is now western Georgia and most of Alabama. In the late eighteenth century, non-native European settlers set up a trading post in the region of what is now the western boundary of Georgia and eastern Alabama. This region became part of the State of Georgia following the First Seminole War in 1818. The area of present-day Andersonville National Historic Site (ANDE) opened for Anglo-European settlement in 1825, following the treaty of Indian Springs. The site lay in Sumter County, created in 1831, and Macon County, which was created in 1837.

The last American Indian inhabitants were expelled from the area in 1836 following the Second Seminole War and Creek Uprising. European-American settlers quickly transitioned the area to farmland, with human slavery-based agriculture dominating the economy of the region from the 1840s through the Civil War. By January of 1861, Georgia had officially seceded from the Union, joined the Confederate States of America, and entered the Civil War soon after.

Largely because the Confederate government refused to parole or exchange African American prisoners, prisoner exchanges between the North and South collapsed. The development of Civil War prisons like Andersonville were a result of this breakdown. The site of present-day ANDE was owned as separate plats by Benjamin Dykes and Wesley Turner prior to the prison's creation. Once the location was selected for development as a prison site, it was leased monthly by the Confederate government for $50 and $30, respectively. While officially named Camp Sumter, the prison was widely referred to as Andersonville.[163]

The first Union prisoners arrived in February of 1864. Stockade Branch, a tributary of Sweetwater Creek, ran through the prison site. This location was a strategic choice that was meant to supply the prison with fresh water. The bakery, cookhouse and Confederate camp were all located upstream of the prison, so the lone source of water for the prisoners was heavily polluted before reaching the interior of the prison pen. In June of 1864 more than 20,000 prisoners were in the camp, compelling officers to enlarge the prison camp by 610 feet to the north. By August of that same year, at the height of summer, the prison population had increased to over 32,000 prisoners. During a torrential downpour, pressure mounted near the north gate as Stockade Branch swelled with water and effluence. This pressure caused part of the stockade to collapse, tearing up part of the ground, and revealing a bountiful spring of fresh water. Prisoners suffering and dying of thirst and disease resulting from their lack of access to clean water were elated to discover this "providential" new water source. They interpreted Providence Spring's

163. National Park Service, *Andersonville National Historic Site Cultural Landscape Report,* 24.

emergence as divine intervention and lined up to drink from the spring. The new source of water was credited with saving thousands of lives during the final months of the Civil War.

One month after the emergence of Providence Spring, Union forces advanced upon Atlanta, spurring the relocation of thousands of prisoners from Andersonville to prison camps in Millen, Georgia and Florence, South Carolina. Only the sick and dying prisoners who were unable to travel remained at Andersonville, and the site transitioned to a prison hospital. Soil and water quality gradually improved in the prison site as overcrowding eased, but the mortality rate remained high. In November 1864, roughly 1,500 prisoners and a few guards were all that remained. In December, the population of Andersonville again rose as other prison camps were evacuated in response to Union troop movements. The Confederate Army, for example, relocated the prisoners at the camp in Millen, Georgia, as Union General William T. Sherman's army advancing towards Savannah. Many of those prisoners eventually ended up at Andersonville. At the same time, the Confederate Army relocated another 2,000 prisoners to Andersonville from Salisbury, North Carolina ahead of Union troop movements in that area. By late December, Andersonville's prisoner population stood near 5,000 and would remain that way until the end of the Civil War. The war ended with the surrender of Confederate General Robert E. Lee to Union General Ulysses S. Grant on April 9, 1865. Records indicate that 12,920 prisoners died during the fourteen months of Andersonville prison's operation.[164]

The Post War Era (1865-1890)

After the Civil War, the Confederate Army hastily abandoned Andersonville prison, leaving an uncompleted third wall of stockade and many dead bodies exposed to the elements. In the ensuing months, the former prison pen became overgrown with trees and underbrush; however, evidence suggests that Providence Spring continued to be cared for during the general period of neglect of the landscape that followed the Civil War. The grounds of the former prison were eventually put into agricultural use and cultivated in cotton; and local farmers erected makeshift barriers around wells dug by the former prisoners, in order to protect their cattle. An unknown individual sunk a square wooden curb into the ground around the spring beneath an uprooted tree stump to protect the source of the spring (Figure A4). There is reference to this curb in a set of travel journals dating to 1873, which also note a wooden gourd hanging nearby as an invitation for visitors to drink.

In one historic photograph, individuals both white and African American gathered around the wooden curb protecting Providence Spring with their canteens in hand; some photographed are drinking from the spring (Figure A6). In another photograph, the tree stump that stood nearby was shown mounted with a small, circular sign, although it is difficult to decipher the text (Figure B1). In 1883, when a former prisoner of war held at Andersonville made a pilgrimage back to the site, newspaper reports of his visit described a group of individuals that gathered at the site of Providence Spring. The reports indicated that the spring was still protected by the wooden curb and that local residents kept it cleared of vegetative overgrowth. There were even reports that people joined the visitor to drink from the spring and listened to talks he gave about his experiences in the camp. In 1889, another ex-prisoner of war who had been held at Andersonville visited the site. In writings, he noted that the site was cultivated in cotton by two African American men who had taken efforts to protect Providence Spring by erecting a small wooden shed.[165]

164. Ibid., 30.

165. Ibid., 38.

Figure B1. A sign mounted to Providence Spring's tree stump, 1893 (Source: ANDE Archives)

Grand Army of the Republic Developments (1891-1896)

The Grand Army of the Republic (GAR), a Union Army veteran's support and commemoration group, organized during a period when public sentiment was growing in favor of the preservation of Civil War battle sites and memories. The GAR formed as a fraternal organization of Civil War veterans in 1866, with various state departments and local posts assembling throughout the country. The Georgia department organized in 1889. Following an outpouring of public support for Memorial Day commemoration at the site in 1889, when thousands of visitors gathered, the GAR made the decision to purchase the former prison grounds so as to honor the many lives lost there. The GAR raised funds and bought the majority of the former prison landscape in 1891, including the site of Providence Spring. They immediately set to work having the undergrowth removed, planting hedges, and grading a roadway around the perimeter of the site. They also had a central avenue graded through to Providence Spring. By 1896 the GAR had overseen erection of a new wooden structure over the site of Providence Spring, which was around the same time posts were put in to outline the location of the stockade (Figure A7).

In 1896, it became clear to the GAR that they lacked sufficient funds to appropriately develop and maintain the former prison site. The group had suffered from declining funds and waning memberships. An auxiliary to the veteran's organization, the Women's Relief Corps, stepped in to express their interest in improving the prison property. Thus, the Department of Georgia, GAR chose to pass their ownership of the site to their auxiliary, the National WRC, as an unencumbered gift.

The Women's Relief Corps Administration (1896-1910)

At the Fourteenth National Convention of the Women's Relief Corps, the organization agreed to accept the GAR's gift of the former prison site and expressed their intention to erect a monument over the site of Providence Spring.

In 1897, the WRC purchased the remaining acreage of the former prison site. Discussion of a memorial at the site of Providence Spring was ongoing until the organization spearheaded the construction of the Providence Spring House in 1901. An Americus, Georgia-based partnership of stoneworkers, Miller & Clark, was reportedly responsible for the design and construction of the Providence Spring House and fountain in newspaper articles published at the time. An organization of ex-prisoners of war donated the marble fountain erected inside the Providence Springhouse.[166] At this time in the Providence Spring House site's evolution, an American flag was flown atop the Providence Spring House's peak. The fountain flowed with spring water piped from a cistern that was located uphill and north of the Providence Spring House. A basin set into the floor of the interior of the Providence Spring House collected surplus water. The top of the brick cistern uphill from the Providence Spring House was set at grade and covered with a cap. A rock-faced granite retaining wall stretched along the slope of the hill between the cistern and the building. Two marble tablets flanked the marble fountain and described the WRC and Union of Ex-Prisoners of War's dedication of the fountain and the Providence Spring House. A newspaper article from 1906 offered a description of the landscape surrounding the Providence Spring House during the early years of its existence. It described several signposts erected at and near the Providence Spring House. These signs and monuments memorialized prisoners who died reaching over the deadline to drink from Providence Spring, as well as the events of the spring's emergence. They also included prisoners' statements about the horrifying conditions of the prison and marked the spot where "raiders" were hanged.[167] Historic images suggest at least one of the signs was constructed of a painted wooden board mounted to a nearby tree trunk.

Written evidence from the minutes of the Journal of the National WRC annual convention described issues regarding water at the Providence Spring House in the first decade of the 1900s. While one newspaper article claimed that the Providence Spring House fountain had run dry, the issues described by the WRC suggested that the problem was actually an abundance of water. The Providence Spring House floor was subsequently raised, with new drainage installed around its perimeter to keep the cement floor dry. The WRC's journal from 1902 briefly describe these alterations.[168] By 1909, water problems relating to failed drainage had returned to the Providence Spring House. Sarah Winans, chairwoman of the WRC, recommended the addition of a pool inside the Providence Spring House in order to stem the need for "constant repairs."[169] In 1910, the WRC's Prison Board Chairwoman described the Providence Spring House to be as beautiful and functional as ever. The WRC again considered adding a new cement floor, but WRC representatives did record that the interior pool, added in 1909, was working and that ferns were growing and beautifying the area around the Providence Spring House (Figure A11).[170]

During the period of management by the WRC, the number of visitors increased. Eventually, the group decided to pass administration of the site to the United States Army because they concluded that they had reached the limit of what they could accomplish.

See Figure B2, WRC Period Plan illustrating the site conditions in 1909 (See also Sheet B14 in Appendix B).

166. Landrum, "Memo to Administration Regarding Marble Fountain at Providence Spring."

167. Boyd, "Inscriptions at Andersonville," 3.
168. "Journal of the 20th National Convention of the Woman's Relief Corps."
169. Ibid.
170. Ibid.

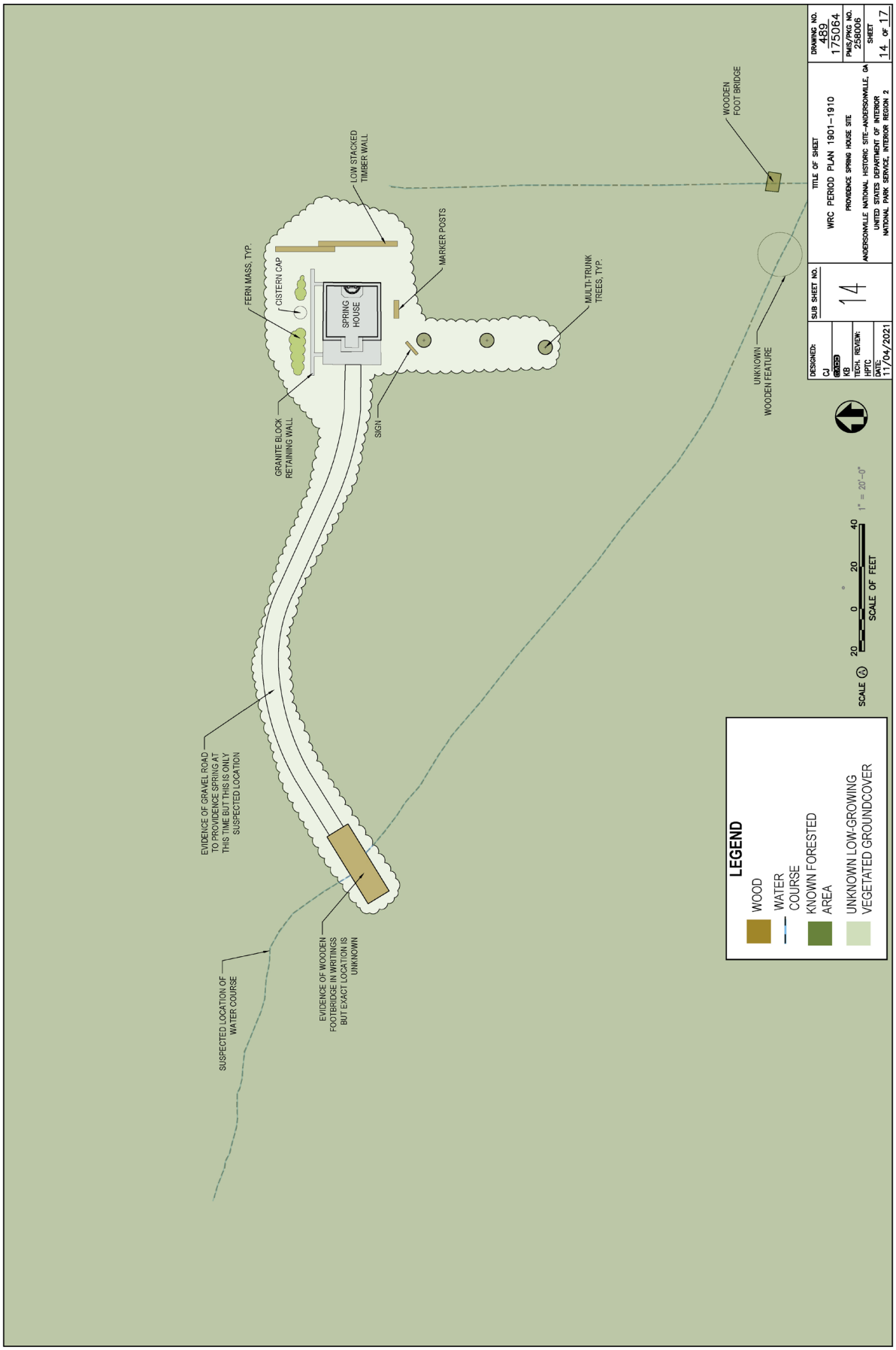

Figure B2. WRC Period Plan (Produced by WLA Studio in 2021, also in Appendix B).

United States Army Administration (1910-1934)

Management records during the United States Army's administration of Andersonville are incomplete, but a set of blueprints dating to 1914 shed light on the existing conditions of the Providence Spring House at that time. Further, a set of historic postcards, dating to the early years of the Army's administration, suggest that the Army inherited the Providence Spring House from the WRC in a condition similar to its original construction. Exceptions to this condition included interior alterations noted in the Journals of WRC, such as the new cement floor and the addition of an interior drainage system and basin. The Journals of the WRC during early years of the Army's administration of Andersonville record their frustration over what they considered inadequate maintenance. The blueprints from 1914 noted that the Providence Spring House fountain no longer flowed at the time and that the two springs that supplied the interior fountain and basin were flowing underneath the building's foundation. Rather than supplying the fountains, the water emerged outside the southern-most exterior wall and flowed downhill. The Army proposed a number of changes, recorded on the blueprints, which included a large plate steel piling installed below grade to collect and funnel water to a new cistern, a new interior basin, and a new set of overflow pipes.[171] The Army apparently completed many of these proposed alterations since evidence of them were found during later excavation at the site. In 1917, the WRC's annual convention noted that water again flowed to the Providence Spring House fountain.

A former prisoner of war's journal, in which he recorded information about a visit to the site in 1918, contains a description of the gravel road that led visitors to Providence Spring. The journal also noted a collapsed bridge over Stockade Branch, which was used as a pig wallow at the time. In 1925, as an historic drought hit the southern half of the United States, a California newspaper article commented the "miracle" that Providence Spring continued to flow through the fountain, suggesting that the Spring was divinely protected from the worst effects of the drought. Later, a historic photograph shows two women drinking from the fountain, which is shown having a small pipe extending from the copper medallion outlet (Figure A20). This pipe was later removed (Figure A21).

171. "Blueprints for the Existing Springhouse, Providence Spring, Andersonville Prison Property."

The Civilian Conservation Corps at Andersonville (1934-1937)

Staggering unemployment during the Great Depression led President Franklin Delano Roosevelt to enact federal legislation creating the Civilian Conservation Corps (CCC), a work relief program that provided manual labor jobs related to conservation and development of public land. Most of the commemorative features built to support the Providence Spring House, including water channels and pools, trees, walls, walkways, a footbridge, and parking area, were constructed between 1934 and 1937. The work involved two CCC companies—CCC Company 1411 (1934-1935) and CCC Company 4455 (1936-1937).

Between 1934 and 1936, the CCC constructed a footbridge to the Providence Spring House. [172] During this period, the CCC also built a stone gateway to the prison park; marked the corners of the stockade location with stone markers; and built culverts, bridges, and a "tour road" around the park perimeter.[173] In January 1936 through January 1937, CCC Company 4455 completed "landscaping work and constructed retaining and freestanding site walls, paved drainage channels, and culverts, as well as [a] retaining 'well' near the Providence Springhouse."[174] Documentation does not explain the purpose or location of the well, but it may be some kind of cistern or overflow feature related to the function of the Providence Spring House. Further work by the CCC at the Providence Spring House, completed circa 1936, included, "a new brick floor inside the springhouse, construction of a parking lot, a concrete walkway with a bridge, and a series of small brick edged

172. National Park Service, *Andersonville National Historic Site Cultural Landscape Report*, 50.
173. National Park Service, *Andersonville Memorial Landscape Cultural Landscape Inventory*, 26.
174. National Park Service, *Andersonville National Historic Site Cultural Landscape Report*, 42.

Figure B3. An image taken post-CCC additions to the landscape that does not appear to show the walk or stairs associated with the lower fountain, circa 1937 (Source: ANDE Archives).

pools to control the outflow from the spring."[175] The main brick water vault was added to the rear of the Providence Spring House around this time, although the exact date of the addition is unknown. The Providence Spring House's new brick floor was apparently built on top of and covering the interior basin and pool that the WRC had added in 1914. The CCC added a brick-lined swale behind a low retaining wall uphill (north) of the original retaining wall. (The original retaining wall was removed at an unknown date, possibly during this project.) Finally, while the CCC is often credited with construction of the lower fountain and connecting walkway and stairs, there is no written or photographic evidence that it dates from the CCC period. A sketch from 1941shows the brick runnel and reflecting pool, but it does not show the lower fountain or the walkway, suggesting that the Army installed these features after the CCC period (Figure A24). A photograph taken after the CCC's installation of ornamental trees at the Providence Spring House, which likely took place between 1936 and 1937, also does not show the concrete walk or steps associated with the lower fountain, although the lower fountain's retaining wall is visible in the image (Figure B3).

175. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 103.

The rubble wall associated with the Providence Spring House parking lot has been repaired and changed through the years. Photographs taken around the time of the parking lot's original construction by the CCC show a low rubble wall surround on four sides of the parking lot. The wall has two openings for the driveway entrance and for the connection to the footpath leading to the Providence Spring House. According to the information in these images, the opening for the footpath on the western edge of the wall was flanked by two concrete-capped portions of wall. There was also a small planting bed surrounding a tree at the left side of the parking entrance drive. Photographs taken later, circa the 1980s, show that a metal handrail-type barrier was installed in front of the parking area's rubble wall on two sides (Figure B4). Part of this rubble wall, as well as the entire metal barrier, were later removed. No park records detail their removal; however, the parking lot was expanded in 1985 in the direction of the missing portion of rubble wall. An internal park memo and project documentation make no mention of the barrier or rubble wall's removal. Furthermore, there is no documentation of the tree or planting bed's removal. A 2015 Cultural Landscape Report details repairs made to the parking area without mentioning of the missing wall, barrier, tree, or planting bed:

Figure B4. Photographs comparing the parking area as it appeared soon after construction by the CCC circa 1937 (top) and with the addition of the metal barrier circa 1980s (bottom) (Source: ANDE Archives).

> Another low rubble retaining wall runs around the edge of the spring pavilion parking lot, with an opening in the wall along the west side where the walk to the springhouse arises. The wall is capped with concrete on either side of this opening. Much of the wall shows signs of repair, with patches of mismatched mortar and one section on the west side with a very thick layer of mortar laid on top of the wall completely obscuring the stones. The stones all came from the same source, but several sections have different repair mortars.[176]

See Figure B5, CCC Period Plan illustrating the site conditions in 1936 (See also Sheet B15 in Appendix B).

United States Army Administration Post-CCC (1937-1970)

The United States Army oversight of Andersonville continued after the dissolution of the Civilian Conservation Corps program and continued through WWII and the postwar period. Records of maintenance activities performed during the Army's administration are incomplete, although photographs and sketches from the intervening years suggest the Providence Spring House landscape underwent some changes, most notably the maturation of ornamental trees planted near the Providence Spring House foundation. An illustrated postcard dating to 1938 depicts two columnar trees flanking either side of the Providence Spring House's front entrance. Two other trees, slightly larger, matured along the foundation on the south side of the Providence Spring House. Absent from the image is the marker post, which was visible in earlier images from the 1910s and which was adorned with flowers in a postcard showing WRC members at the Providence Spring House. The retaining wall, which was previously attached to the left side of the Providence Spring House, is not visible by this time. A new wall, constructed by the CCC, is visible farther up the hillside from the Providence Spring House.

Notable changes were made to the Providence Spring House in 1941, as detailed in correspondence between the US Army Quartermasters Corps and the Andersonville Superintendent. According to documents, new materials replaced the old water supply system of the Providence Spring House and an "excellent supply" of water was piped into the Providence Spring House fountain. Workers also unearthed what they believed to be the original spring during an excavation behind of the building. They also uncovered another, larger "boil" of water; and while the Superintendent did not think it feasible to divert these water sources into the Providence Spring House fountain, he did propose adding a new concrete basin, steps, and walk, in order to "preserve the old historic Spring as its history and origin is known over the entire nation."[177] Further improvements were estimated to cost $400 and a request was made for their speedy allocation however, records indicate that these particular alterations were never made due to a lack funds.

Around 1959, the Army added a sign outside the entrance to Providence Spring House informing visitors that the water inside the fountain was unfit for human consumption. Photographs depict an increasingly wooded landscape, with mature trees and shrubbery surrounding Providence Spring House. The ornamental cedar trees, shrubs, and hedges seen in earlier photographs had all matured. The Army added benches near the reflecting pool and installed a 6'-wide brick patio along the northern edge of the reflecting pool sometime during 1960-1961. This patio was removed in 1986. During this time, the Army also added terracotta drainage piping that ran from the lower fountain to the reflecting pool, parallel to the reflecting pool's western and eastern edges. NPS replaced the west side of terracotta piping in the 1980s, and the east side in 2018.

See Figure B6, U. S. Army Period Plan illustrating the site conditions in 1969 (See also Sheet B16 in Appendix B).

176. National Park Service, *Andersonville National Historic Site Cultural Landscape Report*, 94.

177. Coates, "Repairs to Providence Spring-Prison Park," April 11, 1941.

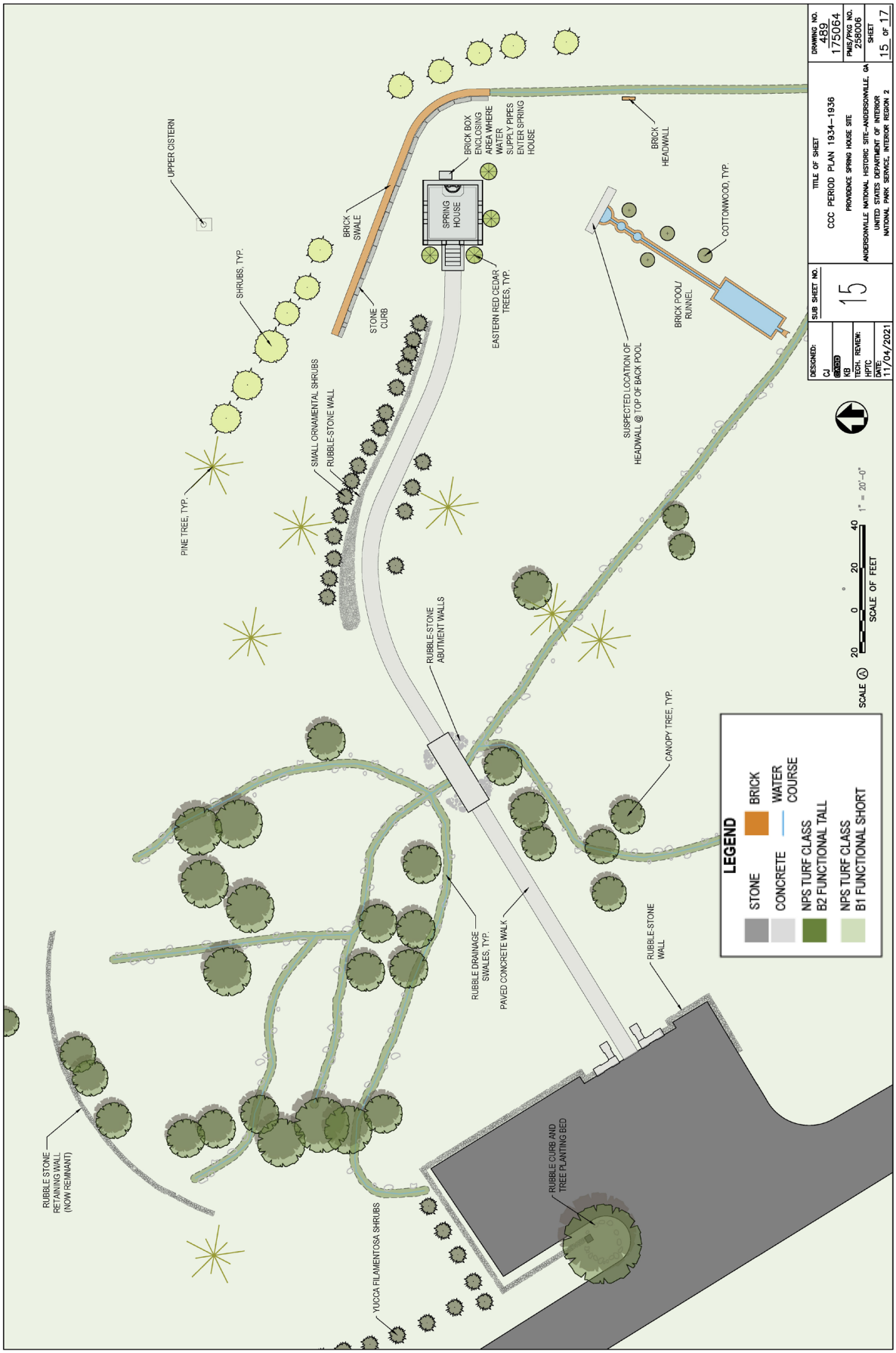

Figure B5. CCC Period Plan (Produced by WLA Studio in 2021, also in Appendix B).

Figure B6. U. S. Army Period Plan (Produced by WLA Studio in 2021, also in Appendix B).

National Park Service Administration (1970-present)

During the 1960s, interest developed in the prison park's potential designation as a national historic site. Under the authority of the Secretary of the Interior, the United States Congress established the national historic site as a unit of the National Park Service (NPS) on October 16, 1970, formally incorporating the two areas previously administered by the United States Army--Andersonville Prison Park and Andersonville National Cemetery. On July 1, 1971, NPS took over management of the property as Andersonville National Historic Site and continues to operate the national historic site today.

In the early 1970s, NPS removed the shrubbery atop the rubble wall leading to Providence Spring House, as well as the ornamental cedar trees around the building. The interior fountain had experienced significant erosion, particularly around the copper medallion where water flowed from the fountain. The hedge behind the lower fountain and the cottonwood trees along the brick runnel remained for the early period of NPS administration. Posts marking the locations of the deadline and stockade were located on either side of the brick pools, along roughly parallel axes. The original posts installed by the CCC circa 1934 were concrete. The locations of the posts have shifted several times since their original installation. The words "stockade" and "deadline" are now printed vertically along the posts. Previous to the period of NPS management, these words were visible on small signs affixed to posts (Figure B7). The NPS replaced the original concrete posts with Carsonite replicas.[178] An interpretive sign was added on the uphill side of the Providence Spring House, near the termination of the rubble wall. The NPS removed the "Water Not Approved for Human Consumption" sign, previously placed to the right of the Providence Spring House entrance.

ANDE staff placed 72,000 square feet of centipede grass sod over meticulously prepared soil in 1980 to prevent soil erosion and beautify the park. The project required many maintenance hours of soil preparation and care to avoid losing the grass to summer drought. 2018 NPS documentation states that Providence Spring ceased flow into the fountain during this particular summer's drought, and they made efforts to restart the spring's flow because "park officials felt that this treasured monument had to be saved."[179] In order to return the spring's flow to its normal level, reservoirs of the spring had to be cleared of "sand and root systems" and some of the pipes from the spring and fountain were cleaned out and replaced.

ANDE records indicate that during cyclic project analysis in 1985 groundwater was accumulating in the area of Providence Spring House. Staff expressed concerns that the structure was in danger of collapse and noted deterioration of the foundation from groundwater intrusion. They prepared sketches that proposed adding waterproofing to the exterior of the north foundation wall, adding French and foundation drains to the north and east sides of the building, adding an additional concrete swale on the south side of the building, and adding a linear drywell north of the proposed French drain.

In 1985, the NPS enlarged the parking area at Providence Spring to alleviate congestion resulting from increased visitation. A year later, the NPS replaced all pipes surrounding Providence Spring House as part of the cyclic maintenance program. In 1986, ANDE staff undertook a major French drain installation project around the Providence Spring House foundation, along the lower fountain walk, along the brick runnel, and along the reflecting pool. These projects disturbed the area north and east of the Providence Spring House. NPS also rebuilt the upper curving portion of the swale north and east of the Providence Spring at this time. They also added additional drainpipes in the area of turf between the footbridge and reflecting pool.

Beginning in the 1990s, ANDE staff determined that several of the CCC-constructed swales were intrusive on the landscape and detracted from their interpretation of the prisoner experience. Staff filled them with dirt, including a portion of the swale leading down to Providence Spring. Park officials later speculated that this effort contributed to water problems in the vicinity of Providence Spring House. The NPS staff removed the shrubbery atop the wall leading to the lower

178. National Park Service, *Andersonville National Historic Site Historic Resource Study*, 186.

179. Ibid., 154.

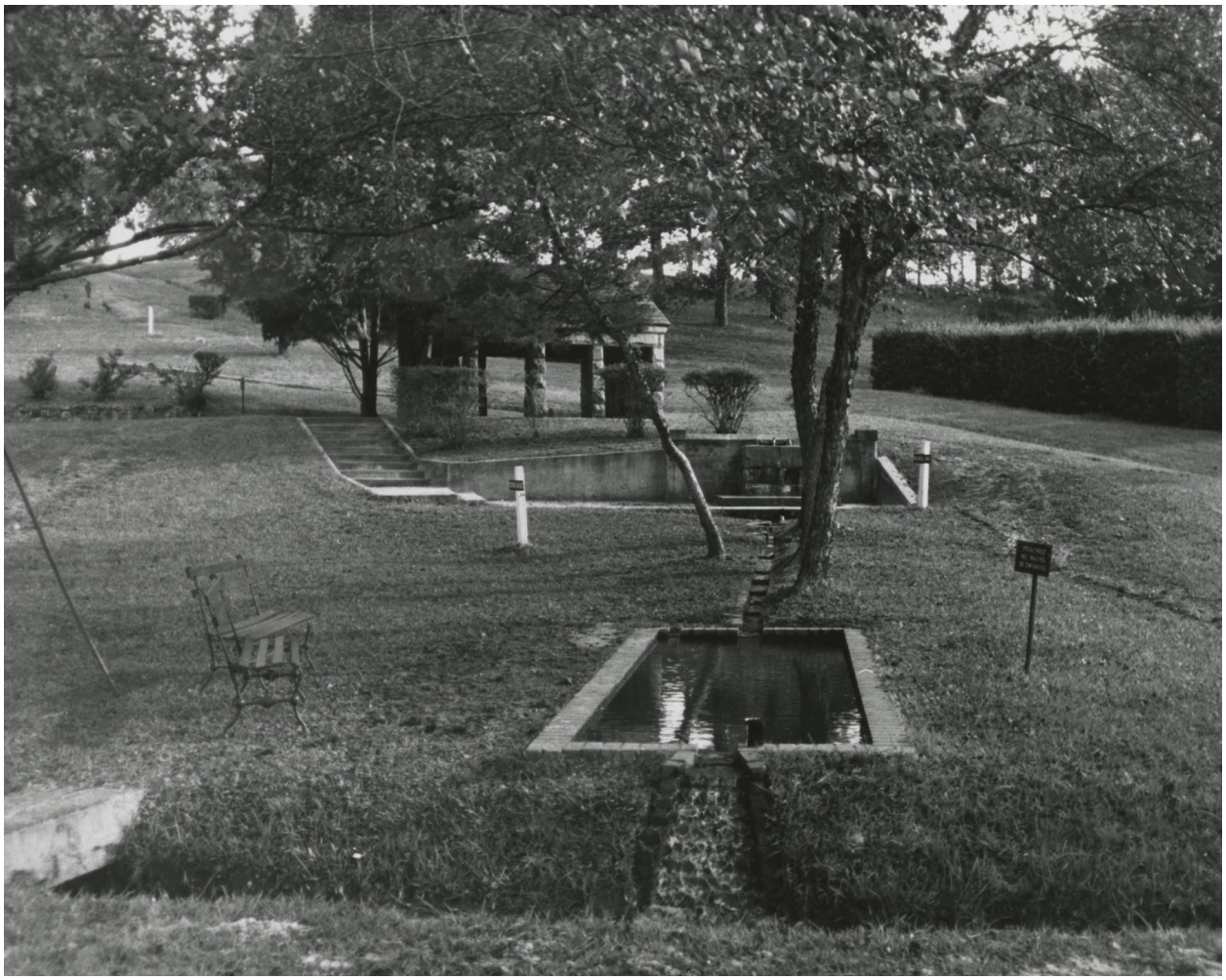

Figure B7. "Stockade" and "Deadline" printed on small signs affixed to concrete posts, circa 1950s (Source: ANDE archives).

fountain. Swales also were cleared during park maintenance in 2004, and again in 2010.

Continuous moisture within the Providence Spring House interior and uncontrolled water in the immediate vicinity continued to present problems for the site's cultural features. Water had begun seeping behind the interior marble fountain and deteriorating the lower portion of the fountain. Also, a significant amount of algae growth developed. Water seeped through the north wall of the Providence Spring House and was discovered bubbling up from the ground on the east side of the reflecting pool.

Bruce Wright, an experienced mason familiar with historic preservation practices, examined the features of the Providence Spring area in May of 2016. ANDE staff was concerned about visible cracks in the upper part of the marble fountain, water leaking around its base, as well as leaks and other general issues facing other historic features in the vicinity. Wright determined that the Providence Spring House was not in good condition. According to his analysis, water intrusion was leading to severe erosion of the marble work as well as causing the growth of algae, mosses, and lichens. The leak around the base of the pedestal's left side was the most severe, and erosion below the exit of water through the copper medallion had almost completely cut through to the back of the feature. The bowl of the fountain was found to be in good condition, however, because it was made of granite, a stone more able to withstand erosion. The upper cracking in the marble fountain was found to be a result of inappropriate Portland cement mortar joints, which had created a granite stress-point. The mason carefully sawed and chiseled away at this stress point and recommended joints be refilled with a special marble epoxy. He also recommended a strategy for troubleshooting the cause of leaks within the

Providence Spring House and laid out a series of options for repairs.

Upon examination of the lower fountain, the mason also found issues with leaks and algae build up. He noted evidence that the head joints had been repaired before, although there is no documentation of these repairs. Other recommendations he offered included: cleaning the interior of the basin and pedestal, waterproofing the inside of the basin to stop future leaking, tightening up and resetting mortar joints, replacing the fountain head, and performing comprehensive tuck pointing of the fountain. He also noted the need to clean and remove algae.

The mason further examined the brick runnel, pools, and reflecting pool. He noted that the water height was flush with the top of existing brick work and recommended the addition of another course of bricks. Invasive tree roots were another major issue, as they threatened to dislodge bricks and lead to more leaks. Recommendations for the reflecting pool included its draining, cleaning, comprehensive tuck pointing, and waterproofing all brickwork and flooring.[180]

In October of 2017, NPS planted three sugar maple trees to replace the cottonwood trees that were removed earlier that year. Their locations were parallel to the previous trees along the runnel. The NPS planted the trees farther away from the runnel in order to avoid issues with invasive root growth. They also adjusted the location of the southernmost tree, moving it slightly to the east, to accommodate an existing deadline marker. (These markers have since been removed from the site.)

Sand began to accumulate in the lower reflecting pool following Hurricane Irma in 2017. The NPS began a project to reconstruct the runnel, pools, and reflecting pool after excavations revealed no foundation beneath these site features. They added a French drain to the southeast side of the runnel in the process of this reconstruction. They also removed remnant tree stumps of the cottonwood trees left from the earlier project.

In 2018, park staff again noted that the area north of Providence Spring House was continually wet and water was seeping into the structure. An investigation of the issues resulted in a series of recommendations, including clean the masonry, repoint the masonry, treat the marble fountain for protection, repair the French drains and brick gutter, repair the brick runnel, and clean and repair the lower fountain. These repairs are ongoing.

Other ongoing projects include lead paint abatement, installation of a new slate roof, foundation repairs, and investigations of the original cistern.

See Figure B8, NPS Period Plan illustrating the site conditions in circa 1995 (See also Sheet B17 in Appendix B).

180. Wright, "Site Visit and Inspection."

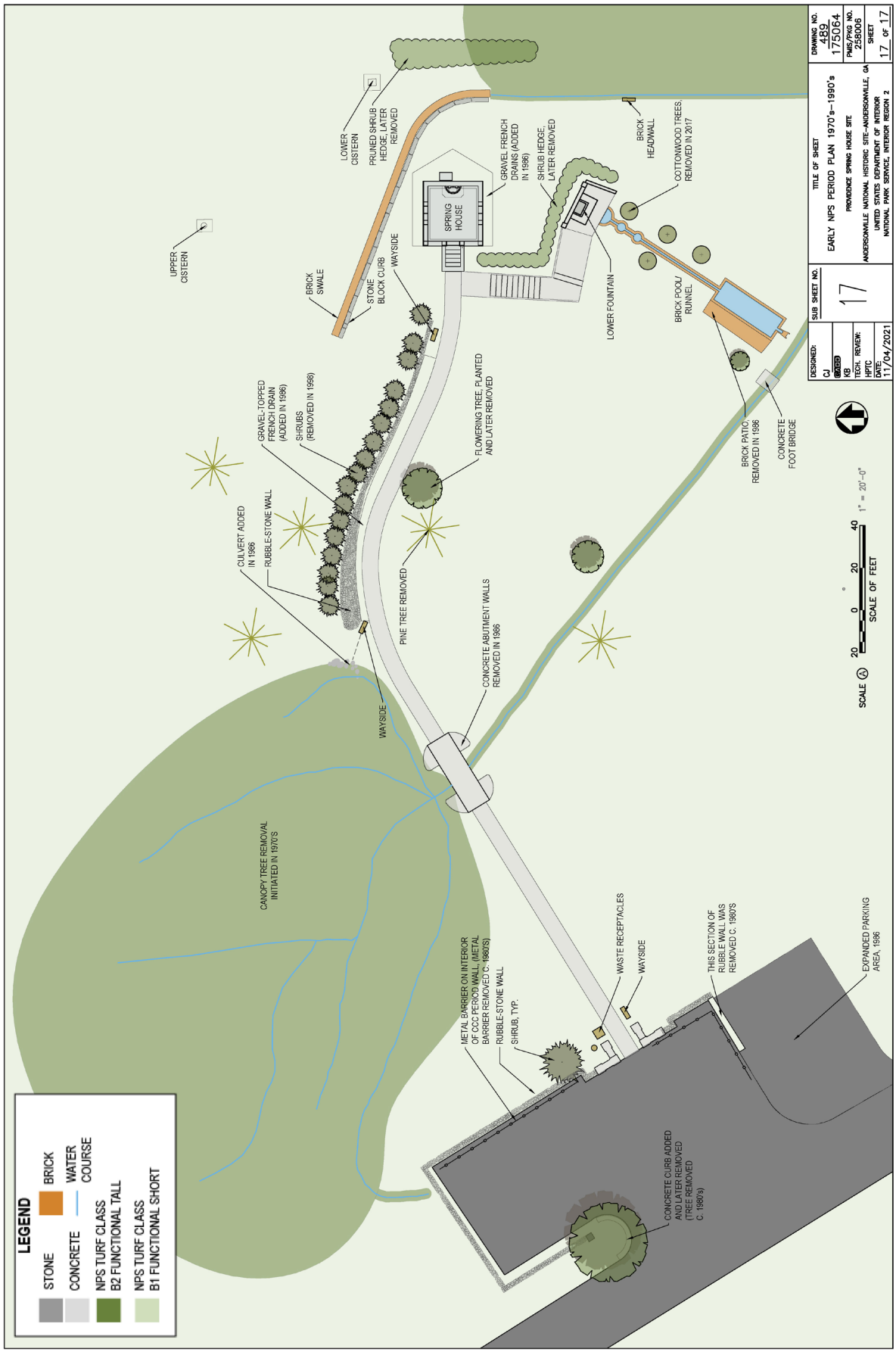

Figure B8. NPS Period Plan (Produced by WLA Studio in 2021, also in Appendix B).

Timeline of Human Activity at Andersonville

Dec. 1863	Confederate Captain W. Sidney Winder selects site of Camp Sumter (later known as Andersonville).
Jan. 1864	Enslaved African American people from local farms clear land, dig ditches, and construct earliest portion of prison stockade, which is approximately 1,010 feet long and 780 feet wide, surrounding 16.5 acres.
Feb. 1864	First 500 prisoners arrive at Camp Sumter (Andersonville prison); first prisoner burial in what later becomes the Andersonville National Cemetery.
June 1864	Workers expand prison stockade to the north to include a total of 26.5 acres.
Aug. 1864	Union prisoner population at Camp Sumter reaches 33,000.
Aug. 9, 1864	Providence Spring emerges at west stockade line.
April 1865	The American Civil War ends.
May 1865	Union forces arrive at Andersonville; last Union prisoners released from Andersonville.
Nov. 1865	United States General Montgomery C. Meigs signs General Order No. 70; formally establishes Andersonville National Cemetery effective July 26, 1865.
1866	The Grand Army of the Republic (GAR) organizes as national sentiment grows in favor of preserving Civil War memories and battle sites.
March 1868	Correspondent for the *Boston Spectator & Weekly Adviser* reports on conditions of the former prison; notes presence of substantial erosion and overgrown vegetation along Stockade Branch, as well as that the site is unguarded and that there were plans for marking the main stockade line with granite posts.
Sep. 1873	Albert Webster reports the accounts of Albert Wheeler and his wife, who visited Andersonville earlier in 1873; conveys that Providence Spring had been cared for, a wooden frame at the point of emergence to protect the spring added, and that the floodplain along Stockade Branch was heavily vegetated with trees as tall as 30'.
1875	United States government purchases 115-acre cemetery site north of former prison grounds.
1880-1930s	A national debate plays out in the press, with two competing views of history: one supporting the story of Providence Spring's divine provenance at Andersonville Prison, and the other claiming that the spring was simply haphazardly covered over in dirt during stockade construction and allowed to re-emerge at a later date.
1881	J.L. Ball of Iowa visits the prison site and describes the area surrounding Providence Spring as overgrown in trees and shrubs.

1883	Two African American men cleared overgrown vegetation from the area surrounding Providence Spring and installed a wooden curb where the spring emerged from the ground.
July 1883	The National Woman's Relief Corps (WRC) is founded in support of the GAR.
1889	Much of the former prison landscape is cultivated in cotton, and the site of Providence Spring is protected by a small wooden shed.
May 1889	Memorial Day commemorative events draw thousands of visitors to the cemetery and former prison site, some of whom are photographed gathered—canteens in hand—around a stump labeled as Providence Spring.
1891	GAR of Georgia purchases 73.5 acres of the former prison site.
1891-1896	The GAR clears undergrowth, plants hedges, and grades a perimeter roadway around the site and a central avenue through to Providence Spring.
1896	National Women's Relief Corps (WRC) takes ownership of former prison site.
1897	The WRC purchases 14.5 additional acres of former prison site and initiates improvement projects including the erection of a caretaker's residence and a stable, wire fencing, clearing of undergrowth, and grass planting.
1898	WRC expresses their intention to erect a pavilion and monument at the site of Providence Spring.
1899	Appropriations for the memorial at Providence Spring are arranged at the WRC's 17th national convention.
1900	WRC selects a design for the pavilion at Providence Spring. Estimates project a cost of fourteen hundred dollars.
	Construction on Providence Spring House begins.
May 1901	The Providence Spring House is dedicated at a Memorial Day event.
1902	The Providence Spring House floor is raised and new drainage added. The cement floor is now reported to be dry after enduring an abundance of excess water.
1906	Early interpretive elements are installed surrounding Providence Spring House, including memorials for soldiers who were killed reaching for water from the spring, and descriptions of the spring's emergence.
1907	Facing impacts from increased visitation to the park, and growing interest in Civil War commemorative monuments and events, the WRC begins to reach the limit of what it believes it is able to achieve at Andersonville.
1908	The WRC decides to donate the former prison site to the Federal Government.
1909	The drainage system at Providence Spring House fails. The addition of a pool is recommended for installation within the monument in an effort to limit the need for future repairs.

1910	The Chairwoman of the Andersonville Prison Board arranges for repairs to Providence Spring House before passing the site to the Federal Government. She oversees installation of a new cement floor and reports that the fountain and pool are in good working order.
	U.S. President Howard Taft accepts the former prison site on behalf of the Federal Government, via an Act of Congress.
1913	Past WRC chairwoman, Sarah Winans, expresses her disappointment with condition of the building following three years under management by the US Department of War.
March 1914	Providence Spring House is without running water to its interior fountain, with the original spring having re-routed to flow beneath the foundation. Blueprints for repairs to Providence Spring House detail proposed alterations, including a steel plate to block water from flowing beneath the foundation, a new cistern, new pipes and an overflow mechanism, and a new floor and gutter.
1918	The bridge at Stockade Branch has collapsed and the area is being used as a pig wallow.
August 1934	A Civilian Conservation Corps (CCC) work project is approved for Andersonville.
1934-1935	CCC Company 1411 is stationed at Andersonville for fifteen months. A new tile floor and a roof are added to the Providence Spring House, as well as a new parking area with a retaining wall constructed of local rubble. The CCC installed a walkway and pedestrian bridge. In addition, there are 32 acres of forest improvement projects, which included replanting 38 acres of field in trees. Graded and paved all park roads (3.4 miles worth); built a new, separate entrance gate for the prison site; and constructed rock walls, all before the camp was closed after fifteen months of work.
1936-1937	A side camp of CCC Company 4455 continues work at Andersonville.
	Ornamental trees and shrubs are installed around the Providence Spring House structure.
April 1941	The entire water supply system for Providence Spring is replaced with new materials and an abundant supply of water is piped through to the interior fountain.
	Two other “boils” of water are located during probing in the area, one of which is believed to be the original spring that appeared in August of 1864. The second “boil” is reported to be more abundant in flow but cannot be piped into Providence Spring House. A new concrete walk, steps, and basin are proposed for construction around this second boil as it is flowing so abundantly it threatens to undermine the foundation, but is never completed.
1959	A sign is added outside the Providence Spring House alerting visitors that the Providence Spring House fountain water is unfit for human consumption.
	The landscape surrounding Providence Spring House is wooded with medium to large trees and shrubbery.
1960-1961	Benches are added near the lower reflecting pool.
	A six-foot-wide, brick reflecting pool patio is added along the pool’s northernmost edge.
1970	Andersonville officially transferred from the United States Army to the National Park Service, Department of the Interior (NPS).

1980	Concrete repairs are made to the CCC-era swales.
	The park begins a campaign of tree removal within the prison site in order to restore the site to open landscape.
Mid 1980s	Park replaces the original copper piping in the interior fountain with PVC piping inserted into copper piping in both the inlet and outlet details of the fountain.
1985	Providence Spring House foundation is in danger of being undermined by significant ground water penetration flowing down the hillside above the Providence Spring House, while water flow to the two fountains is intermittent. Repairs are made to the Providence Spring House, approach bridge, and lower fountain.
	The Providence Spring House parking area is expanded to alleviate congestion, and portions of the surrounding CCC-era rubble walls are removed.
	A third spring source is located during the process of repairs. Some of Providence Spring House's terracotta pipes are replaced with PVC.
March 1986	The reflecting pool patio is removed.
	The park installs a French drainage system around Providence Spring House and along the rubble wall leading to it; also, along the lower fountain sidewalk, the brick runnel and reflecting pool, thus heavily disturbing the immediate area north and east of the Providence Spring House west of runnel in the process.
	The upper curve portion of the swale north and east of the Providence Spring House is redone by NPS.
	Additional drainpipes are added in the area of turf between the footbridge and reflecting pool.
1992	The park staff determine that several of the CCC-constructed swales are confusing the interpretation of the prison landscape and fills them with dirt, including a portion of the swale leading down to Providence Spring.
1998	Shrubs are removed atop the rubble wall leading to and behind Providence Spring House. The previously wooded character of the landscape is now markedly absent.
2004	The park staff cleans out stream beds associated with the swales along Stockade Branch near Providence Springs.
2010	Park maintenance staff uses a small backhoe to clear the swales surrounding the Providence Spring House of debris and vegetation.
2016	The Providence Spring House fountain suffers from cracks in the upper marble fountain, leaks, and erosion. The pedestal of the marble fountain has a significant leak on the lower left side, with moss algae and lichen present, suggesting it is continually wet. Significant erosion is present surrounding the copper medallion where water exits the face of the marble fountain, this erosion cuts almost all the way through to the back of the marble feature.

A visiting Vicksburg National Military Park (VICK) mason works to remove Portland mortar on the left side of the interior fountain and uses a scope to inspect behind the marble, detecting a two-inch crack at back of the marble, on the left side, during the inspection process. The mason uses chisels, a drill, and an angle grinder to remove Portland cement mortar. He re-tucks using masonry mix from the top of the left cornice down to the basin bowl. A continuing water leak beneath the fountain's bowl leads park staff to decide against re-tucking this area.

The visiting mason also grinds stone away at the point of the marble break to relieve pressure on the right side of the fountain. This side is then re-tucked with mortar mix.

The CCC-built fountain is also experiencing water leaks and algae build-up.

The water height is reported to be at the top of existing brick work within the first pool along the brick runnel.

February 2017 Water is discovered bubbling up from the ground on the east side of the reflecting pool by park staff. NPS staff clear terracotta pipe with water jet, but ground remains wet and concludes piping was dislodged by tree roots.

The Southeast Archeological Center conducts a survey using ground penetrating radar (GPR) in the area of Providence Springs and the reflecting pool.

March 2017 Water is seeping through north wall of the Providence Spring House structure and continues to pool on the east side of the reflecting pool.

Maintenance staff excavate in search of terracotta pipes, based on the February 2017 GPR survey, to replace them with new materials. During this project, the three cottonwood trees are removed. Two were dead and the third presented a safety hazard to visitors and staff. The tree trunks are removed but stumps are left behind. Terracotta pipes are replaced from the base of the lower fountain patio's southeast corner to south swale.

The copper piping, encasing PVC, that was added to the Providence Spring House fountain in the mid- 1980s has deteriorated, leading to leaks and further erosion of the masonry work that secured the piping for the outlet. Water has subsequently seeped down behind the basin and is deteriorating the lower part of the fountain.

May 2017 Historic Preservation Training Center (HPTC) staff make repairs to the lower fountain, including repointing, tucking stone (digging out mortar joints to a certain depth and then refilling them with new mortar), and cement work.

HPTC makes repairs to the reflecting pool, including repointing and tucking brickwork.

Temporary repairs are made to the Providence Spring House roof using in-kind materials to avoid damage to exposed underlayment of materials from the elements.

Bats are nesting in gaps between the Providence Spring House fascia and building face.

October 2017 Excess sand has been dumping into the reflecting pool since Hurricane Irma passed through in September of 2017.

Archeological monitoring for location of replacement trees; new trees moved east of runnel to avoid intruding tree roots.

2018 Area around the north side of the Providence Spring House is continually wet, with water seeping into the Providence Spring House. Park staff request that the source of the excess water is investigated.

HPTC performs cleaning and selective repointing and tucking within the Providence Spring House, including around the interior fountain in order to stop ongoing leaks.

The Providence Spring House roof is replaced, and lead abatement and repainting is performed by contractor.

Park staff plant three sugar maple trees east of the runnel to replace those removed in 2017, albeit slightly further east from the runnel than the cottonwood trees were originally. Two of these trees do not survive transplantation and establishment and are replaced by park staff.

2019 American Conservation Experience crew removes remnant cottonwood tree stumps from the east side of the runnel and excavates dirt on both sides of the runnel in preparation of repointing and tucking project by Harpers Ferry Training Center Staff.

The structure and upper marble fountain are rinsed, cleaned, and treated for protection from deterioration by HPTC.

The lower fountain is rinsed, cleaned, repointed, and checked for watertightness by HPTC.

Missing, loose, and deteriorated mortar joints in the building are repointed.

The runnel is reconstructed after experiencing damage from tree root encroachment from the cottonwood trees. The brick pools are selectively repointed, and the connecting channels between the pools are reconstructed. A new French drain is added to the southeast side of the runnel, as well as a foundation of clean stone and filter fabric, after an excavation reveals no foundation supporting existing brick work within the runnel and pools, and a steady stream of water flowing from beneath the lower fountain.

2020 The existing French drain on the north side of the Providence Spring House is exposed and inspected. Six-inch drainage is added alongside the existing pipe. The new drainage pipe connects to a previously unknown drainage line originating from the area of the original cistern. The new piping remedies the problem of pooling water in the northeast corner of the Providence Spring House.

2021 Ongoing planning continues for making access to the cisterns safe by replacing lids, making repairs to erosional loss at foot bridge, leveling sidewalks to Providence Spring House, cleaning swales of excess vegetation and soil while working in wetlands.

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1.C Physical Description and Existing Conditions

General Description

Memorial Landscape of Andersonville National Historic Site

The site of the Providence Spring House is a part of the Andersonville Memorial Landscape at Andersonville National Historic Site (ANDE), which includes approximately 515 acres. Andersonville National Cemetery, the National Prisoner of War Museum, the former site of Camp Sumter, associated circulation and small-scale features, and the surrounding forested backdrop, make up ANDE.

The most dominant physical characteristic of the landscape of ANDE is the valley of Stockade Branch, which runs from west to east through the former prison site (Figure C1 and C2). The museum, cemetery, and the road that connects them are located on a ridge above and to the north of Stockade Branch. The Providence Spring House site is located on the west side of the former prison stockade, just north of where the stream enters the former prison area.

Figure C1. View of the west side of the Andersonville Memorial Landscape facing north from the hilltop south of Providence Spring House site; note the deep valley of Stockade Branch running from left to right in the photograph (Source: WLA Studio, 2020).

Figure C2. View of the valley of Stockade Branch east of Providence Spring House facing northwest from the east side of the former stockade line (Source: WLA Studio, 2020).

The landscape of ANDE is characterized by gently rolling topography and is located in the upper reaches of the East Gulf Coastal Plain near the southern boundary of the Georgia Piedmont region. Soils on the site originate from the Tallahatta formation and include a mixture of fine to medium-fine sands and loams that are highly erodible when stripped of vegetation. South and east of the boundaries of ANDE, there are known formations containing kaolin and bauxite, many of which have been mined and processed. The north portion of the former prison site, which became a part of the stockade in July 1864, contains a layer of clay that prisoners used to make adobe building blocks while imprisoned at Andersonville.

Andersonville's memorial landscape protects, commemorates, and interprets the site of Camp Sumter, where approximately 45,000 Union soldiers were imprisoned and nearly 13,000 died of disease and malnutrition between February 1864 and May 1865.

Providence Spring House and the associated features are commemorative and have been maintained and preserved by stewards of the site since their construction. As outlined in the previous chapters of this Historic Structures Report (HSR), the stone Providence Spring House and its surroundings have been modified several times since initial construction in 1901, but the size, orientation, and configuration of the Providence Spring House itself has been preserved alongside other commemorative features in the larger memorial landscape of ANDE.

Site Features

Topography and Ground-Level Drainage Features

The built features of the Providence Spring House site are situated on the south-facing slope overlooking Stockade Branch. The site is steepest at the north end, then levels out slightly in the area immediately surrounding the Providence Spring House, and slopes gradually down to the east and south below a concrete retaining wall near the center of the site (Figure C3 and C4).

Figure C3. The Providence Spring House and its associated features are situated on the hillside north of Stockade Branch; photographer facing northeast from the Providence Spring House parking lot (Source: WLA Studio, 2020).

Figure C4. View of Providence Spring House site from the north approximately halfway up the surrounding hillside; photographer facing southeast (Source: WLA Studio, 2020).

Figure C5. View of the boggy area that drains into the south swale; photographer facing northwest from south side of swale (Source: WLA Studio, 2020).

Figure C6. South swale; photographer facing east (Source: WLA Studio, 2020).

There is a low, boggy area in the northwest portion of the site that includes remnants of drainage swales dug by the Civilian Conservation Corps (CCC) in 1936-1937 to channelize and drain the area. The boggy area drains into a single earthen drainage swale (south swale) that is approximately 2' deep and carries water from northwest to southeast across the south side of the site and into Stockade Branch (Figure C5 and C6). A second primary earthen swale on the site (east swale) is also approximately 2' deep. It is located along the east side of the site and drains into the south swale (Figure C7).

A brick-paved swale with a granite-block curb on its lower edge runs from northwest to southeast diagonally across the hillside north of the Providence Spring House (Figure C8). On the east end, the swale curves south behind the Providence Spring House before terminating at the site's east swale. The brick swale appears to no longer serve its intended function of substantially redirecting the flow of surface water runoff around the northeast side of the Providence Spring House. While the brick swale likely redirects at least some runoff, especially during large rain events, groundwater appears to be routinely traveling below the feature and reaching the north end of the Providence Spring House.

The earthen swales described above were constructed in 1936 and 1937 by the CCC. While it is likely that drainage features existed on the site prior to their construction, the CCC's efforts to channelize the site's surface water runoff had a major effect in terms of limiting erosion and preventing the presence of standing water.

Spatial Organization

To the west of the Providence Spring House site, Stockade Branch flows within a well-defined channel; however, where the stream reaches the former stockade area its banks begin to flatten and become a broad, swampy floodplain. The prison was constructed on either side of the stream, which, it was hoped, would provide fresh water and meet prisoners' needs for sanitation. Due to the poor drainage of the stream, however, the prison experienced serious problems with water quality.

Rather than obtain water directly from the stream, many of the prisoners excavated wells and/or drew water from natural springs on the lower end of the north bank of Stockade Branch. Providence

Figure C7. East swale; photographer facing south (Source: WLA Studio, 2020).

Figure C8. Brick swale; photographer facing southeast (Source: WLA Studio, 2020).

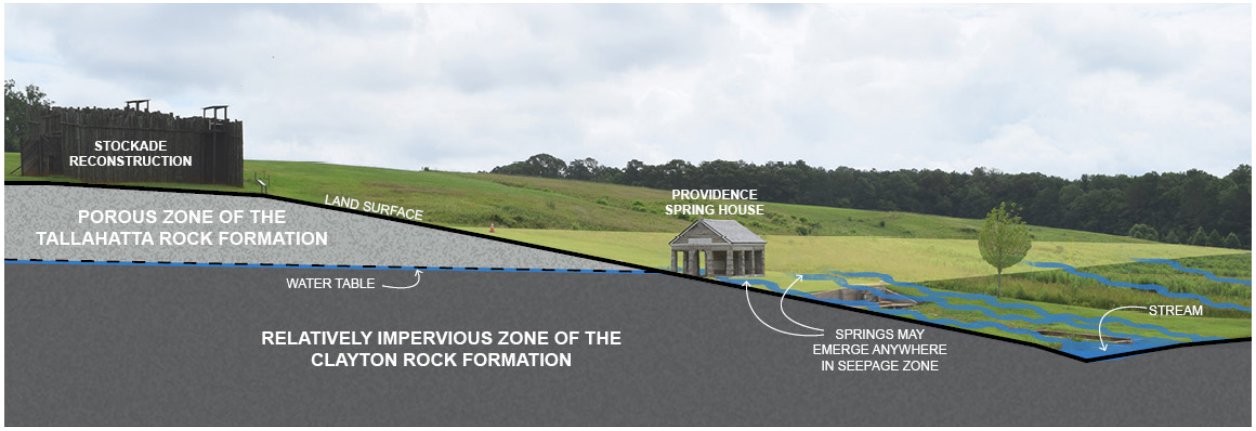

Figure C9. Diagram of theoretical groundwater seepage at the Providence Spring House site; rendered by WLA Studio, 2021.

Figure C10. Providence Spring House parking lot accessible from Prison Site Road; photographer facing north from top of hill near southwest corner of the former prison stockade (Source: WLA Studio, 2020).

Spring is one such water source. In August 1864, the spring emerged outside of the stockade to the west, became channelized, and entered the prison, providing a much-needed source of fresh water.

Since its emergence, the natural outlet has continued to shift, and it is unknown exactly where the spring initially emerged. Due to the character of the soil, terrain, and erosion that has occurred on the site, and the presence of constructed features above and below ground, Providence Spring today emerges as a seep on the hillside of the site (Figure C9).

As such, the various constructed water features of the Providence Spring House site—including the Providence Spring House and internal fountain, the two cisterns to the north, various above- and below-ground drains and walls, as well as the lower fountain, brick runnel, and reflecting pool—effectively collect and channelize the spring's natural outflow as a cohesive system.

Circulation

There is an asphalt parking lot west of the Providence Spring House site (Figure C10). The parking lot is accessible from Prison Site Road, a paved road that loops around the entire former prison site. A curvilinear concrete walkway, oriented east-west, bisects the Providence Spring House site and connects the parking lot to the Providence Spring House (Figure C11). The walk crosses a concrete footbridge near the top of the south swale. Views of the Providence Spring

House, lower fountain, brick runnel and reflecting pool, former prison site, and Stockade Branch are unobstructed along the walkway.

There is a second concrete walkway connected to the east end of the main walk. This walkway provides pedestrian access south to the patio at the lower fountain. The route to the lower fountain includes two sets of concrete steps flanked by retaining walls (Figure C12).

Above-Ground Buildings and Structures

The Providence Spring House and associated above-ground structures are the primary focal points for people visiting the site. In relation to the sidewalk and the topography, the features are organized in a way that creates a legible sequence of spaces. From the parking lot, visitors cross the concrete footbridge and traverse the site along the south side of an approximately 80'-long stone retaining wall before reaching the Providence Spring House entrance (Figure C13).

Providence Spring House is situated on a leveled terrace at the center of the site and is the primary focal point. A secondary focal point is the series of water features south of the Providence Spring House, which includes the lower fountain and the brick runnel and reflecting pool below (Figure C14).

Other above-ground structures of the site include the drainage features, such as the brick swale north of the Providence Spring House, the earthen swales, and a brick head wall at the outlet of a drain pipe that leads from the Providence Spring House to the east swale.

Subterranean Structures and the Spring's Emergence

Rather than emerging from the ground at a definable location, the natural flow of Providence Spring seeps into a system of subterranean cisterns and drainage features that capture and direct it to both above- and below-ground features. The spring emerges most vigorously on the hillside north of the Providence Spring House. The system of constructed features at the site ultimately deposits the collected groundwater into Stockade Branch via the southeast end of the south swale. The various components of the system include

Figure C11. Concrete walkway connecting parking lot and Providence Spring House and lower fountain area; photographer facing east (Source: WLA Studio, 2020).

Figure C12. Concrete stairs and walkway south of Spring House; photographer facing north (Source: WLA Studio, 2020).

Figure C13. View approaching the Providence Spring House along the main pedestrian access route, which runs adjacent to a curvilinear rubble-stone retaining wall; photographer facing east (Source: WLA Studio, 2020).

those that collect the groundwater, those that carry it, and those that allow it to be directed through various features of the site (such as the fountains and drainage ditches). These features are organized as follows:

- **Features that collect groundwater**: located in the north portion of site; includes two cisterns with inlet pipes and a defunct inlet pipe northwest of the Providence Spring House.
- **Features that carry groundwater**: various portions of site; includes pipes of various sizes, material, and age, as well as French drains.
- **Main water vault**: located at the east (rear) side of the Providence Spring House; this is the primary feature that allows site managers to direct the flow of groundwater collected by the cisterns. The main water vault serves as a junction box and as the system's overflow drainage basin. The vault houses the valves that control the flow of water into the fountains.
- **Remnant features**: located in various portions of the site; includes structures such as defunct pipes and French drains, remnants of concrete and metal retaining walls, and small fragments of various constructed features.

Vegetation

Historically, the vegetation in the Providence Spring vicinity included a mixture of pines, oaks, and understory trees and shrubs. During the Civil War, Confederate soldiers cleared large trees from the site to use for the stockade walls, and the stockade and surrounding areas remained mostly clear of large vegetation during the war. After the war, the site underwent different phases of clearing and revegetation. A small wooden shed shielded Providence Spring from disturbance while most of the prison site was cultivated in corn and cotton immediately following the war.

After buying the site, the GAR initiated a revegetation program as part of efforts to rehabilitate the site to a commemorative landscape. The GAR planted ornamental shrubs and hedges and cleared the site of trees and underbrush. When the GAR passed the site to the WRC, landscape beautification surrounding the Providence Spring House continued with the installation of roses, ferns, pecan trees (*Carya illinoinensis*), Bermuda grass, and perennial and annual flowers.

During the periods of administration by the United States Army and the CCC, the landscape around Providence Spring House was allowed to revegetate with medium to large shade trees. Shrubs were installed along the walk to the Providence Spring House, atop the lower fountain retaining wall, and as a screen to the east of the building. Ornamental trees were planted along the southernmost foundation of the Providence Spring House, and cottonwood (*Populus deltoides*) trees were planted or allowed to grow naturally along the brick runnel.

Figure C14. View of the primary focal points of the Providence Spring House site (from upper left to lower right) Providence Spring House, the lower fountain and patio, and the brick runnel and reflecting pool; photographer facing northeast (Source: WLA Studio, 2020).

Figure C15. View of the three sugar maple trees planted by NPS in 2018; photographer facing east (Source: WLA Studio, 2020).

The NPS subsequently removed all shrubs, with those above the lower fountain removed last, in the 1980s. Only the cottonwood trees remained until 2017, when the NPS removed them as well. In the 1980s, the NPS began a program that sought to interpret the vastness and open character of the prison site. As part of that rehabilitation of the prison site, the park removed all large trees and most understory vegetation in the Providence Spring House site vicinity.

Since the 1980s, the NPS has maintained the open spaces in the area immediately surrounding the constructed features of Providence Spring House site as NPS Turf Class B1, Functional Short grassy groundcover. The mixed grass species present include Bermuda, Bahia, and miscellaneous weedy species. There is little to no understory vegetation. The park maintains the swales and open areas beyond them as NPS Turf Class B2, Functional Tall.

Besides mown grass, there are three sugar maple trees (*Acer saccharum*), planted by NPS in February 2018, in the landscape surrounding Providence Spring (Figure C15). These trees were installed to replace three lost historic cottonwood trees removed in 2017 to prevent continued encroachment of the root systems that had dislodged bricks from the nearby runnel. The sugar maples were planted along the same axis as the original cottonwood trees but several feet away from the runnel to prevent root invasion into the runnel. The southernmost sugar maple in the row of trees has since died, and the middle tree is struggling to survive.

Exotic invasive species undergo regular monitoring and removal by park staff. Wisteria (*Wisteria sinensis*), privet (Ligustrum spp.), and Japanese honeysuckle (*Lonicera japonica*) have been observed along the edge of woodlands within the site.

Resilience to Natural Hazards

The climate at Providence Spring House is classified as humid subtropical. Average temperatures range from the mid-40s in winter, to the low 80s in summer, with high humidity. Rainfall is high, typically around 50 inches annually. (The United States rainfall average is 37 inches annually.) Snowfall is rare in the region.

Average temperatures have increased in the Southeastern United States since the 1970s, and temperatures are projected to continue to increase worldwide. Increasingly, severe storms and droughts accompany the trend in rising temperatures. Flooding, heat waves, and drought are three natural hazards increasing as a result of climate change. Flooding has seen the most extreme increases in frequency. This is of

particular concern for an area already vulnerable to flooding and experiencing detrimental effects of uncontrolled water flow, such as the Providence Spring House and its landscape.

The Providence Spring House and associated features are vulnerable to increasingly extreme climactic events associated with climate change, particularly changes in precipitation patterns and increasing temperatures. Providence Spring House was built in 1901 by the Woman's Relief Corps (WRC) at the site of a spring which emerged at a desperate moment in history, saving the lives of dying soldiers during the American Civil War. As such, the location of the Providence Spring House is site-specific, and cannot be moved to mitigate risks associated with changes in climatic events. Maintenance strategies must remain vigilant against threats resulting from natural hazards to best preserve the Providence Spring House and associated structures.

Specific threats associated with extreme climatic events include wind damage and weathering; damage from wildlife infestation; increased efflorescence due to heightened rates of evaporation during heat waves, which can lead to structural cracking and deterioration; heat and drought stress on vegetation; and corrosion of concrete, mortars, and metal components. Further, increased moisture absorption by porous stone and brick resulting from high humidity associated with increasing temperatures can lead to a decrease in crystallization and dissolution of salts within the masonry. Algae and vegetation, such as mosses, may also increase with higher rates of humidity. Algae may eat away at mortar and clog inlet and outlet pipes.

Salt deposits on masonry surfaces may intensify as precipitation decreases during drought. During precipitation events, these salts will subsequently re-absorb into masonry structures, possibly causing spalling and fracturing. Increasingly intense storms introduce heavier rain, lessening the ability of structures to shed water in a timely manner, which allows water to enter into interior areas of the Providence Spring House and landscape features. Extreme periods of wetting and drying will increase rates of masonry decay. Also, byproducts of fossil fuel-based power generation, automobile exhaust, and industrial pollution cause acid rain. Acid rain has been widely documented as a cause of deterioration of historic buildings and monuments, particularly those fabricated from stone, concrete, and metal materials.

Architectural Description

Providence Spring House

Providence Spring House (Figures C16-C21) is a partially open, roughly square, stone pavilion with a front-gabled roof. The pavilion is made of rough-cut granite and hewn marble with a framed roof covered with slate tiles. In plan, it measures approximately 15' × 15', with all covered space sunken roughly 3'-6" into the ground. Below the ground plane the building's walls are formed by three courses of granite blocks that retain the surrounding soil. At the ground level, a single course of polished marble forms the building's water table.

The frame roof with granite-infilled gables rests on vertical stacks of granite blocks on the front (west) and sides (north and south). The rear (east) wall is full-height granite and encloses the rear of the pavilion. The interior features include a marble and granite fountain centered on the rear wall and two rectangular engraved marble tablets flanking the fountain. There is a ceramic-tile interior floor with drains along all four sides.

All four façades of the Providence Spring House are symmetrical and include even courses of 12" and 6" granite blocks and 6" hewn marble blocks. Mortar joints are ½" thick with a beaded profile. The pavilion's only entrance is at an arched opening centered in the three-bay front façade. Large granite-block lintels form rectangular bays on either side of the arched entry bay. The building has a simple cornice consisting of a single course of 6" thick marble with a 2" bull nose profile.

The front gable is infilled with eight courses of 6" thick granite blocks. There is a carved marble block centered above the entrance that says "PROVIDENCE SPRING" in large bold letters, and a decorative carved stone finial at the top of the front gable (Figure C22). The rectangular finial tapers slightly at its top and has a hole that can receive a metal or wood flagpole. The front gable has simple 4" rake trim boards protected by 2" copper drip edge strips.

Figure C16. West (front) façade of Providence Spring House; photographer facing east (Source: WLA Studio, 2020).

Figure C19. South façade of Providence Spring House; photographer north (Source: WLA Studio, 2020).

Figure C17. North façade of Providence Spring House; photographer facing south (Source: WLA Studio, 2020).

Figure C20. South and west façades of Providence Spring House; photographer facing northeast (Source: WLA Studio, 2020).

Figure C18. East (rear) façade of Providence Spring House; photographer facing west (Source: WLA Studio, 2020).

Figure C21. North and west façades of Providence Spring House; photographer facing southeast (Source: WLA Studio, 2020).

Figure C22. Detail views of the carved stone final that adorns the top of the Spring House's front wall; photographer facing east in left photograph and south in right photograph (Source: WLA Studio, 2020).

The one-room interior of the Providence Spring House is accessed via a set of five sunken concrete steps centered at the front (west) side of the building (Figure C23). The side (north and south) façades also have three bays each, formed by vertical stacks of rough-cut granite blocks supporting large flat granite lintels (Figures C24 and C26). The marble cornice continues around the sides of the pavilion and serves as the top plate supporting the rafters of the frame roof on either side.

The rear façade includes six courses of granite blocks supporting the marble cornice and a granite-infilled gable. The details of the rake, mortar joint profile, and marble cornice match those of the front façade.

The covered interior space measures approximately 11'-11" from north to south and 13' from east to west. The interior floor is raised slightly and finished with a grid of 6" × 6" ceramic tiles. There are floor gutters (5" wide by 2½" deep) at the base of all four walls that carry water to two drains at the rear of the pavilion. The interior surfaces of both gables have a layer of stucco. The interior roof structure is exposed and painted white.

The fountain at the center of the rear wall, as well as the two flanking engraved marble tablets, are the most prominent decorative features of the pavilion. A system of cisterns and pipes north of the Providence Spring House collect and direct spring water to the fountain. The water enters the fountain via a 1½" PVC pipe running through the

Figure C23. Interior view of entry stair at front of Providence Spring House; photographer facing west (Source: WLA Studio, 2020).

Figure C24. View of interior north wall and Providence Spring House floor; photographer facing north (Source: WLA Studio, 2020).

Figure C25. View of the interior rear wall of Providence Spring House with fountain and flanking engraved tablets; photographer facing east (Source: WLA Studio, 2020).

Figure C26. View of interior south wall and floor of Providence Spring House; photographer facing south (Source: WLA Studio, 2020).

rear wall of the Providence Spring House and into the back of the fountain. Water exiting the fountain flows to the site's east swale via the main water vault and a 3" PVC pipe behind the Providence Spring House.

The fountain includes three main components: (1) a large five-piece gray marble base, (2) a semicircular brown granite basin, and (3) an ornately carved white marble tablet (Figure C25). The granite basin receives spring water from a bronze outlet protruding from the bottom of the marble tablet above. Decorative elements in deeply-carved relief on the white marble tablet include classically-inspired pilasters with bases, columns, and capitals; a broken pediment at the top; two carved bird figures, including a dove at the bottom (from which the fountain outlet extends) and an eagle holding a Civil War soldier's satchel at the top; and a central raised panel with the words "WITH CHARITY TO ALL AND MALICE TOWARD NONE."

The engraved marble tablets to the left and right of the fountain state details of the pavilion's construction—including that it was commissioned by the WRC and erected in 1901—and commemorate the "…men who suffered and died in the Confederate prison at Andersonville…".

Lower Fountain

The lower fountain (Figures C27-C28) at the Providence Spring House site is situated on a concrete patio that occupies a terraced area south of the Providence Spring House. An L-shaped concrete retaining wall supports the adjacent hillside to the north and east of the fountain and patio. A set of concrete steps to the west connects the patio to the concrete walkway at the Providence Spring House.

The lower fountain is a simple, rectangular, stone basin sitting on a concrete base attached to the south-facing side of the concrete retaining wall (Figure C29). The stone basin measures 3'-8" wide, 2'-6" deep, and 2'-9" tall, and consists of three courses of rough-cut granite blocks. The top course of stone is slightly larger and forms a cap on the structure. The fountain's mortar joints are slightly recessed. The portion of the retaining wall attached to the fountain is approximately 11'-9" long and 3'-7 ½" tall and features a tapered top edge and pointed rectangular caps on either end. The concrete of the fountain's base, retaining wall, and patio is buff-colored and includes smooth, brown river stone aggregate. The joinery of the various components includes mortar, metal pinning, and flexible sealant.

Like the fountain within the Providence Spring House, the system of cisterns and pipes in the north part of the site supplies spring water to the lower fountain. Water enters via a 3" steel pipe that runs through the rear concrete wall, turns 90 degrees vertical, and then splits into three ¾"

Figure C27. View of lower fountain, patio, and retaining walls looking north (Source: WLA Studio, 2020).

Figure C28. View of west side of lower fountain, patio, and retaining walls facing east from adjacent concrete walkway (Source: WLA Studio, 2020).

Figure C29. View of south façade of lower fountain basin and concrete base; photographer facing north (Source: WLA Studio, 2020).

Figure C30. View of lower fountain basin and outlet; note how the retaining wall forms a part of the basin; photographer facing north (Source: WLA Studio, 2020).

outlet spouts (Figure C30). The water falls from the spouts into the main basin (approximately 11" deep) and exits the fountain via a 1½" PVC drain at the rear of the basin. The water travels through a 1½" PVC pipe under the fountain, base, and patio and flows directly into a brick runnel and reflecting pool below.

Brick Runnel and Reflecting Pool

At the south end of the site, a brick runnel and reflecting pool (Figure C31) make up a single linear water feature. The feature is set at ground level and stretches approximately 56' from north to south from the base of the lower fountain to the south swale. The top portion of the feature consists of a long, narrow runnel (approximately 1' wide and 34' long) with a series of three 10" deep pools, including one semicircular pool where water enters at the top and two circular pools separated by narrow sections of shallow runnel that are 3' long (Figure C32). The runnel terminates at the head of the reflecting pool, which measures approximately 20' from north to south and 7' east to west (Figure C33). At the base of the pool, the spring water cascades over a 2'-8" tall, corbeled-brick spillway.

Figure C31. View of the brick runnel and reflecting pool; photographer facing north (Source: WLA Studio, 2020).

Figure C32. Top section of the brick runnel with semicircular basin at the head and two circular basins below; photographer facing east (Source: WLA Studio, 2020).

Subterranean Features

The subterranean features of the Providence Spring House site facilitate the collection and management of groundwater and allow site managers to control the flow of the spring through the constructed water features described above. The measured drawings in Appendix B depict the organization of these features and the flow of groundwater within of the system.

Upper Cistern

The upper cistern is the northernmost point at which groundwater enters the system (Figure C34); there are at least thirty-six 4" terracotta inlet pipes that collect and drain groundwater from the immediate area into the basin; on the south wall of the cistern, there is a 4" terracotta outlet connected to a 3" PVC pipe that runs southeast and turns back south and west before terminating into the main water vault for the system at the rear of the Providence Spring House.

Figure C33. Upper portion of brick runnel and reflecting pool; photographer facing north (Source: WLA Studio, 2020).

Figure C34. Two views of upper cistern top with door open; photographer facing south (Source: WLA Studio, 2020).

Figure C35. Two views of lower cistern top; photographer facing north (Source: WLA Studio, 2020).

Lower Cistern

The lower cistern is the easternmost point at which groundwater enters the system (Figure C35); water emerges from the sandy bottom of the cistern in at least one place; there are also at least ten 4" terracotta inlet pipes that carry groundwater from the immediate area into the basin; a 3" PVC outlet pipe carries the groundwater out of the west side of the cistern and terminates at the main water vault at the rear of the Providence Spring House.

Former Points of Spring Outflow

Several sources document historic changes in the location of the spring's outflow. These changes are often described as "new" spring emergence. Of particular note are the locations of spring-water emergence found during the investigations and site work conducted by ANDE staff in 1986. During excavation, park staff located a point of groundwater emergence approximately 10'-6" northwest of the Providence Spring House, near the south edge of the brick swale. That point was noted as "Spring No: 3 Found 1986" on the corresponding set of measured drawings (see Appendix A-10). The drawings show a 2" PVC pipe leading from that point along the north and east sides of the Providence Spring House and terminating at the main water vault behind the structure. While that pipe remains intact, at least at the water vault, there is no active continuous outflow.

Main Water Vault

The main water vault for the system is a 2'-6" × 3'-0" brick drainage basin at the east end of the Providence Spring House (Figure C36). The vault is roughly 3'-4" deep and has a 6"-thick concrete cap that can be removed to access the pipes and valves within. The vault serves two main purposes: (1) to house the pipe junctions and valves used to direct water into both the Providence Spring House fountain and the lower fountain, and (2) as an overflow drainage basin for water collected in the cisterns and the Providence Spring House floor. There are three PVC inlets and two PVC outlets housed within the main water vault, as well as a 3" PVC pipe at the base of the vault that drains the basin into the east swale (Figure C37).

Figure C36. The main water vault with concrete cap, located at the rear of the Spring House; photographer facing southwest (Source: WLA Studio, 2020).

PVC and Terracotta Pipes Associated with Spring Emergence

Currently, the flow of Providence Spring is primarily carried by PVC and terracotta pipes of various sizes and ages. While the main flow of the spring is traceable as defined in this HSR, field observations and research reveal the existence of several pipes that do not appear to function as originally intended, are replacements of older pipes, or are no longer functioning at all. Due to the extensive alterations made to the site over time, it is quite possible that there are pipes (whether historic or contemporary) that have not yet been discovered. The known pipes include:

- 3" PVC pipe from upper cistern to main water vault – functioning as intended;
- 3" PVC pipe from lower cistern to main water vault – functioning as intended;
- 2" PVC pipe from spring outlet found in 1986 to main water vault – no outflow present;
- ¾" PVC supply from main water vault to fountain – functioning as intended;
- 2" PVC supply from main water vault to lower fountain – functioning as intended;
- Main drain line to east ditch—includes series of 3" and 4" terracotta and 3" PVC pipes that drain the main water vault, the Providence Spring House floor, and the fountain within – functioning as intended;
- Lower fountain outlet to top of brick runnel—includes a 4" terracotta pipe with a 1 PVC pipe inside – terracotta is defunct and PVC insert functioning as intended;
- Potential overflow outlet from upper cistern to reflecting pool—includes sections of 4" terracotta and 3" PVC pipe—exact configuration unknown but appears to function as intended.

French Drains

Much of the moving and stationary groundwater on the site is collected in French drains that transfer it to either the east or south swales and, ultimately, into Stockade Branch. They are strategically placed and, when functioning as intended, prevent unwanted water intrusion and undermining of the site's structures. They also carry water away from relative low points of the site that would otherwise become intermittently inundated. As the natural flow of groundwater and surface water has changed over time—whether due to erosion or the alterations of vegetation, soil, and/or structures on the site—site managers have altered or added French drains to manage soil moisture. Site investigation and research has revealed the location and configuration of many French drains; however, it is likely that there are other subterranean drainage structures that have not been discovered or documented. Known French drains include:

- **Providence Spring House foundation drain**: 6" perforated polyethylene pipe in washed gravel bed. North section runs from northwest corner of Providence Spring House, along north foundation

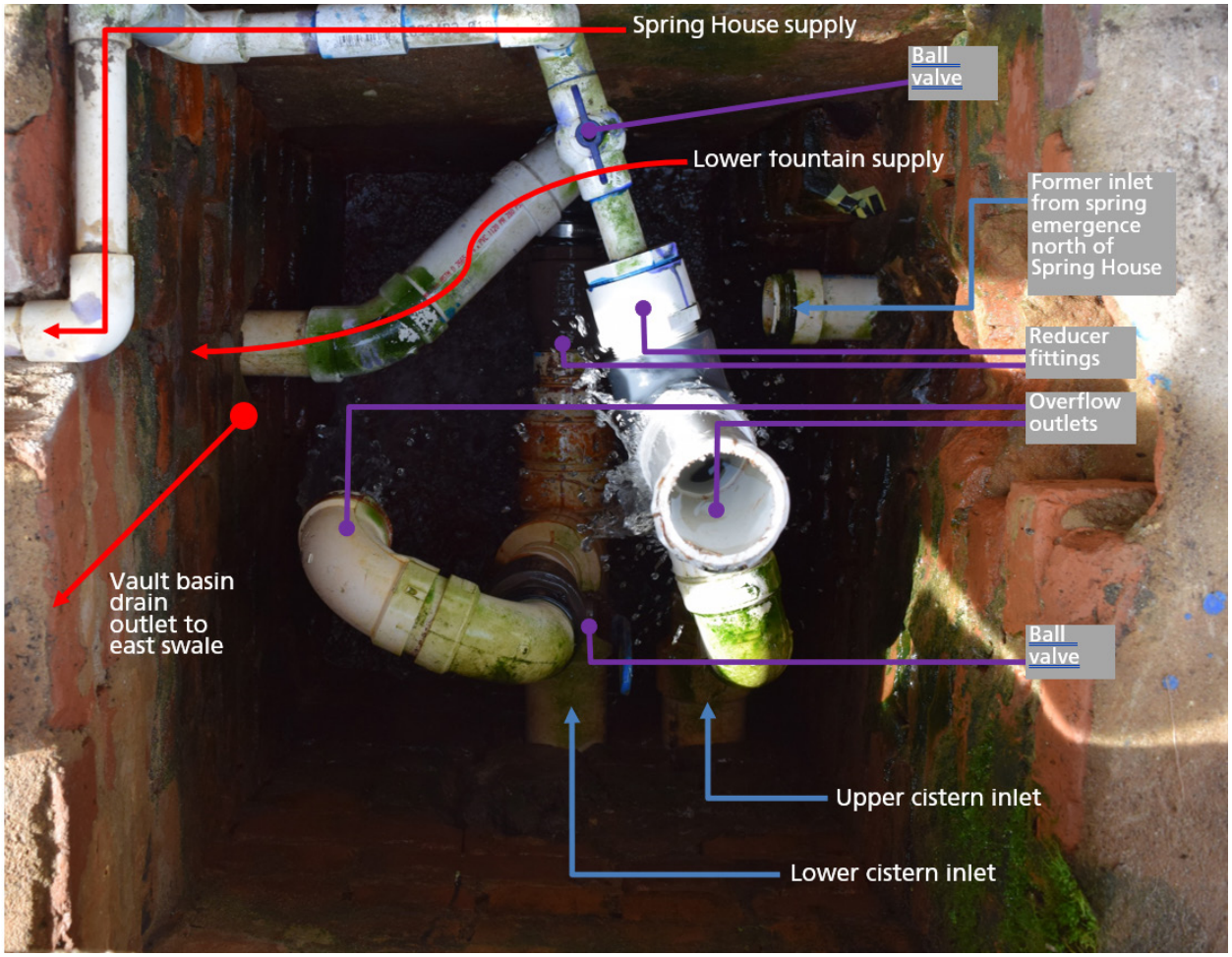

Figure C37. Interior of main water vault; photograph oriented with west up; markup by WLA Studio, 2021.

wall, around back (east) side of Providence Spring House, and southeast to brick headwall at east ditch. There is a junction and standpipe with cleanout fitting just north of the northwest corner of the Providence Spring House. Gravel bed for north section of drain is approximately 18" wide by 4' deep. South section extends from southwest to southeast corners of the Providence Spring House and connects to north section. Gravel bed for south section is approximately 3' wide by 3' deep. Details for design and installation of this drain included in 1986 set for *Water Collection System Providence Spring*; assumed to be constructed to specification. Drain was dug up and tested by a crew from the National Park Service's Historic Preservation Training Center (HPTC) in winter of 2020—it functions as intended.

- **Lower fountain patio drain**: 6" and 4" perforated polyethylene pipe in washed gravel bed. Runs along the south edge of the concrete patio at the lower fountain, curves south and runs along west side of brick runnel and reflecting pool before draining into south ditch. Gravel bed is approximately 18" to 21" wide and 20" to 26" deep at various points. There is a clean-out at the highest point of the drain (northwest end). Details for design and installation of this drain are included in the 1986 set for *Water Collection System Providence Spring*; assumed to be constructed to specification. No recent tests of functionality, but active outflow observed at south ditch—it appears to function as intended.
- **West drains**: the "Work Area Detail" drawing in the 1986 set for *Water Collection System Providence Spring* (see **Appendix A-10**) shows three French drains in the west portion of the Providence Spring House site. Field investigations for this HSR did not confirm the presence of these features; however,

research suggests that they existed when the detail plans were drawn and that they likely remain in place but are buried under topsoil.

Remnant Walls and Pipes

In addition to routine visual inspection of the site from above ground, ANDE staff and others commissioned by the park have performed direct investigations of subsurface conditions and features at various times. Known investigations have included excavations, soil sampling, and ground penetrating radar. The following is a list of the known remnant features discovered during such investigations:

- **"Lackawana" style metal piling (or wall) north of the Providence Spring House and associated terracotta pipes shown on the 1914 scaled drawings of the Providence Spring House** and the 1986 scaled drawings (see **Appendix A-10**). Recent investigations by ANDE staff confirm the existence of the metal piling and various fragments of terracotta pipes surrounding the Providence Spring House. Although ANDE staff have not fully excavated the piling, investigations confirm that the metal piling spans approximately 25' east-to-west and forms a C-shape (in plan view below the surface). Research suggests that workers constructed the 12'-tall piling during the repairs conducted in 1914 to slow the flow of groundwater north of the Providence Spring House. The 1914 scaled drawings show a circular well structure north of the piling with two terracotta outlets, one leading to a concrete basin within the Providence Spring House and the other (an overflow pipe) leading around the back of the Providence Spring House. The 1914 plans show the outlets passing through the piling. The 1986 scaled drawings show a 2" PVC pipe carrying the outflow from "Spring No. 3" passing through the piling's west end.
- **Concrete walls east of the Providence Spring House indicated on 1986 scaled drawings** (see **Appendix A-10**). The scaled drawing shows an 11" concrete wall running north-south and an 8" concrete wall running east-west. The configuration and date of construction of these features is unknown.
- **4" Iron outlet pipe from lower cistern indicated on 1986 scaled drawings** (see **Appendix A-10**). The scaled drawing shows a 4" iron pipe extending from the southwest corner of the lower cistern to the brick swale. The configuration and date of this pipe is unknown; however, its location and orientation suggest that it may have been associated with the remnant concrete walls described above.

Figure C38. View of the main pedestrian walkway connecting the parking lot to the Spring House; photographer facing east from parking lot (Source: WLA Studio, 2020).

Figure C39. South façade of the concrete footbridge; photographer facing north (Source: WLA Studio, 2020).

Circulation Features

Vehicular Access

Vehicular access to the Providence Spring House site is restricted to a public parking lot west of the site (Figure C10). The asphalt parking lot is connected to Prison Site Road and includes nine parking places, one of which is universally accessible.

Pedestrian Circulation

A universally accessible concrete walkway provides pedestrian access to the Providence Spring House site (Figure C38). The walkway traces the most-likely route of an early (circa 1901) path to Providence Spring developed by either the GAR or WRC. The CCC developed and paved the existing path in 1936-1937. At the west end, the walkway passes between two rubble-stone cheek walls built by the CCC. Traveling east toward the Providence Spring House, visitors remain on relatively level ground and cross a concrete footbridge that was also constructed by the CCC in 1936-1937 (Figure C39). After crossing the footbridge, the route curves to the southeast and runs along the south side of a rubble-stone retaining wall before reaching the entrance to the Providence Spring House.

The entrance to the Providence Spring House includes a subterranean set of six concrete stairs with concrete cheek walls on either side that retain the adjacent soil. The stairs provide the only access to the sunken pavilion floor inside the Providence Spring House (Figure C23). There is no universally accessible access to the Providence Spring House interior or lower fountain, brick pools, runnel, or reflecting pool.

Just west of the Providence Spring House entrance there is a second concrete walkway attached to the south side of the main walk that provides access generally south to the lower fountain patio. The north end of the walkway includes a landing above a set of eight steps with retaining walls on either side. At the base of the stair set, there is a lower landing that connects to a single concrete step leading southeast to the lower fountain patio (Figure C40).

Figure C40. The lower fountain is accessible via two sets of concrete steps south of the Spring House; photographer facing northwest from southeast of the lower fountain (Source: WLA Studio, 2020).

Figure C41. There are no formal pedestrian circulation features in the south portion of the site; therefore, circulation is informal in this area and occurs on the turf grass; photographer facing north (Source: WLA Studio, 2020).

Although there are no other formal circulation features on the site, foot traffic is unrestricted, and visitors tend to walk around the site freely to experience the site. Visitors interested in up-close viewing of the lower end of the brick runnel and reflecting pool must leave the paved paths and travel in the turf grass (Figure C41).

Retaining Walls

There are two types of retaining wall on the site: rubble-stone and concrete. The rubble-stone walls were constructed by the CCC in 1936-1937 and include two with cast-concrete caps on either side of the walkway leading from the parking lot into the Providence Spring House site (Figure C42), one that wraps around the north end of the parking lot (Figure C43), and one on the north side of the walkway to the Providence Spring House (Figure C44).

Figure C42. View of the south end of the rubble-stone retaining wall at the Providence Spring House parking lot; photographer facing north (Source: WLA Studio, 2020).

The concrete retaining walls were constructed prior to the 1950s either by the CCC or the United States Army. They include a series of walls retaining the terraced ground above the concrete walkway, stair sets, and lower fountain patio (Figure C45).

Figure C43. View of the north end of the rubble-stone retaining wall at the Providence Spring House parking lot; photographer facing west (Source: WLA Studio, 2020).

Figure C44. This curvilinear, rubble-stone retaining wall supports the soil adjacent to the main concrete walkway to the Spring House; photographer facing west from the east end of the wall (Source: WLA Studio, 2020).

Figure C45. This series of concrete retaining walls support the terraced area where the lower fountain and patio are located; photographer facing north (Source: WLA Studio, 2020).

Small-Scale Features

Small-scale features of the Providence Spring House site include waysides and other interpretive features, visitor-services features, and NPS signs. As a heavy-use area within the larger memorial landscape of ANDE, these features provide essential visitor services and interpretation.

Interpretive Features

Interpretive features at the site include three NPS waysides (Figure C46), the commemorative marble tablets inside of the Providence Spring House (Figure C47), and a metal survey marker (Figure C48). There is also a small hole in the concrete retaining wall west of the lower fountain that appears to have once held an additional metal survey marker.

The waysides are located along the main walkway from the parking lot to the Providence Spring House, at the west end of the walkway, and at either end of the rubble-stone retaining wall north of the walkway. The waysides provide information related to the inadequacy of Stockade Branch as a water source for prisoners; the North Gate to the prison, which was located just north of the site of Providence Spring; and Providence Spring itself (described respectively from west to east).

During site work that took place in 2017, 2018, and 2019, the NPS removed two white, painted concrete bollards that indicated the former location of the prison's stockade wall and "deadline" from the south side of the site. These features, which were never replaced at the Providence Spring House site, were constructed by the CCC in 1936-1937. They were part of a larger interpretive feature of the prison site that included two parallel rows of such bollards running along the entire stockade boundary and stone monuments marking three corners of the former stockade.

Figure C46. There are three waysides at the Providence Spring House site, all of which are located adjacent to the main concrete walkway (from left to right) at the parking lot, at the west end of the rubble-stone retaining wall, and at the Spring House (Source: WLA Studio, 2020).

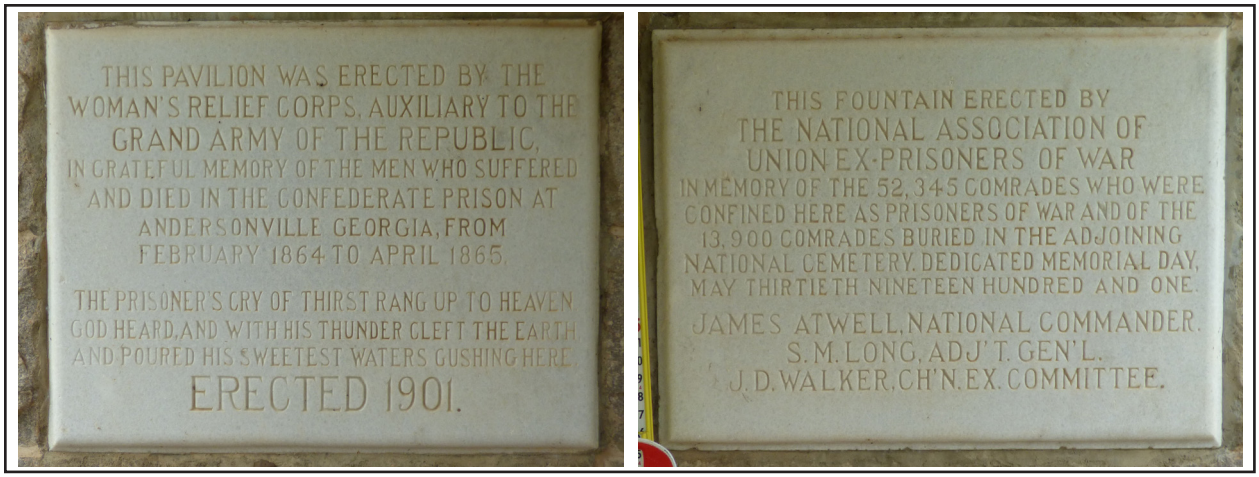

Figure C47. These engraved marble tablets are inset into the interior face of the rear wall of the Spring House on either side of the central fountain; photographer facing east (Source: WLA Studio, 2020).

Figure C48. (Left) This metal land survey marker is attached to the south concrete cheek wall of the Spring House entry stair. (Right) This ½" bored hole in the concrete retaining wall west of the lower fountain likely once held an additional metal survey marker (Source: WLA Studio, 2020).

Figure C49. These two waste receptacles are located at the west end of the main concrete walkway near the parking lot; photographer facing northeast (Source: WLA Studio, 2020).

Figure C50. Two signs located adjacent to the main concrete walkway to the Spring House warn visitors that the spring water is non-potable; photographer facing southeast (Source: WLA Studio, 2020).

Figure C51. This sign at the southeast boundary of the site warns visitors of the common presence of venomous snakes in the area; photographer facing east (Source: WLA Studio, 2020).

Visitor Services Features and Signs

Small-scale visitor-services features include a brown metal waste receptacle and plastic cigarette-waste receptacle at the west entrance from the parking lot (Figure C49) and three NPS signs—including two just south of the main walkway, which state "Water Unfit For Human Consumption DO NOT DRINK" (Figure C50); and one at the southeast corner of the site that warns visitors about the presence of venomous snakes in the low-lying areas in and around the site (Figure C51).

Construction Characteristics

The scope of investigation performed for this HSR involved nondestructive analysis of structural systems as well as the spring-water supply systems. Based on documentation of work performed at the site since the NPS acquired the property in 1970 and visual inspection of existing conditions, the

HSR team determined that invasive measures of investigation such as removing sections of surface material and finishes or extensive excavation would be inappropriate. The visual and surface-level investigations performed for the HSR suggest that the foundation of the Providence Spring House, lower fountain, circulation features, and other structures on the site exist and function as they did when the NPS produced the set of measured drawings in 1986 (see Appendix A-10). Any known alterations to features located underground or otherwise inaccessible within the scope of investigations for this HSR are discussed in the corresponding section(s) below.

Providence Spring House

Foundation

The Providence Spring House's exterior walls sit on a granite-block footing set approximately 5'-6" below the top of the building's marble water table. The three courses of granite blocks located below grade are stacked on the footing and are capped by the marble water table (Figure C52). These lower walls serve as the foundation for the upper (above-grade) portion of the pavilion.

Rising damp and biological growth were noted in places along the lower portions of the foundation walls. A moisture meter was used to test the moisture content of the walls in a grid across the exposed interior of the foundation. The results of that analysis are presented in the *Summary of Physical Conditions* section of this HSR.

Based on historical research, the foundation material for the interior ceramic-tile floor of the pavilion is suspected to be a bed of mortar originally laid in 1901 that received a second top-coat in 1902. The second coating effectively raised the floor in the middle of the building enough to provide approximately 2'- to 3'- deep gutters along the interior base of the foundation walls. Detailed chemical analysis of the foundation material would require removal of several layers of finished floor surfaces, and, because the floor appears stable and functional, such investigation was not performed for this HSR.

Figure C52. The lower portions of the Spring House's walls are situated below grade and rest on a stone foundation not visible in this photograph; likewise, the foundation of the ceramic-tile floor is also not visible; photographer facing east (Source: WLA Studio, 2020).

Walls

The Providence Spring House walls above the building's marble water table consist of rough-cut granite blocks with ½" beaded mortar joints (Figures C53 and C54). The granite blocks vary in length and are 12" thick and 12" wide. The four exterior walls support a frame roof structure.

The front (west) and side walls of the pavilion include eight granite-block piers in total, each of which is a vertical stack of five 12" × 12" × 12" blocks. The vertical piers are evenly spaced and form three symmetrical open bays on each of the three façades. The piers support granite lintels that, in turn, carry the building's marble cornice and roof above. The lintel over the center bay of the front (west) wall is carved to form a decorative arched opening with a faux dropped keystone at the center (Figure C55). The upper blocks of the piers carrying the carved lintel taper in at the top, giving it depth at the place where a true arch springing would begin. Beads of mortar set on the face of the carved lintel and pier blocks outline faux voussoirs. All other lintels over the open pavilion bays are flat.

Figure C53. The Providence Spring House's front and side walls are formed by vertical piers of granite blocks resting directly on the building's marble water table; photographer facing northwest looking at the base of the south wall (Source: WLA Studio, 2020).

Figure C54. Detail view of the beaded mortar joints on the north end of the rear wall of the Providence Spring House, representative of all exposed exterior mortar joints of the building; photographer facing west (Source: WLA Studio, 2020).

At the building's rear (east) wall, between the marble water table and cornice, there are six courses of granite blocks. The marble fountain tablet and two flanking engraved tablets are attached to the interior face of the rear wall.

A continuous course of carved marble with a bull-nose profile serves as a simple cornice on the front and rear of the building and as a top plate, supporting the low end of the frame roof, on the sides.

The Providence Spring House's front and rear gables are infilled with eight courses of granite. The front gable has a marble tablet (5'-5" wide and 2' tall) carved with the letters "PROVIDENCE SPRING" set in the center of the gable just above the marble cornice. The peak of the front gable is topped with a carved finial that doubles as a flagpole holder. The stone of the rear gable exhibits a slightly rougher appearance and less-refined tooling than those of the front. Three large stones at the bottom-center of the rear gable occupy two vertical courses, visually mirroring the placement of the marble tablet at the building's front. The interior of the gables is covered with a buff-colored, type-N stucco (Figure C56).

Roof and Exterior Trim

The Providence Spring House is covered with a steep-pitched frame roof with a slate-tile covering (Figure C57). The 2" × 12" rafters bare directly on the marble top plate and support a wood decking of tongue-and-groove 1" × 3" boards. There are six 2" × 2" wide beams and no ceiling joists on the interior of the roof structure. The interior surfaces of the roof structure are painted white (Figures C58-C60).

Figure C55. Eight of the Providence Spring House's nine open bays are formed by flat granite lintel stones; the center bay of the front wall (right) has a carved lintel with decorative faux mortar (Source: WLA Studio, 2020).

Figure C56. The interior surface of both the Providence Spring House's gables have a coat of masonry stucco; note that the front central lintel stone (left photograph) does not include faux beaded mortar like on its' outside face; note the absence of stucco coating on the bottom-center stone of the rear gable (right photograph) (Source: WLA Studio, 2020).

Figure C57. View of north side of the Providence Spring House's slate-tile roof; photographer facing southeast (Source: WLA Studio, 2020).

Figure C58. Interior view of front gable and roof structure of Providence Spring House; photographer facing west (Source: WLA Studio, 2020).

Figure C60. Detail view of rafter ends resting directly on marble top plate/cornice course; photographer facing west (Source: WLA Studio, 2020).

Figure C59. Interior view of south side of Providence Spring House roof structure; photographer facing south (Source: WLA Studio, 2020).

Figure C61. Detail of marble cornice, bull-nose trim, rake, drip edge, and roof overhang; photographer facing west at southeast corner of Providence Spring House (Source: WLA Studio, 2020).

The bull-nosed marble top plate creates a 2" overhang on the north and south sides of the building, but there are not any true eaves. Rather, the minimal overhangs are finished with 2" copper drip edges over 1" bull-nosed fascia trim on the north and south drip edges and simple 4" rake moldings on the gable ends (Figure C61).

Interior Floor

The interior floor of the Providence Spring House includes at least two layers of mortar or concrete of an unknown type supporting a grid of 6" × 6" ceramic tiles. The total finished floor space is approximately 11' wide from north to south and 12' wide from east to west. The raised floor drains to the perimeter of the covered space where 5½"-deep gutters transfer any water that enters the building to one of two PVC drain pipes on either side of the fountain attached to the rear wall (Figure C62).

Interior Fountain

The granite and marble fountain (Figures C63-C66) at the rear of the Providence Spring House includes a five-piece gray marble base, a large brown granite basin, and a carved white marble tablet above.

The marble foundation of the fountain's base is set flush with the adjacent ceramic-tile floor with its top surface exposed. The front portion of the base includes two pieces of marble that support the front of the granite basin above. Two flanking carved pieces of marble, at the rear of the base, flare out at the bottom to give the base a tripartite configuration. The overall height of the base is 1'-9" from the top of the finished floor.

The large brown granite basin measures 3'-8" wide and 1' tall. It is semicircular in shape and flares out from the base to a carved top edge. The basin extends approximately 1'-10" from the

rear Providence Spring House wall. Above the basin, spring water cascades from an outlet with a decorative copper ring attached to the white marble tablet above. A ¾" PVC drain is located at the center-rear of the basin.

The white marble tablet above the fountain's granite basin measures approximately 3' at its widest point and 5'-4" tall. It rests on the rear edge of the granite basin below and is attached to the rear wall of the Providence Spring House with three iron ties at its top. There is evidence of significant chemical erosion surrounding the spring water outlet. Historic photographs offer documentation to support the idea that chemical erosion has been an ongoing issue affecting the condition of the marble tablet, as historic images show what was a more prominent and larger dove carving at the base of the tablet, with an integrated marble basin over which water would cascade (The *Historical Background and Context* contains a description of the Providence Spring House fountain's original configuration.) Erosion surrounding the face of the dove also suggests that spring water originally exited at the dove's beak, before falling into the marble basin, where it would cascade over the dove's shoulders into the granite basin below. The copper medallion that currently serves as spring water outlet was a later addition, occurring at an unknown date. (The *Summary of Physical Condition* includes a full discussion of the chemical erosion issues).

Commemorative Tablets

The two carved white marble tablets flanking the interior fountain within the Providence Spring House are set into the rear wall and their perimeter edges are mortared flush. It is likely that they are attached to the wall with iron pinning; however, site investigation and research did not confirm the method of attachment.

Lower Fountain

The lower fountain (Figure C67) is a prominent constructed water feature of the Providence Spring House site and includes the adjacent concrete retaining wall, patio, base, and granite fountain.

Foundation

There is no true foundation for the various components of the lower fountain; however, the concrete retaining wall, patio, and fountain base adequately support the granite fountain both structurally and functionally as a water feature. The 1986 measured drawings indicate that the patio and retaining wall rest on a leveled "sand bed" (see Appendix A-10). There is no reference to the presence of steel or other reinforcement within the wall and patio. The plans do not show the manner in which the wall, patio, or fountain base are tied to one another.

Figure C62. The floor gutters on the perimeter of the Providence Spring House interior transfer any water collected inside of the building to one of two drain outlets located below the finished floor level on either side (north and south) of the fountain; photographer facing east at southeast corner of the building.

Figure C63. The Providence Spring House's interior fountain includes a blue marble base, brown granite main basin, and white marble tablet; photographer facing east (Source: WLA Studio, 2020).

Figure C64. The marble tablet component of the Providence Spring House's interior fountain is attached to the rear wall of the building with three iron pins; the arrows indicate the location of the pins in the left photograph. The right photograph is of the pin at the top of the tablet (Source: WLA Studio, 2020).

Figure C65. Spring water cascades from an outlet in the lower portion of the marble tablet into the granite basin below; photographer facing east (Source: WLA Studio, 2020).

Figure C66. Detail view of the fountain's supply outlet with copper ring, the PVC drain pipe, and existing condition of lower portion of the marble tablet; the dashed line outlines what is suspected to be the former shape of an upper basin; the blue arrows indicate where water may have once cascaded out of the upper basin (Source: WLA Studio, 2020).

Retaining Walls

The retaining wall of the fountain includes two sections that form an L-shape in plan and retain the adjacent soil to the north and east. The north section of the wall serves as the rear of the fountain and is adorned with a pointed cap across the top edge and two 14" × 14" pointed caps on either end. The east wall tapers from 2'-8" tall at the north end (where it meets the north wall) to a point below grade at the south end.

Both sections of the wall are of board-formed concrete with a smooth gray exterior skim coat. Buff-colored, smooth, river-pebble aggregate is visible where the exterior skim coating has weathered. Some, but not all of the joints between the wall and patio and fountain are filled with a polyurea joint compound.

Lower Fountain Patio

The rectangular patio at the lower fountain measures roughly 12' from east to west and 8' from north to south and is of poured-in-place concrete. Its gray surface is weathered, exposing the buff-colored, smooth, river-pebble aggregate. The lower fountain base sits at the center-north side of the patio.

Fountain

The fountain includes a four-piece gray granite basin resting on top of two courses of gray granite blocks with both gray- and buff-colored flush mortar joints. The rectangular-massed fountain rests on a two-piece, poured-in-place concrete base. The rectangular base measures 5'-6" × 4'-0" wide and 5" tall.

Figure C67. Diagram indicating components of the lower fountain; photographer facing northeast (Source: WLA Studio, 2020).

The fountain's lower courses of granite blocks are roughly 9" tall, and the four pieces that form the basin at the top are 13" tall. The pieces that form the basin are carved square on all but one side, the other being a concave curve on the interior side of the basin. The pieces are situated to form an irregular, but symmetrical, trapezoidal shape when viewed in plan. There is a single 1¼" PVC outlet at the rear-bottom of the basin. Because the outlet is located at the bottom, the basin holds a variable amount of spring water depending on the rate of in-flow.

Fountain Water Supply

Spring water that runs through the lower fountain is collected in the lower cistern in the northeast portion of the site. From the cistern, a 3" PVC pipe carries the water to the main water vault at the rear of the Providence Spring House, where it is directed to the lower fountain after passing through a wye coupling and ball valve. In the water vault, the pipe includes a wye with ball valves on both outlets that allows site managers to redirect the flow to a 3" PVC overflow outlet that drains directly into the bottom of the water vault. Water that collects in the vault drains to the east swale via a 3" PVC pipe. When the supply to the lower fountain is on, the water is carried by a 2" PVC pipe to a rubber boot and 4" cast iron pipe that passes through the retaining wall and into the fountain. The water then cascades from a three-way outlet connected to the 4" cast iron pipe and into the fountain basin. There is a 1¼" PVC drainpipe at the base of the fountain basin that carries the spring water through a 4" terracotta pipe conduit to an outlet at the south edge of the adjacent patio.

Brick Runnel and Reflecting Pool

Foundation

Historic documents indicate that the brick runnel and reflecting pool were originally constructed on a compounded mixture of loose aggregate and sand with no cement or mortar. Research indicates that this remains the case for the reflecting pool; however, in 2019, a team from the NPS Historic Preservation Training Center (HPTC) added a foundation and reconstructed the upper circular brick features and runnel.

Because ground water flows naturally under the brick runnel and upper pools, the NPS excavated a roughly 6'-wide area surrounding the runnel, within which the feature's foundation sits. The foundation area includes a filter fabric installed over the sandy soil base and gravel-fill up to the base of the runnel and to grade on either side. There is a perforated plastic drainpipe on either side of the runnel, making the entire 6'-wide area essentially a French drain.

The gravel bed is the only foundation for the circular pools in the upper portion of the feature. The sections of runnels, however, rest on two layers of concrete cloth set directly on the gravel bed at the center of the drainage area. The NPS construction reports, available at ANDE Archives, state that the concrete cloth "provided a flat stable surface upon which to lay bricks."

General Characteristics

The brick runnel and reflecting pool are set into the surrounding ground plane and form a cohesive constructed water feature that channelizes and directs spring water from the lower fountain to the site's south swale. Although the upper portion of the feature has been reconstructed and a significant amount of the reflecting pool has been repointed and repaired with new brick, the feature retains its original shape, location, appearance, and functionality. The feature is sunken into the ground plane and includes red brick with buff-colored mortar. The exposed brick of the upper pools and runnel are weathered and original material of the feature, while the bricks of the top course at the reflecting pool are replacements.

Structure

The reconstructed brick runnel includes non-original bricks in the first three courses of the structure and reclaimed original bricks in the top courses, which are visible in the completed work. During the 2019 reconstruction, the HPTC altered the original bonding pattern by providing header bricks tying the wythes together—effectively adding greater structural integrity. This alteration occurs below the finished grade of the surrounding soil and is not visible in the finished work, thus maintaining the original look of the structure.

Cisterns

As was the case for other features of the site, the investigations for this HSR did not involve direct investigation of the structural components of the cisterns (Figures C68-C70). Rather, historical research and surface-level investigations provided

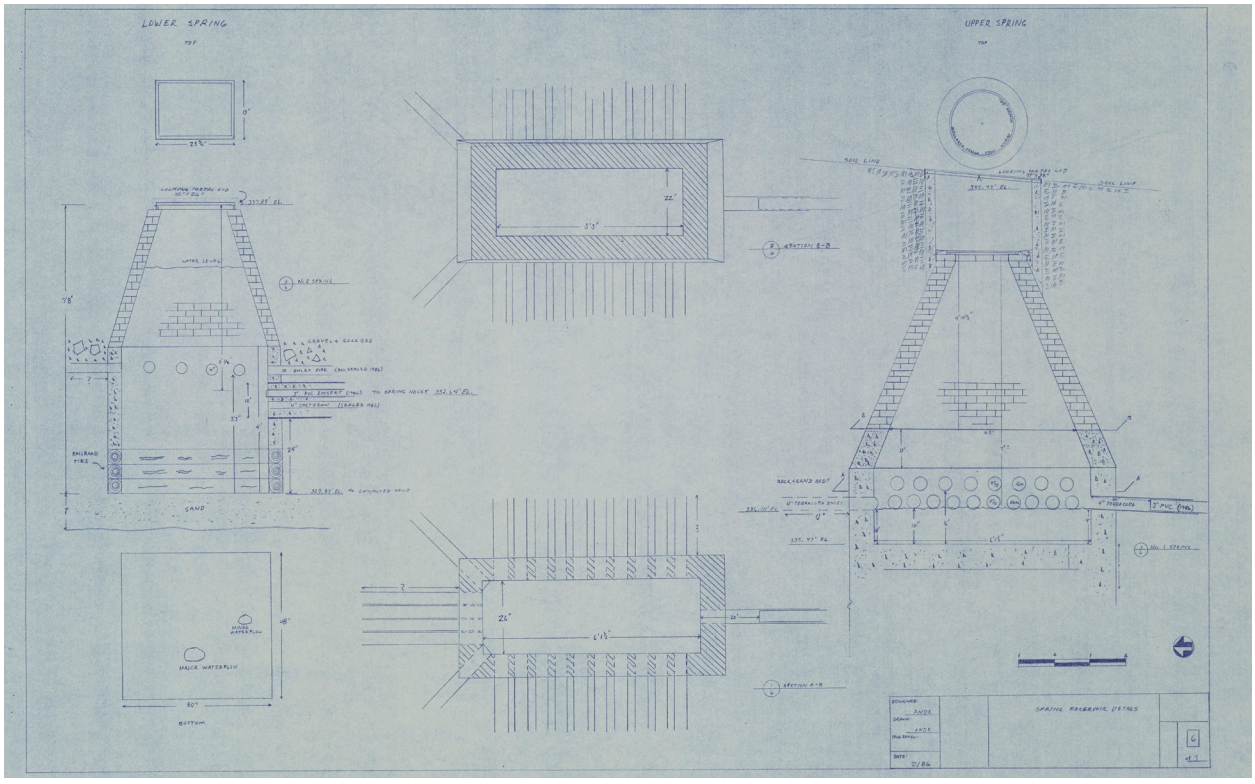

Figure C68. Excerpt of the 1986 NPS measured drawing set; these are the only known historic measured drawings of the two on-site cisterns (Source: ANDE Archives; see Appendix A-10).

the basis for analysis. As such, the cisterns are described below based on analysis of the existing conditions documented in the 1986 NPS measured drawings and investigations in 2020-2021 by the HSR team.

It should be noted that both cistern lids are currently unsecured, and pose a risk to the health and safety of visitors and staff. The existing cistern covers were added by the NPS during their work at the Providence Spring House in the 1980s.The lock hasps and hinges that were originally installed have become damaged and no longer secure the lids. This poses a safety risk to park visitors who could open the existing covers and fall into the cistern and drown.

Upper Cistern

The upper cistern is a rectangular concrete basin, measuring 2'-2" by 6' 1½" in plan view and 3' deep, set approximately 10' below grade. Above the basin, corbeled brick walls retain the surrounding soil. The walls taper as they rise to a circular entry

Figure C69. View from the open top of the upper cistern; photograph oriented with north up; note the PVC outlet pipe visible near the cistern's bottom (Source: WLA Studio, 2020).

Figure C70. Interior views of the lower cistern; photographs oriented north at top (Source: WLA Studio, 2020).

point (roughly 2' in diameter) approximately 2' below grade. At the top of the brick cistern walls, there is a 2' × 2' × 2' concrete vault with a steel lid that provides access to the circular entry point.

Water enters the cistern via 4" terracotta inlet pipes that pass through the walls of the basin. The outlet is also a 4" terracotta pipe with a 3" PVC insert beginning approximately 20" south of the south cistern wall. The cistern outlet pipe runs directly to the main water vault at the rear of the Providence Spring House, where it is redirected to the inner fountain or into the site's east swale.

Lower Cistern

The lower cistern is a roughly square concrete and timber structure without a bottom, measuring 4'-2" by 4'-0" in plan view and 4' deep, set approximately 7'-8" below grade. Above the basin, corbeled brick walls retain the surrounding soil. The walls taper as they rise to a 2'-1¾" × 1'-1" opening fixed with a steel top at the surface.

Spring water emerges from at least two places in the bottom of the cistern. There are also 4" terracotta inlet pipes that pass through the walls of the basin approximately 3'-3" above the sandy bottom. There is a sealed cast-iron outlet pipe as well as a functioning 3" PVC outlet that leads from the cistern to the main water vault at the rear of the Providence Spring House. From the vault, the water is directed to the lower fountain or into the site's east swale.

Concrete Walkway, Stairs, and Retaining Walls

The walkways and stair sets (Figures C71 and C72) that provide access to the Providence Spring House and lower fountain rest on graded areas of naturally sandy soil. They are of poured-in-place, gray- or buff-colored concrete with a smooth, river-pebble aggregate. There are stress joints in the walkways approximately every 4' and at the junction of the stair sets. Retaining walls exist on either side of both stair sets, and the set at the entrance to the Providence Spring House includes a headwall on the west side (top of set). The edges of the concrete features, including the point of the stair treads, have a smoothed, quarter-round bevel.

Figure C71. Upper concrete stair set with retaining walls; photographer facing north (Source: WLA Studio, 2020).

Figure C72. Lower concrete stair set with adjacent retaining wall to the north; photographer facing west (Source: WLA Studio, 2020).

Figure C73. View of south side of the concrete footbridge; photographer facing north.

Figure C74. The red arrow indicates the concrete footing at west side of footbridge (Source: WLA Studio, 2020).

Concrete Footbridge

The concrete footbridge (Figures C73 and C74) measures 4'-4" wide and spans approximately 18'. It is supported by full-width concrete footings on the east and west ends. The footings are set into the abutment walls at an unknown depth. Historically, the banks of the abutment walls were covered with rubble stone with a concrete stucco coating—all of which has either deteriorated or is covered with vegetation.

Structurally, the reinforced-concrete bridge includes two main horizontal supports (roughly 7" wide and 12" tall each) on either side of a 3'-3" wide walkway. As such, the sides of the bridge form curbs running the length of the structure.

Decorative elements include beveled concrete edges and a combination of recessed and raised panels. On either side of the walkway there are 26" tall black painted iron railings with vertical pickets attached with brackets to the top of the outside horizontal beams.

Stone Walls

The two rubble-stone retaining walls at the site include the low wall surrounding the north portion of the parking lot and the retaining wall along the north side of the main sidewalk to the Providence Spring House. The walls were both constructed by the CCC in 1936-1937 and consist of the same mixture of blonde, buff, and gray stones; however, they exhibit slightly different design characteristics. There is evidence of a range of repair work at both walls—from basic repointing to near-complete rebuilding of sections.

Stone Wall at Parking Lot

The rubble-stone wall at the parking lot (Figures C75-C78) is both a retaining wall and a free-standing guard wall. The wall sections measure approximately 16"-18" wide and are of uncoursed rubble stone set to form flat exposed faces and top. On the northwest end of the parking lot, the wall rises up to 4' at its highest point in the northwest corner. That section, along the west and north edges of the parking lot, functions as a retaining wall for the soil to the northwest. On the east edge

Figure C75. South end of stone retaining wall in parking lot.

Figure C76. Cheek wall on south side of main concrete walkway; photographer facing southeast.

Figure C77. View of the north portion of east wall at the parking lot; photographer facing northeast.

of the parking lot, the wall does not function as a retaining wall, but rather as a formal border. The east section is low, 3" at the lowest and 18" at the highest, and once had a continuous cast-concrete cap. A gap in the wall at the walkway to the Providence Spring House forms a formal entry to the site and includes short columns and cheek walls with cast-concrete bases and caps. The bases and caps are of a buff-colored concrete and have 2" beveled edges. The cheek walls (running east-west along either side of the walkway) are set nearly flush with the ground plane. Portions of the wall, especially along the east edge of the parking lot, show signs of repair using mismatched mortar that is very thick and covers the stones in places.

Figure C78. View of the west portion of the retaining wall at the parking lot; photographer facing south (Source: WLA Studio, 2020).

Rubble-Stone Retaining Wall North of Walkway

The rubble-stone wall north of the walkway to the Providence Spring House (Figure C79) is curvilinear and spans approximately 73', east to west. The wall retains the soil to the north of the walkway, and there is a 2' wide swath of turf between the wall and the north edge of the walkway. The wall is approximately 4' tall at the west end and tapers gradually to approximately 1'-10" at the east end. The wall's exposed face is sloped to match the adjacent terrain on the west end and becomes gradually more vertical to the east.

The stones of the retaining wall appear to match those of the wall surrounding the parking lot; however, they are laid in such a way that they do not create a flat surface. Rather, the stones are loosely stacked in an irregular three-dimensional pattern with deep mortar joints. While some evidence of repairs exists, overall, the wall along the walkway exhibits much less alteration than the wall around the parking lot.

Figure C79. Two views of the uncoursed stonework of the retaining wall north of the Providence Spring House walkway; photographer facing northeast in left photograph and north in right.

Swales

Brick Swale

The swale north of the Providence Spring House (Figure C80) includes a brick-paved, sloped surface and a granite curb that collect surface water runoff from the hillside above and transfer it to the east and south, where the swale terminates at the head of an earthen swale on the east side of the site (east swale). The entire feature is approximately 7' long and drops from its east end to its west at an average of roughly 3.5 percent slope.

The brick surface includes three courses in stacked bond with flush mortar joints on a compacted bed of sand and gravel dust. The curb includes one course of granite blocks that measure approximately 12" × 12" in section and vary from 2' to 6' long. The granite blocks are not pinned together and lie on the same foundation as the brick surface. The mortar-filled joints between the granite blocks, as well as between the curb and the brick surface, are flush where intact.

Earthen Swales

The east and south swales (Figures C81 and C82) are prominent drainage features of the site and carry a significant amount of surface water and groundwater from the site into Stockade Branch to the southeast. The swales are approximately 16" wide and as much as 2' deep. They are cut directly into the soil and do not have exposed paved surfaces or stone lining. As such, they require periodic removal of sediment and vegetation to function as intended.

The east swale runs approximately 100' at a fairly consistent 7.5 percent slope, dropping from its north end, at the end of the brick swale, to its south end where it meets the site's south swale.

The south swale runs more than 300' at a mild slope of less than 3 percent down from its northwest end, near the concrete footbridge, to its east end at Stockade Branch.

In addition to the east and south swales, there are several earthen swales that drain the boggy area in the northwest portion of the site. When constructed by the CCC, these swales were lined with loose stones, none of which remain clearly visible but likely have been covered by sediment and vegetation. These swales connect to the head of the south swale near the concrete footbridge.

French Drains and Headwalls

The upper French drains of the site (Figures C83 and C84) include 4" perforated pipe set within linear beds of crushed stone. The stone bed and pipe are separated from the adjacent soil by a layer of filter fabric. The gravel beds measure from 12" to 22" wide and 8" to 48" deep. The drains do not have filter fabric covers and there is a shallow layer of soil and turf on top of the gravel beds.

The drains have clean-out fittings located below the surface that are unmarked. The Providence Spring House foundation drains terminate at a brick headwall on the west edge of the east swale. That brick headwall also protects the 3" PVC drainpipe from the Providence Spring House and main water vault.

Two lower French drains are located in the open area below the Providence Spring House sidewalk. Drains were installed circa 1986, and each includes 4" perforated pipe set within linear beds of crushed stone, with each drain outlet emptying into the south earthen swale. These drains are not visible on the ground surface, so the condition of these drains is not known.

Figure C80. View of the brick swale from east of the Spring House; photographer facing west (Source: WLA Studio, 2020).

Figure C81. View of earthen swales of the Providence Spring House Site; photographer facing southeast (Source: WLA Studio, 2020).

Figure C82. South earthen swale at Providence Spring House site; note the moderately-steep and short banks; photographer facing east (Source: WLA Studio, 2020).

Figure C83. View of excalvated French drain at north foundation of Providence Spring House during repair work performed on December 3rd, 2020; red arrow indicates the clean-out fitting (Source: WLA Studio, 2020).

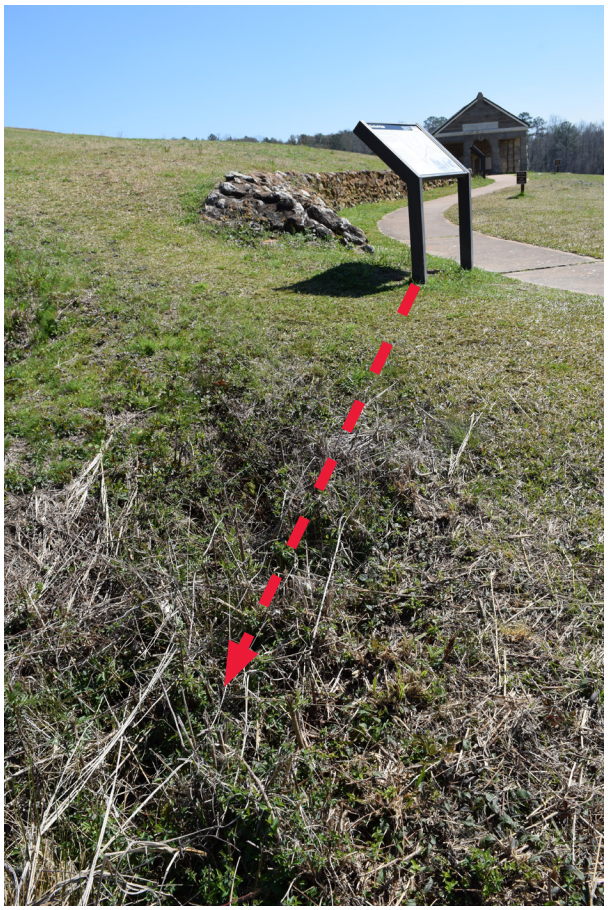

Figure C84. A French drain carries water from the west end of the rubble-stone retaining wall to an earthen swale north of the concrete footbridge; dashed line indicates approximate location of perforated pipe; photographer facing east (Source: WLA Studio, 2020).

Character-Defining Features

The NPS's *Preservation Brief 17: Architectural Character – Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving their Character* states:

> *The Secretary of the Interior's Standards for the Treatment of Historic Properties* embody two important goals: 1) the preservation of historic materials and, 2) the preservation of a building's distinguishing character. Every old building is unique, with its own identity and its own distinctive character. Character refers to all those visual aspects and physical features that comprise the appearance of every historic building. Character-defining elements include the overall shape of the building, its materials, craftsmanship, decorative details, interior spaces and features, as well as the various aspects of its site and environment.

This approach to identifying a building's character-defining features involves 1) identifying the building's overall visual character, including form, roof, openings, and setting; 2) identifying materials, features, and craftsmanship at closer range; and 3) identifying the visual character of interior spaces, features, and finishes.

Using this approach as a basis for evaluation of all features of the Providence Spring House site, this HSR identifies important visual and functional characteristics and the physical features that define them. Based on that evaluation, the following character-defining features are present:

Site-Wide Character

The following characteristics of the Providence Spring House site help define its character as a component of the larger memorial landscape of ANDE. On the site-wide scale, the Providence Spring House site is generally characterized by (1) the ways in which constructed features respond to natural features and (2) the relationship between the site and the surrounding Prison Camp landscape, with its various commemorative, interpretive, and functional features.

Natural Systems and Features

The constructed features of the site are configured and situated in response to the natural systems and features, including the topography and, particularly, Providence Spring. The natural features provide the site's setting and link the site to the larger memorial landscape of ANDE. These natural features include:

- Providence Spring and the groundwater that emerges at the site
- Stockade Branch
- Steep slopes to the north of the site
- Low, boggy areas in the northwest and southern parts of the site

Spatial Organization

The constructed features of the site are organized in response to the natural terrain, natural flow of Providence Spring as it emerges from the hillside north of the Providence Spring House, and the larger memorial landscape of ANDE. The site's location, at the historic west boundary of the former prison stockade, north of Stockade Branch, now serves as a heavy use point of interest for visitors that is accessible via the Prison Site Road. Within the site, the location of graded areas, circulation features, and both above- and below-ground structures (including the Providence Spring House) create a sequence of spaces that defines visitors' experience of the site. The following organization delineates the site's overall visual and functional character:

- *Terrain*—steepest in the north where spring water is collected in cisterns; terraced at location of the Providence Spring House, retaining walls, circulation, and lower fountain; low and boggy in west and south with constructed swales to manage groundwater and surface water runoff.
- *Circulation*—pedestrian circulation is unrestricted at the site, but generally occurs along the central concrete walkway from the parking lot at west end to the Providence Spring House and lower fountain at the east end.
- *Buildings and Structures*—occupy the east portion of the site and are oriented north-south aligning with the natural flow of groundwater from the hillside at the north to the lowest areas to the south and east.

- *Subterranean Structures, Supply Pipes, and Drains*—the cisterns, attached spring water-supply pipes, and drainage features are organized in a cohesive system stretching generally from the north, where groundwater is collected and emerges naturally, through the constructed water features near the center of the site, to the south, where groundwater enters the south swale and ultimately Stockade Branch.
- *Vegetation*—nearly the entire site is open with a turf covering; the boggy area in the northwest part of the site has a thicker and taller mixture of grasses and low shrubs; there are two sugar maple trees on the east side of the site. East of the Providence Spring House site, within the former stockade area, the vegetation is a mixture of grasses and shrubs that are mowed less often than the turf areas within the site—which effectively creates a visual boundary for the site.

Circulation

The circulation features of the site define its functional and visual character as a high-use commemorative site within the larger memorial landscape of ANDE. The circulation features provide access to, and support use of, the site's commemorative features—including the Providence Spring House, lower fountain, and brick runnel and reflecting pool. The character-defining circulation features include:

- Parking lot
- Concrete walkway
- Concrete stair sets
- Concrete footbridge

Architectural Form, Features, and Materials

Providence Spring House

Character-defining features of the Providence Spring House include its simple rectangular massing, partially-sunken siting, coursed-stone structural systems, partially-open façade configuration, front-gabled roof profile, decorative beaded mortar joints, unhewn exposed stone surfaces, simple marble water table and cornice, simple eve and rake details, slate-tile roof, decorative carved finial and marble tablet on front façade, interior ceramic-tile floor, interior floor gutters, and carved marble and granite fountain and commemorative tablets.

Lower Fountain, Base, and Patio

Character-defining features of the lower fountain include the size, shape, and configuration of the patio, base, fountain, and adjacent retaining wall, as well as the concrete and stone structural systems, flush mortar joints, rough concrete and stone surfaces, and the iron and PVC water supply and drain pipes.

Brick Runnel and Reflecting Pool

Character-defining features of the brick runnel and reflecting pool include the axial symmetry and tripartite design with three small pools at the top, a central linear runnel, and a lower rectangular reflecting pool with spillway, as well as its sunken profile and brick-and-mortar surfaces.

Concrete Walkways and Stair Sets

Character-defining features of the concrete walkways and stair sets include the curvilinear route of the main walkway, the tread depth of the stair sets to the lower fountain, and the bulky massing of the main entry stair at the Providence Spring House.

Concrete Footbridge

Character-defining features of the concrete footbridge include the scale in relation to the concrete walkway that crosses the bridge, the exposed concrete surfaces, decorative raised and recessed panels on the side façades, and the painted metal railings.

Retaining Walls

The site's retaining walls are defined by their size, color, configuration, and material. The concrete walls have smooth, grey surfaces with bull-nosed edges. The rubble-stone wall north of the site's main concrete walkway is defined by its curvilinear shape, uncoursed rubble-stone, and deeply recessed mortar joints. The wall at the parking lot is defined by its long, straight runs and ninety-degree turns, roughly-coursed stonework with recessed mortar joints, stucco-coated top surfaces, and L-shaped cheek walls with cast concrete bases and caps at the main Providence Spring House walkway entrance.

Summary of Existing Conditions

Since acquiring the site in 1970, the NPS has maintained Providence Spring House and the associated constructed features with an overall preservation-oriented approach. NPS maintenance projects conducted since 1970 on the Providence Spring House, lower fountain, brick runnel, reflecting pool, and other constructed features of the site focused on keeping the historic configuration and materials wherever possible. While such projects have helped preserve the constructed features in overall good structural and aesthetic condition, specific issues and adverse conditions are present and require the park's attention. This section of the HSR outlines those issues and informs the *Treatment* chapter that follows.

A significant number of the NPS's repair campaigns, as well as those conducted by site managers prior to NPS ownership, have resulted in alteration to subterranean features and, subsequently, the natural flow of groundwater on the site. Of note are those that included alterations to French drains, terracotta and PVC drains, swales, retaining walls, subterranean walls and basins, and circulation features. Known structural and aesthetic repairs of the most prominent character-defining features of the site—including the Providence Spring House, lower fountain, brick runnel and reflecting pool, circulation features, and stone walls—range from basic cleaning and repointing of failed mortar to complete reconstruction. Vegetation has also been altered significantly on the site, which has affected the site's overall aesthetic and functionality as a heavily used commemorative site within ANDE.

While most current concerns are largely aesthetic and represent no present threat to life safety of the general public or NPS staff, some are actively affecting the physical and aesthetic conditions of significant features of the site. The following sections outline the existing conditions of site features and list adverse conditions in terms of three levels of threat:

- **High Concern** – Immediate threat to the life/safety of people or character-defining features of the site
- **Medium Concern** – Delayed threat to people or features
- **Low Concern** – Aesthetic issues primarily affecting interpretation and public use, but posing no threat to people or features

Providence Spring House – Conditions

Structural Systems – Low Concern

The foundation components of the Providence Spring House—including the stone footings, lower walls, and floor—are in good condition. Adverse conditions present include evidence of moisture retention and rising damp on portions of the interior lower walls, resulting in low-level concerns for aesthetic reasons.

French drains at the foundation, protective coatings applied to the exterior surfaces of the lower walls, and the interior floor drains within the Providence Spring House are considered protective features. These features appear to be functioning as intended and are in good condition but require routine cleaning and maintenance.

Roof – Low Concern

The NPS replaced the building's roof covering in 2018. The roof structure, slate surface, and protective copper drip edge material are in good condition, protecting the building from moisture infiltration from the roof.

Exterior Walls and Details – Low Concern

The stone exterior façades are in generally good condition with small locations of carved graffiti, hairline cracks, abrasions, efflorescence, cracked and/or missing mortar, and biological growth (Figures C85 and C86). The painted wood facia and rake moldings are in good condition and are protected by the roof and copper drip edges (Figure C87). The presence of such adverse conditions on the building's exterior are of a low-level concern because they are non-structural and do not pose an immediate threat to people or other features of the building.

Interior Walls – Low to Medium Concern

While the interior walls are in moderate to good condition, there are locations with carved graffiti, hairline cracking, abrasions, and cracked/failing mortar (Figure C88). Such adverse conditions are considered low-level concerns. On the interior lower walls, there are larger locations exhibiting effloresce, biological growth, and failing mortar (Figures C89-C90). These areas pose a potential medium-level concern if not addressed soon.

Figure C85. Mortar repair and graffiti are low-level concerns for the Spring House (Source: WLA Studio, 2020).

Figure C86. Soiling caused by backsplash at and above the building's water table is most obvious at mortar joints (Source: WLA Studio, 2020).

Figure C87. Air gaps behind the rake molding and drip edge trim allow animals and insects to infiltrate the exterior envelope and occupy the cavity above the building's cornice; evidence of bats and wasps utilizing the space was noted during field visits (Source: WLA Studio, 2020).

Figure C88. View of cracked corner of marble water-table stone at southwest interior corner of the Providence Spring House; photographer facing west (Source: WLA Studio, 2020).

Figure C89. Failing mortar with cracks on interior of the Providence Spring House's south wall; photographer facing south (Source: WLA Studio, 2020).

Figure C90. Efflorescence and evidence of moisture retention is most pronounced on the interior of the north (in view above) and east walls of the Providence Spiring House; photographer facing north (Source: WLA Studio, 2020).

The most-likely causes of such conditions are (1) rising damp from areas near poorly-functioning interior floor drains (Figure C91) and (2) moisture intrusion into wall mortar and stone caused by failing joinery at the interior fountain and the rear wall of the Providence Spring House.

Interior Floor – Low Concern

The interior ceramic-tile floor is in good condition. The floor drains appear to be functioning properly when they are kept free of vegetation and loose debris.

Interior Fountain – Medium to High Concern

The interior fountain is in overall fair to good condition; however, there are localized areas and components that exhibit significant damage and partial loss. The material loss is likely the result of chemical erosion caused by the spring water that flows through the fountain. Recent tests of the spring water's pH reveal that the water is highly acidic (low pH levels) and that it may be actively causing erosion to the marble.

The marble components show the most extensive signs of deterioration with hairline cracks above the outlet and suspected material loss at the ornamental dove's beak and what used to be the upper basin (Figure C92). Evidence of material loss and significant erosion is also visible on the face and top of the fountain's marble base.

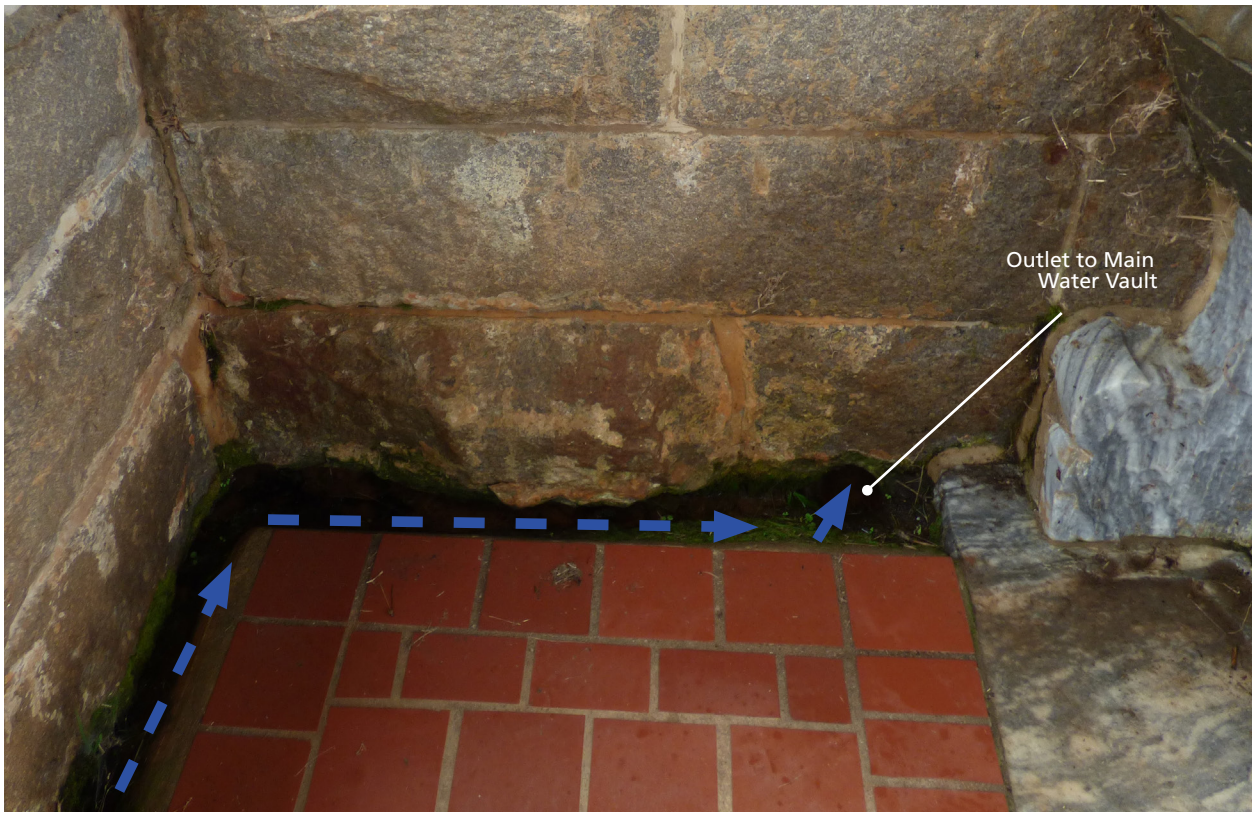

Figure C91. View of biological growth, efflorescence, and moisture retention at interior northeast corner of Providence Spring House; water is actively flowing through the floor gutter in this photograph as indicated (Source: WLA Studio, 2020).

Other adverse conditions at the fountain include horizontal cracks in the carved columns on the right and left of the upper marble tablet, efflorescence on the granite basin and marble base, and corrosion and missing material on the bronze water outlet element (Figures C93-C95). Some of these conditions may be the result of failing supply and drain components and/or joinery between the fountain's components and the adjacent Providence Spring House wall.

The low pH of the spring water is a high-level concern due to the possibility of continued erosion of the fountain's components. The cracking, efflorescence, and metal corrosion are mid-level concerns associated with improper functionality of the fountain's water supply and draining and/or joinery. If not addressed soon, these issues may lead to future failure or damage to components of the fountain.

Figure C92. Biological growth and evidence of chemical erosion and material loss are visible at the lower end of the fountain tablet (Source: WLA Studio, 2020).

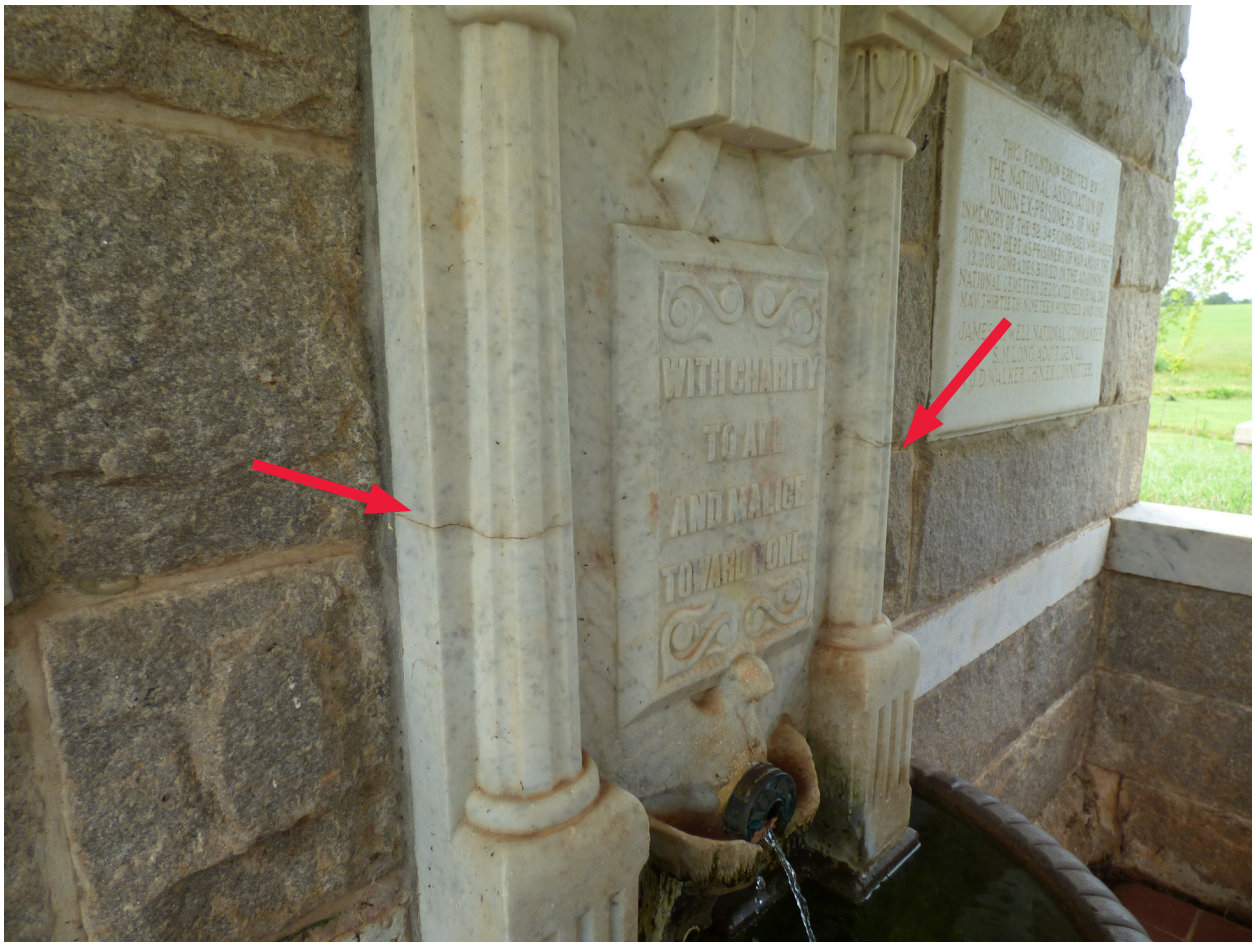

Figure C93. The marble tablet has several minor cracks, with those at the vertical center (indicated with red arrow) being the most pronounced (Source: WLA Studio, 2020).

Figure C94. Hairline cracks are visible at the carved dove near the base of marble tablet (Source: WLA Studio, 2020).

Lower Fountain

Structural Systems, Retaining Walls, and Patio – Medium Concern

The lower fountain is supported by the adjacent concrete retaining wall (north side) and the concrete patio upon which the fountain and base are situated. The foundation material for the retaining wall and patio appears stable overall, but there is evidence of water undermining the southwest portion of the patio (Figures C96 and C97). A gap between the east side of the patio appears to have widened recently, becoming further separated from the retaining wall to the east.

The exposed surfaces of the retaining wall and patio exhibit weathering with small, localized areas of pitting, cracking, evidence of moisture retention, and the presence of biological growth.

Figure C95. View of north side of the fountain base; note evidence of moisture retention and localized failing mortar as indicated by the red arrows (Source: WLA Studio, 2020).

Figure C96. View of lower fountain with conditions markup based on field notes from December 3rd, 2020; dashed blue line indicates area with most extensive moisture retention; red arrows indicate cracks and failing joint compound (Source: WLA Studio, 2020).

Figure C97. Point of localized soil erosion occurring under the southwest corner of the lower fountain's concrete patio (Source: WLA Studio, 2020).

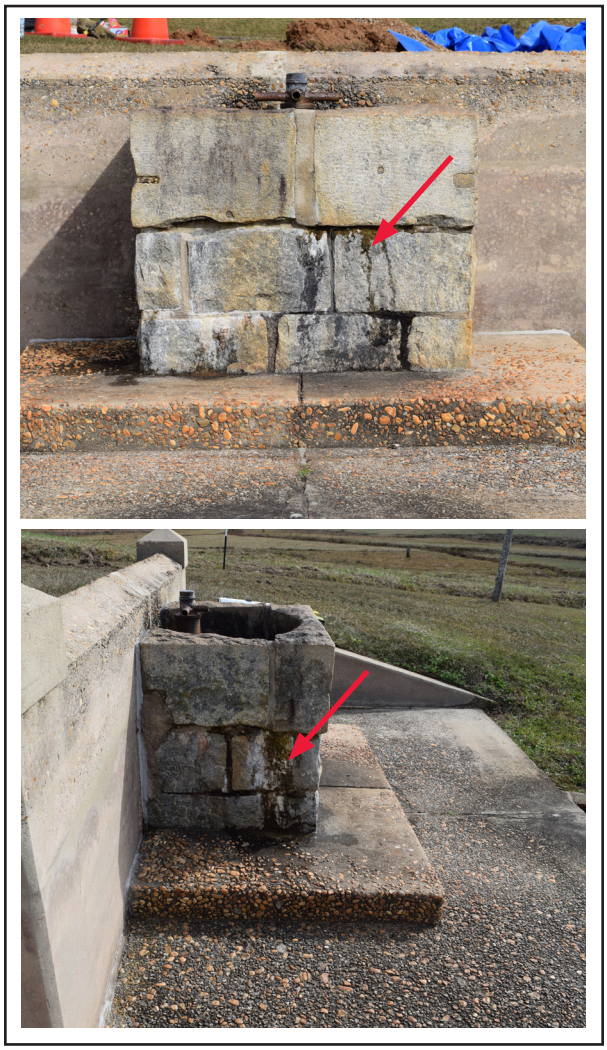

Figure C98. Efflorescence and evidence of moisture retention and failing mortar are visible on all three sides of the fountain but are most significant on the west and south sides below the top granite course; the red arrows indicate where water actively leaks from the basin through failing exterior mortar joints (Source: WLA Studio, 2020).

Figure C99. View of biological growth and evidence of moisture retention in the fountain basin (Source: WLA Studio, 2020).

On the central-south portion of the patio, where the main fountain outlet supplies water to the brick runnels below, an approximately 3-square-foot semicircular area of the patio exhibits consistent moisture retention—likely caused by rising damp and/or splash-back from the outlet pipe.

Although these issues primarily affect the fountain's appearance, if the features are not sealed and supported properly, moisture intrusion may continue to undermine the patio and portions of the wall and/or cause extensive deterioration of the exposed concrete surfaces.

Fountain – Medium Concern

The lower fountain and its components are in fair to good condition overall, but there are significant localized issues that may cause extensive deterioration of aesthetic, structural, and functional aspects of the feature if not addressed. The presence of efflorescence, biological growth, failing mortar, and evidence of moisture retention on the lower courses of stone as well as the fountain's base suggest that the supply and/or drain components may be malfunctioning and allowing spring water to infiltrate the lower portion of the fountain (Figure C98). Bio growth and evidence of moisture retention are present in the main fountain basin, and there is minor corrosion of the cast iron outlet pipe (Figure C99).

Figure C100. Left: view of unlevel soil surrounding the brick runnel and reflecting pool. Right: the unlevel areas are most obvious surrounding the top portion of the runnel, at the three small pools (Source: WLA Studio, 2020).

Figure C101. Failing mortar and biological growth are present almost everywhere that spring water comes in contact with surfaces of the brick runnel and reflecting pool (Source: WLA Studio, 2020).

Brick Runnel and Reflecting Pool

Foundation – Low Concern

The brick runnel's crushed-stone foundation bed with filter fabric and perforated drains were recently constructed and appear to be in good condition. There is evidence that sand continues to spill into the reflecting pool from the secondary pipe. The soil in areas immediately surrounding the runnel exhibits some settling and sinking (Figure C100). As such, the edges of the brick feature do not sit flush with the adjacent ground plane. The exposed portions of the feature—including the brick runnel and walls and spillway of the reflecting pool—are stable and in good overall structural condition. The adverse conditions described above are merely aesthetic and are, therefore, of low-level concern.

Figure C102. In addition to the presence of biological growth and localized areas with failing mortar, at least one brick in the spill way below the reflecting pool has become dislodged (Source: WLA Studio, 2020).

Exposed Surfaces – Low to Medium Concern

The exposed brick-and-mortar surfaces of the feature exhibit mild biological growth and localized areas of cracking and/or failing mortar (Figure C101). The mortar between the sides and

base of the longest run of the feature (the lower portion of the runnel) exhibit the most extensive degradation. The failing mortar may cause further degradation of the brick foundational layers of the runnel if not addressed.

Figure C103. Sediment in the ground water that enters the reflecting pool collects near the pour-over from the runnel and the outlet of a PVC drain at the northwest corner. This photograph was taken during excavation of the French drain at the north foundation of the Spring House (December 3rd, 2020) and shows a higher-than-normal amount of sediment entering the pool (Source: WLA Studio, 2020).

Figure C104. Typical amount of sediment at the northwest corner of the reflecting pool (Source: WLA Studio, 2020).

Mortar failure or mechanical damage has caused at least one brick to become loose at the base of the reflecting pool's spillway (Figure C102).

Basins – Low Concern

Sandy sediment collects in the bottom of each of the four basins within the brick runnel, including the upper three brick basins and the reflecting pool (Figures C103 and C104). As these features are located near the bottom of the larger spring system, this condition is considered a minor aesthetic issue.

Swales

Brick Swale – Low to Medium Concern

The brick swale (Figure C105) is in fair condition with the primary concern being its compromised ability to capture and transfer surface water running off of the hillside above the building. The brick-and-mortar component of the swale is stable on its sand-and-gravel-bed foundation and is in good overall condition with only minor localized areas exhibiting cracking or failing mortar. However, the granite-block curb component is in poor to fair condition, with the primary issues being a lack of sufficient means of attachment to the brick component and failing mortar between the granite blocks themselves. The joint between the curb and brick surface, which is where water is supposed to be carried laterally across the hillside, is no longer sealed, allowing water to undermine the granite curb and continue past the swale. Dried and live vegetation as well as some biological growth is present within the swale, causing both aesthetic and functional concern that may further degrade the feature if not addressed.

Earthen Swales – Low Concern

The earthen swales constructed by the CCC in 1936-1937—including those in the northwest boggy area, the east swale, and the south swale—serve the intended function of transferring water to the south and east into Stockade Branch. The NPS has mechanically removed sediment and vegetation from the east and south swales at least once since the 1970s; however, there is no documentation of such cleaning of the swales in the boggy area. All earthen swales on the site have low, dense vegetation on their banks that is maintained by mowing several times each year. Some of the original rock lining exists but some has been lost. All also exhibit sedimentation build-up.

Figure C105. Two views of vegetation in the deepest portion of the brick swale; photographer facing southeast for both photographs (Source: WLA Studio, 2020).

Subterranean Site Features

The condition of the cisterns, spring-water supply pipes, and drainage features of the site are generally in fair to good condition and function as intended when constructed. Many of the original pipes that carried water through the site were terracotta or iron and have been partially or totally replaced with PVC. Where retrofitted PVC pipes join older pipes, there may be leaking and/or failing materials; however, the scope of investigation for this HSR did not afford first-hand assessment of such connections. Known issues related to subterranean features include long-term failure of French drains where soil has infiltrated the gravel drain beds. Periodic removal of vegetation, cleaning of near-surface gravel, and inspection of the perforated pipes have helped maintain the functionality of the French drains.

Figure C106. Soil erosion on the bank of the earthen swale adjacent to the concrete footbridge has resulted in undermining of the concrete walkway; the extensive erosion is at the southwest corner of the bridge as indicated by the red arrow (Source: WLA Studio, 2020).

Circulation Features

The circulation features of the site, both vehicular and pedestrian features, are in overall good condition with localized areas of minor cracking and evidence of surface-level weathering and biological growth being the most notable adverse conditions. Because the features are stable and functional, these conditions issues are considered low-level concerns.

The only potential medium-level concern is erosion at the connection between the concrete sidewalk at either end of the footbridge (Figure C106). Soil loss appears to be actively occurring at a moderate rate and, if not addressed, may cause structural issues related to the stability of the sidewalk at the surface-level transition between the walkway and the bridge.

Retaining Walls

Stone Wall at Parking Lot – Low to Medium Concern

The rubble-stone walls at the parking lot are in fair overall condition with localized areas exhibiting extensive repair using inappropriate Portland-rich cement (Figures C107-C109). While the levels of concern range from purely aesthetic issues to those that may eventually culminate in loss of historic material, the walls effectively retain the adjacent soil as required for use of the parking lot and the concrete sidewalk.

Low-level concerns include the adverse aesthetic aspects of inappropriate repairs and the elevated level of the adjacent paved surface of the parking lot and soil. The surface of the parking lot appears to have been repaved since the NPS acquired the site and covers a substantial portion of the formerly-exposed west side of the wall on the east side of the parking lot. The level of the ground surrounding the formal entry walls on either side of the site's concrete walkway appears to have risen due to inappropriate infill or sedimentation. Some areas of wall repair include Portland-rich cement of a gray color that adversely impacts the overall aesthetic value of the historic portions of the wall which are characterized by a mixture of buff- and tan-colored mortar and stone.

Figure C107. A thin layer of stucco on the top side of the north portion of the parking lot's retaining wall is failing in many places; photographer facing west (Source: WLA Studio, 2020).

The medium-level concerns regard the long-term preservation of the structure. The presence of Portland-rich cement at repaired areas may cause damage to the softer historic materials of the feature. Likewise, damaged portions of the wall may continue to deteriorate if not repaired properly.

Rubble-Stone Wall along Sidewalk – Low Concern

The rubble-stone wall north of the concrete sidewalk is in good condition and adequately retains the adjacent hillside. There are some loose stones and areas of cracking and failing mortar; however, these issues are considered purely aesthetic at present.

Concrete Retaining Wall – Low Concern

The concrete retaining wall adjacent to the walkway to the lower fountain is in good overall condition the only concern being the potential of future failure of the polyurea joint compound in place at the stress joint between the wall and the adjacent sidewalk and stair sets. The joint compound is presently in good condition but will require routine replacement at an unknown maintenance interval to avoid moisture infiltration into the joints. There is one minor crack in the retaining wall (Figure C110).

Figure C108. View of the northwest corner of the parking lot retaining wall; note the historic mortar and different sizes of stone remain intact and exposed without a stucco coating or presence of Portland-rich cement repairs (Source: WLA Studio, 2020).

Figure C109. View of the south end of the parking lot retaining wall with a thin layer of stucco and areas that have been repointed with Portland-rich cement (Source: WLA Studio, 2020).

Figure C110. View of crack in concrete retaining wall on north side of the stairs leading from the main concrete walkway down to the lower fountain patio; photographer facing east (Source: WLA Studio, 2020).

Vegetation

Turf – Low Concern

The site's turfgrass lawn is in good condition and is easily maintained by site managers. Areas of potential concern include those that require consistent maintenance to avoid overgrowth and encroachment upon constructed site features—such as at the base of the Providence Spring House; edges of walkways, stair sets, the brick runnel and reflecting pool, retaining walls, cistern access doors, and swales. The encroachment of denser vegetation in the boggy area and from the former stockade areas to the east and south may pose a potential concern; however, routine mowing, trimming, and application of herbicides by park maintenance staff appears to be affectively preventing such encroachment.

Trees – Low Concern

Of the three sugar maple trees planted by the NPS in 2018, the northernmost tree remains healthy, the middle tree is in poor health, and southernmost tree has died. The poor condition of the middle and southernmost trees are low-level concerns that adversely impact the overall aesthetic of the site.

Small-Scale Features

The site's small-scale features are in good condition and do not exhibit aesthetic or structural issues of notable concern.

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Treatment and Use

Introduction

Andersonville National Historic Site's Providence Spring House and its associated features currently serve to memorialize the emergence of a spring that saved the lives of Union soldiers imprisoned at Camp Sumter during the Civil War. Andersonville National Cemetery and the former "Prison Park," including the Providence Spring House site, were listed in the National Register of Historic Places (NRHP) on October 16, 1970 when ANDE was established. On November 27, 1978, the Keeper of the National Register accepted a National Register nomination form for Andersonville National Cemetery and Andersonville Prison Park, which documented additional information for the resources within the park's boundaries, including the Providence Spring House and associated features discussed in this HSR.

The 1978 National Register nomination form lists Providence Spring House as structure #107 and includes the following description:

> A stone structure approximately 15' x 15' constructed in 1900 at the site of a natural spring in the prison site. The structure has no historical significance however, the spring itself does. The structure has undergone no structural changes. Significance: Third order. Recommended Treatment: Preservation.[181]

Despite the statement that the Providence Spring House itself is not a significant structure, the nomination's Statement of Significance includes the following language:

> Andersonville National Historic Site was created to provide an understanding of the overall Prisoner of War story in the Civil War, to interpret the role of Prisoner of War camps in history and commemorate the sacrifice of Americans who lost their lives in such camps. . . . To the National Park Service and to the country [Andersonville National Historic Site] has become a place to memorialize all prisoners of war throughout our country's history.[182]

Therefore, Providence Spring House is a significant commemorative resource in the designed public memorial landscape of ANDE.

The Providence Spring House landscape has undergone phases of development that involved the addition and/or removal of ornamental plantings, walks, retaining and free-standing walls, a lower fountain, runnel, reflecting pool, brick patio, parking area, and rubble and vegetated swales. The Providence Spring House has undergone little structural change above-grade; however, the spring has moved several times since the Providence Spring House's initial construction. As a result, changes have been made, especially below-grade, in an effort to control the spring's volume of water output and directional flow.

The 2014 *Andersonville National Historic Site Foundation Document* provides basic guidance for future planning and management decisions, including the treatment and management of the site's cultural resources.[183] The document identifies the park's *fundamental resources*, those attributes which are "essential to achieving the purpose of the park and maintaining its significance."[184] Fundamental resources to Andersonville National Historic Site, as identified in this document, include the "prison site and associated resources," as well as "commemorative monuments."[185] A list of resources associated with the prison site includes Providence Spring, while the Providence Spring House and associated features are included in a list of commemorative monuments.[186]

Other important resources and values identified as significant in the foundation document include "CCC structures and features."[187] Significant

181. Staff of Andersonville National Historic Site, "National Register Nomination for Andersonville National Cemetery and Andersonville Prison Park" (National Register of Historic Places Inventory/Nomination Form, November 27, 1978), Section 7, Continuation Sheet Page 3.
182. Staff of Andersonville National Historic Site, Section 8, Continuation Sheet Page 2.
183. National Park Service, "Andersonville National Historic Site Foundation Document" (National Park Service, Southeast Regional Office, 2014).
184. Ibid., 6.
185. Ibid.
186. Ibid., 6–7.
187. Ibid., 7.

repairs and improvements to Providence Spring House, associated features, and landscape, were made by the 207 members of the Civilian Conservation Corps who were stationed at Andersonville from 1934 to 1936. These included a new tile floor and roof for Providence Spring House, as well as a new parking area with a retaining wall constructed of local rubble. They also built a walkway and pedestrian bridge approaching the Providence Spring House and installed ornamental plantings.[188]

The foundation document identifies the production of Historic Structure Reports (HSR) as an essential task, needed to create an inventory, conditions assessment, and treatment recommendations for historic buildings.[189] This HSR fulfills that need for the Providence Spring House and associated features.

The NPS's ultimate goal for Providence Spring House is to continue the current use as a commemorative monument and to preserve the Providence Spring House structure and associated features. The HSR's treatment recommendations align with the park's goals and are focused on long-term protection and preservation of the Providence Spring House and associated features, including the landscape.

Requirements for Treatment

The treatment and use of Providence Spring House must be considered within a framework of applicable laws, regulations, agreements, and policies. These mandates govern a wide range of management issues beyond the preservation, protection, and interpretation of the Providence Spring House and the surrounding landscape; they extend to issues of visitor and staff use, safety, universal accessibility, and resiliency to natural hazards, among others. Applicable laws, regulations, and requirements that apply to the treatment recommendations include the following:

- Section 106 of the National Historic Preservation Act (NHPA). This act mandates that federal agencies, including the NPS, take into account the effects of their actions on properties listed or eligible for listing in the National Register of Historic Places and give the Advisory Council on Historic Preservation an opportunity to comment.
- National Park Service Cultural Resources Management Guideline (Director's Order 28). This order requires planning for the protection of cultural resources on park property. The HSR is the first step in the preservation planning process for Providence Spring House.
- Secretary of the Interior's Standards for the Treatment of Historic Properties.
- Americans with Disabilities Act (ADA).
- Current building codes (International Building Code - 2018 Edition with Georgia Amendments.

Ultimate Treatment and Use

Andersonville National Historic Site was listed in the National Register of Historic Places in 1970. The National Register nomination submitted in 1978 identified Providence Spring as a contributing resource. Several later NPS documents, prepared in 2010, 2015, and 2018, identified Providence Spring House and its associated features as contributing resources. Its management category is "Must be Preserved and Maintained." Therefore, the recommended ultimate treatment for the Providence Spring House and associated features is Preservation, as defined by the Secretary of the Interior. Considering the applicable laws, agreements, and policies prior discussed, the recommended ultimate treatment and use of Providence Spring House and associated features are as follows:

188. National Park Service, *Andersonville Memorial Landscape Cultural Landscape Inventory*, 2010, 52.
189. Ibid., 15.

Recommendations for Preservation by Feature

Providence Spring House

To preserve the Providence Spring House, this HSR recommends that the park maintain the existing materials, structural systems, roof, exterior walls and details, interior walls and floors, and interior fountain as they are today. Routine maintenance and pre-approved rehabilitation projects may be conducted as needed to continue to support the current use as a commemorative site at ANDE. This HSR recommends the following specific treatments organized by feature of the Spring House:

Structural Systems

- Inspect exterior walls and foundation annually, ideally in the spring, to maintain the good condition of stone footings, lower walls, and floor.
    - Exterior inspections usually proceed from the roof down to the foundation, working on one elevation at a time, moving around the building in a consistent direction.
    - Common conditions of concern to look for are misaligned stone surfaces, excessive damp spots, cracks in masonry units, diagonal cracks in masonry joints, spalling masonry, and/or open joints.
- Monitor water absorption levels at the interior fountain at least annually using a RILEM field absorption field test. Refer to Appendix C for details on the use and analysis of RILEM field absorption tests.
- Inspect any stone cracks annually. Prepare and fill cracks as necessary using a mortar-based crack filling material in lieu of epoxy or polyester based material. These fillers both adhere better and are easier to remove and replace. Refer to recommendations in Appendix C for details.

Roof

Providence Spring House's slate roof is character-defining and should not be duplicated using substitute materials. Slate roof replacement and repair represents a significant financial investment. As such, the Spring House roof should be continually monitored for any signs of damage so that the park can address problems in a timely manner. In addition, the items below should be added to park staff's cyclical maintenance tasks.

- Perform regular visual inspection of the roof from the ground using binoculars or from a ladder or cherry picker. Document the condition of the slate roofing surface, protective copper drip edge material, and roof structure to ensure the building remains protected from moisture infiltration through the roof.
- Document cracked, broken, misaligned, and missing slates, as well as the degree to which delamination has occurred. Use photographs for documentation of any problems and for discussion with contractors. Replace any damaged slates promptly.
- Check the interior rafters for water stains and rot.
- Schedule professional inspections every five to seven years, to be conducted by those experienced in working with slate.
- Maintain accurate records in the form of a logbook and the systematic filing of all bills and samples. Records will help in piecing together a roof's repair history and is an important part of maintenance.
- Retain details contributing to the appearance of the roof, when replacement is necessary, such as the color-shade, size, texture, and thickness of slates.

NOTE: As part of regular maintenance, an attempt should be made to keep foot traffic off the roof. If maintenance personnel must walk on the roof, ladders should be hooked over the ridge so that workers may walk on the ladders to better distribute their weight. If slates are to be walked on, it is best to wear soft soled shoes and to step on the lower-middle of the exposed part of the slate unit.

While an outdated practice, park staff should be aware of the history of "relic hunters" breaking off slate chips from the Providence Spring House's roof edge.

See NPS Preservation Brief Series #29, *The Repair, Replacement, and Maintenance of Historic Slate Roofs,* for more details on the repair, replacement, and maintenance of historic slate roofs.[190]

Exterior Walls and Details

- Selectively repoint cracked or missing mortar joints using in-kind material. Follow crack's direction and use monitor to see if it is active. Refer to recommendations in Appendix C for details.
- Annually inspect and clean stone surfaces of biological growth using the gentlest means possible.
- Inspect and clean stone surfaces of efflorescence, grout haze, hard water deposits, mortar smears, and atmospheric staining every five to seven years, or as necessary, using the gentlest means possible. Refer to The National Park Service's Preservation Brief #1: *Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings* for detailed cleaning recommendations that should be followed during any cleaning projects.
- Perform regular inspections of facia, moldings, roof, and copper drip edges to insure they remain functional and in good condition.

Cisterns

- Replace cistern lids with a custom built steel angle iron frame. Use concrete anchors to secure the frame to each cistern. Use heavy duty hinges and tab, accompanied by a padlock, to secure the lid to each cistern.
- Choose a shade of green paint that blends as seamlessly as possible into the groundplane, and paint cistern lids using this color.

Interior Walls

- Perform annual visual inspections of mortar as part of a cyclical maintenance program.
- Spot-point failing mortar as necessary using in-kind material.
- Clean areas of efflorescence and biological growth on lower interior walls, using the gentlest means possible, as needed. Refer to The National Park Service's Preservation Brief #1: *Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings* for detailed cleaning recommendations.
- Where biological growth and/or efflorescence are present on the interior walls, clean using gentlest means possible.
- Routinely clean and inspect the French drains at the building's foundation, as the functionality of these drains impact conditions on the interior walls. Inspect existing drain pipe. Condition is currently unknown, but life spans of French drains are limited. If collapsed or clogged, install new 4" perforated pipe that connects to existing drain line. Install perforated pipe in trench with 1% minimum slope. Backfill trench with loose, washed gravel to protect archeological resources. Use geotextile wrap to prevent material migration and to protect against clogging. Add 4" of soil amendment and re-sod trench. Fine grade as necessary.

Interior Floors

- Routinely examine floor drains to insure they are kept free of vegetation and loose debris.
- Should any issues with ceramic floor tiles arise, refer to The National Park Service's Preservation Brief #40*: Preserving Historic Ceramic Tile Floors*.[191]

Interior Fountain

The interior fountain has undergone dramatic deterioration since its installation in 1901, and the precise mode of deterioration is not fully understood. Evidence suggests that a combination of chemical and physical erosive processes have had the most significant impact on the feature's deteriorated appearance and function.

190. Jeffrey S. Levine, "Preservation Brief 29: The Repair, Replacement and Maintenance of Historic Slate Roofs," Technical Preservation Services, September 1992, 29, https://www.nps.gov/tps/how-to-preserve/briefs/29-slate-roofs.htm.

191. Anne E. Grimmer and Kimberley A. Konrad, "Preservation Brief 40: Preserving Historic Ceramic Tile Floors," Technical Preservation Services, October 1996, 40, https://www.nps.gov/tps/how-to-preserve/briefs/40-ceramic-tile-floors.htm.

Because the recommended ultimate treatment for Providence Spring House's interior fountain is Preservation, the following recommendations prioritize stabilizing the existing condition. Chemical consolidants and water repellents assist in slowing deterioration of marble and are relatively easy to apply, although the stone does need to be dry before application, presenting an obvious challenge for the fountain. Chemical consolidants and water repellents also require frequent re-application (roughly every three to five years) as part of a cyclical maintenance program. Ultimately, no treatment is successful without regular maintenance. Therefore, diligent record-keeping and ongoing maintenance will prove the most successful strategy when attempting to preserve this character-defining feature.

Even with the additional protection that chemical consolidants offer, the fountain will continue to erode as a natural function of time, and this is to be expected. Staff should not attempt to hide the visual cues of the passage of time, deterioration, and erosion on the marble. These processes offer a visual poetry and interpretative resource of their own. The goal of stone consolidation is to slow this natural process, which in the case of the interior fountain, is considerably fast given the acidic pH of the spring water. As long as the interior fountain remains functional and secured to the Providence Spring House wall, the park should leave it in place and retain the present use regardless of aesthetic considerations.

Prior to full consolidation of the interior fountain, park staff should perform testing to determine the most effective material to be used and to ensure that no negative effects result from the application of a consolidant. Three recommended chemical consolidants that may be considered for testing are Conservare OH100, Conservare H100, and Siloxane PD. Refer to Appendix C for product data sheets on all recommended consolidants.

To test consolidants, the marble should be fully dry. Park staff should shut off all water entering the Providence Spring House. Temperature and weather conditions will influence the amount of time that it will take for the marble to completely dry, so check the marble regularly in order to determine the most appropriate conditions for patch test application.

Once dry, small areas (approximately 2" x 4") of two or three consolidant products can be applied in an inconspicuous area, monitored, and evaluated. Evaluations should entail monitoring areas for absorption, surface friability, and color both before and after patch testing to determine the effectiveness of each treatment.

Consolidants do not have a visual impact if applied correctly. There should be no sheen or darkening/discoloration of the stone, although different materials react differently. So, to confirm there would be no visual impact, testing is required. Further, the recommended consolidants are designed to be breathable, penetrating products. They are not like a coating or a film that traps moisture behind it. There is a very specific application technique that involves applying the liquid very slowly and in multiple applications/passes to avoid this. If there is a significant concern about permeability, the NPS may want to consider just using the ethyl silicate consolidant (OH100), which contains no water repellents.

Other recommended treatments at the interior fountain include the following:

- Document and monitor horizontal cracking on the marble columns. Should cracks worsen, reevaluate safety risks that may be posed to visitors and park staff. The safety of staff and visitors always takes first priority.
- Document through hi-resolution photography and 3-D scanning.
- Consult with qualified building materials conservationists on the replacement of the deteriorated copper medallion with an in-kind copper replica. Ensure that the new copper medallion serves to limit contact between the marble tablet and water entering the fountain from the fountain's water supply pipe, before it cascades into the granite basin.
- Investigate supply and drain components and/or joinery between the fountain's components and the adjacent wall for signs of failure.
- Engage further research to determine the possible effects the application of chemical consolidants may pose to aquatic and vegetative life in the stream below Providence Spring House. In the event

that chemical consolidants are applied to stone surfaces, spring water would theoretically flow directly through and over treated marble, the lower fountain, pools, and runnel before depositing into the naturally-occurring stream below, where it would encounter an established and possibly fragile ecosystem.
- Test spring water as often as is feasible, but at least three times per year. Park staff should document test results as part of the cyclical maintenance program.

Note: The NPS and the authors of this report considered but eventually rejected several alternative treatment options for the interior fountain. These alternatives are provided at the end of this section.

Lower Fountain

Structural Systems, Retaining Walls, and Patio

- Document and monitor conditions of the concrete patio and retaining wall. Should the patio become increasingly uneven with the associated concrete walkway, posing a tripping hazard to park visitors or staff, the park should consider reconstructing the concrete patio using in-kind materials.
- Remove existing filler compound from the connecting joint of the patio and retaining wall. Also remove debris and vegetation growing within the joint on the east side of the patio. Refill the crack using in-kind material and continue to monitor and refill as necessary in order to prevent water from penetrating the joint.
- The implementation of an overall, cyclical maintenance program is the most effective means to protect the historic concrete structural systems of the lower fountain. Lack of maintenance on the overall site, especially related to the site drainage systems, can negatively impact long term health of concrete features and their foundational material.
- Continue to monitor and document existing conditions of exposed concrete surfaces. Future interventions should be planned based on baseline information collected during these efforts. Documentation efforts should also assist in tracing any deterioration that may go undetected without an established, thorough photographic documentation process.
- Address areas with biological growth and efflorescence by cleaning as needed with the gentlest means necessary; follow NPS guidance for preparing test patches as described in *Preservation Brief 15: Preservation of Historic Concrete*, which states, "For any cleaning process, trial samples should be performed prior to full-scale implementation. The intent of the cleaning program should not be to return the structure to a like new appearance. Concrete can age gracefully, and as long as soiling is not severe or deleterious, many structures can still be appreciated without extensive cleaning."[192]

Fountain

- Assess the overall functionality of the supply and drain components to determine if spring water is infiltrating the lower portion of the fountain.
- Regularly clean and clear the main basin of biological growth and debris as part of a regular cyclical maintenance program.
- Remove surface rust on the cast iron outlet pipes using a clean wire brush, and immediately coat with a corrosion-inhibiting primer. Should pipes experience total failure, replace using in-kind materials.

Brick Runnel and Reflecting Pool

Foundation

- Schedule routine inspections of the crushed-stone foundation bed to insure its continued functionality.
- Fill sunken areas immediately surrounding the runnel with fill-dirt and tamp down, to even the grade with the adjacent ground plane, and to support existing brickwork. Continue to monitor filled areas, refilling as necessary.
- Continue to regularly remove the sand that is dumping into the reflecting pool (from the secondary pipe in the pool's southwest corner).

192. Paul Gaudette and Deborah Slaton, "Preservation Brief 15: Preservation of Historic Concrete," Technical Preservation Services, 2007, 15, https://www.nps.gov/tps/how-to-preserve/briefs/15-concrete.htm.

Exposed Surfaces

- Annually inspect mortar and repoint as necessary using in-kind material.
- Repoint, using in-kind mortar, between the sides and base of the lower portion of the runnel to prevent further degradation of the brick foundational layers. Refer to Appendix C for detailed mortar mix recommendations.
- Monitor and address biological growth, as needed, on exposed surfaces of the feature. Refer to the National Park Service's Preservation Brief #1: *Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings* for detailed instructions on the removal of biological growth.
- Replace and repoint the dislodged brick that has become loose at the base of the reflecting pool's spillway. Use in-kind material.
- Clear sediment and debris from basins as needed to maintain the aesthetics and functionality of the pool and four basins.

Swales

Brick Swale

- Remove intruding live and dried vegetation; manage vegetation by regular hand-pulling and trimming as needed. Maintain a 4" buffer zone between the trimmer string and historic features. Pull any intruding vegetation remaining in this buffer zone by hand.
- Reset shifted and unstable granite blocks in the curb. Maintain the existing configuration and aesthetic when resetting by ensuring that stones are set evenly in a straight course at the same height. Where stones are moved, attempt to stabilize the ground beneath by adding fine, easily compactible fill-dirt underneath.
- Do not operate heavy machinery within 3' of the brick swale. Machines may cause unwanted compaction of the soil adjacent to the feature, leading to instability.
- Replace or repoint mortar at cracked or failed mortar joints within the brick swale.
- After stabilizing, repoint failed mortar joints using in-kind material between components of the granite block curb to reestablish a functional retaining curb.
- Thoroughly seal the connecting joint between the brick swale and granite block curb. Refer to Appendix C for recommended mortars and sealants.

Earthen Swales

- Cyclical maintenance on earthen swales should continue at regular intervals to preserve their functionality and aesthetics.
- Routinely trim vegetation using a manually operated string trimmer with nylon string.
- Refer to the National Park Service's Procedural Manual #77-1: *Wetland Protection* in order to delineate wetlands prior to initiation of any improvement project which might affect wetland ecology.

Subterranean Site Features

- Future subterranean investigations can target connections between retrofitted PVC piping and older pipe joints. Leaking or failing materials may be present.
- Sediment infiltration into gravel French drain beds around the Providence Spring House foundation's perimeter should be documented. Continue periodic removal of vegetation, surface-level gravel cleaning, and perforated pipe inspections to maintain functionality of the French drains.
- Regrade the Providence Spring House's south elevation to bring the grade down so it is no longer in contact with the marble, while leaving the existing French drain in place. Historic photographs show the ground plane well below the level of the marble course after its initial construction and it remained that way for at least a decade (Figure D1).

NOTE: Park staff should exercise extreme caution when undertaking any subterranean work or investigations in the area of the Providence Spring House or its associated features, as the location of the spring is unstable and ground disturbance of any kind may adversely impact the spring emergence or other subterranean drainage systems.

Circulation Features

- Monitor and document the condition of circulation features, such as the concrete walkways and stairs, to establish baseline

conditions that can be used to evaluate changes over time and the need for future interventions.
- Install a small rip rap bed at the connection between the concrete sidewalk and footbridge in order to slow the velocity of rainwater traveling down the sidewalk and actively eroding soil at the footbridge's northwest corner.
- Expand the provision and access to interpretive signage that fully complies with ADA accessibility guidelines and standards. Ensure new signage preserves the integrity of the historic site.

Retaining Walls

Stone Wall at Parking Lot

- Document and monitor conditions of the rubble-stone wall. Remove areas of inappropriate Portland-rich cement mortar, replacing with in-kind material found in other areas of rubble wall.
- Hand-pull vegetation intruding into the stone wall interior and along the base of the wall on an as-needed basis.
- String-trim vegetation along the base of the wall bordering grassy areas using nylon string, maintaining 4" of clearance between the wall and string trimmer
- Hand-pull vegetation originating in cracks between the asphalt parking lot and wall.

Rubble-Stone Wall along Sidewalk

- Thoroughly document and monitor condition of the rubble-stone wall north of the concrete sidewalk to establish baseline conditions that can assist in informing any future interventions.
- Manage vegetation at the foundation of the stone wall routinely by string trimming as necessary using nylon string.
- Maintain 4" of clearance between the string trimmer and wall materials, hand -pulling remaining vegetation along the immediate wall edge.

Concrete Retaining Wall

- Incorporate routine replacement of polyurea joint compound into cyclical maintenance programs. This compound, which runs between the concrete retaining wall and the adjacent sidewalk and stair sets, is presently in good condition, but it requires removal, cleaning, and replacement as necessary to avoid moisture infiltration into the joints.

Vegetation

Grass

The park's current routine for managing vegetation includes maintaining the grass in the area immediately surrounding the constructed features as NPS Turf Class B1, Functional Short. The park maintains the swales and open areas beyond them as NPS Turf Class B2, Functional Tall. Based on site investigations, this treatment is satisfactory for long-term preservation. This HSR recommends the following:

- Continue routine maintenance of grass in proximity to constructed features as NPS Turf Class B1, Functional Short; take exceptional care when operating mowers and other machinery around the base of the structures and features to protect them from mechanical damage.
- Consider alternative, low-growing, native grass species with deeper root systems, that may more adequately slow erosion. Establishing alternative turf grass may be especially beneficial for the slope north of the Providence Spring House. Buffalo grass (*Bouteloua dactyloides)* is one alternative grass species to consider.

Trees

The only trees in the study area include the three sugar maple (*Acer saccharum*) trees in the southeast part of the site. Parks have a reasonable duty of care to inspect and maintain trees. In terms of tree selection for removal and assessing risk, the NPS should keep in mind there are no "safe" trees and that each tree has potential to damage cultural resources on site. NPS policy in Director's Order 77 (DO-77) should be adhered to, but tree risk assessment should also follow the guidance found in ANSI A300 (Part 9 in particular) as well as ANSI Z133 (for safety).

Based on site investigation and historical research, this HSR recommends that the park replace the non historic sugar maple trees, planted to replace the historic cottonwood trees (*Populus deltoides*), with river birch (*Betula nigra)*, a tree species more similar in form, size, and texture to cottonwoods.

The existing sugar maples are struggling to survive, and river birch trees are more well-suited for the site conditions. Furthermore, replacement with cottonwood trees is not recommended due to their extremely fast growth rate, leading to an unsuitable combination of weak wood and large size, which could potentially put features such as the brick runnel and reflecting pool in danger from falling branches.

The 2015 Cultural Landscape Report for Andersonville National Historic Site mistakenly refers to the historic cottonwood trees as river birch trees. It recommends replacement with one of three options, sugar maple (*Acer saccharum*), Japanese zelkova (*Zelkova serrata* 'Village Green'), or white ash (*Fraxinus Americana* 'Rose Hill') although these recommendations are no longer prudent. Sugar maples have demonstrated failure under present site conditions, Japanese zelkova is recognized as an invasive species, and white ash is extremely susceptible to the destructive emerald ash borer.

River birch trees have an upright character which lends itself well to being planted in a row. The tree also offers shade and is tolerant of sun. Most importantly, this species will be better suited to the site conditions, particularly period flooding, with a higher chance of long-term survival.

River birch trees do shed small twigs, which will require regular maintenance for removal, however, this poses a much reduced risk for historic features

Further, river birch is very visually similar to historic cottonwood trees, most notably in leaf and bark texture, hence the Cultural Landscape Report's misidentification.

Alternative Vegetation Treatment: Landscape Re-establishment

This HSR documents four distinct historic periods for the Providence Spring House site: 1901-1910, 1934-1936, 1937-1969, and 1970-Present. The character-defining spatial relationships and features of each period are noted on their respective period plans (Appendix B). Should the park consider a landscape improvement project for the Providence Spring House site, this HSR recommends reestablishing the wooded landscape character that was present during both the WRC and United States Army administration periods, when the site was part of a "Prison Park."

Reestablishing Providence Spring House's historic wooded landscape character would offer a unique interpretive opportunity for the park to illuminate the role the CCC played in the park's history and development. Furthermore, landscape improvements guided by historic evidence (as detailed in the following paragraphs) would contribute to the overall resiliency of the park.

Historic photographic evidence available in park archives is a valuable resource that will assist in successfully reestablishing the landscape to historic conditions. Although this proposed project would not be considered a true restoration as defined by the Secretary of the Interior, a high level of accuracy and detail is possible through a thorough examination of existing resources. Furthermore, it is likely, based on site investigation, that extant historic features such as rubble swales and a rubble retaining wall remain buried on site. Historic photographs of the site document the locations and size of dozens of trees, shrubs, and ornamental plantings, some of which are identifiable down to the species level. Restoring stone and earthen swales and planting trees and other ornamental vegetation will stabilize the site's soil and reduce the intensity of the sun at the site—effectively increasing the park's resiliency to climate change.

Reestablishing Providence Spring House's historic wooded landscape character includes:

- Planting trees, shrubs, and ornamental vegetation based on historic photographic documentation of the landscape, which is summarized in the WRC, CCC, and U.S. Army Period Plans included in this HSR (Appendix B, see also the narrative descriptions for each period in the Chronology of Development and Use chapter of this HSR).
- Archaeological investigations may uncover buried CCC-era rubble swales and a retaining wall on the north side of the associated parking lot.
- Replace missing pine tree at entrance to parking lot and the historic planting bed that was removed under NPS administration.

During the period of WRC administration, Providence Spring House sat in a small clearing surrounded by forested area. There was bracken planted on the north side of the Providence Spring House's retaining wall and multi-trunked trees standing nearby in the approximate locations of the cottonwood trees that park staff removed in 2018.

Under U.S. Army management, with CCC assistance, the landscape was more heavily vegetated, with hardwood trees, understory trees, evergreen trees, ornamental shrubs, and yucca present. Rubble swales and a rubble retaining walls conveyed and directed water through the wooded landscape. Historic photographs show that Providence Spring House was a shady refuge for visitors from as early as the 1920s until the NPS clearing of the site in the 1970s.

Reestablishing the vegetated landscape of Providence Spring House will require dedicated maintenance. However, landscape reestablishment offers a highly desirable opportunity to enhance interpretation of the CCC's role in the development of ANDE.

Additional goals of this treatment alternative are to stabilize character-defining features, uncover extant historic features that may remain buried on site, slow erosion of the sloping landscape, and increase the overall resiliency of the site.

ANDE's *Climate Change Trends for the State of the Park Report* details projections for significantly warmer temperatures and more variable precipitation patterns, leading to both more frequent droughts and more severe flooding and erosion issues within the park.[193] The *State of the Park Report* for ANDE lists "water quality and quantity" as an area of significant concern for the park. "Air quality" and "flora and fauna" are both areas of moderate concern.[194]

193. Nicholas Fisichelli, "Climate Change Trends for the State of the Park Report, Andersonville National Historic Site" (NPS Climate Change Response Program, n.d.).

194. "State of the Park Report for Andersonville National Historic Site," State of the Park Series No. 15 (Washington, D.C.: National Park Service, 2014), http://npshistory.com/publications/state-of-the-park/ande-2014.pdf.

Figure D1. Historic photograph of Providence Spring House's Southeast corner, showing the ground plane's historic location, two-and-a-half to three granite courses below the level of the marble course.

During the period of the CCC work at ANDE, the landscape of Providence Spring House was heavily wooded in both deciduous and evergreen trees. Tree respiration improves air quality and water quality. Tree canopy intercepts rain, decreasing erosion. Furthermore, the extensive root network of mature trees functions as an anchor within the soil, preventing soil from washing away in the form of site erosion.

Trees assist in allowing water to enter the ground, filtering it in the process, and recharging the water table. The soils, shade, and organic materials beneath tree canopy help retain soil moisture and replenish groundwater levels.

The Providence Spring House fountains, runnel, and pools are fed by a naturally occurring, historic spring. Restoring the site's historic vegetation

and landscape character will assist in preserving Providence Spring as a historic resource by aiding in long-term groundwater replenishment, thereby insuring it continues to flow for future generations of park visitors. Increasing vegetation on the site will also increase pollutant filtering and assist in water quality improvements for Stockade Branch and Sweetwater Creek.

Recommended Use

The preferred ultimate use of Providence Spring House and its associated features is to allow for interpretive use of the Providence Spring House landscape, while considering the applicable laws, agreements, and policies discussed above.

Implementation Projects

The recommendations included above have been categorized into a series of implementation projects below. These projects are presented in a format consistent with the Project Management Information System (PMIS) forms used by the NPS for the coordination of projects with annual funding requests. Each of the projects listed below includes a brief summary description of the project, justification for the work, specific implementation recommendations, and methods for evaluating the measurable results of recommended treatment interventions. Items that have been identified as regular maintenance or as-needed repairs are not included in the projects identified below.

Document, clean, and consolidate Providence Spring House fountain

Description: Clean and consolidate the interior fountain's marble tablet and pedestal.

Justification: The interior fountain has undergone dramatic deterioration since its installation in 1901. While the precise mode of deterioration is not fully understood, evidence suggests some combination of physical and chemical erosive processes as having the most dramatic impact on the fountain's deteriorated appearance. While some erosion on the fountain's marble is to be expected as a natural function of time, chemical analysis of the water in the Providence Spring House fountain suggests that an acidic pH (6.3) may be speeding up this natural process significantly. Marble features are particularly susceptible to damage from acidic water.[195] Chemical consolidants and water repellents can assist in slowing deterioration of marble and are relatively easy to apply.

Recommendations: Fully document the conditions of the interior fountain using high resolution photography and three-dimensional scanning before beginning this implementation project. Continue to monitor and document changes to the fountain as part of a cyclical maintenance program. Clean the interior fountain's tablet and base using the gentlest means possible. Shut off water to the Providence Spring House interior. Ensure marble is fully dry by monitoring moisture levels of the stone. Once dry, test two to three chemical consolidants (in small inconspicuous areas of approximately 2" × 4" each) to determine the most effective proprietary material to be used, and to ensure that no negative effects result from the application of a consolidant. Fully consolidate marble using the consolidant deemed most appropriate. Continue to monitor and document the fountain's condition. Reapply consolidant routinely as directed by the product manufacturer.

Measurable Results: The variables impacting the deterioration of the fountain are not fully understood, and a measurable understanding of the speed at which the fountain is actively eroding is currently unknown. However, it is known that the fountain is experiencing erosion and that consolidation is a proven method to slow that process. To determine the viability of consolidants on the interior fountain, the development of a long-term monitoring program is critical. This program should include regular documentation using high resolution photography and possibly three-dimensional scanning, while comparing documented and existing conditions on an annual basis.

Stabilize and repair the brick runnel

Description: Use fill-dirt to fill sunken areas immediately adjacent to the sides of the brick runnel. Re-install the dislodged brick that is now in the area of the reflecting pool's spillway.

195. Roger J. Cheng, Jung T. Hwu, and Mei Leu Show, "Deterioration of Marble Structures. The Role of Acid Rain.," *Analytical Chemistry* 59, no. 2 (January 15, 1987): 104A-106A, https://doi.org/10.1021/ac00129a002.

Justification: The brick runnel lies within the ground plane of the Providence Spring House landscape. The surrounding ground plane, in addition to a recently installed foundation bed, supports the brick runnel that allows water to flow from the lower fountain into the reflecting pool. Unsupported brickwork is more likely to migrate, causing mortar cracking and even the dislodging of bricks, which may be lost or broken in the process. The integrity of the brick runnel is vital to the successful conveyance of water through the system of site features and to the overall design intent of the site. Thus, preservation of this character-defining feature is of utmost importance.

Recommendations: Fill sunken areas immediately adjacent to the east and west sides of the brick runnel with fill-dirt. Tamp down dirt so it is flush with the surrounding ground plane. Seed areas of exposed fill dirt with grass seed of the same genus and species as the surrounding lawn or allow the surrounding turf lawn to spread into the repaired areas. Continue to monitor and refill sunken areas as needed in-kind periodically to maintain a consistent grade adjacent to the runnel.

Replace and repoint the dislodged brick that has become loose at the base of the reflecting pool's spillway. Repoint areas of the runnel with failing mortar joints using in-kind materials. When repointing, use mortar with a hydraulic lime, such as a hybrid Portland cement-lime mortar that is compatible with the masonry or a natural hydraulic lime mortar.

Measurable Results: Once repointed and supported by soil infill at the sides, the brick runnel should continue to function as intended by conveying spring water from the lower fountain into the brick reflecting pool. Park staff should be aware that mortar is intended as a temporary material, meant to support the preservation of the bricks and the functionality of the runnel. As long as mortar is regularly monitored and selectively repointed as needed, the historic bricks that make up the runnel should remain in their present condition for many more decades. If bricks continue to be dislodged, broken, or lost, recommendations should be revised.

Repair the lower fountain, associated patio, and retaining wall.

Description: Investigate and address the cause of leaking water that is visually apparent on the exterior of the bottom half of the lower fountain. Repair the area of separation between the concrete retaining wall and patio.

Justification: The lower fountain, associated patio, and retaining wall are character-defining features of the Providence Spring House landscape. They are also important components of the system that moves Providence Spring's water through the site's features and into the natural stream below. In order to ensure these features continue to function as intended, and to assist in their preservation, further investigations are needed. Investigations should seek to determine the most appropriate interventions to address the continued leaking in the lower fountain and the separation between the retaining wall and adjacent patio. The fountain plumbing should adequately transport water through the base without leaking into the stone structure, preventing advanced efflorescence and mortar deterioration. The gaps between the patio and retaining wall should be properly sealed to prevent water from intruding into the connecting joint and running beneath the concrete patio.

Recommendations: Investigate and repair the cause of leaks in the lower portion of the lower fountain. Correct the internal problem by repairing or replacing the interior plumbing.

Remove and replace failed joint compound from between the retaining wall and patio. After replacement, this compound should be regularly inspected (at least every six months) and replaced as needed to maintain a sealed connecting joint. Park staff should use a hybrid Portland cement-lime mortar or a natural hydraulic lime (NHL) mortar when sealing and re-sealing the joints. Refer to Appendix C for details on recommended mortars.

Measurable Results: Once repaired and cleaned, water will no longer leak from the bottom portion of the lower fountain and the exterior stone surface should no longer show evidence of salt leaching. Once sealed, water will no longer run into the gap between the patio and retaining wall, which will prevent long-term undermining of the foundational material and soil below the

features. Visual inspections should confirm that the connecting joint between the concrete patio and retaining wall remains sealed, with the patio and wall meeting at or near a ninety-degree angle.

Clean and repair the brick swale and associated block curb

Description: Clean and repair the brick swale to the north of the Providence Spring House. Reset shifted and unstable granite blocks in the curb. Selectively repoint failed mortar joints as necessary. Seal the connecting joint between the brick swale and granite block curb. Clean all exposed surfaces.

Justification: The CCC installed the brick swale and block curb sometime between 1934 and 1936. Cleaning the swale of intrusive vegetation and repointing failed mortar joints will assist in the preservation of this historic resource and restore the intended functionality of the swale—which is to assist the conveyance of surface water around and away from the building's foundation.

Recommendations: Remove intruding live and dried vegetation within the brick swale by hand. Replace or repoint mortar at cracked or failed mortar joints within the brick swale using in-kind materials. Reset shifted and unstable granite blocks in the curb. Maintain the existing configuration and aesthetic when resetting by ensuring that stones are set evenly in a straight course at the same height. Where stones are moved, attempt to stabilize the ground beneath by adding fine, easily compactible fill-dirt underneath. After stabilizing, repoint failed mortar joints between components of the granite block curb to reestablish a functional retaining curb. Thoroughly seal the connecting joint between the brick swale and granite block curb using a cementitious mortar compound. Refer to Appendix C for details on recommended mortars and sealants.

Measurable Results: Once repaired, the brick swale and granite curb will collect surface level runoff and divert it around the Providence Spring House, avoiding excess water and sediment being carried toward the north side of the building. Observe the brick swale during rain or storm events. The swale should move rainwater and runoff around the Providence Spring House and other site features towards the natural spring.

Engage contractor to perform a 3D scan of interior fountain

Description: Engage a qualified contractor to perform a 3D scan of the Providence Spring House fountain.

Justification: The Providence Spring House fountain is an important and character-defining feature of the Providence Spring House landscape. The fountain commemorates the provision of clean drinking water to imprisoned soldiers dying of thirst. And the fountain is an important component of the system that conveys water through the Providence Spring House landscape.

Recommendations: Engage a qualified contractor to perform the scan. Ensure the contractor is able to perform the scan while all components of the fountain remain in-place. It is not recommended that anyone attempt to move any component of the fountain.

Measurable Results: A 3D scan will provide the best record of existing conditions, against which the NPS can compare the fountain's condition in the future. Additionally, the NPS can use the 3D scan to create a replica of the fountain. The replica could be used for interpretation at the Visitor Center or, potentially, used to replace the original fountain if the NPS decides that is the best method of preserving this feature.

Additional Future Research to support Preservation

This HSR recommends that the park:

- Monitor aquatic life and vegetation for impacts from chemical consolidants applied to Spring House features.
- Monitor site erosion surrounding the Providence Spring House.
- Conduct an archaeological investigation to locate evidence of CCC-era rubble swales and retaining wall in the area north of the Providence Spring House parking area
- Update the National Register Nomination to include Providence Spring House and associated features as contributing resources.

Resilience to Natural Hazards and Climate Change

Providence Spring House is susceptible to threats associated with climate variability and environmental pollution. The memorial's location is vulnerable to flooding, rising temperatures, changes in precipitation patterns, acid rain, and increased frequency of severe weather. Specific threats include increased crystallization of efflorescent salts due to increased evaporation rates, sulfur dioxide deposits corroding concrete and metal components, wind damage and weathering, damage from potential future wildfires, and added stress from sudden thermal change.[196]

Cultural resources including historic buildings "are fixed in place or derive much of their significance from the place within which they were created. Many are non-living, and all are unique. As a result, the capacity of cultural resources to adapt to changing environments is limited."[197]

As stated in the *Director's Policy Memorandum 14-02*, "NPS cultural resource management must keep in mind that (1) cultural resources are primary sources of data regarding human interactions with climate change; and (2) changing climates affect the preservation and maintenance of cultural resources."

An increase in temperature can lead to the "increased crystallization of efflorescent salts due to increased evaporation rates, leading to increased rates of structural cracking and deterioration."[198] Higher relative humidity, resulting from higher temperatures, will increase the moisture absorption rates for brick and porous stone. This increased moisture absorption will result in the decrease of crystallization and dissolution of salts within the masonry. The increased moisture will also increase the rates of growth of vegetation on masonry surfaces and increase the rate of corrosion of ferrous metal features.[199]

A decrease in precipitation may be expected to increase the levels of salt deposits that collect on the surfaces of masonry and porous stone. These salt deposits would then be infiltrated into the porous stone during a rain event. This cycle would cause spalling and fractures in the material.

An increase in heavy rain events would stress the memorial's ability to shed water, allowing water to find cracks and crevices into the interior of the slate roof and wooden rafters. The infiltration of water into the interior will result in increased pressure on the masonry. The extreme rain events will result in accelerated decay of masonry due to increased extremes of wetting and drying. The extreme cycle of wetting and drying will also increase the deposition and the eventual infiltration of salts into the porous material of the structure.

Carbon dioxide, sulfur oxide, and nitrogen oxide from fossil-fuel-based power generation, automobile exhaust, and industrial pollution cause acid rain, which has been widely documented as a cause of deterioration of historic buildings and monuments, particularly stone and concrete materials and metals. Threats associated with extreme weather events include damage from wind, rain, and wind-borne debris.

According to NPS documents, impacts to buildings and structures related to temperature and drought extremes include deterioration, conflagration, and desiccation. A loss of resource integrity may occur over time from conditions related to climate variability and its impacts. Typically, documentation is one of the first mitigation techniques undertaken in response to deterioration. This document, which includes narrative, photographs, measured drawings, and recommendations, fulfills this first step in the mitigation process.

This resource exhibits signs of previous deterioration and recommendations for repair are included in this document. The treatment recommendations also address many of the threats inherent from climate variability. The ultimate Preservation treatment would be designed to

196. Marcy Rockman et al., "Cultural Resources Climate Change Strategy" (Washington, DC: Cultural Resources, Partnerships, and Science and Climate Change Response Program, National Park Service., 2016).
197. Ibid.
198. Ibid., 20.
199. Ibid., 20.

present a more stable feature and surrounding landscape, better able to withstand these pressures than the memorial's present condition.

Based on these findings, the following recommendations are made for addressing climate change impacts to Providence Spring House and the associated features:

- Include Providence Spring House and its associated features in all maintenance plans and disaster preparation plans that address impacts from climate change.
- Perform regular maintenance of site features, including monitoring the condition of the masonry, foundation and floor, roof structure, and roofing materials to reduce the effects of higher temperatures, longer dry periods, heavy rainfall events, and other increased risks from climate change.
- Monitor site drainage to ensure that water moves away from the Providence Spring House foundation, especially during heavy rainfall.
- With the predicted increase in temperatures and the potential for longer periods without precipitation, drying of the site features' masonry will require more maintenance, particularly the mortar.
- Monitor site erosion and drainage, particularly with the increased risk of heavy rainfall events. Ensure that the site's drainage is adequate.
- Reduce emissions throughout the national historic site with the use of more efficient and well-maintained maintenance vehicles and HVAC systems.
- Restore historic vegetation in the Providence Spring House landscape to slow erosion, shade and shelter site features, and filter pollutants.

Treatment Alternatives to Address Advanced Deterioration of the Interior Fountain

Note: The following section records treatment alternatives that were discussed during the preparation of this HSR. The NPS and the authors of this report eventually rejected these alternatives in favor of the ultimate treatment recommendations provided above. The authors of this report decided to include a record of all treatment interventions that were explored during the treatment discussions. Future conditions of the site's historic resources may change and reconsideration of these alternative recommendations may be warranted in the future.

Alternative One: Modify the water's content or pH to reduce its effect on the marble

On June 16, 2020, park staff contracted with DeVane Pool Service and Supply of Americus, Georgia, to test Providence Spring's water. Testing concluded that the water at the interior fountain and lower fountain were both slightly acidic, with a pH of 6.3. Acidic water has been shown to negatively affect the preservation of marble material. Studies on the effects of acid rain on marble works determined that the acidity of the water converts calcium carbonate, an insoluble component of marble, into gypsum, a soluble material, weakening and dissolving the marble.[200] Park staff have proposed a treatment using surplus marble chips from the cemetery to filter spring water before it travels into the interior fountain, altering its pH to reduce detrimental effects on the marble posed by acidic spring water. Park staff report that this treatment has been used by the NPS at another site. The potential viability of such a treatment is undetermined.

The following issues potentially apply to this alternative treatment:

- Determine the proportion, quantity, and active life of this marble chip filter and develop a maintenance schedule.
- Evaluate maintenance and staffing needs of this treatment to determine if it is feasible for the park.

200. Roger J. Cheng, Jung T. Hwu, and Mei Leu Show, "Deterioration of Marble Structures. The Role of Acid Rain.," Analytical Chemistry 59, no. 2 (January 15, 1987): 104A-106A, https://doi.org/10.1021/ac00129a002.

- Regular cleaning with compatible materials and methods will be required to address biological growth.
- Perform regular pH testing before and after water enters the filtration device in order to monitor and evaluate ongoing effectiveness.

Alternative Two: Modify the water's path to slow the rate of marble erosion

The upper basin and face of the marble tablet exhibit the most intense deterioration and loss of relief in carved features. This is the area where water is now entering the fountain. Historic images suggest water originally entered the fountain's granite basin through water cascading over the lip of the upper basin (formerly the wings and shoulder of the dove), which was filled with water pouring from the dove's beak. Historic photographs show this configuration was altered by 1917, when water was diverted to flow into the granite basin through a pipe and metal outlet that deposits water through the area of the former upper basin, now eroded almost completely. The granite basin shows little to no erosion relative to its original condition. This treatment alternative seeks to slow further erosion of the marble by limiting contact between the water and the marble. A clear, plastic pipe, approximately 5"-long should be fitted to extend out from the metal medallion. Water would then travel through the medallion and clear, plastic pipe, before flowing into the granite basin in a location where splash-back would have less of an effect on the marble.

The following issues potentially apply to this alternative treatment:

- Regular cleaning with compatible materials and methods will be required to address biological growth.
- Alteration of the fountain's historic configuration, in place since at least 1917.

Alternative Three: Eliminate or reduce the amount of time water flows through the fountain

The natural spring water, while vital to the story of Providence Spring and the commemorative intent of the building, poses the most significant danger to preservation of the interior fountain as a character-defining feature. It is, therefore, worth evaluating the option to eliminate or reduce the amount of time water flows into the fountain. Existing subterranean systems offer the option of diverting water flow before it enters the Providence Spring House, either directly into the adjacent streambed through overflow pipes or around the building and into the lower fountain, runnel, and pools below, before passing into the natural stream.

The following issues potentially apply to this alternative treatment:

- Elimination of water flowing through the fountain does not reflect the intent of the fountain but reduces further damage to the fountain.
- The fountain will require regular cleaning with compatible materials and methods to address biological growth and the accumulation of debris in the dry basin.
- Reducing the amount of time water flows through the fountain (i.e. reduced hours of operation) will slow deterioration of the marble due to chemical and physical erosion. However, wet/dry cycles have been shown to negatively affect the condition of stone features when salts form on the surface of stone during dry periods, then expand during crystallization, and subsequently cause damage.
- Park staff will need to install a timer system or manually shut off and turn on spring water flow into the fountain daily, or at set intervals.
- Further research is needed to determine the level of risk posed to the marble by wet/dry cycles vs. the chemical and physical erosive properties of uninterrupted water flow, in order to best determine which option offers the least destructive intervention.

Alternative Four: Restore the fountain to its 1901 appearance

One alternative treatment for the deteriorated interior fountain is to fully restore it to its 1901 condition. Restoration of the interior fountain would preserve the design intent of the Providence Spring House as a memorial feature. This alternative would require reconstructing and replacing at least the lower part of the marble tablet to restore the appearance of the missing and damaged sections of the tablet, upper basin, and dove. Documentation indicates that the fountain attained its present configuration and appearance

by 1917. Because ANDE's period of significance extends to 1970, it is difficult to justify a restoration treatment for the fountain and the rest of the site, especially if the later features of the site, such as the lower fountain and 1930s CCC-constructed features, are retained.

Alternative Six: No intervention

The option of no intervention requires less work than other treatment options; however, it will possibly limit visitors' ability to understand the memorial's historic appearance and its significance as an early Civil War commemorative feature. Should the park decide to pursue no intervention as a treatment, the interior fountain may continue to erode, ultimately leading to destruction of the historic fabric of this character-defining feature of the Providence Spring House and site. Further research and monitoring will assist in determining the precise rate of marble erosion currently underway, which can help determine the projected lifespan of the interior fountain under this treatment alternative. Based on analysis of historic photographs, the marble tablet, upper basin, and dove showed signs of significant erosion by 1917, just sixteen years after its installation in the Providence Spring House. In contrast, the fountain has remained in essentially the same configuration since 1917, more than one-hundred years later, suggesting that the fountain's marble erosion has slowed. Monitoring the condition and erosion of the fountain is a key strategy in determining the appropriateness of completely refraining from physical intervention.

Documentation of the fountain is a vital component of this treatment alternative. It is crucial to preserve documentation of the current form of the fountain should it continue to slowly erode, regardless of the park's ultimate decision on intervention. Should this treatment alternative be considered, it is recommended that the park perform a 3D scan of the fountain's existing condition in order to preserve a record of the fountain should the park decide to create a replica for interpretive use or to replace the original fountain at a later date.

It should be noted, that attempting to remove or relocate the original marble tablet is not recommended as it would be difficult to remove the marble tablet without causing damage to the marble itself and to surrounding materials. To remove the tablet, a contractor would need to remove all mortar joints and the pins anchoring the marble. Due to the positioning of the joint between the tablet and wall, this task would prove difficult.

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Bibliography

Anderson, Alan. "A Chronology of Americus and Sumter County, Georgia, 1540-1914." Accessed March 16, 2021. http://www.sumtercountyhistory.com/history/1540_1914.htm.

"Andersonville Suggested For Inclusion in U.S. National Parks." *Rural Georgia*. December 1968, 10.

Averill, James P. "Andersonville Prison Park. Report of Its Purchase and Improvement," n.d.

Barton, Clara. "Letter to Mr. Edward H. Clement," n.d. Manuscript Division. Library of Congress. http://hdl.loc.gov/loc.mss/ms005010.mss11973.0426.

———. "Letter to Secretary of War, E.M. Stanton," n.d. Manuscript Division. Library of Congress. http://hdl.loc.gov/loc.mss/ms005010.mss11973.0426.

Bearss, Edwin C. Andersonville National Historic Site Historic Resource Study. Washington, D.C.: National Park Service, Eastern Service Center, 1970.

"Beautiful Designs In Cemetery and Monumental Works. Miller and Clark." *The Atlanta Constitution*. October 5, 1902. Newspapers.com.

"Beautiful Melrose." *Nashville Banner*. May 10, 1890. Newspapers.com

Biddle, Kathryn, and Dorothy Krotzer. "Memo from Kathryn Biddle and Dorothy Krotzer, Building Conservation Associates, Inc. to J. Keyes Williamson, WLA Studio," July 17, 2020.

"Boston Gates at Andersonville." *National Tribune*. April 28, 1898. Newspapers.com.

Boyd, William Riley. "Inscriptions at Andersonville." *The Atlanta Constitution*. May 13, 1906. Newspapers.com.

"Bridges at Famous Georgia Prison Built By CCC Workers." *The Atlanta Constitution*. November 26, 1935. Newspapers.com.

Caldwell, Wilber W. *The Courthouse and Depot in Georgia, 1883-1910: The Architectural of Hope in an Age of Despair.* Macon, GA: Mercer University Press, 2001.

"Chat About Retailers." Rock Products VII, no. 6. (January 5, 1908).

"Clark's Monumental Works." *Daily Times-Recorder*. June 30, 1912.

Cloyd, Benjamin Gregory. "Civil War Prisons in American Memory." Dissertation, Louisiana State University, 2005. https://digitalcommons.lsu.edu/cgi/viewcontent.cgi?article=1120&context=gradschool_dissertations.

Coates, William. "Repairs to Providence Spring-Prison Park," April 11, 1941. National Archives.

Commemorative Landscapes, University of North Carolina. "Pennsylvania Monument, Salisbury National Cemetery." Accessed March 16, 2021. https://docsouth.unc.edu/commland/monument/80/.

"Comrades Dedicate Memorial Fountain," 1901. ANDE Archives.

Cox, Amanda S. "Blue Sulphur Springs Pavilion, Greenbrier County, WV, National Register Nomination Form," 1992. http://www.wvculture.org/shpo/nr/pdf/greenbrier/92001481.pdf.

Craig, Robert M. "Grady Memorial Hospital." *SAH Archipedia*. Accessed March 17, 2021. https://sah-archipedia.org/buildings/GA-01-121-0074.

———. "Rhodes Hall." *SAH Archipedia*. Accessed March 17, 2021. https://sah-archipedia.org/buildings/GA-01-121-0045.

"Cumberland Gap Park." *Asheville Citizen-Times*. March 1, 1892. Newspapers.com.

Edmondson, C. D. "Attention Invited to Communication from the Superintendent of Andersonville National Cemetery with Reference to the Discovery of What Is Believed to Be the Original 'Providence Spring.'" April 16, 1941. National Archives.

Ferree, Barr. *Year Book of the Pennsylvania Society*. New York: Pennsylvania Society, 1905.

"Georgia Marble Dealers." *Rock Products* VI, no. 7 (March 5, 1907).

Gobel, David. "Poetter Hall, SCAD." *SAH Archipedia*. Accessed March 17, 2021. http://sah-archipedia.org/buildings/GA-01-5A07.

Goss, Warren Lee. "The Last Word. Concluding Letters of the Controversy Concerning the Andersonville Spring." *The National Tribune*. April 26, 1883. Newspapers.com.

"Handsome Shaft Finished." *Americus Times-Recorder*. April 14, 1900. Newspapers.com.

Hess, Earl J. *Lincoln Memorial University and the Shaping of Appalachia*. Knoxville: University of Tennessee Press, 2011.

"Journal of 31st National Convention of the Woman's Relief Corps," 1913. HathiTrust Library.

"Journal of the 19th National Convention of the Woman's Relief Corps," 1901. HathiTrust Library.

"Journal of the 20th National Convention of the Woman's Relief Corps," 1902. HathiTrust Library.

"Journal of the 27th National Convention of the Woman's Relief Corps," August 12, 1909. ANDE Archives.

"Journal of the 28th National Convention of the Woman's Relief Corps," 1910. HathiTrust Library.

"Journal of the 35th National Convention of the Woman's Relief Corps," 1917. HathiTrust Library.

"Journal of the 18th National Convention of the Woman's Relief Corps," 1900. Google.com. https://play.google.com/books/reader?id=f_USAAAAYAAJ&pg=GBS.PP1.

"Journal of the 14th National Convention of the Woman's Relief Corps," 1896. HathiTrust Library.

"Journal of the 25th National Convention of the Woman's Relief Corps," September 12, 1907. ANDE Archives.

Kinsel, Amy. "From These Honored Dead: Gettysburg in American Culture, 1863-1938." PhD Dissertation, Cornell University, 1992.

Landrum, Brenda. "Memo to Administration Regarding Marble Fountain at Providence Spring," December 26, 1986. ANDE.

Le May, Francis M. "Andersonville Cemetery To Get General Cleanup by CCC Unit." *The Atlanta Constitution*. July 12, 1934. Newspapers.com.

"Legend About Providence Spring Has Been Exploded." *The Atlanta Constitution*. May 13, 1901. Newspapers.com.

Leonard, Elizabeth D. *Yankee Women: Gender Battles in the Civil War.* New York: W. W. Norton & Company, 1995.

"Made a Change in Business." *Americus Weekly-Times Recorder*, April 7, 1899. Newspapers.com.

Maile, John L. *Prison Life in Andersonville With Special Reference to the Opening of Providence Spring.* Los Angeles, California: Grafton Publishing Company, 1912.

"Matters of Interest." *Nashville Banner*. March 29, 1890. Newspapers.com.

McElroy, John. *Andersonville: A Story of Rebel Military Prisons*. The Avalon Project, Yale Law School, 1879. https://avalon.law.yale.edu/19th_century/ander.asp.

"Memories of Andersonville." *The Montgomery Advertiser*. December 7, 1955. Newspapers.com.

Morgan, Francesca. *Women and Patriotism in Jim Crow America.* Chapel Hill: University of North Carolina Press, 2005.

National Park Service. Andersonville Memorial Landscape Cultural Landscape Inventory, 2010.

———. Andersonville National Historic Site Cultural Landscape Report. National Park Service, Cultural Resources Division, Southeast Regional Office, 2015.

———. Andersonville National Historic Site Historic Resource Study. Southeast Regional Office, National Park Service, 2018.

———. "Andersonville: Preserving the Prison; Saving a Nation. The Civilian Conservation Corps at Andersonville." National Park Service, May 2012.

———. "United States Department of the Interior Environmental Assessment for General Management Plan/Development Concept Plan, Andersonville National Historic Site, Georgia." United States Department of the Interior, Denver Service Center, June 1979.

Null, Druscilla J. "White Sulphur Springs Spring House, Greenbrier County, WV, HABS Architectural Data Form," 1983. https://tile.loc.gov/storage-services/master/pnp/habshaer/wv/wv0200/wv0223/data/wv0223data.pdf.

Office of the Depot Quartermaster. "Blueprints for the Existing Springhouse, Providence Spring, Andersonville Prison Property," March 20, 1914.

Pelsbury, J.B. “Providence Spring Fake Ventilated. A Veteran Who Was There Tells It Straight.,” 1900.

Pennsylvania at Andersonville, Georgia: Ceremonies at the Dedication of the Memorial. Harrisburg: C. E. Aughinbaugh, 1905.

Pennsylvania at Salisbury, North Carolina: Ceremonies at the Dedication of the Memorial. Harrisburg: C. E. Aughinbaugh, 1910.

“Post and Paddock.” *Nashville Banner*, December 13, 1889. Newspapers.com.

“Private Smith.” *The Atlanta Constitution*. August 18, 1883. Newspapers.com.

Report of the Commission on Andersonville Monument. Boston: Wright and Porter Printing Company, 1902.

“Reports The Spring Flowing.” *Americus Times-Recorder*. September 10, 1901. GaHistoricNewspapers.com.

Ricks, John. “Andersonville National Historic Site Administrative History (Draft).” National Park Service, 1986.

Ross, Benjamin L. “The Indiana State Soldiers’ and Sailors’ Monument: German Nationalism and Hoosier Commemoration of the Civil War.” Paper Presented at Twenty-Seventh Annual Meeting, Southeast Chapter of the Society of Architectural Historians, Jackson, Mississippi, 2009.

“Sale of Melrose.” *The Daily American*. November 3, 1889.

Schulze, Stephanie Marie. “The Woman’s Relief Corps: ‘Missionaries of the Flag,’ 1893-1918.” Master of Arts, Indiana University, 2016.

“Sent at a Merry Clip.” *Memphis Daily Avalanche*, March 23, 1890. Newspapers.com.

SHPO. “Improving Drainage on Prison Site, CCC Ditch Cleaning and Repairs,” December 2017.

“Spring of Civil War Fame Again Survives Drought.” *The Fresno Morning Republican*. December 13, 1925. Newspapers.com.

“Stone Trade Notes.” *Stone XVII*, no. 5 (April 1899).

“The Relief Corps. The Seventeenth National Convention at Philadelphia.” *The National Tribune*. September 14, 1899. Newspapers.com.

“The Spring Gone Glimmering. Fabled Hole at Andersonville Has Gone Dry.,” 1901. ANDE Archives.

“Tool Chest.” *The Reporter 38*, no. 2 (February 1905).

“Tourists Gone to Anderson.” *Americus Times-Recorder*. May 30, 1901. GaHistoricNewspapers.com.

“Turf Talk.” *Nashville Banner*, February 20, 1890. Newspapers.com.

United States Sanitary Commission. “Prison At Andersonville, Ga.” Sanitary Commission Bulletin. N.Y., Waters & Son SC., 1864. Library of Congress. https://www.loc.gov/item/99447300/.

Vaughter, John B. *Prison Life in Dixie*. Chicago: Central Book Concern, 1880.

Warden, Margaret Lindsley. "More Change for Melrose." *The Tennessean*, November 12, 1950. Newspapers.com.

Webster, Albert. "A Jaunt in the South." *Appleton's Journal* 10, no. 234 (September 13, 1873).

"Will Cost Big Money." *Nashville Banner*. January 11, 1890. Newspapers.com.

Wisconsin Monument Commission. Madison, WI: Democrat Printing Company, 1911.

"Woman's Relief Corps." *The Morning Journal Courier*. October 23, 1899. Newspapers.com.

"Woman's Relief Corps." *The Western Veteran*. November 1, 1900. Newspapers.com.

"Woodlawn Park Plans Announced." *Nashville Tennessean*, Woman's Section, August 19, 1928. Newspapers.com.

Wright, Bruce. "Site Visit and Inspection," n.d. ANDE Archives.

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Appendix A: Project Correspondence, Memorandum, and Previous Drawings

A-1 June 10, 2020: WLA Studio to Dorothy Krotzer (Building Conservation Associates, Inc.); Subject: Providence Spring House at Andersonville National Historic Site.

A-2 June 11, 2020: WLA Studio to HSR Project Team; Subject: Providence Spring House at Andersonville National Historic Site.

A-3 July 8, 2020: WLA Studio to HSR Project Team; Subject: Providence Spring House Water Filtration System Treatment.

A-4 July 17, 2020: Building Conservation Associates, Inc., to HSR Project Team; Subject: Providence Spring House -- Andersonville National Historic Site.

A-5 Minutes of March 26, 2021 Phone Interview with Fred Boyles, ANDE Superintendent from Nov. 1989 - May 2009.

A-6 March 20, 1914 Measured Drawings of "Existing Springhouse: Providence Spring, Andersonville Prison Property (Office of the Depot, Quartermaster, USA, Washington, D. C.).

A-7 1941 Hand Sketch of Spring House Site, attachment to April 11, 1941 memorandum to Quartermaster, 4th C. A. #540 P. O. Bldg., Atlanta, Georgia, from William Coats, ANDE Superintendent (ANDE Archives Item 1343, 001, Part 1).

A-8 1985 Hand Sketches of Spring House Site, attachment to February 26, 1986 memorandum to David Ates, Southeast Cultural Resources Preservation Center, National Park Service, from John Tucker, ANDE Superintendent (ANDE Archives, Facility Records, B4, FB6, 001, 0010).

A-9 1985 ANDE Internal Memorandum and Details, Providence Spring Parking Lot Expansion (ANDE Archives).

A-10 1986 Measured Drawings of Providence Spring, Andersonville National Historic Site (ANDE Archives, Unlabeled Box 1, Folder 12).

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Memorandum

To: Dorothy Krotzer (BCA)

Cc: Chris Jackson (WLA Studio)

From: Keyes Williamson (WLA Studio)

Date: June 10, 2020

Re: Providence Springhouse at Andersonville National Historic Site

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Dorothy,
This is an attempt to put into writing the issues we saw on site today.

Background. Southeast Regional architect Ali Miri expressed concern about a project that Historic Preservation Training Center (HPTC) is planning to complete on the springhouse this summer.

HPTC Project.
We have asked for information on the proposed project from HPTC, but have not received anything. But this is how the park describes what they are planning to do:

HPTC is planning to dig a new reservoir and fill it with marble chips. They will pipe the water from the two existing reservoirs to this new marble-filled reservoir, which would then feed the fountains. This is apparently an attempt to adjust the PH of the water.

A quick google search shows that water in regions with kaolin clay tend to have pH values below 7. (There is a kaolin plant within view of the park.)

Additionally, they repaired mortar, that I will try to point out in pictures below, in 2019.

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Existing Conditions.

Overview:
The fountain is predominately marble and granite. There is a metal (copper or bronze?) ring around the water outflow.

Erosion damage is significant on almost all of the fountain except the granite basin.

It appears that the water filled a small basin that overflowed into a larger granite (brown stone) basin underneath.

This smaller basin is missing about a third of its bowl, apparently from erosion.

The metal ring around the spigot is missing the bottom quarter, apparently from erosion.

There is a drain in the larger basin. Water appears to have either overflowed over the lip of this basin or leaked from the bottom of the basin, because erosion is visible on the face of the marble base supporting the basin. The erosion is crazy.

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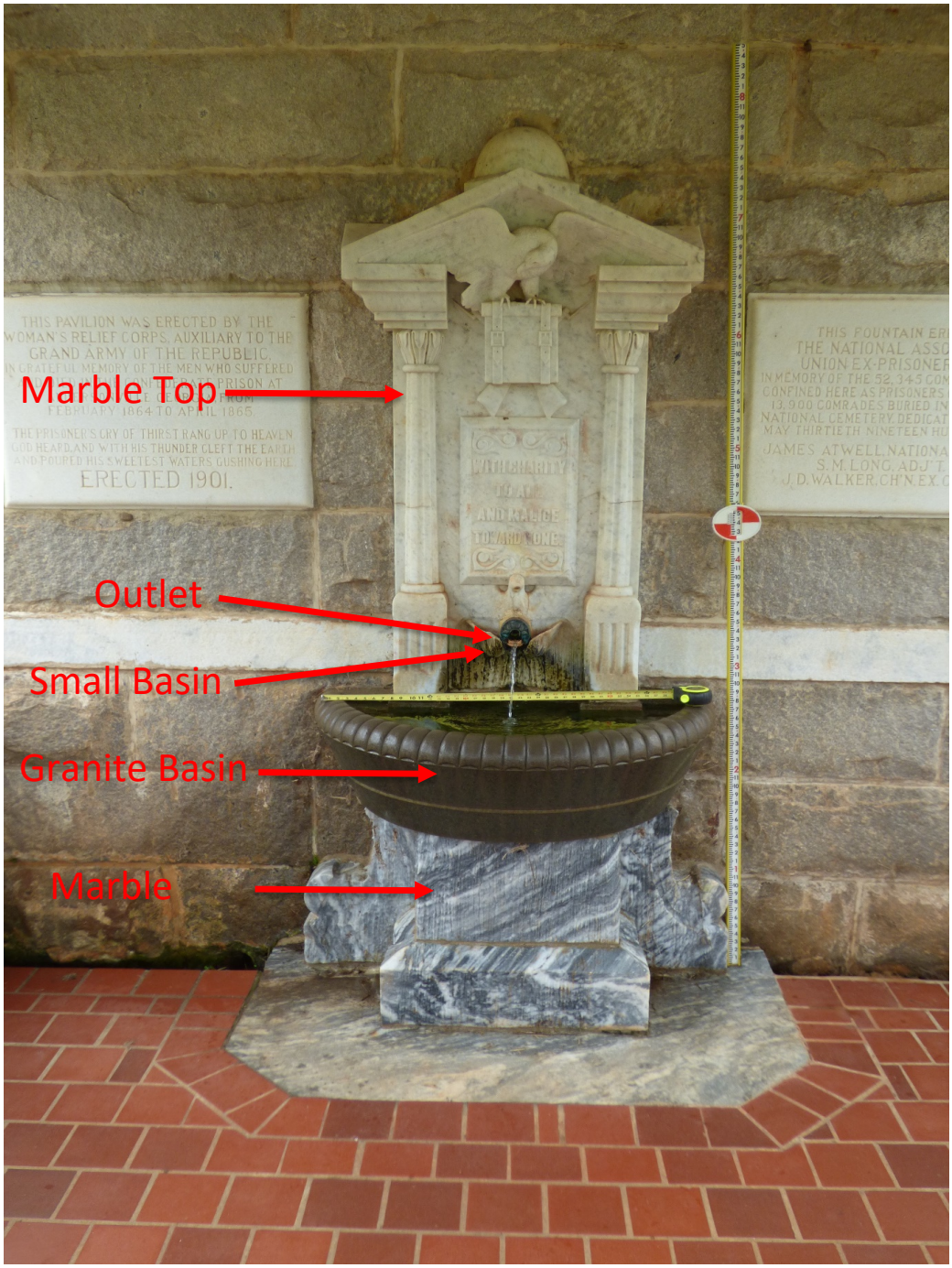

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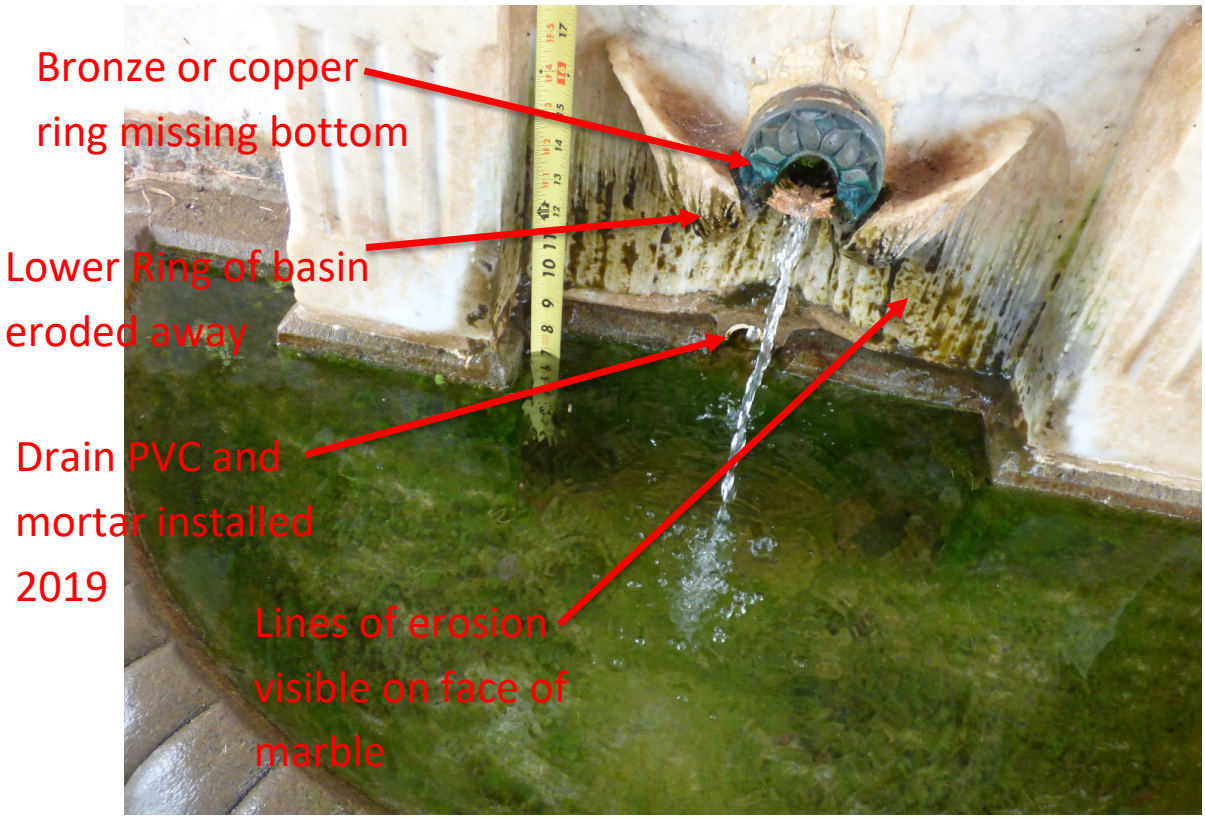

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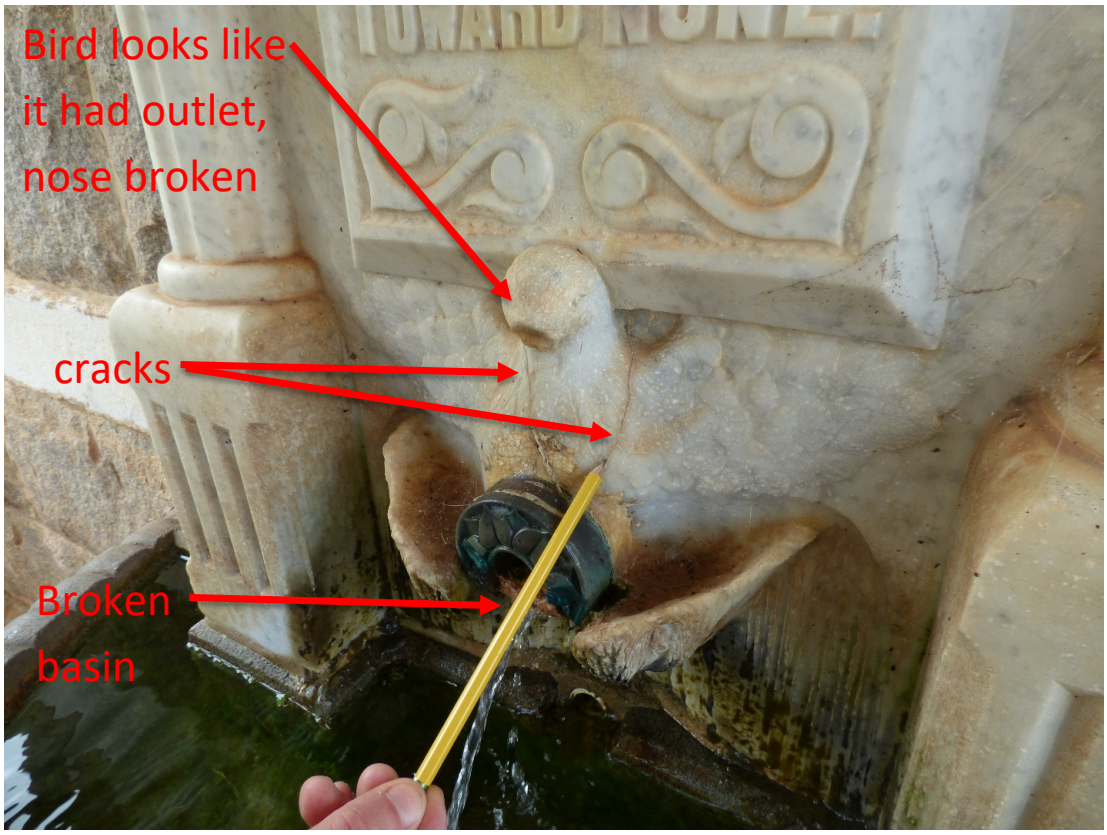

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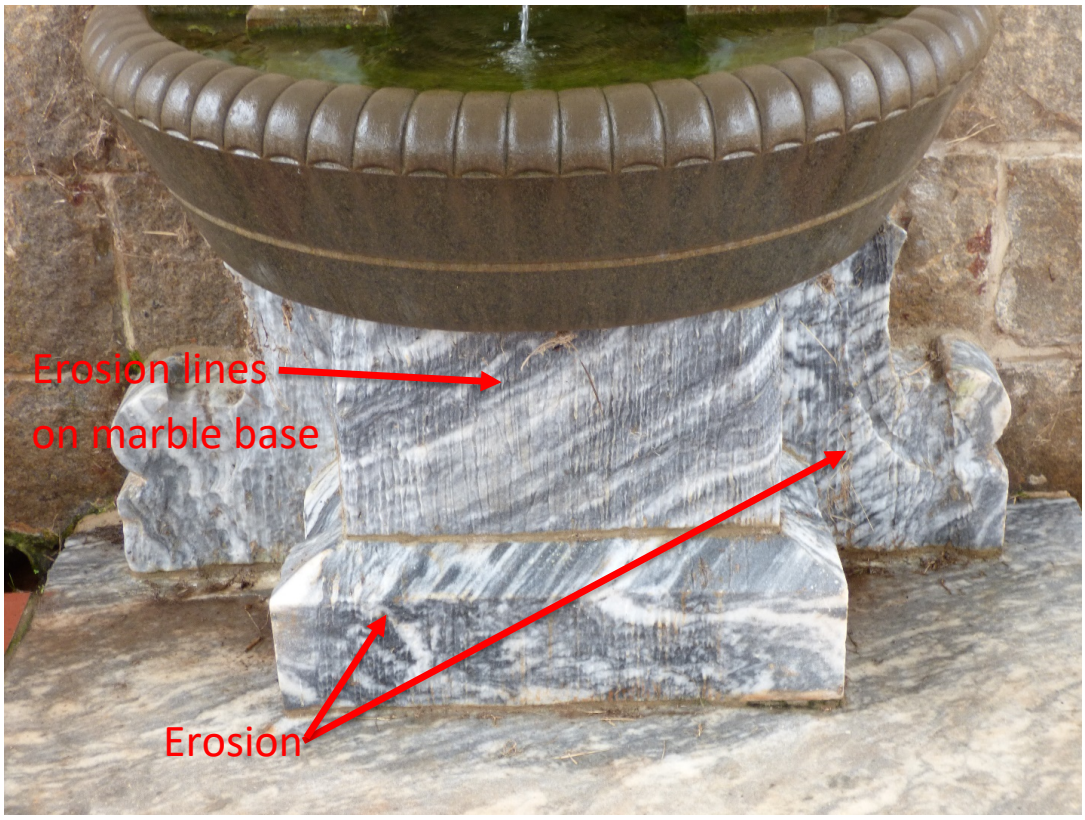

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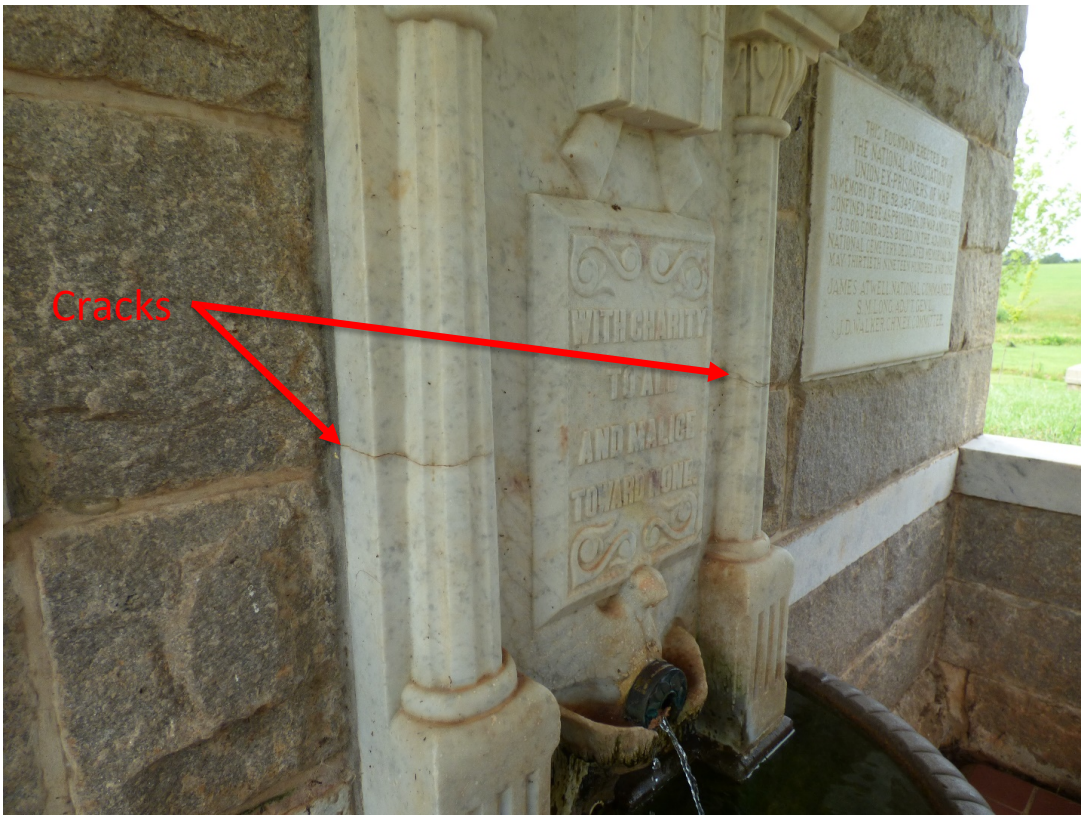

It looks like the marble shield?? is pinned to the wall in three places at the top. The speculation of park ranger is that the base of the monument is settling?

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Memorandum

To: Bridget Beers (Museum Curator, Andersonville National Historic Site), Dr. Ali A. Miri (Historical Architect, NPS, Cultural Resources Partnership and Science Division)

Cc: Keyes Williamson (WLA Studio)

From: Chris Jackson (WLA Studio)

Date: June 11, 2020

Subject: Providence Springhouse at Andersonville National Historic Site

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Bridget and Ali,

The following is a summary of our (WLA Studio's) site visit to Providence Springhouse on June 10th, 2020. WLA's team included Keyes Williamson (Principal Landscape Architect) and Chris Jackson (Historic Preservation Specialist). The purpose of the visit was to perform a reconnaissance survey of the Springhouse, associated constructed features, and surroundings. Keyes and Chris met with Bridget Beers (ANDE Museum Curator) and James Taylor (ANDE Maintenance Supervisor) to discuss known chronology of the site's development as well as identified issues associated with existing conditions.

Background:
An additional purpose of the site visit relates to NPS SERO architect Ali Miri's concern about a project that NPS Historic Preservation Training Center (HPTC) is planning to complete on the Springhouse in July. While the full scope of HPTC's project has not been formally determined, it is WLA Studio's understanding that a marble-filled filter basin will be installed between the two cisterns and the Springhouse Fountains in an attempt to lower the acidity of the water and potentially reduce the rate of chemical erosion of the fountains' components.

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Summary of WLA's Examination of Existing Conditions:

Our reconnaissance survey confirmed the existence, location, and condition of numerous landscape features and structures on site—including the Springhouse, two fountains, a brick runnel and reflecting pool, two cisterns, numerous features related to underground water systems (consisting of PVC, "French Drains", terracotta pipe, brick vaults with water pipe junctions and valves), and various natural systems and features.

Our survey included (1) visual inspection of all features associated with the Springhouse, fountains, runnels, reflecting pool, subsurface features, and surrounding natural features, (2) collection of photographs, (3) recordation of dimensions of built features, and (4) conversation with Bridget and James.

General Observations:

- The concrete walkways are in fair to good overall condition with places exhibiting poor conditions.
- The Springhouse is structurally sound and in overall good condition.
- Presence of bats inhabiting the spaces between the top of the Springhouse's stone walls and roof structure is evident; guano was present on the ground surrounding the structure and we could hear the bats while in proximity to the structure.
- The grassy area to the north of the Springhouse exhibits recent excavation and the ground plane is unlevel; an area is covered with steel plates to prevent sinking of mechanical equipment; there are remnants of brick, concrete, and steel features lying loose on the ground in this area.
- Three on-site trees are in poor to fair condition.
- Evidence of active chemical erosion is highly evident on all marble and brick components of fountains and other designed water features.
- Granite features are generally in overall good condition.
- Site vegetation maintenance seems adequate and only one small area exhibits standing water (near southwest end of general Springhouse vicinity near adjacent stream).
- Several masonry surfaces exhibit minor mechanical damage, such as abrasion from lawn mower on north side of concrete retaining wall at CCC-era fountain (lower fountain).
- Brick and granite-block gutter north and east of Springhouse is in poor to fair condition and may not function as intended.

Springhouse Structure:

- While in the field, the team reviewed 1914 and 1986 renderings of the site with Bridget and James while discussing existing conditions.
- Team noted former locations of water basins and associated water pipes, as well as alterations to French drains, terra cotta and PVC drains, retaining walls, subsurface steel pilings, and brick basins.

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- Team noted stucco over stone on inside of gables; new roof construction date of 2019; known repairs to stone joinery in Springhouse structural components, between walls and fountain, and adjacent concrete stair set; flooring material and condition (good).
- Team noted existing interior and exterior drain features as well as former and existing locations of subsurface valves, pipes, and site drains.
- Team confirmed dimensions and material composition of structure and joinery.
- There are several locations with carved graffiti, minor cracks and/or abrasions, rising damp, efflorescence, and biogrowth.

Springhouse Fountain:

- The fountain is predominately marble and granite. There is a metal (copper or bronze?) ring around the water outflow.
- Erosion damage is significant on essentially all marble surfaces that have had contact with water, including the bases.
- The granite basin exhibits little to no erosion.
- The metal pinning that stabilizes the upper marble tablet appears to be properly functioning; however, there are two significant cracks on either side of the tablet. *Bridget and James note that the cracks have expanded significantly since 2012; Keyes and Chris suggest installing crack monitors immediately.*

CCC (lower) Fountain, Brick Runnel, and Reflecting Pool:

- Surface of concrete pad and retaining walls around CCC fountain exhibits evidence of erosion, exposing underlying river-gravel aggregate.
- Evidence of efflorescence noted on granite of the fountain.
- Evidence of water leakage through the mortar was seen around the base of the fountain.
- Water spigot of fountain has corrosion.
- Algae is growing in the fountain basin.
- Minor cracks and some settling found on the concrete pad.
- Brick runnel and reflecting pool in good condition, except for one dislodged brick at spillway into creek.
- Grade around runnel and pool is uneven and can be improved by soil infill/leveling.
- Some sedimentation noted on northwest end of pool from Springhouse drain outlet.

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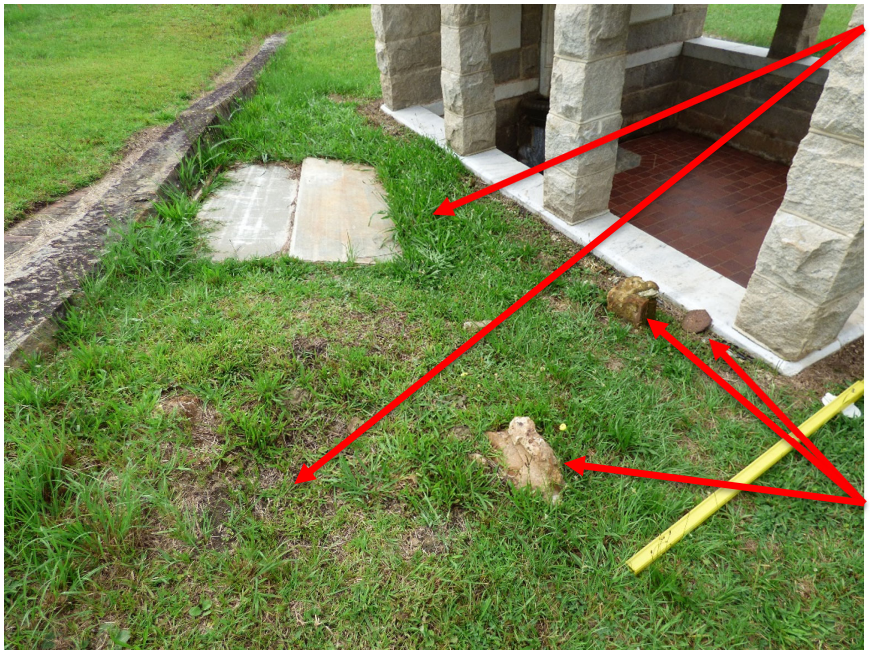

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Suspected entry/exit point utilized by bats

Rising damp

Drain outlet

Efflorescence

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Concrete stucco over portion of interior of east stone gable

Concrete stucco over interior of west stone gable

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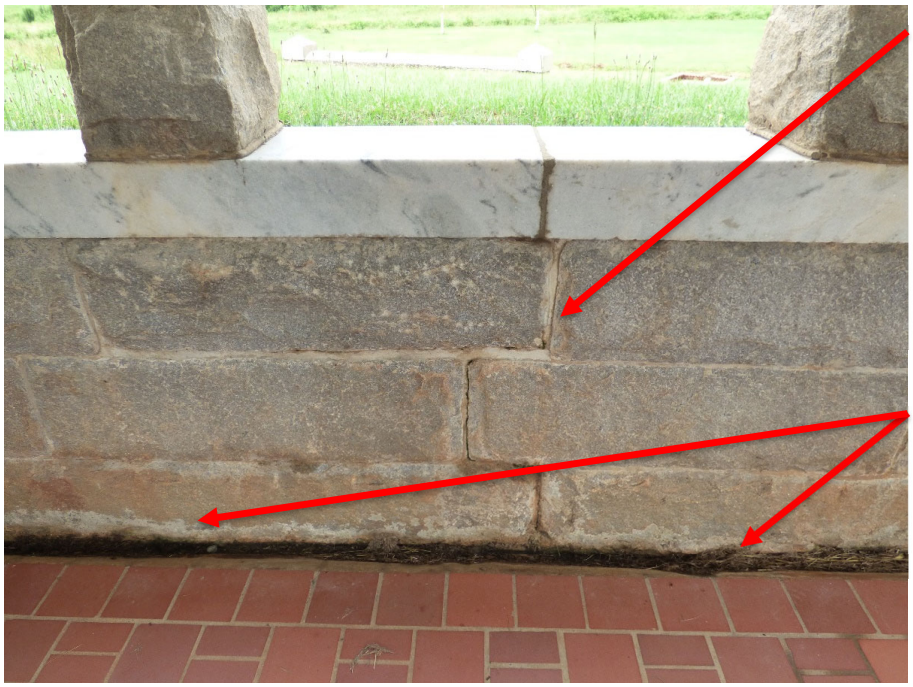
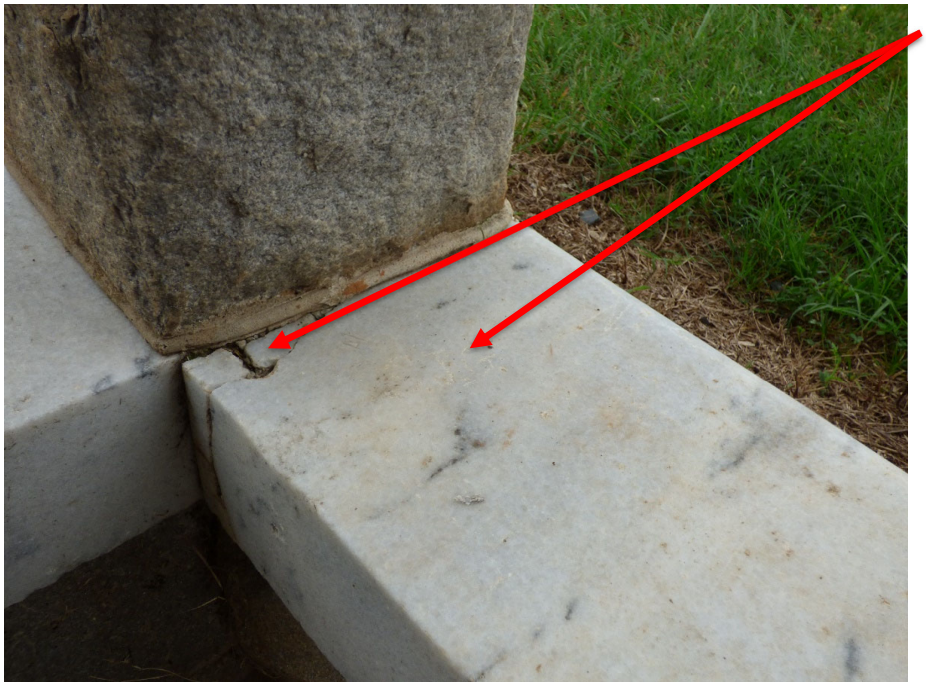


Failing joinery on interior of south wall

Minor efflorescence and rising damp above interior gutter



Minor cracks and carved graffiti at southwest corner of Springhouse

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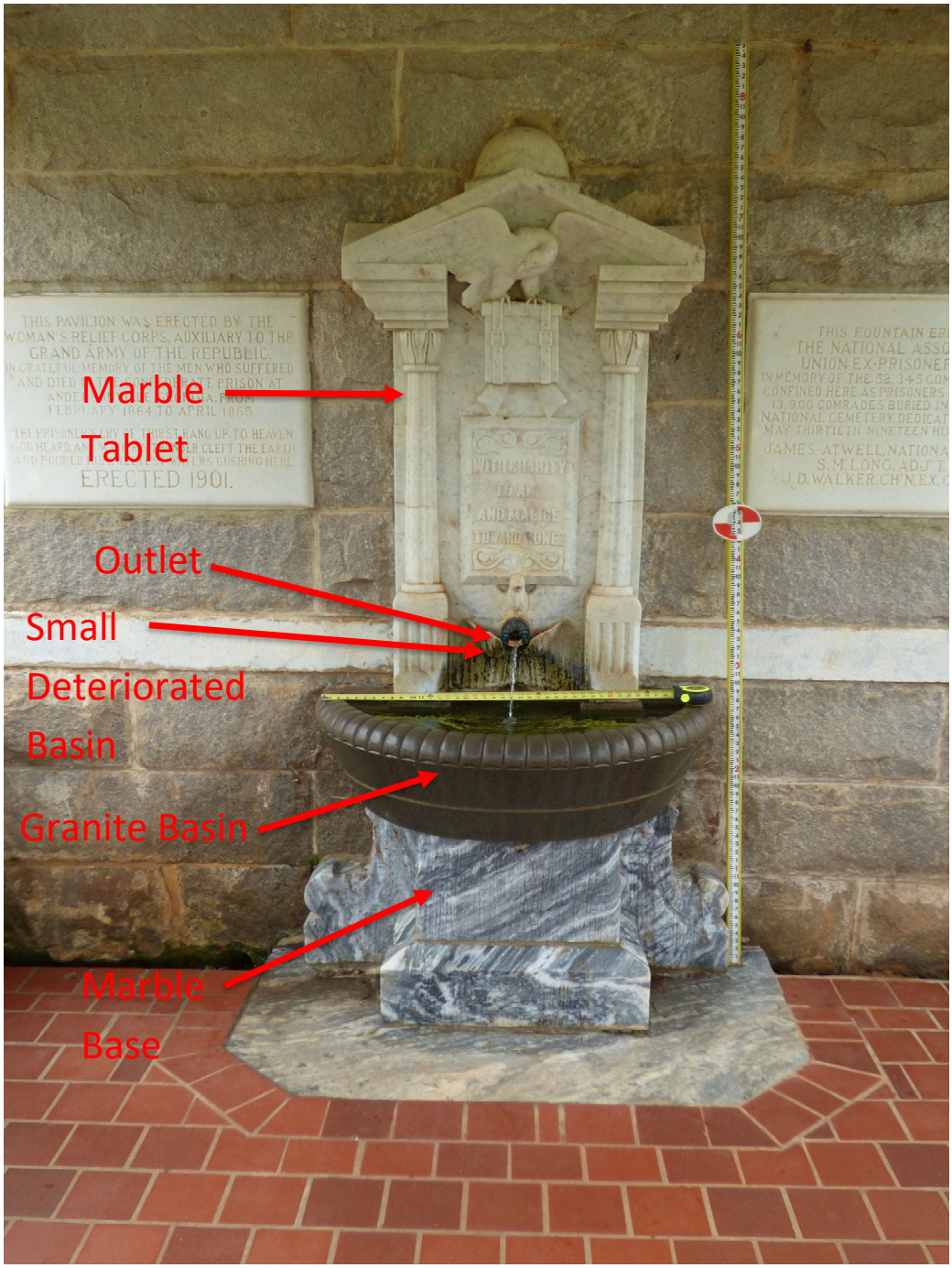

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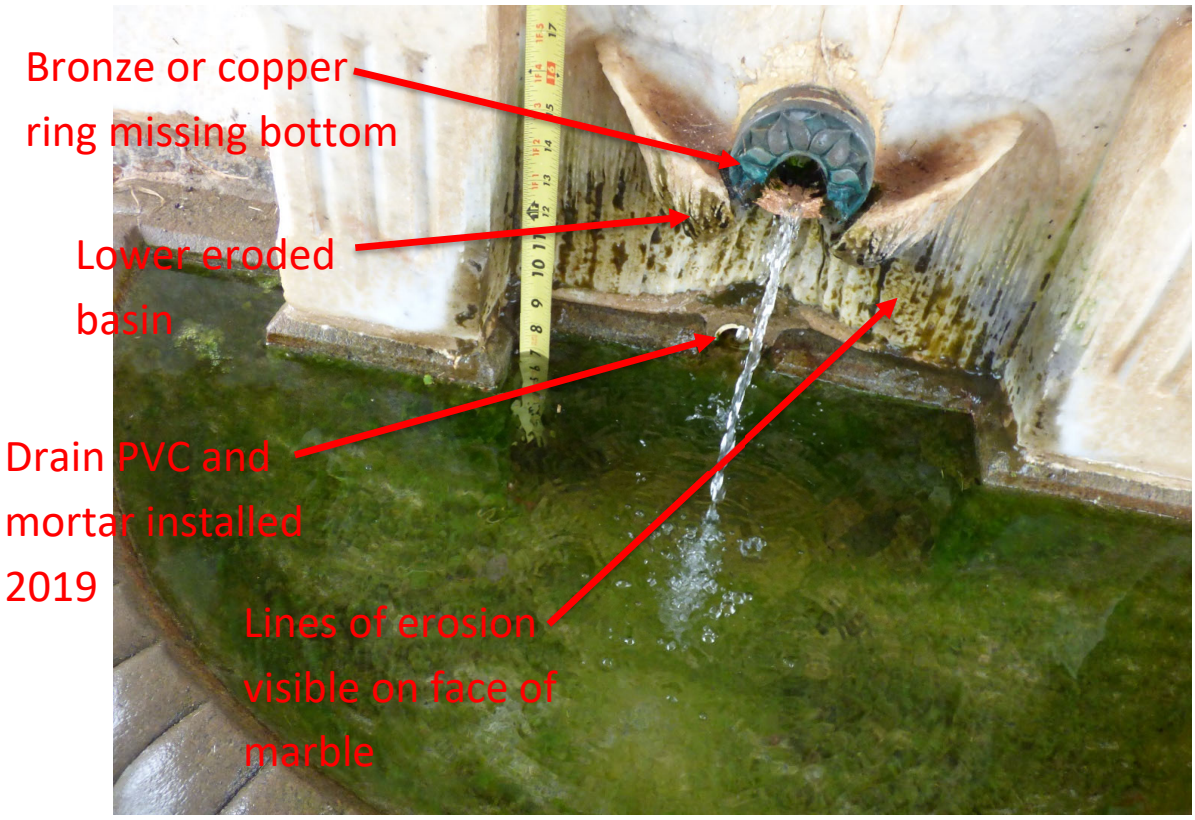

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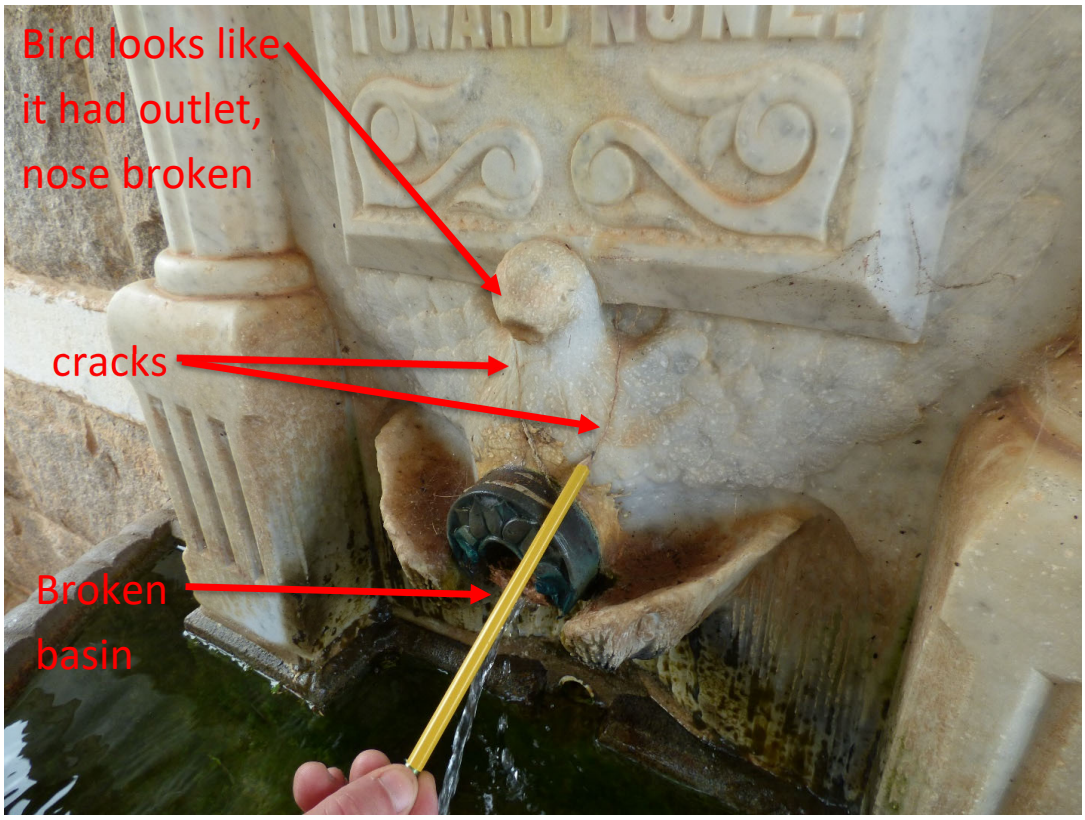

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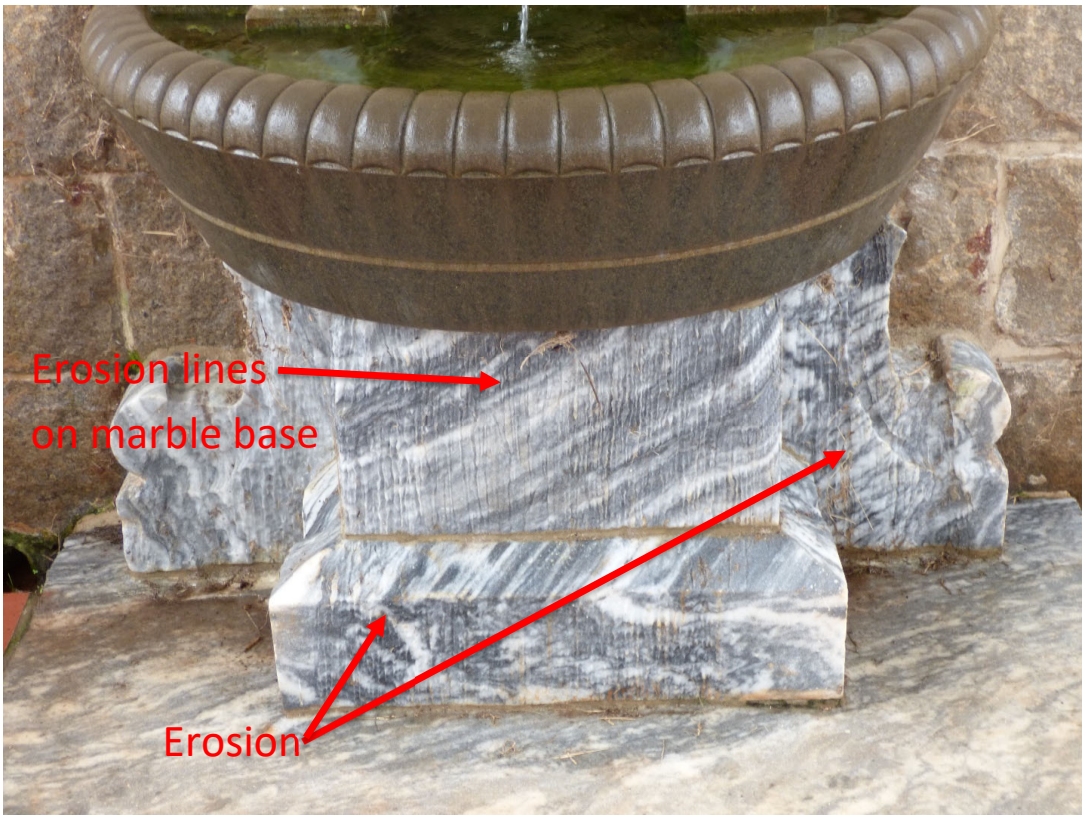

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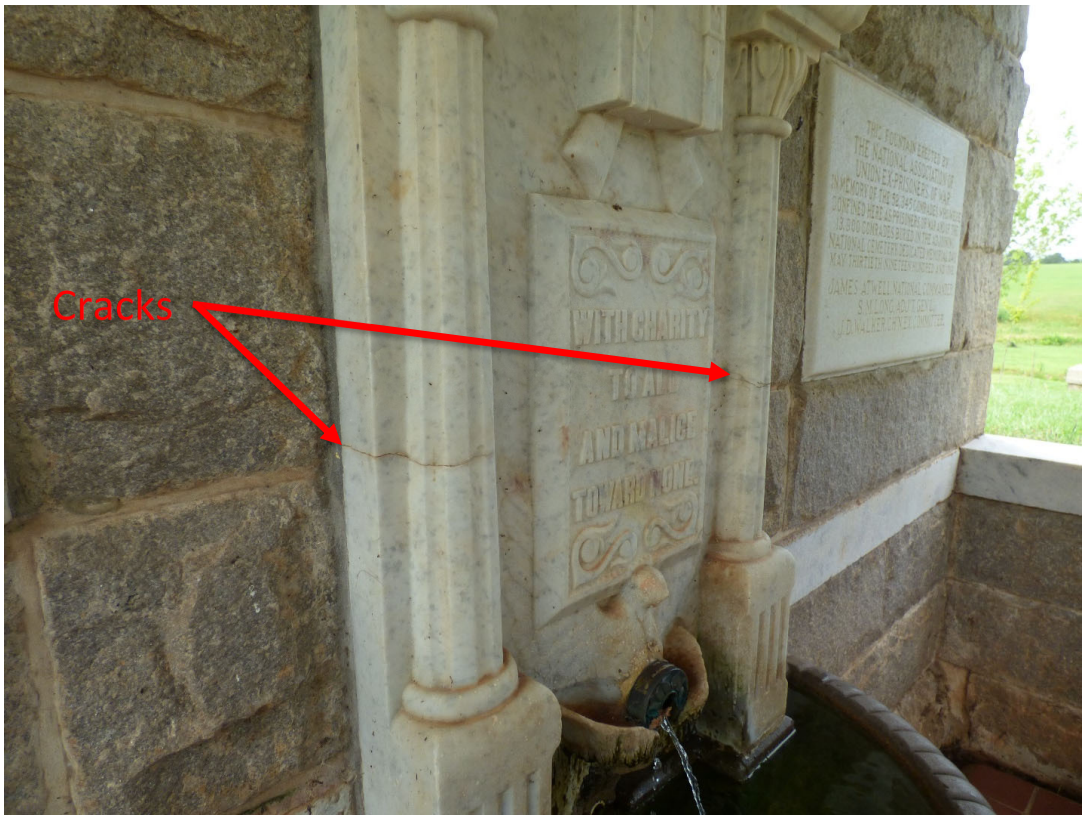

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Landscape Architecture • Historic Preservation • Planning • Environmental Assessment

July 8, 2020

To: Jody Mays (Chief of Interpretation and Resource Management, Andersonville National Historic Site) and Bridget Beers (Museum Curator, Andersonville National Historic Site)

Cc: Dr. Ali A Miri (Historical Architect, NPS Cultural Resources Partnership and Science Division), Craig Davis (chief of Facility Management, Andersonville National Historic Site), James Taylor (Maintenance Supervisor, Andersonville National Historic Site), and Keyes Williamson (Principal Landscape Architect, WLA Studio)

Re: Providence Spring House Water Filtration System Treatment

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Dear Mrs. Mays and Mrs. Beers,

Per your request and that of Dr. Miri, I have reviewed the document entitled "Final Project Agreement" for PMIS #239843 (dated July, 2019). The document describes the proposed project as follows:

> At the request of the Andersonville National Historic Site (ANDE), the Historic Preservation Training Center (HPTC) will assess the functionality of the existing French drain surrounding the Providence Spring House and install a natural filtration system in an attempt to lower the acidity of the water prior to entering the Spring House and contacting the historic Marble Fountain.

Based on our correspondence, I understand that the park has secured funding for the proposed project and that work was recently scheduled for July, 2020; however, HPTC's timeline for initiating the project has been delayed and a start date remains undetermined.

In May, 2020, WLA Studio was awarded a contract through NPS Southeast Regional Office (SERO) to produce a Historic Structure Report (HSR) for Providence Spring House and associated structures. On June 10, 2020, Keyes Williamson and I visited the Spring House site and performed a reconnaissance survey of existing conditions. I provided a report of our visit with summaries of our observations to ANDE and SERO via email on June 11, 2020.

During our site visit, Keyes and I noted evidence of active chemical erosion of the masonry components of both fountains and the brick runnel. Additionally, we noted evidence of mechanical ground disturbance and several issues associated with site runoff at and below surface level.

It is my understanding that the goal of the proposed project is to inspect and address two adverse conditions including (1) inadequate functionality of existing French drains on the north and east sides of the Spring House and (2) the active erosion of marble fountain elements.

The first condition involves excavating the areas just north and east of the Spring House to inspect and potentially replace parts or all of the existing French drains. That aspect of the project has been approved by the Historic Preservation Division (HPD), Georgia Department of Natural Resources, and is essentially a "repair and replace" treatment.

Regarding the chemical erosion of fountain components, the results of a recent water test (provided to our team by Bridget Beers) indicate that the spring water is extreme acidic (pH of less than -2.6). ***While the proposed "natural filtration system" may provide a means for park staff to lower the pH and, subsequently, reduce the rate of erosion, our team is unable to provide comment as to its appropriateness at this time. The historical research and analysis of National Register significance—which will be provided in the 45% draft submittal of the HSR—are critical to the development of treatment recommendations.***

Our team is not aware of any formal design specifications (such as construction drawings) for the filtration system other than those outlined in the project agreement with HPTC. If the park can supply such specifications, our team will be able to evaluate the proposed system as a potential treatment option to address the chemical erosion issue. There may, however, be substantial discoveries during the research and analysis for the HSR that suggest an entirely different preferred treatment.

The project agreement with HPTC also proposes "consolidation treatment," 3D laser scanning of the marble fountain, and cleaning. Presumably, the scope of consolidation and cleaning will be determined upon project start-up and the HPTC will document such work while the project is underway. Regarding the 3D scanning, the project agreement does not clearly state exactly what will be scanned. While the HPTC is onsite with 3D-scanning equipment, it may be beneficial and cost effective to scan the entire Spring House and other site features, including the lower fountain, brick runnel, adjacent concrete surfaces, gutters and drains, and even the natural drainages.

Please feel free to contact me regarding these issues and any others related to the HSR. I am available by email at chris@wlandstudio.com or on my cell (working remotely) at 404-217-0734.

Sincerely,

C Jackson

Chris Jackson, MHP
Historic Preservation Specialist

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MEMO

To:	J. Keyes Williamson, WLA Studio
From:	Kathryn Biddle & Dorothy Krotzer, Building Conservation Associates, Inc.
Date:	July 17, 2020
Subject:	Providence Spring House – Andersonville National Historic Site

At the request of WLA Studio, Building Conservation Associates, Inc. (BCA) reviewed the conditions of the Providence Spring House Structure and Fountain. The goal of the work performed by BCA was to evaluate the masonry issues and provide preliminary treatment recommendations. WLA Studio provided BCA with reports and photographs of the Providence Spring House structure and fountain for review. BCA was not able to make an in-person visit to the site due to COVID-19 travel restrictions. The following memo summarizes BCA's initial observations and recommendations.

The Providence Spring House is a National Park Service site located in Andersonville, GA. The structures on site include the Spring House, two fountains, a brick runnel and reflecting pool, two cisterns, numerous features related to underground water systems (consisting of PVC, "French Drains", terracotta pipe, brick vaults with water pipe junctions and valves), and various natural systems and features. BCA reviewed the conditions and previous repairs made to the Providence Spring House structure and fountain as presented in the reports provided by WLA Studio and has summarized this information below.

1.0 PREVIOUS REPAIRS

Previous repair campaigns to the Providence Spring House structure include alterations to French drains, terra cotta and PVC drains, retaining walls, subsurface steel, pilings, and brick basins. There is evidence of former locations of water basins and associated water pipes. There are known repairs to the stone joinery in the Spring House structural components, between the walls and the fountain and adjacent concrete stairs.

In Spring 2019, the National Park Service Historic Preservation Training Center (HPTC) performed repairs to the Providence Spring House Channel and Reflecting Pool. The focus of this project was to address needed masonry repairs including pointing, stone cleaning, and construction of a new water channel. All masonry from the Spring House to the Reflecting Pool was power washed. A new roof was installed. The marble fountain in the Spring House was cleaned with D/2 Biological Solution and small scaling tools to remove biological growth, soiling and old mortar. Failed mortar joints in the Springhouse exterior granite stone units were removed and new mortar installed. Mortar was removed and replaced at the fountain marble base. Based upon the reports provided to BCA, the mortar that was reinstalled in the Providence Spring House consisted of 1 part Argos Brand Type N "Beige" color mortar and 2 parts Sakrete Playsand, bagged.

BCA

2.0 CONDITIONS

Providence Spring House Structure

The Providence Spring House structure is constructed of three primary materials: granite, marble, and wood. There is stucco on the inside of the east and west gables. There are several locations with carved graffiti, hairline cracks, abrasions, efflorescence, and biological growth. The granite walls exhibit failing and cracked mortar. There is minor efflorescence and rising damp above the interior gutter.

Providence Spring House Fountain

The Providence Spring House fountain is constructed of four primary materials: white marble, gray marble, brown granite, and metal. The fountain consists of a marble base, top, and small basin including spout, granite basin, and bronze metal ring at the water outlet. In 2019 a PVC drain and mortar were installed beneath the spout.

The condition of the masonry materials varies depending on the element. The marble shows the most signs of deterioration and damage. Hairline cracks are observed above the spout and there is material loss at the bird beak and small basin. The material loss at the small basin appears to be caused by water erosion. There are signs of water erosion visible on the face of the marble top near the water output and on the marble base. Cracks in the marble are also located on the carved columns on the right and left sides of the carved tablet on the fountain. Efflorescence is present on the granite basin and marble base, most likely due to rising damp. The bronze metal element at the water outlet has a corroded and missing a section.

3.0 CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

Overall, the Providence Spring House structure and fountain are in good condition. However, there are localized areas of significant damage associated with the marble fountain. This damage is due to water overflow and deterioration issues related to the water's low pH. Included below are recommendations related to both treatment of the water, as well as other repairs to the masonry.

Water Treatment

Water testing results provided to BCA yielded reports of low pH (acidic) water being delivered to the Providence Spring House fountain. This water acidity has purportedly contributed to the stone and metal deterioration over time and will continue to do so if not abated.

WLA Studio informed BCA that the NPS intends to install a marble aggregate-filled filter basin will be installed between the two cisterns and the Spring House fountain in an attempt to lower the acidity of the water and potentially reduce the rate of chemical erosion of the fountain components. If this cistern work is completed and is successful, the rate of stone deterioration and future causes of damaged will be greatly reduced.

BCA

If this cistern work is not completed or it is not successful, it is necessary for the longevity of the fountain to remove the acidity of the water in another manner. Alternate options include adding chemicals to the water to alter the pH of the water or cutting off the natural water supply from the cisterns and adding a new and filtered water supply to the fountain.

Other Repairs

Included below, BCA presents two options for repair to the structure and fountain. The recommendations are based on the assumption that the proposed cistern or another method will be installed and that it will address the source of the marble erosion.

[NOTE FOR WLA: We can provide more detail for the recommendations below (e.g., specific products, repair techniques, etc.) if you think it would be helpful and/or appropriate.]

Option #1

Option #1 includes a relatively conservative repair approach focused on preserving and maintaining the Spring House and Fountain, but not restoring significantly damaged elements.

1. Clean Stone Elements

Cleaning of all stone elements of the Spring House with a low pressure water rinse. In areas where biological growth is present, use a biocide or conservation detergent and a natural bristle brush to remove biological growth. In areas where efflorescence is present, use efflorescence removers that are safe for use on historic masonry to remove efflorescence, mortar smears, grout haze, hard water deposits, atmospheric staining and other blemishes on the surface of masonry. Follow manufacturer product data and safety data sheets for the proper application, dwell times, rinsing, and clean-up of all materials. In addition, test all cleaners prior to using them.

2. Selective Repointing

Repointing of open or deteriorated mortar joints is recommended for the long-term preservation of the structure and fountain. Cut out and repoint all deteriorating and failed mortar in masonry joints to create a watertight masonry assembly.

3. Filling Veins and Narrow Cracks with Grout

Fill open veins and narrow cracks in the granite and marble using a cementitious or lime-based grout or fill material, tinted to match existing stone in each location.

Option #2

Option #2 includes more substantial repairs to the fountain to restore missing or damaged elements.

1. Replicate Missing Marble Elements

Provide replication of missing carved pieces to replace missing marble elements including the bird beak, and small basin. Match new stone to existing in color, texture, and physical properties. This would involve cutting away portions of deteriorated stone and damaged stone to sound stone and installing new stone to match the adjacent surfaces similar to a dutchman repair.

2. Replace Metal Ring at Water Outlet

Replace or repair the decorative bronze metal ring at the water outlet. Replicate the decorative detailing and size to fit and attach to current fountain elements. Allow for natural water flow into the basin.

3. Consolidate Marble

Application of a consolidant with a water repellant to the white marble top of the fountain. The consolidant works by penetrating deeply into deteriorated masonry surfaces, collecting at contact points between individual stone particles and binding them together, while simultaneously protecting the treated surface from water-related deterioration. This work will require yearly monitoring of marble water absorption levels and cyclical reapplication of the consolidant. Follow manufacturer product data and safety data sheets for the proper application, absorption times, and clean-up of all materials.

Minutes of a March 26, 2021 Phone Interview with Fred Boyles, Superintendent of Andersonville National Historic Site from November 1989 - May 2009

Interview was conducted by Kelsey Brooks and Chris Jackson of WLA Studio, Athens, Georgia.

The interview began with introductions followed by Mr. Boyles describing a booklet he is writing that uses the technique of "staff rides" to educate military personnel about the history of Andersonville National Historic Site. As he explained, staff rides are military educational exercises that began in European military outfits in the 1880s and gained in popularity in the US in the 1890s. They involve military personnel riding horseback around former battle sites to examine them up-close and critically analyze the decisions, terrain, and leadership etc. that took place during battle and influenced the turn of events. The booklet is an exercise in historic exploration and an educational tool that employs this military technique, a new perspective for Andersonville as it is not a battle site. The goal is to use the concept of staff rides to help frame the decision-making process and influences that led to the horrific prison conditions during the Civil War.

Mr. Boyles then explained his position as Superintendent of Andersonville National Historic Site, which he stated involved responsibility for "everything" at the site. He was employed in the position from November of 1989 until May of 2009.

He elaborated that the person he feels is most responsible for the greatest impact on Providence Spring House is his predecessor, John Tucker. Mr. Tucker served as superintendent for a 10-year span immediately prior to Mr. Boyles. John Tucker oversaw the Spring House repairs in 1986, which Mr. Boyles characterized as a rehab. These repairs are detailed in ANDE records. Mr. Boyles explained that he was told the repairs came about primarily because Mr. Tucker and other staff were concerned that water flowing into the Spring House had slowed to a tiny trickle. So, the park's primary motivation in all the repairs which were undertook during that time was to make sure that the slow water flow was fixed. He also mentioned the cracked terra cotta pipes as a contributing factor.

Mr. Boyles further explained that his first visit to the park took place during the NPS administration of John Flinster (around 1978-1979). At this time, the bottom of the creek and much of the landscape was fully forested, and that once John Tucker became Superintendent, he enacted a "logging campaign" to remove the trees using what he called "day labor."

It was then that Mr. Boyles explained his belief that Providence Spring House is primarily a "commemorative resource." He witnessed many people during his administration that came to visit the Spring House for inspiration, and that he has personally heard sermons of preachers preaching of the miracle of Providence Spring. He further described how Providence Spring served as a "kindred reunion" for freed men and Andersonville survivors after the war. He stated all this to convey that he loved the shade of the trees and commemorative interpretation of the site. He detailed his experience of watching children play in the runnels and reflecting pool, how visitors would bring "twenty" milk jugs to fill up with water from Providence Spring and bring home with them—even though he is not sure how they used the water. He stated the fact that Providence Spring House is the first commemorative structure at Andersonville, and is "all about faith," and therefore vitally significant to the park and in and of itself as it was to survivors and others all around the country.

He also told of how many visitors to the site throw money into the lower reflecting pool and runnels. This led to an anecdote about three past maintenance workers that were originally employed during US Army administration and left their positions in the park right before Mr. Boyles began his tenure. He told of how once a year these maintenance workers: "Ham" (who was an enormous man and therefore looked similar to a ham),

and a skinny man named Oscar English, along with one other man, would clean out the fountain's "gunk and leaves," runnels and pool once a year, take all the money and go into Andersonville town to buy a fifth of liquor and get completely hammered before heading home for the day.

We began a discussion of the continuing controversy of Andersonville National Historic Site. Mr. Boyles shared an anecdote of a discussion he gave during his turn as Superintendent (sometime in the 90s) that ended with a confrontation by a local resident, Mr. Pryor, who is coincidentally an ancestor of a former Confederate officer at Andersonville, who asked is Mr. Boyles really believed "all this shit about the spring." Mr. Boyles replied that he believed God listens to prayers, and that there must have been many prayers asking God for clean water during the time Union soldiers were imprisoned at Andersonville.

Mr. Boyles then explained that he is familiar with another park, a Civil War battle site, which is in the position where its significance is no longer of any consequence to the people that visit the park. It is now a place people enjoy as a spot to bring your dog or your family, but the original significance of the site is no longer of much consideration to the public. This was shared in order to emphasize Mr. Boyles point that Andersonville was and continues to be a very controversial place. As he began his term as administrator, he was nervous about the controversy, but eventually grew to appreciate it as it meant that people cared and was preferable to the site's significance being forgotten entirely.

Mr. Boyles shared one resource he enjoys and believes has useful information about the Spring House, particularly because it is a companion of an ex-prisoner diary and memoir. It is by Charles Hopkins, edited by William B Styple and published by Bellgrove Publishing, copyright 1988.

When asked about any routine maintenance that was performed on the Spring House and Spring House landscape during the time of Mr. Boyles administration, he stated that they didn't have much time to commit to the Spring House as there "were not enough hours in the day," and there was so much else to attend to. He explained that they didn't clean out the runnels and reflecting pool as often as they should have but would sometimes engage volunteer groups to clean them with the offer that they could keep whatever money they cleaned out in the process. It was primarily performed by scout groups. They were instructed to throw the gunk and leaves on the grass nearby. He also reported that the runnel and pool were always full of enormous craw dads, and that visiting children loved that.

Mr. Boyles told of a mild controversy over Swifts (2-3 nests of birds) using the Spring House as a nesting site. He believes the birds used the swampy area below the Spring House as their food source, and so the Spring House provided a convenient location nearby to food for them. Some park staff wanted to remove the birds because they felt their excrement was a nuisance as it fell onto the floor and walls. Other staff was concerned for the safety of the birds and did not want their nests removed. Mr. Boyles decided that it was probably fine for the resource (the Spring House), which was not in danger from the birds, and so they did nothing.

Mr. Boyles then shared that email and mailing address contact was forthcoming for John Tucker, the previous Superintendent prior to Mr. Boyles, and told of an historic newspaper article that claims that the Providence Spring is terrible for sewing division among people after the war, etc. He believes it was in the Sumter Republican sometime in the 1896-1898 range.

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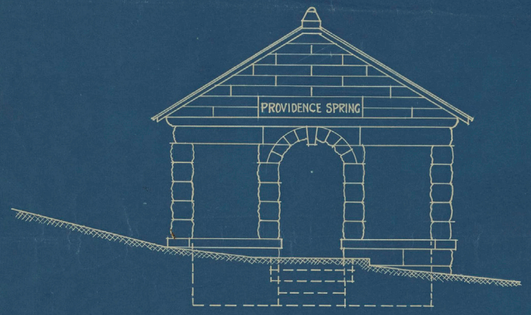

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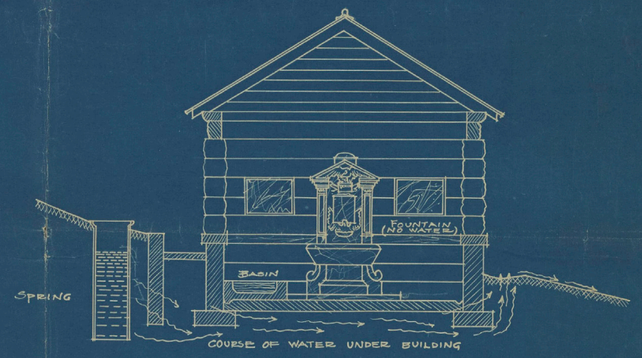

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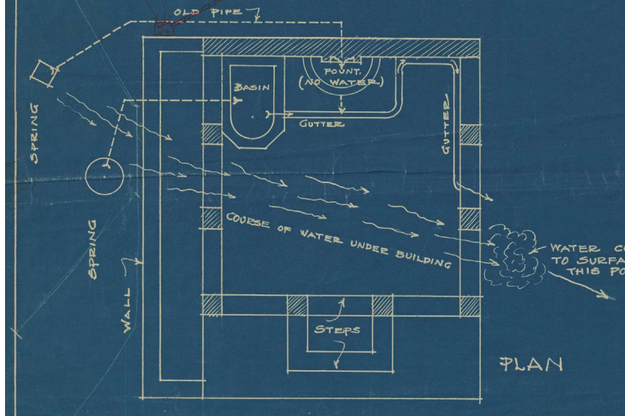


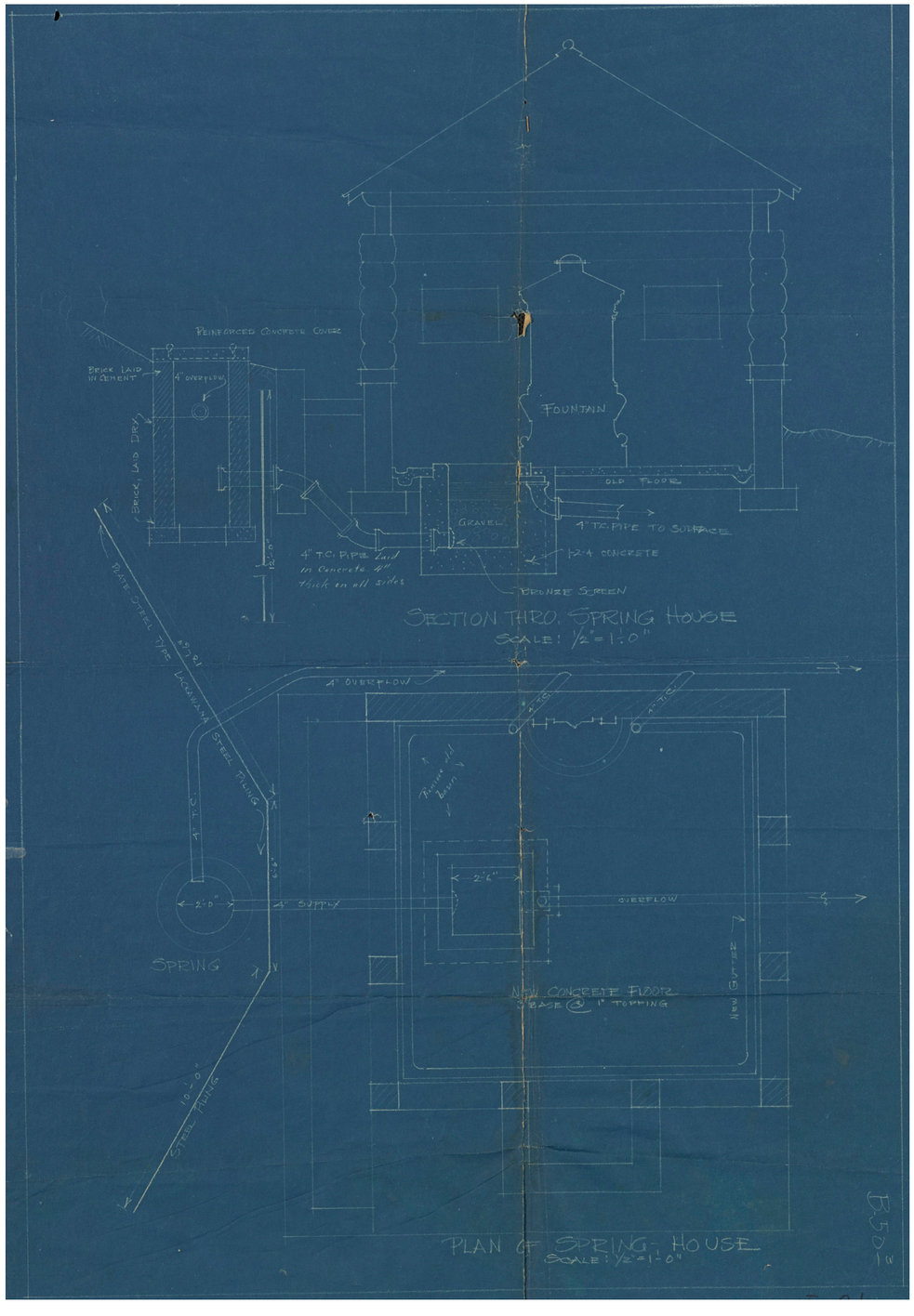
PLAN

EXISTING SPRINGHOUSE
"PROVIDENCE SPRING"
ANDERSONVILLE PRISON PROPERTY

ANDERSONVILLE GEORGIA

SCALE: ¼" = 1'-0"

OFFICE OF THE DEPOT QUARTERMASTER U. S. A.,
WASHINGTON D. C. MARCH 20, 1914.



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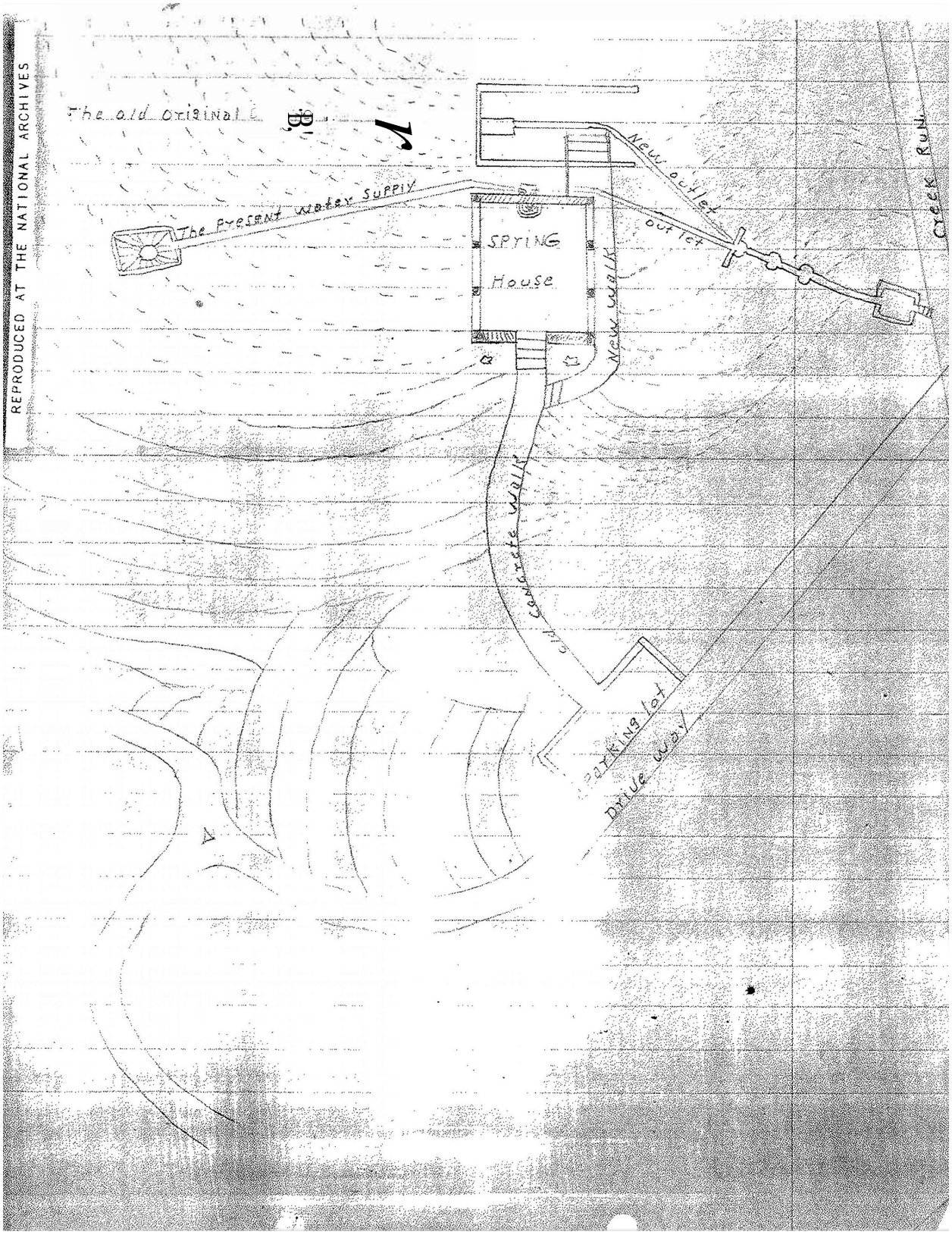
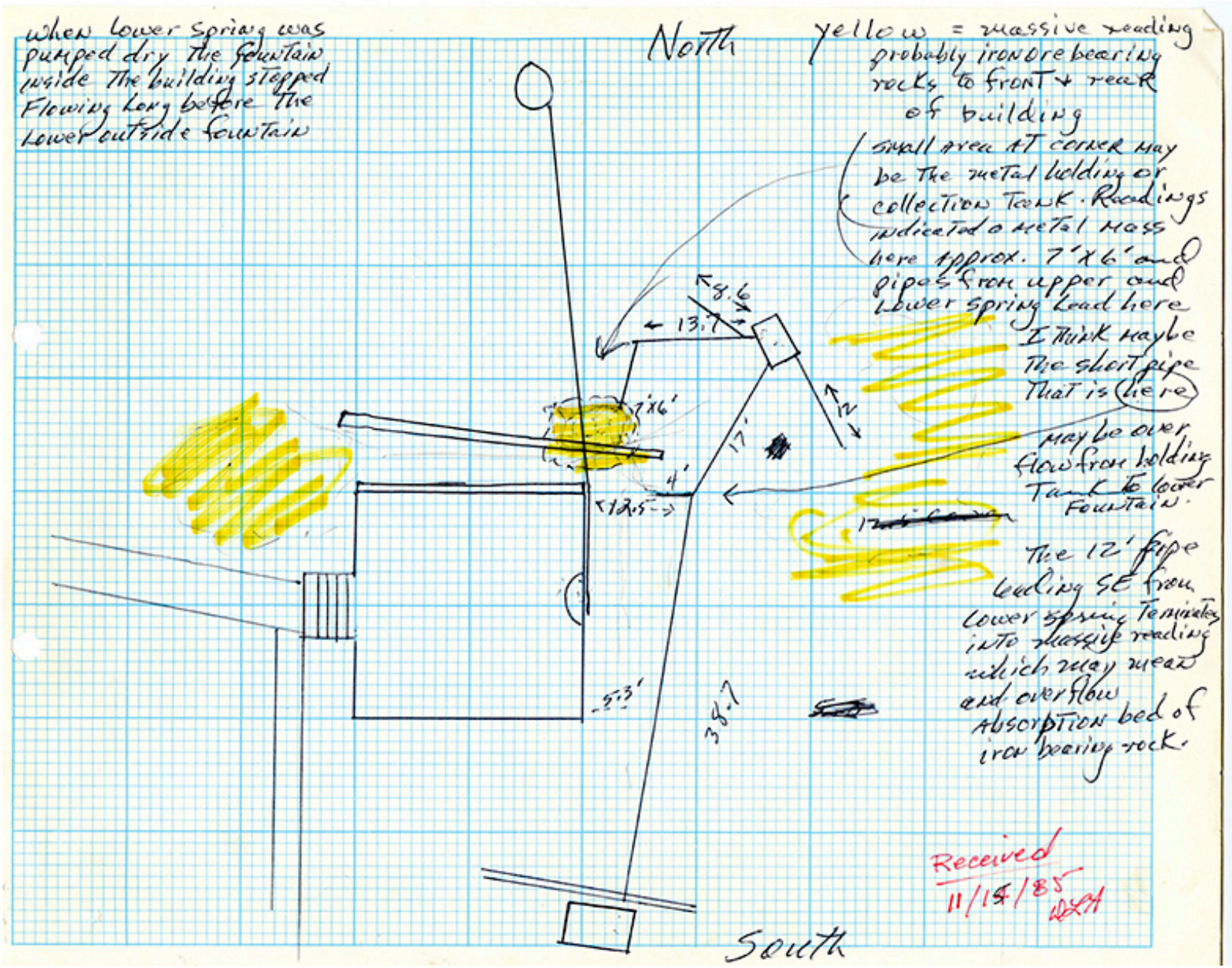
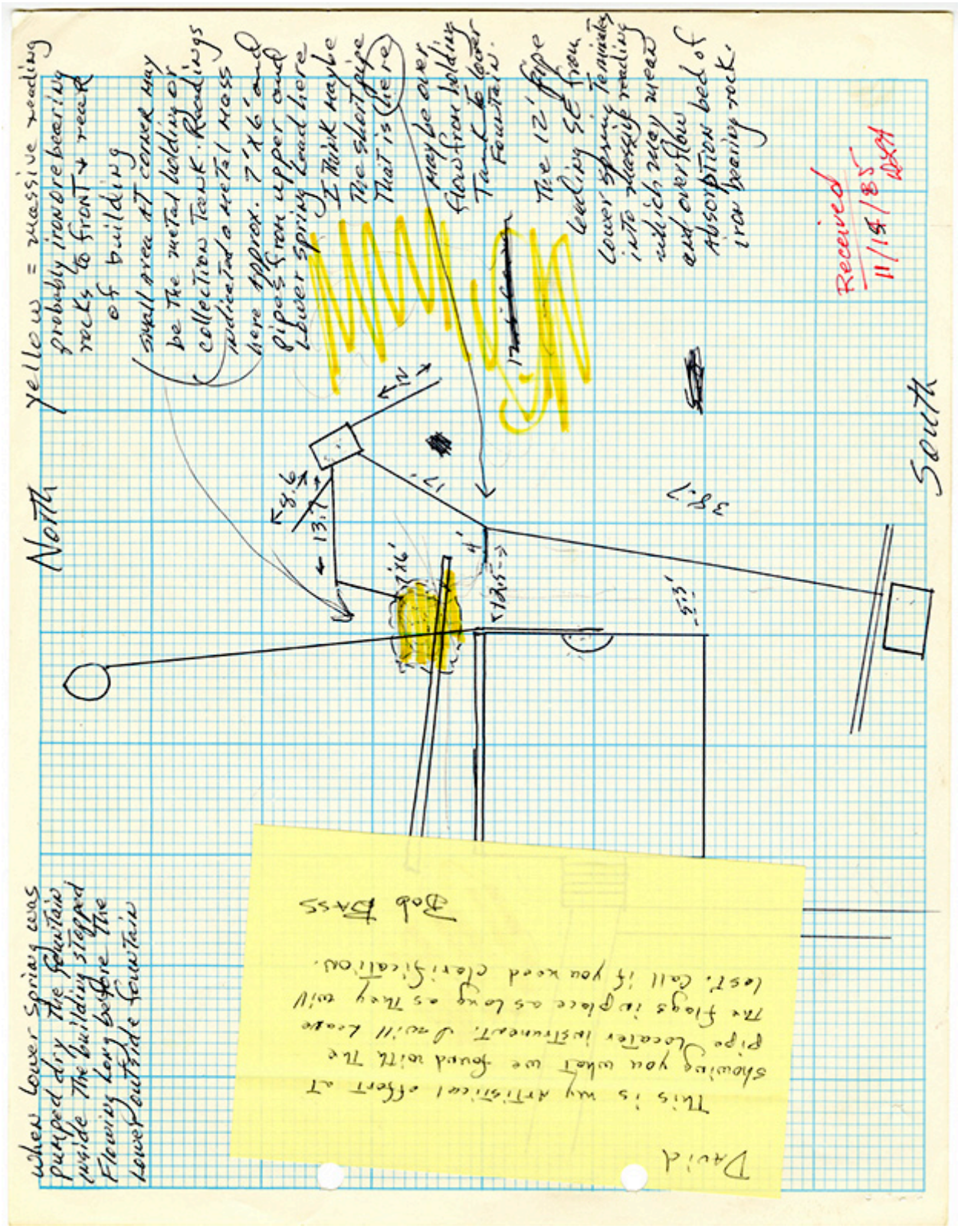
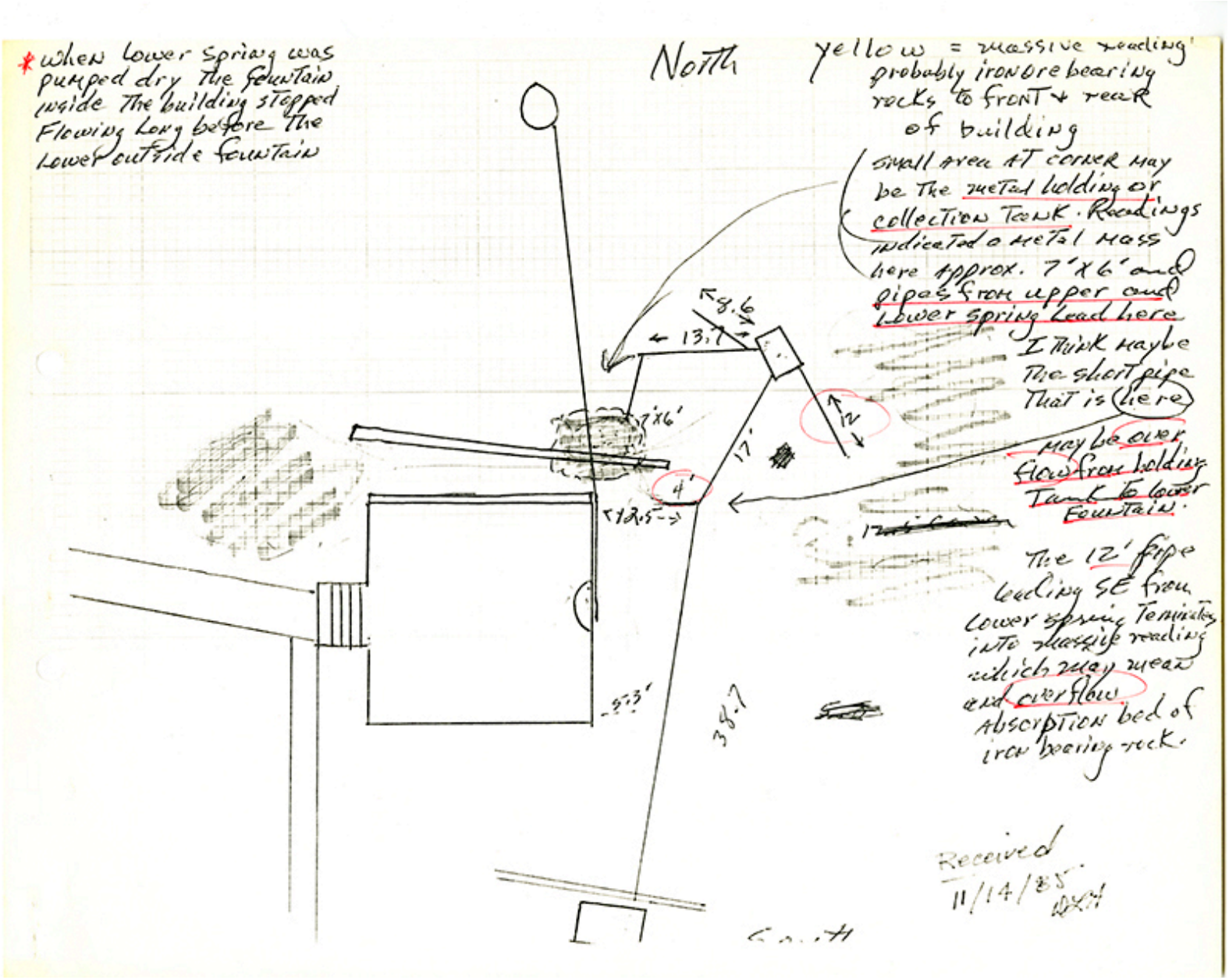

REPRODUCED AT THE NATIONAL ARCHIVES
The old original
The present water supply
SPRING
House
New outlet
outlet
New walk
Old concrete walk
Parking lot
Drive way
Creek Run
A
B

Page intentionally left blank

Re.: 12.19.65
DAVID MYERS
SEQUOIA
upper spring
Water level is 11" higher in upper spring than lower spring, and 17" higher than outlet in spring house.
11"
17"
spring house
lower spring
Water level in lower spring is 30" higher than outlet.
30"
1'
6"


when lower spring was pumped dry the fountain inside the building stopped flowing long before the lower outside fountain
North
yellow = massive reading probably iron ore bearing rocks to front + rear of building
small area AT corner may be the metal holding or collection tank. Readings indicated a metal mass here approx. 7'x6' and pipes from upper and lower spring lead here
I think maybe the short pipe that is here
may be over flow from holding tank to lower fountain.
The 12' pipe leading SE from lower spring terminates into massive reading which may mean end overflow absorption bed of iron bearing rock.
8.6
13.7
7'x6'
12.5
17'
4'
5.3'
38.7
South
Received
11/14/85


Yellow = massive reading probably inwards bearing rocks to front → rear of building
small area at corner may be the metal holding of collection tank. Readings indicated a metal mass here approx. 7'x6' and 6' deep
Pipes from upper and Lower springs lead here
It think maybe the short pipe that is there
may be over flow from holding Tank for lower fountains.
The 12" pipe leading SE from Lower springs terminates into a rectangle reading which may be over flow and/or DISSIPATION bed of iron bearing rock.
Received 11/14/85
North
South
when Lower Springs was pumped dry the fountain inside the building stopped flowing long before the Lower/outside fountain
David
This is my artistical effort at showing you what we found with The Pipe Locater last Thursday. You will have to forgive its gloppiness as long as they will flow in glorious Technicolor. I'll call if you need clarification.
Bob Bass


* When lower spring was pumped dry the fountain inside the building stopped flowing long before the lower outside fountain
North
yellow = massive reading probably iron ore bearing rocks to front & rear of building
small area at corner may be the metal holding or collection tank. Readings indicated a metal mass here approx. 7'x6' and pipes from upper and lower spring lead here
I think maybe the short pipe that is here may be over flow from holding tank to lower fountain.
The 12' pipe leading SE from lower spring terminates into shaft reading which may mean end overflow absorption bed of iron bearing rock.
Received 11/14/85
13.7
9.6
7'x6'
17'
4'
12.5
35.7
N
South

H4217(SER-AC)

October 24, 1985

Memorandum

To: Wendell Chason, Contracting and Property Management Division, SERO

From: Superintendent, Andersonville NHS

Subject: Road Repaving

The general maintenance 106 prepared at Andersonville National Historic Site in 1981 covers all existing parking area repaving. The 106 forwarded to Len Brown on October 22 covers improvements to the parking area at Providence Spring.

John N. Tucker

NPS:JTUCKER:sr:10/24/85:912-924-0343

Southeast Regional Office
(Attach continuation sheets as necessary)
or continue on back of page

A. Originating Office

1. Park: Andersonville National Historic Site

2. Description of proposed action: ( ) Energy Management Action; ( ) Handicapped Access; (X) Action under PMA; ( ) Section 106 Action not under PMA (Region to fill in blocks).

Add paved parking area 60' x 10' parallel to park road at Providence Spring parking area.

3. Explain why the action is needed:

To alleviate congestion in Providence Spring area.

4. Cultural resources affected by proposed action (name and LCS number, if applicable):

Providence Spring LCS 107

5. In affecting cultural resources, the proposed action will (check as many as apply):

__Destroy historic fabric.
__Remove historic fabric.
__Replace historic fabric in kind.
__Replace missing historic fabric.
__Add nonhistoric elements to a historic structure.
__Remove nonhistoric elements from a historic structure.
__Alter historic terrain, groundcover, or vegetation.
__Introduce nonhistoric elements (visible, audible, or atmospheric) into a historic setting or environment.
__Reintroduce historic elements in a historic setting or environment.
__Remove historic elements from a historic environment.
__Remove nonhistoric elements from a historic environment.
__Disturb, destroy, impair, or render inaccessible archeological (surface or subsurface) resources.
X Possibly disturb presently unidentified archeological resources or historic fabric.
__Incur gradual deterioration of historic fabric, terrain, or setting.
__Other (Describe briefly):

	Yes	No	N/A		
(Negative certifications must be justified on attachments.)	1( )	( )			
	2( )	( )	( )	Regional Archeologist	Date
	1( )	( )	( )		
( ) Energy Consultation Held	2( )	( )	( )	Regional Historian	Date
	1( )	( )	( )		
Regional Energy Coordinator Date	2( )	( )	( )	Regional Historical Architect	Date

Additional requirements of the proposed action:

C. Regional Director Approval of Proposed Action including Additional Requirements

( ) The proposed action, including any additional requirements stated above, meets all conditions in B.1 and 2, or is an Energy Management Project meeting only conditions in B.1, and therefore, satisfies the requirements of Section 106.

Date Regional Director

D. WASO Record

Assessment received and noted:

Assistant Director, Cultural Resources Date

Describe the indicated effect(s) concisely:

Some visual intrusion will occur since the parking surface will be enlarged. This will also result in less traffic on lawn areas.

6. The proposed action is limited to preservation maintenance Yes ( ) No ( ). If not, identify supporting approved plan(s), comment and/or action thereon by Advisory Council on Historic Preservation, dates of ACHP action and NPS approval, and section(s) of the plan(s) pertaining to the action. If none, so state:
General Management Plan for Andersonville National Historic Site.

7. Identify any important relationships between the proposed action as it affects cultural resources and pertinent NPS management policies, standards, and guidelines:

The action will lessen congestion at Providence Spring parking area and improve traffic flow and safety.

8. Describe any measures planned to minimize or lessen the loss or impairment of historic fabric, setting, integrity, or data:

Archeologist Jack Walker has previewed the site on October 22 and found no problem with this project.

9. Identify supporting study data and date(s) of preparation (attach if feasible):

Environmental Assessment for Andersonville National Historic Site.

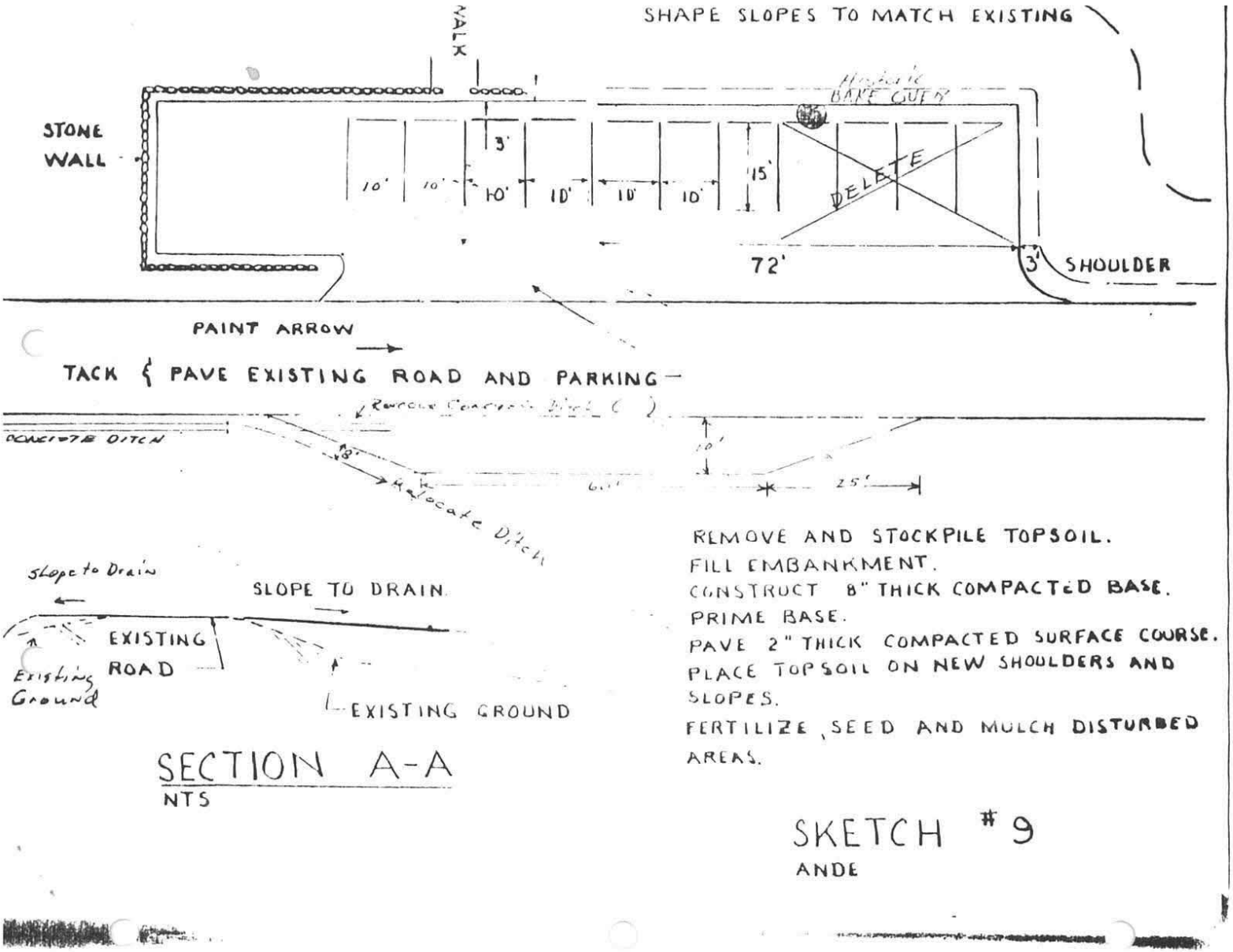
10. Prepared by: _____ Title: _____

11. Signature of Park Superintendent: John N. Tucker John N. Tucker Date: 10/23/85

B. Regional Professional Review and Certification

1. The foregoing assessment of effect is adequate; the proposed action is consistent with all applicable NPS management policies, standards, and guidelines reviewed and concurred in by the Advisory Council; and the proposal incorporates all feasible measures to minimize adverse effects to cultural resources.

2. The proposed action is limited to preservation maintenance or it is authorized by an approved planning document reviewed and concurred in without relevant exceptions by the Advisory Council.


SHAPE SLOPES TO MATCH EXISTING
WALK
STONE WALL
Historic BARE CUT
3'
10'
10'
10'
10'
10'
10'
15'
DELETE
72'
3'
SHOULDER
PAINT ARROW
TACK & PAVE EXISTING ROAD AND PARKING
CONCRETE DITCH
Relocate Ditch
10'
25'
SLOPE TO DRAIN
Slope to Drain
EXISTING ROAD
Existing Ground
EXISTING GROUND
SECTION A-A
NTS
REMOVE AND STOCKPILE TOPSOIL.
FILL EMBANKMENT.
CONSTRUCT 8" THICK COMPACTED BASE.
PRIME BASE.
PAVE 2" THICK COMPACTED SURFACE COURSE.
PLACE TOPSOIL ON NEW SHOULDERS AND SLOPES.
FERTILIZE, SEED AND MULCH DISTURBED AREAS.
SKETCH #9
ANDE

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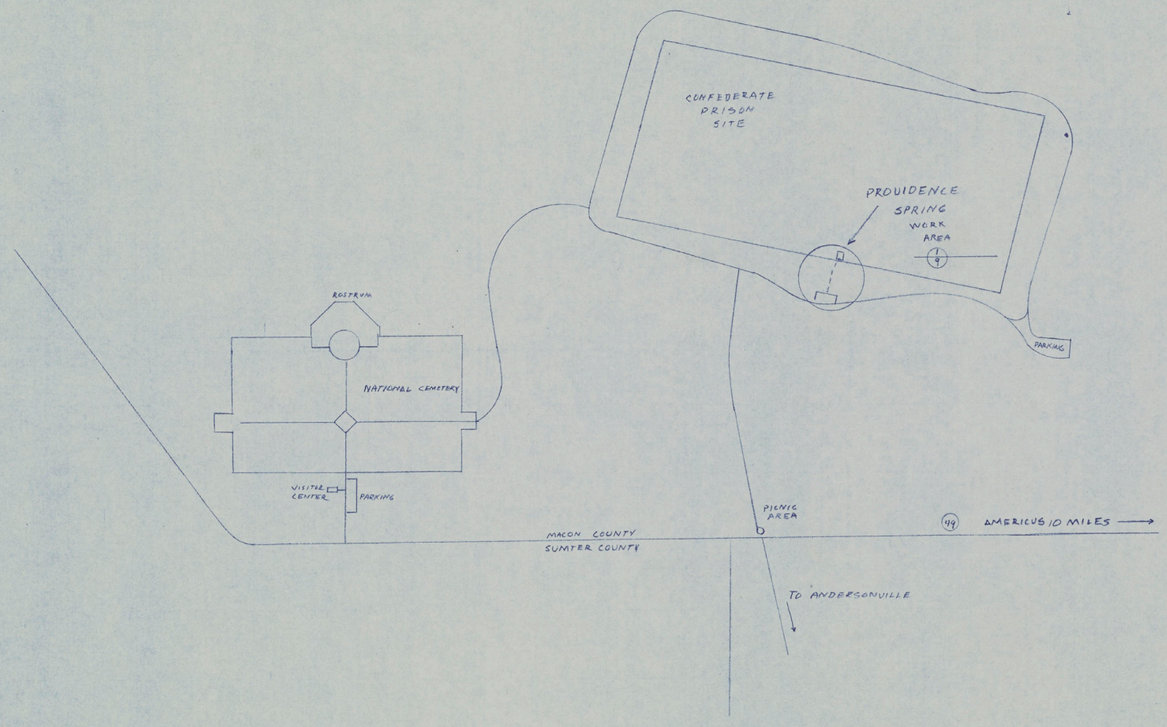
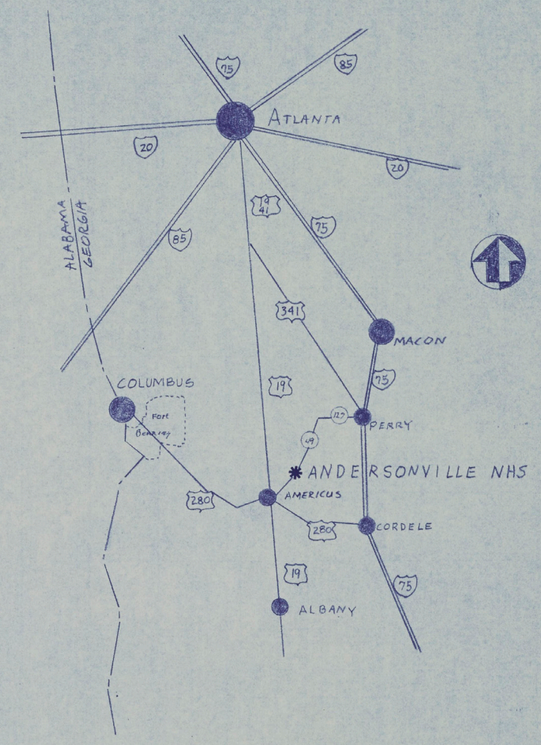
PROVIDENCE SPRING





	DESIGNED: ANDE	WATER COLLECTION SYSTEM	DRAWING NO.
	DRAWN: ANDE	PROVIDENCE SPRING	PROJ. NO. / SHEET 1
	TECH. REVIEW:	ANDERSONVILLE NATIONAL HISTORIC SITE	of ___
	DATE: 2/86	SOUTHEAST REGION / MACON COUNTY / GEORGIA	

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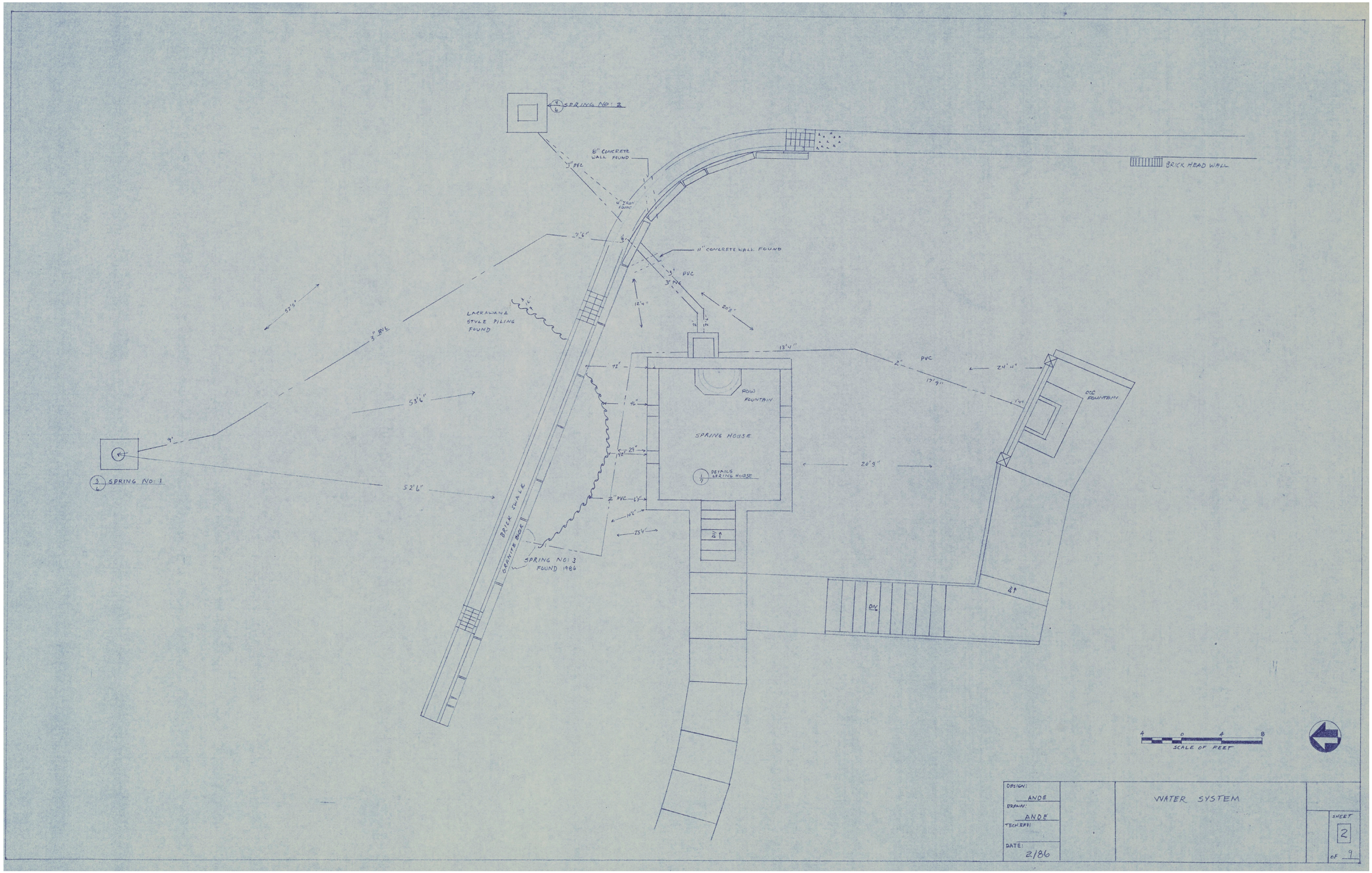
SPRING NO: 2
8" CONCRETE WALL FOUND
3" PVC
4" IRON COUPLING
BRICK HEAD WALL
11" CONCRETE WALL FOUND
3" PVC
3" PVC
12'4"
90°
LACKAWANA STYLE PILING FOUND
13'4"
7'2"
2" PVC
24'4"
17'9"
POW FOUNDATION
OSC FOUNDATION
SPRING HOUSE
DETAILS SPRING HOUSE
26'9"
5'-2"
19'2"
2" PVC
14'6"
25'6"
BRICK RUBBLE
GRANITE BLOCK
SPRING NO: 3 FOUND 1986
DN
UP
UP
3 SPRING NO: 1
9'
52'6"
53'6"
3" PVC
62'5"
4
0
4
8
SCALE OF FEET
DESIGN: ANDE
DRAWN: ANDE
TECH'RD'I
DATE: 2/86
WATER SYSTEM
SHEET 2 OF 9

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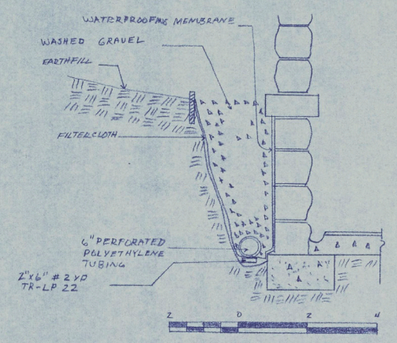

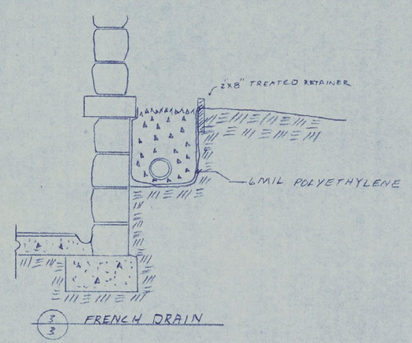

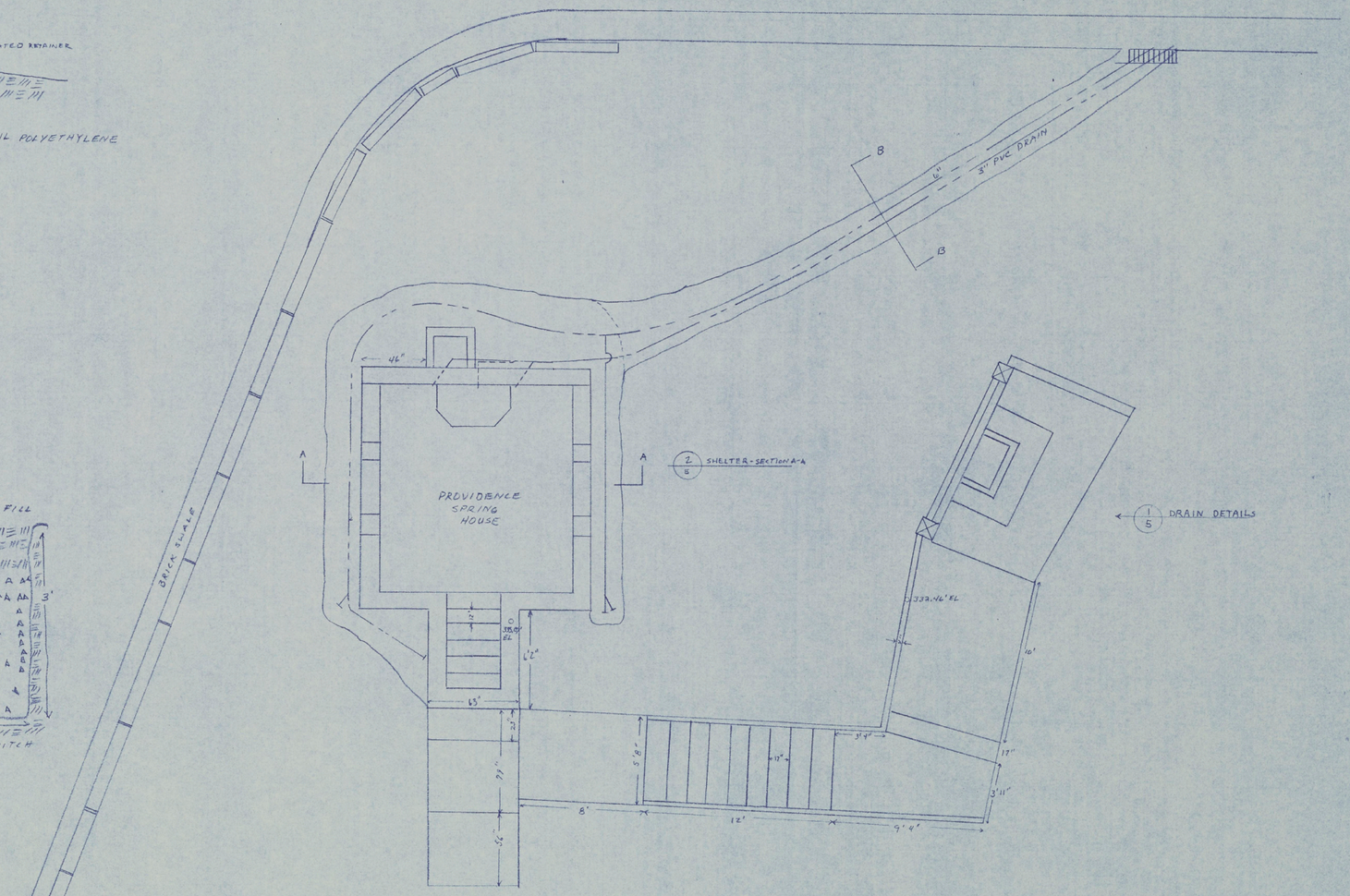

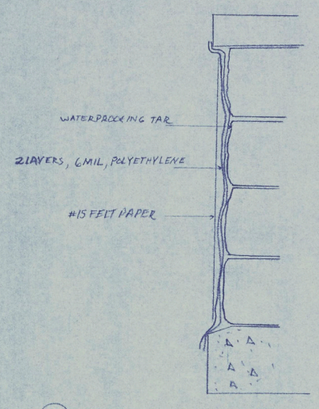

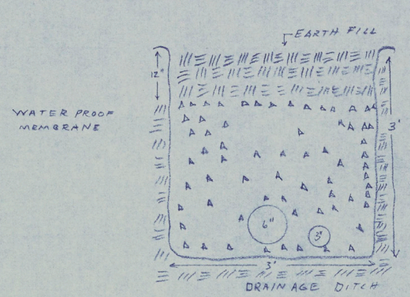

2/3 MEMBRANE DETAILS

1/3 SECTION B-B

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DRAWN: ANDE			
TECHREV:			
DATE: 2/86			of 9

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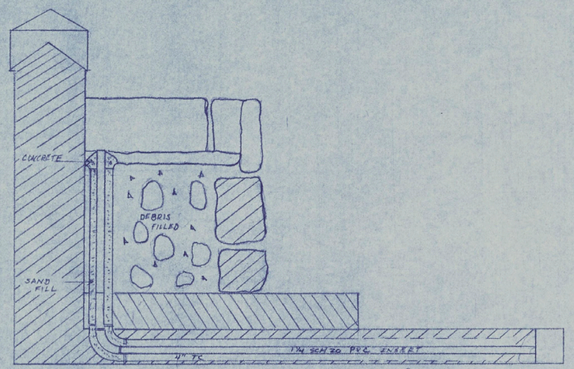
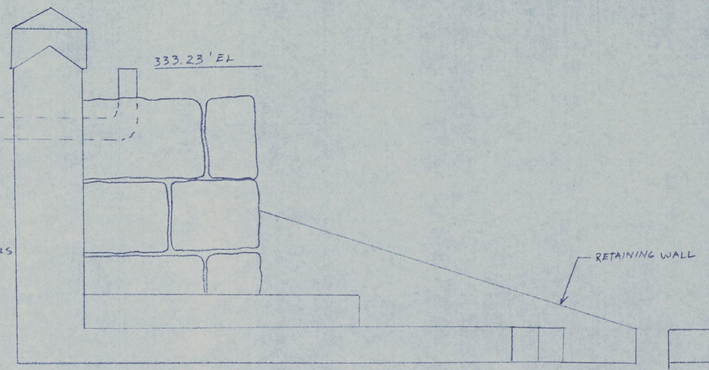
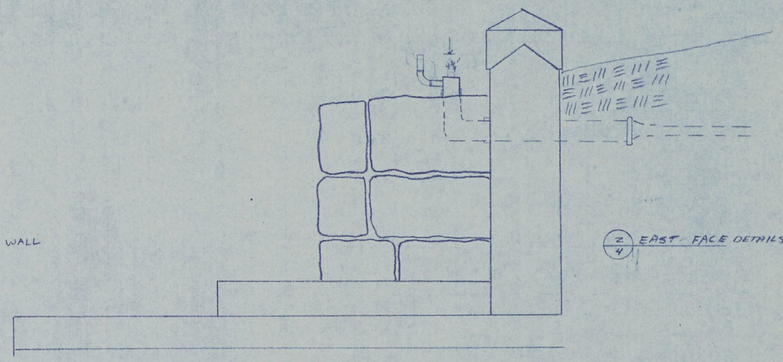


4/4 SECTION A-A



1/4 WEST FACE DETAILS



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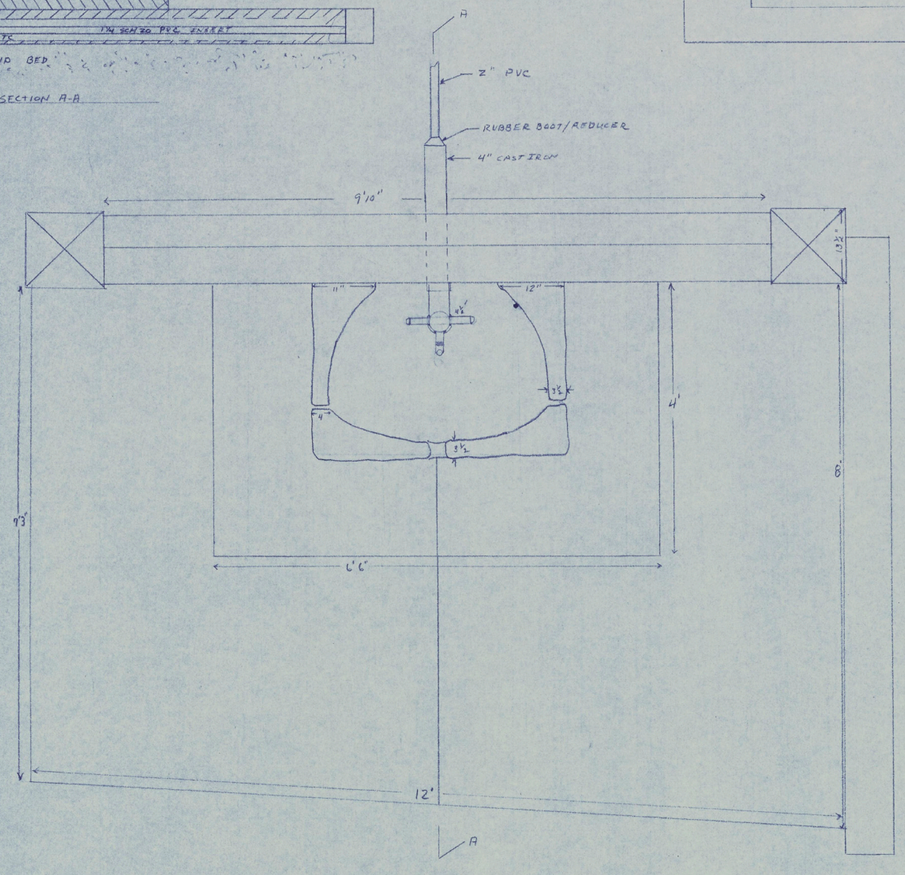

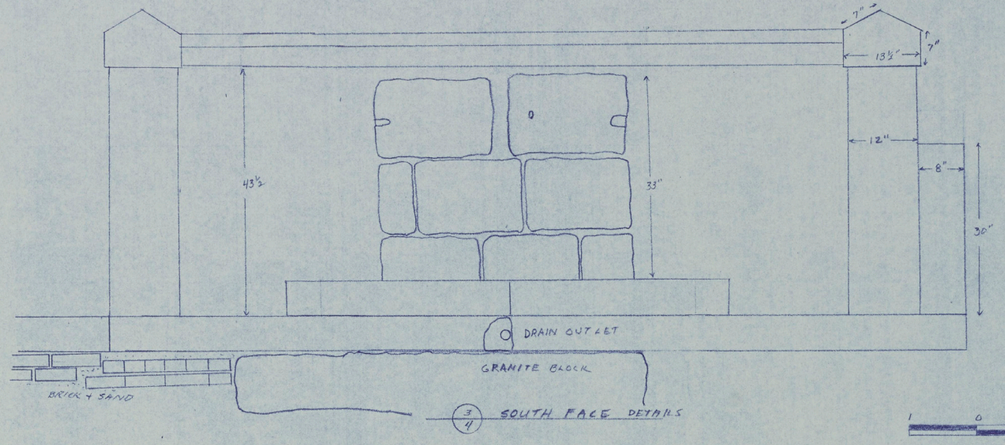

3/4 SOUTH FACE DETAILS

1 0 1 2

DESIGN: ANDE DRAWN: ANDE TECH REVIEW: DATE: 2/86		CCC FOUNTAIN & INLET	SHEET 4 OF 9

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DEADLINE

DEADLINE

1/5 DRAIN DETAIL

CCC FOUNTAIN

9 BRICKS

9 BRICKS

8½ BRICKS

33 BRICKS

21'6"

REFLECTING POOL

19'2"

16"

12"

28"

28"

22½°

6' BRICK

DN TO STORMDRAIN BRANCH

8'2"

7'5"

12'6"

45°

14'

3" PVC

3" PVC

4" TC

TO SPRING HOUSE? 20'+

STORAGE

STORAGE LINE

N 31°30' E

PATIO INSTALLED 1960-61

PATIO REMOVED 8/86

BRICK SWALE

GRANITE WALL

FRENCH FOUNDATION DRAIN

SAND BED (UNKNOWN SIZE)

4'4½"

8'6½"

24"

36"

3'

Z/5 SHELTER SECTION A-A

Z" PVC

12'5½"

3/3 FRENCH DRAIN DETAIL

LACKAWANA STYLE STEEL PILING

FILTER CLOTH

4/5 SECTION D-D

7/5 SECTION E-E

5/5 SECTION B-B

Filter cloth

SAND

26"

18"

3/5 SECTION A-A FRENCH DRAIN

10½" Drop

21"

32"

24"

16"

20"

LOG FOUND

4" DRAIN

BASKET WEAVE PATIO REMOVED 3/1/86

FRENCH DRAIN

CLEAN OUT 6" Drop

Filter cloth

6/5 SECTION C-C

4 0 4 8

DESIGNED:		MISCELLANEOUS DETAILS - REFLECTING POOL	
DRAWN: ANDE			
TECH REVIEW: ANDE			5
DATE: 2/86			of 9

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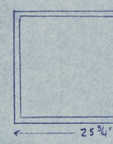
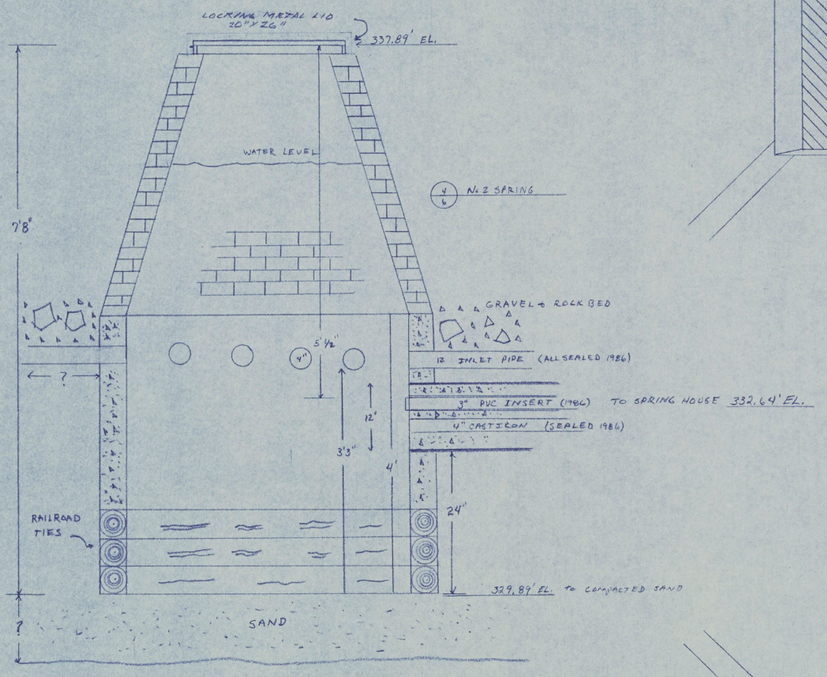
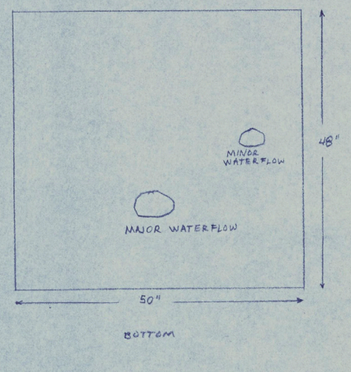
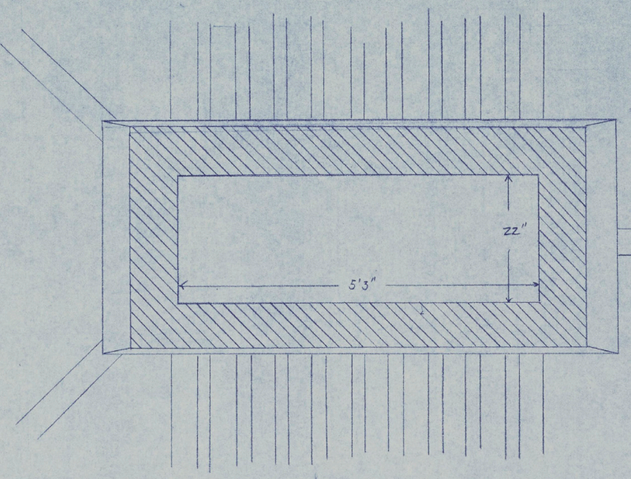
LOWER SPRING

TOP

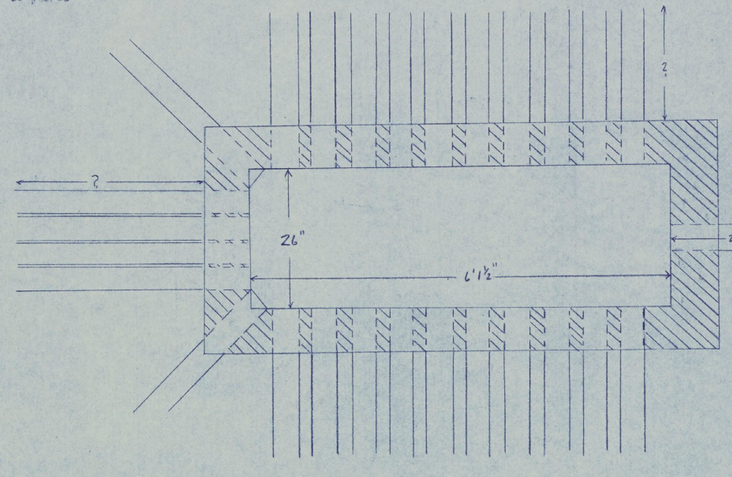








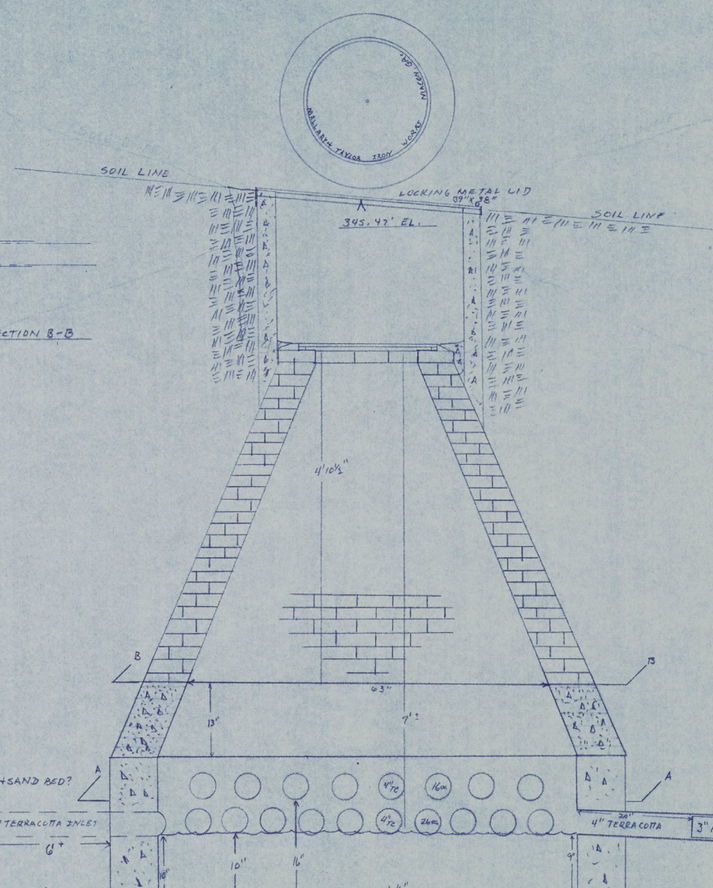
2/6 SECTION B-B



1/6 SECTION A-A

UPPER SPRING

TOP



1 0 1 2

DESIGNED: ANDE	SPRING RESERVOIR DETAILS
DRAWN: ANDE	
TECH. REVIEW:	
DATE: 2/86	6 of 9

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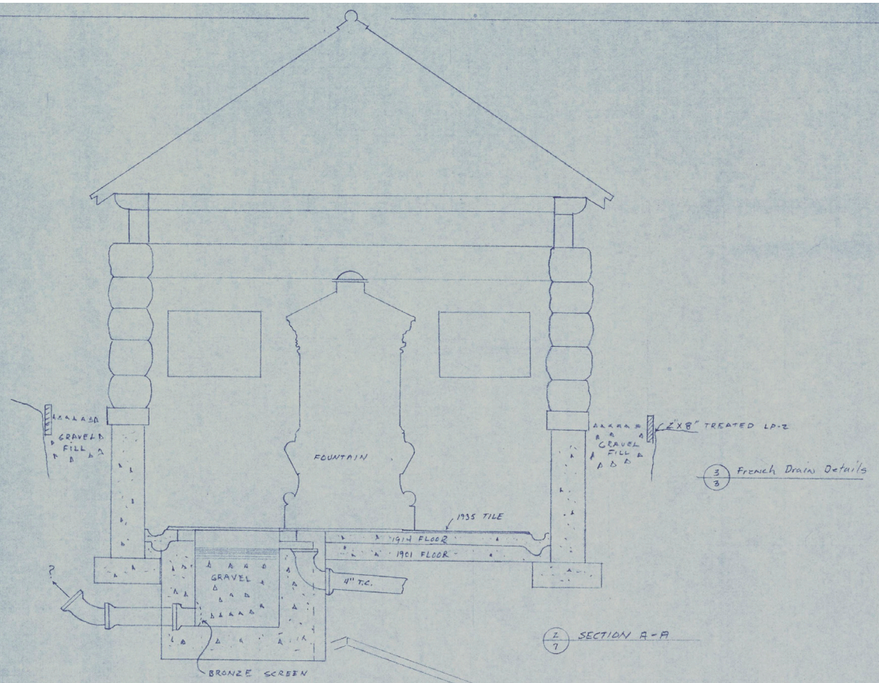

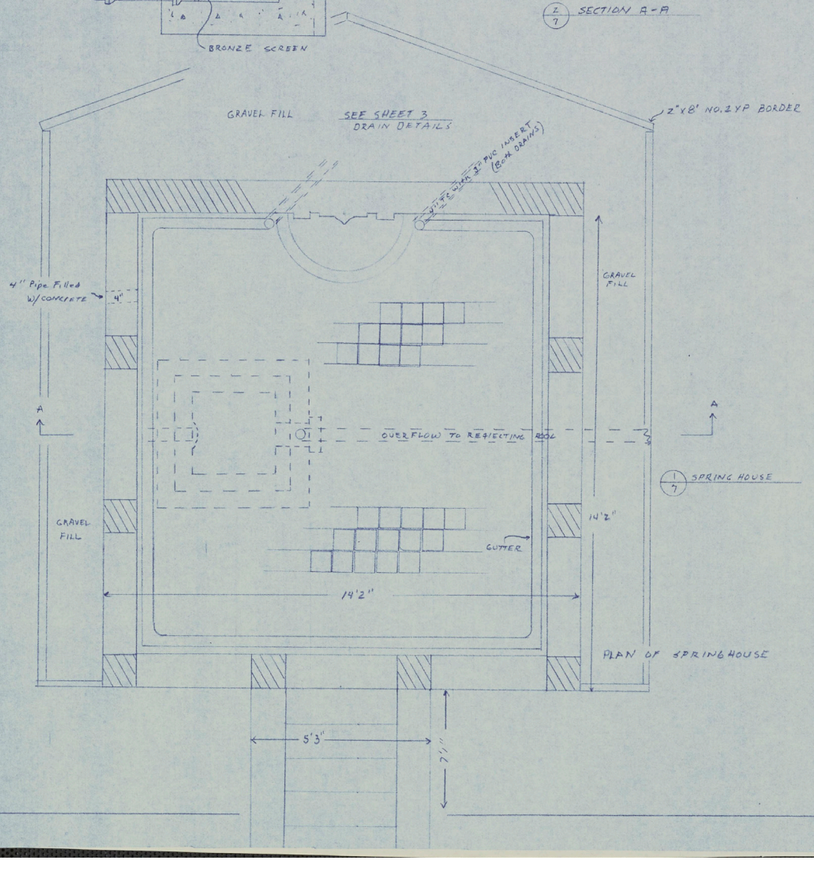

1 0 1 3 5

DESIGN: ANDE		PLAN OF SPRINGHOUSE	
DRAWN: ANDE			7
TECH REVIEW:			of 9
DATE: 2/86			

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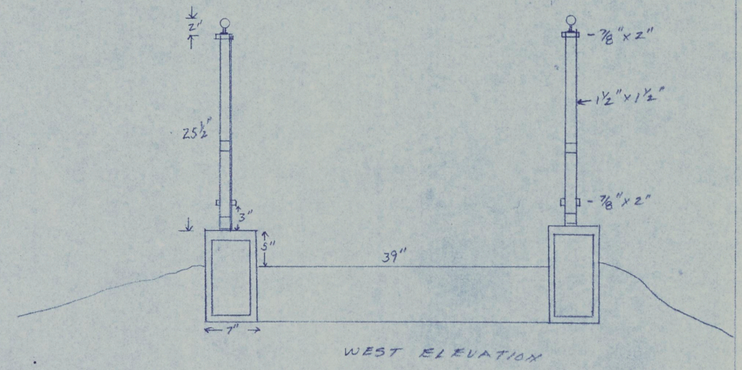
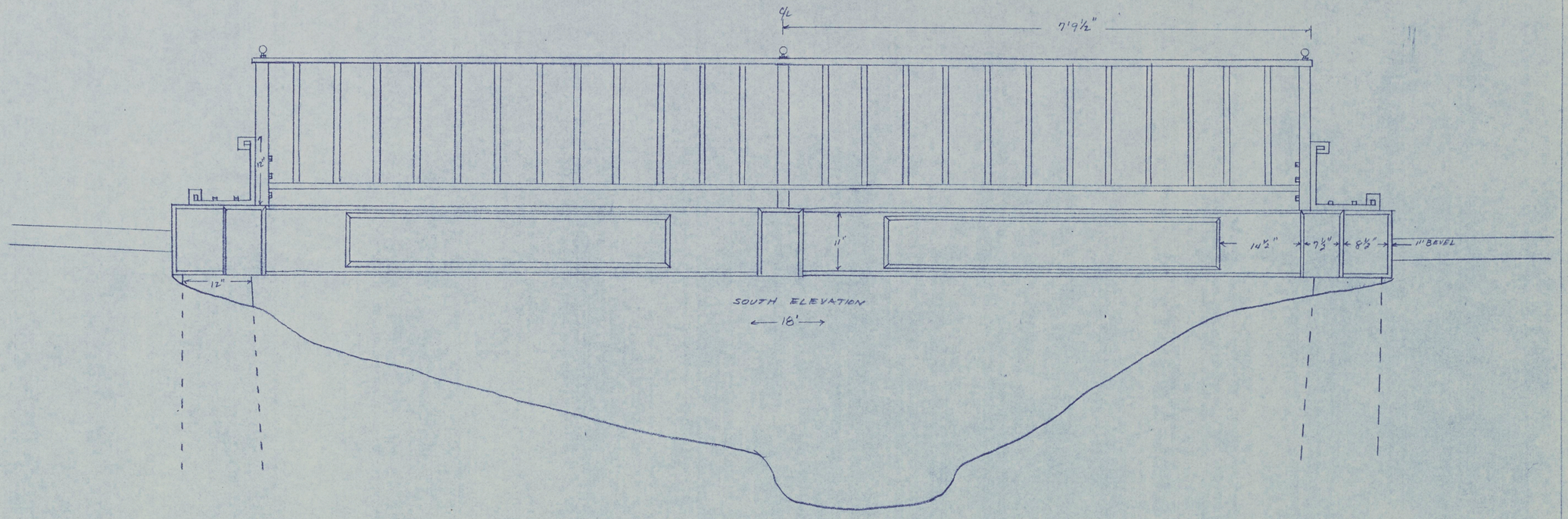


WEST ELEVATION



SOUTH ELEVATION

DESIGN: ANDE DRAWN BY: ANDE TECH REV: DATE: 2/86	FOOT BRIDGE DETAILS	8 of 9

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ELEVATIONS

1/8" = 1 Foot

UPPER SPRING

NEW SPRING

LOWER SPRING

POND FOUNTAIN

CCC FOUNTAIN

346.0'

TANK TOP @ 345.47'

344.0'

342.0'

340.0'

338.0'

336.0'

WATER LEVEL @

OUTLET PIPE 336.30'

TANK BOTTOM @ 335.47'

334.0

TANK TOP @ 337.89'

WATER LEVEL @

POND @ OUTLET 335.05'

332.0

OUTLET PIPE @ 332.64'

@ 333.54' CCC OUTLET

330.0'

TANK BOTTOM @ 324.89'

328.0'

1/4" = 1 FOOT

PROVIDENCE SPRING

ROCK WALL (TYP.)

4" DRAIN (FRENCH)

23'7"

23'8"

33'6"

41'11"

23'6"

6'3"

4'

64'7"

43'6"

111'

40'6"

33'

169'

130'

16'

BM

25'3"

1/9 WORK AREA DETAIL

10 5 0 20 40

DESIGNED ANDF

DRAWN ANDF

TECH/REVI

DATE 2/86

WORK AREA ELEVATIONS

9 of 9

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Appendix B: Documentation Drawings

B-1 Sheet 1 - Location Map

B-2 Sheet 2 - Existing Site Plan

B-3 Sheet 3 - Spring House Drainage Plan

B-4 Sheet 4 - Spring Water Supply Plan

B-5 Sheet 5 - Spring Houser Plan and Details

B-6 Sheet 6 - Spring House Plans

B-7 Sheet 7 - Spring House Elevations

B-8 Sheet 8 - Spring House Sections

B-9 Sheet 9 - Interior Fountain Details

B-10 Sheet 10 - Cisterns

B-11 Sheet 11 - Lower Fountain

B-12 Sheet 12 - Brick Runnel and Reflecting Pool

B-13 Sheet 13 - Footbridge

B-14 Sheet 14 - WRC Period Plan (1901-1910)

B-15 Sheet 15 - CCC Period Plan (1934-1936)

B-16 Sheet 16 - U.S. Army Period Plan (1937-1969)

B-17 Sheet 17 - Early NPS Period Plan (1970-1990s)

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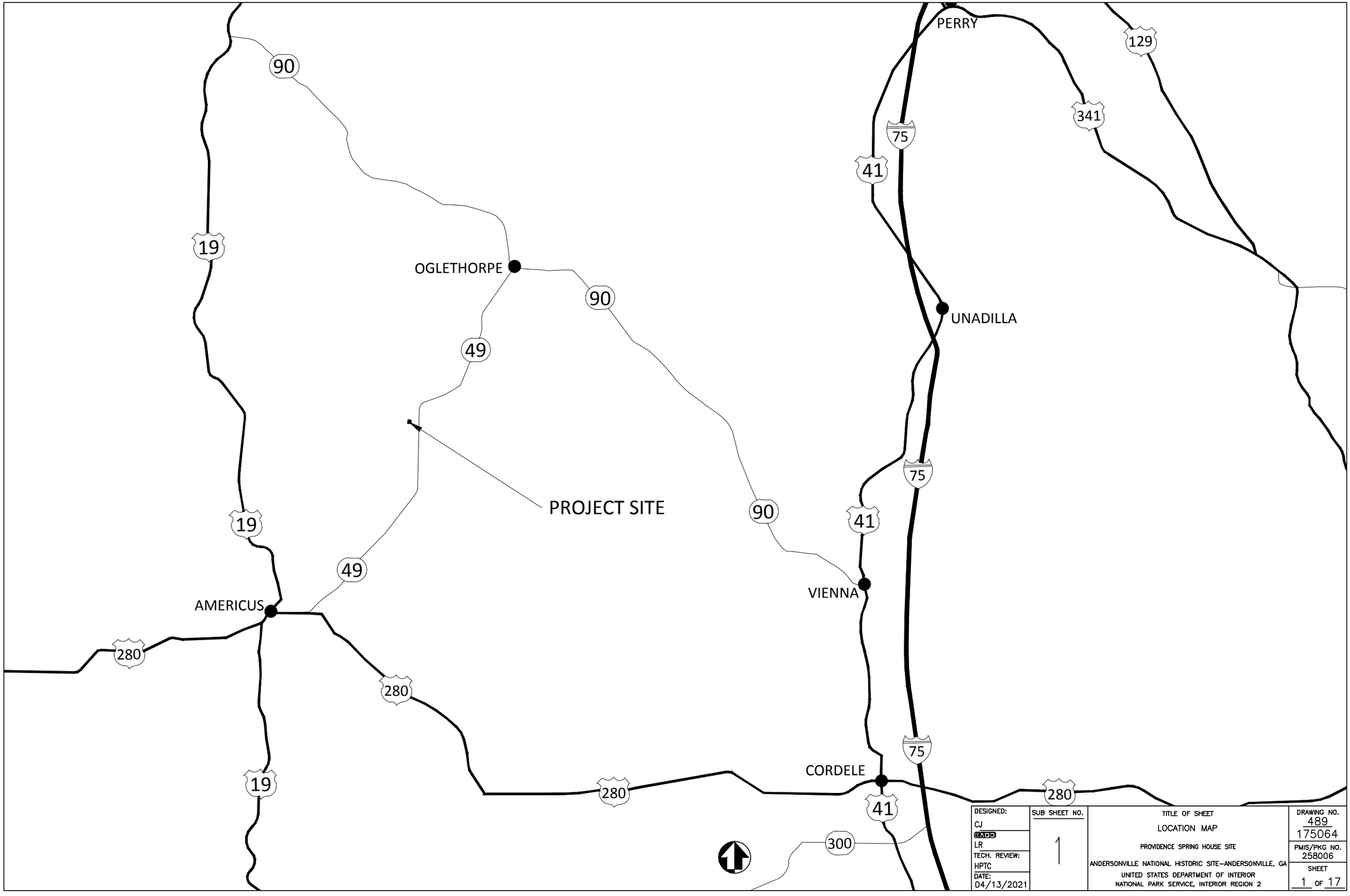

DESIGNED: CJ CADD LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 1	TITLE OF SHEET LOCATION MAP PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 1 OF 17

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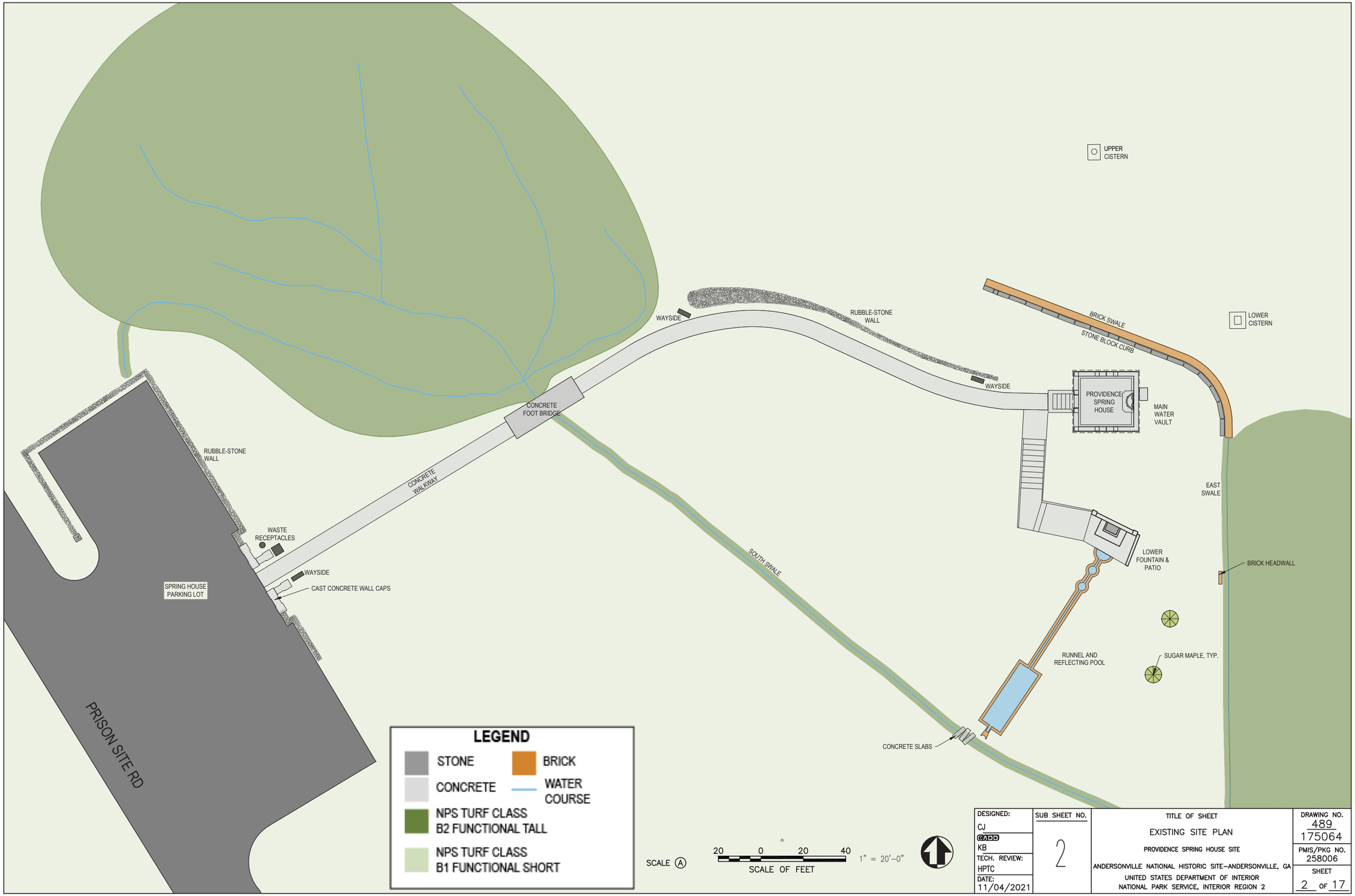

DESIGNED: CJ DRAWN: KB TECH. REVIEW: HPTC DATE: 11/04/2021	SUB SHEET NO. 2	TITLE OF SHEET EXISTING SITE PLAN PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 2 OF 17

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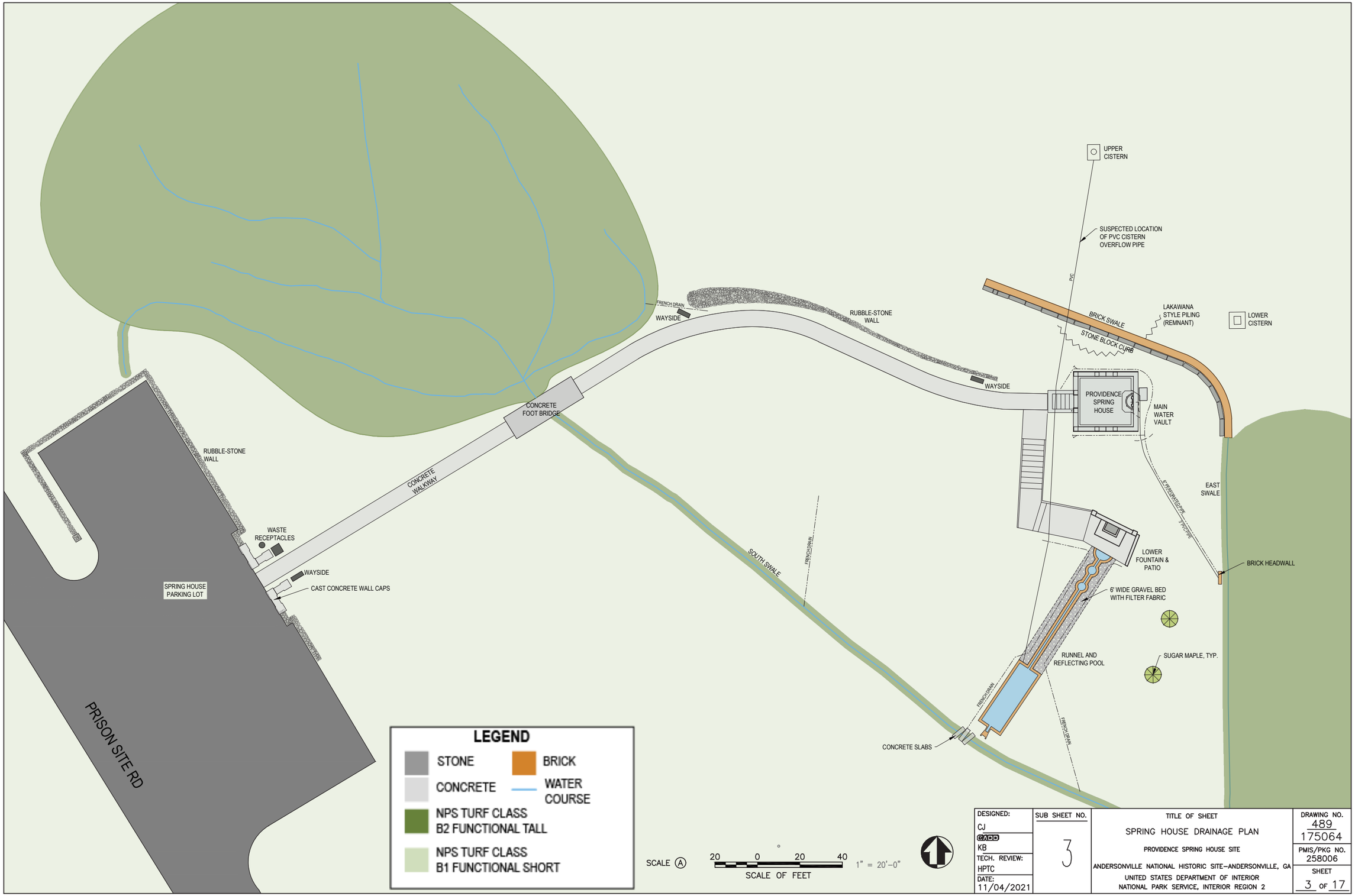

DESIGNED: CJ DRAWN: KB TECH. REVIEW: HPTC DATE: 11/04/2021	SUB SHEET NO. 3	TITLE OF SHEET SPRING HOUSE DRAINAGE PLAN PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 3 OF 17

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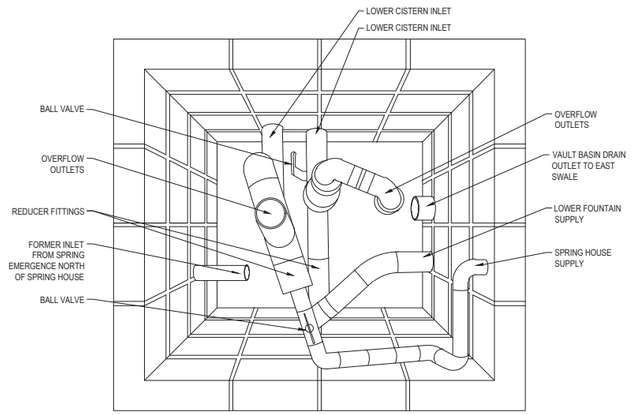

1 / A4 MAIN WATER VAULT DETAIL
NTS

SPRING NO. 2
REMNANT 4" IRON
8" CONCRETE WALL FOUND
11" CONCRETE WALL FOUND
3" PVC
3" PVC
3" PVC PIPE
BRICK HEADWALL
EAST SWALE
MAIN WATER VAULT, (SEE INSERT DETAIL ABOVE)
2" PVC
3" PVC
SPRING NO. 1
2" PVC
PROVIDENCE SPRING HOUSE
LOWER FOUNTAIN
1 1/4" PVC
SPRING NO. 3, FOUND 1986 (NO LONGER POINT OF EMERGENCE)
RUNNEL AND REFLECTING POOL
SOUTH SWALE

SCALE (A)
10 0 10 20
SCALE OF FEET
1" = 10'-0"

DESIGNED: CJ CADD: LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 4	TITLE OF SHEET SPRING WATER SUPPLY PLAN PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE—ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 / 175064 PMIS/PKG NO. 258006 SHEET 4 OF 17

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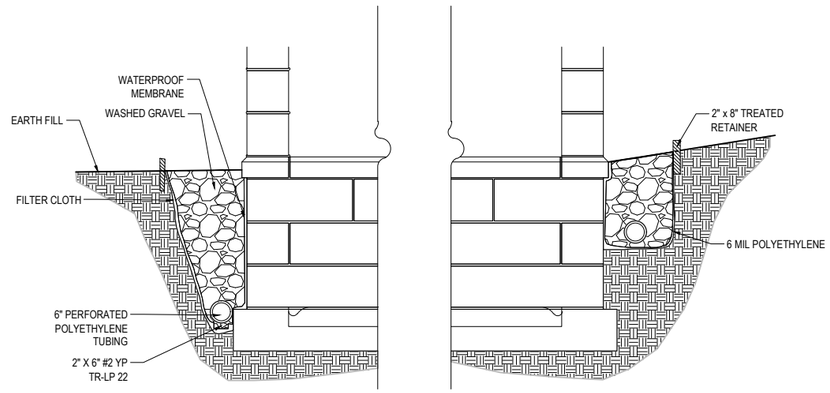
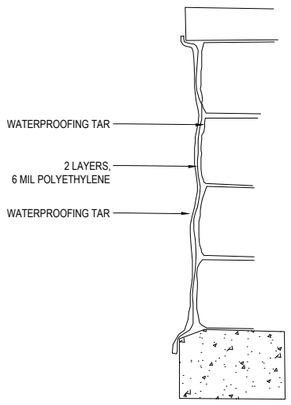
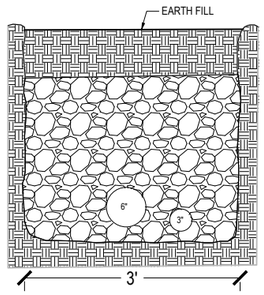


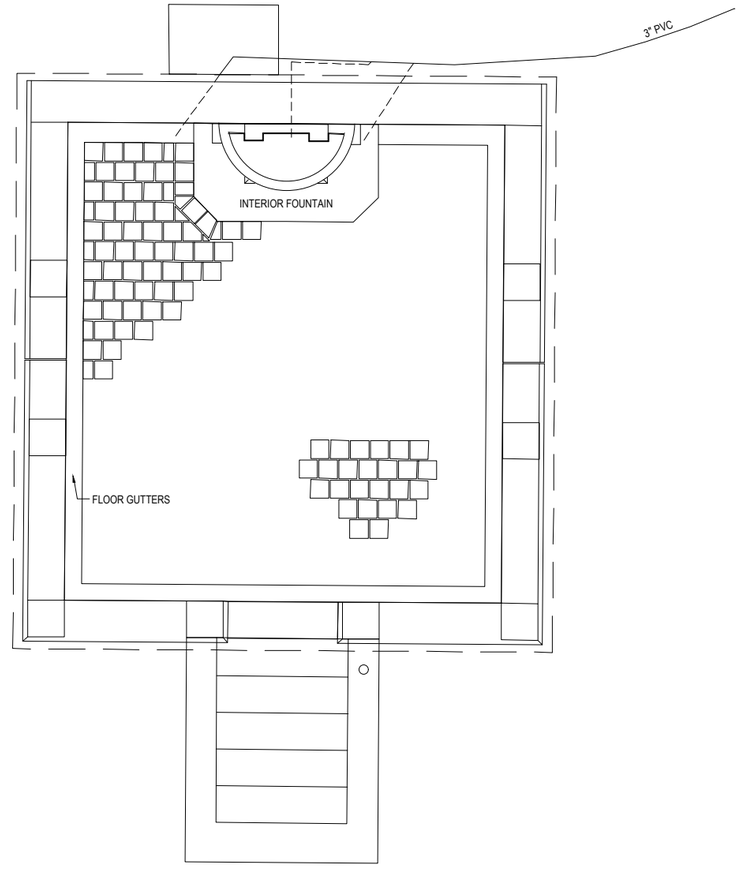
1 A5 FRENCH DRAIN
SCALE - 1" = 2'-0"



2 A5 MEMBRANE DETAILS
SCALE - 1" = 1'-0"



3 A5 DRAIN LINE SECTION
SCALE - 1" = 1'-0"



4 A5 SPRING HOUSE DRAINAGE PLAN
SCALE - 1" = 4'-0"

DESIGNED: CJ DRAWN: LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 5	TITLE OF SHEET SPRING HOUSE PLAN AND DETAILS PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 5 OF 17

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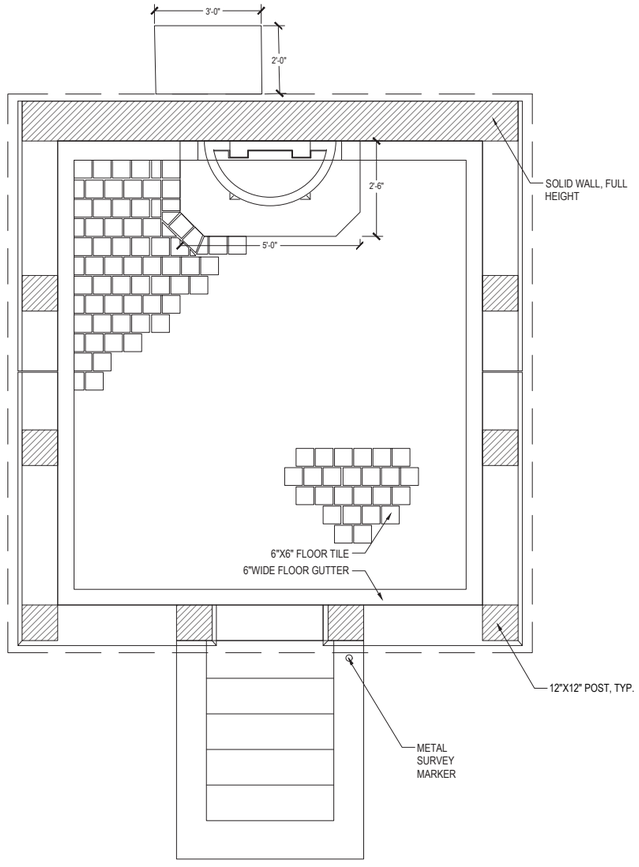
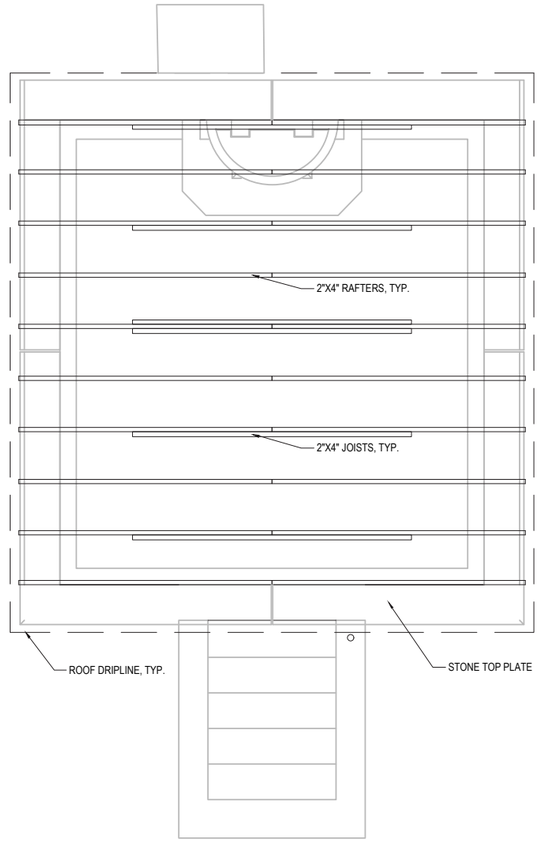


1 A6 SPRING HOUSE PLAN



2 A6 ROOF STRUCTURE PLAN

SCALE A 4 0 4 8 SCALE OF FEET 1" = 4'-0"

DESIGNED: CJ DRAWN: LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 6	TITLE OF SHEET SPRING HOUSE PLANS PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE—ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489/175064 PMIS/PKG NO. 258006 SHEET 6 OF 17

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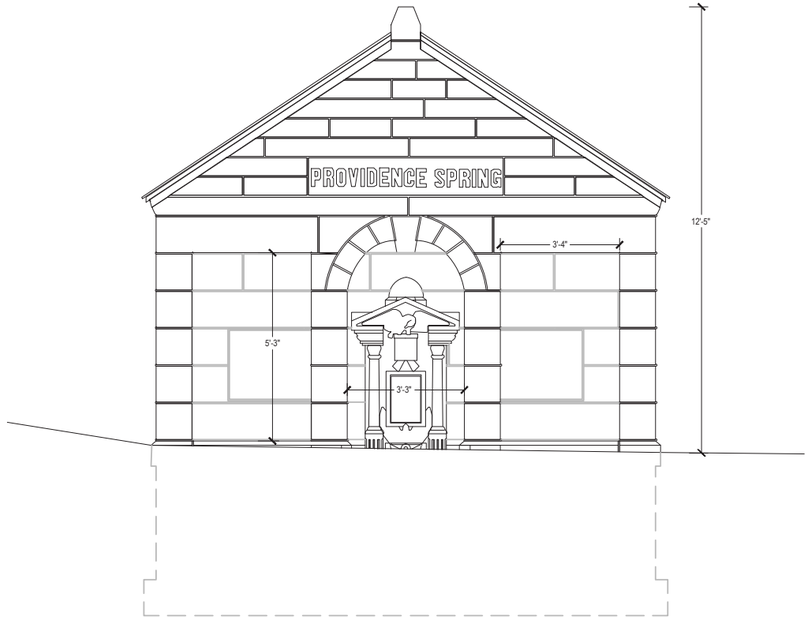
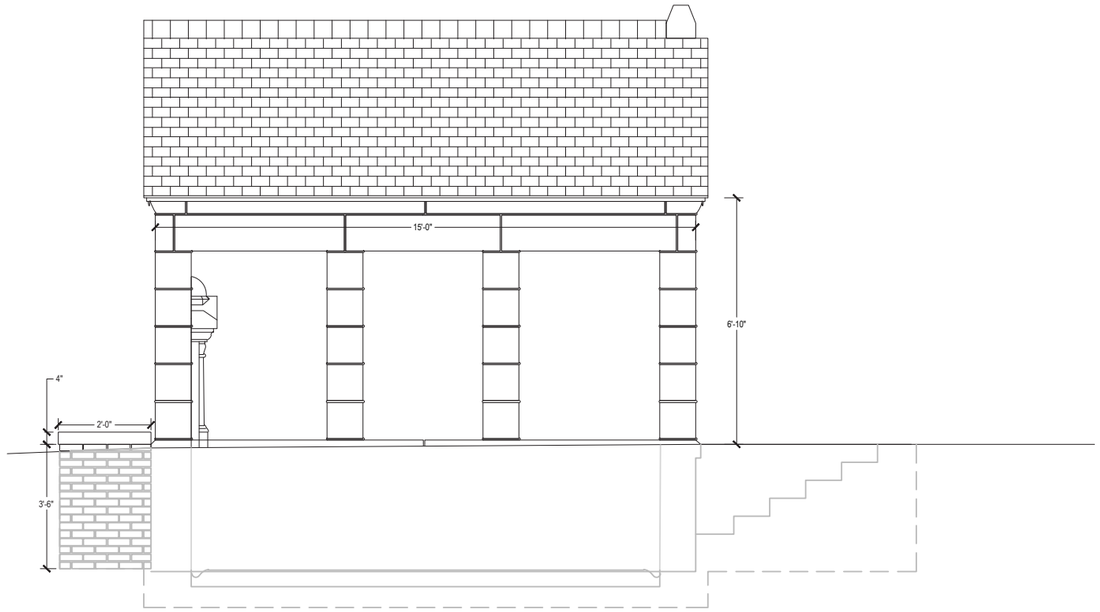
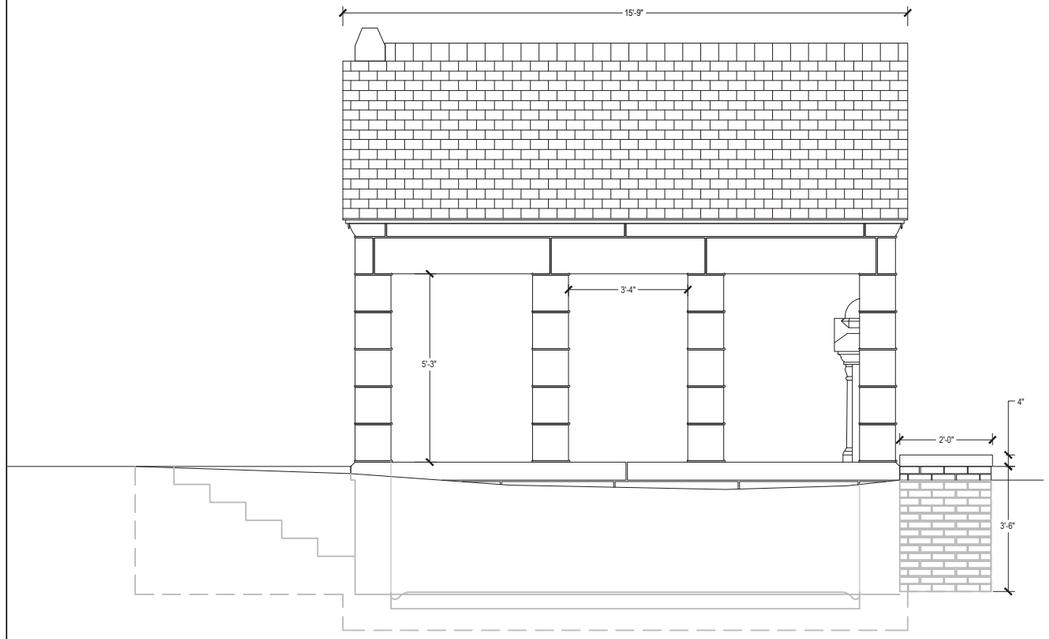


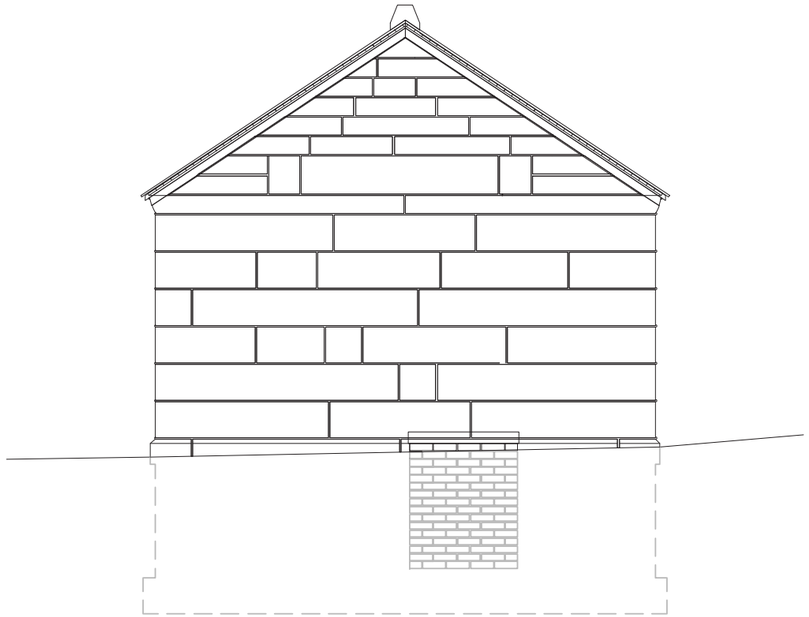
1 A7 NORTH ELEVATION
SCALE - 1" = 4'-0"



2 A7 WEST ELEVATION
SCALE - 1" = 4'-0"



1 A7 SOUTH ELEVATION
SCALE - 1" = 4'-0"



2 A7 EAST ELEVATION
SCALE - 1" = 4'-0"

SCALE (A) 4 0 4 8 1" = 4'-0"
SCALE OF FEET

DESIGNED: CJ DRAWN: LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 7	TITLE OF SHEET SPRING HOUSE ELEVATIONS PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 7 OF 17

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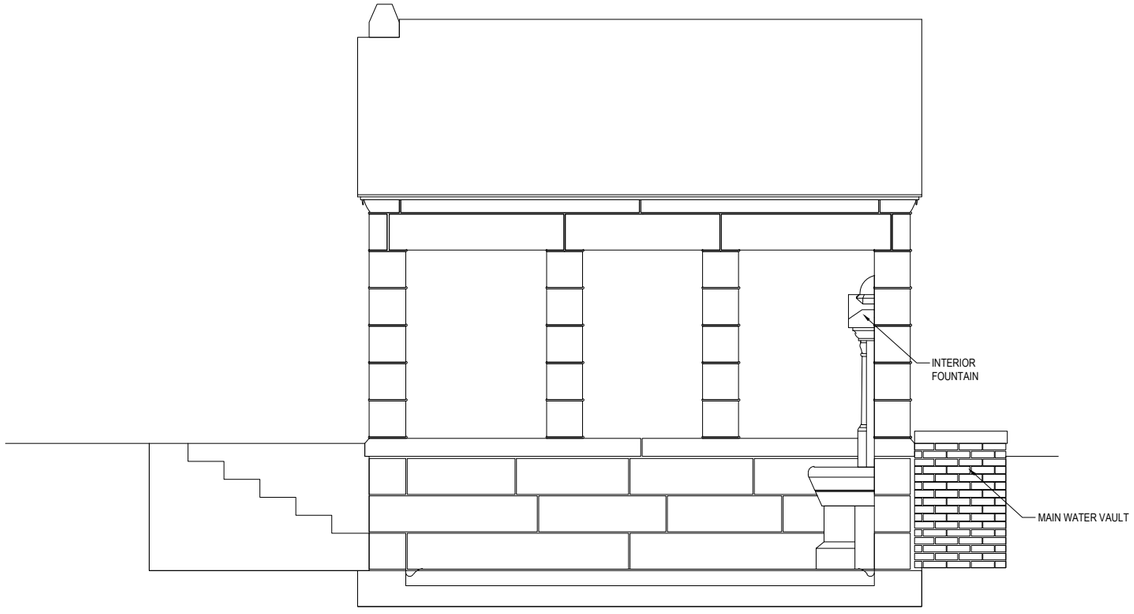
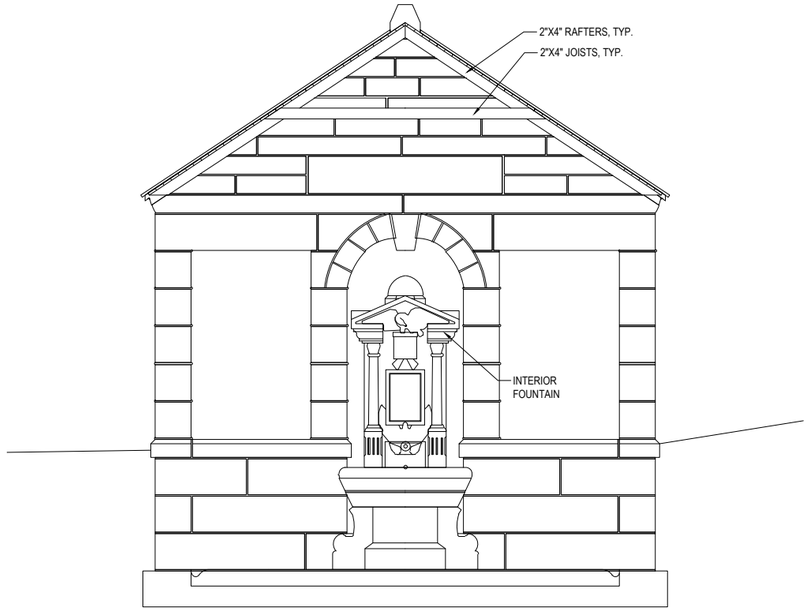


1 A8 "EAST-WEST" SPRING HOUSE SECTION
SCALE - 1" = 4'-0"



2 A8 "NORTH-SOUTH" SPRING HOUSE SECTION
SCALE - 1" = 4'-0"

SCALE (A) 4 0 4 8 SCALE OF FEET 1" = 4'-0"

DESIGNED: CJ DRAWN: LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 8	TITLE OF SHEET SPRING HOUSE SECTIONS PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE—ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 8 OF 17

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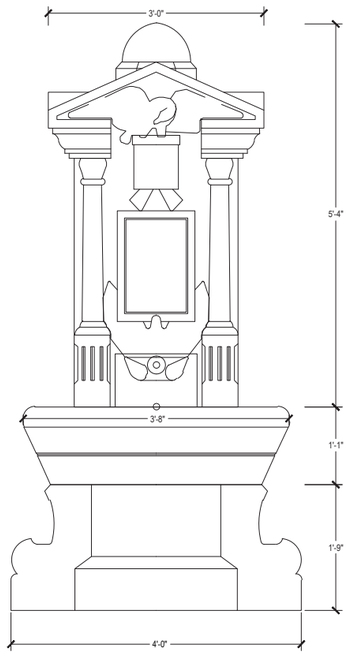
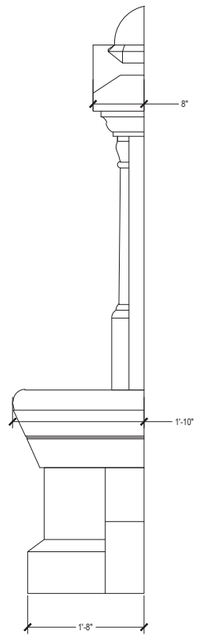
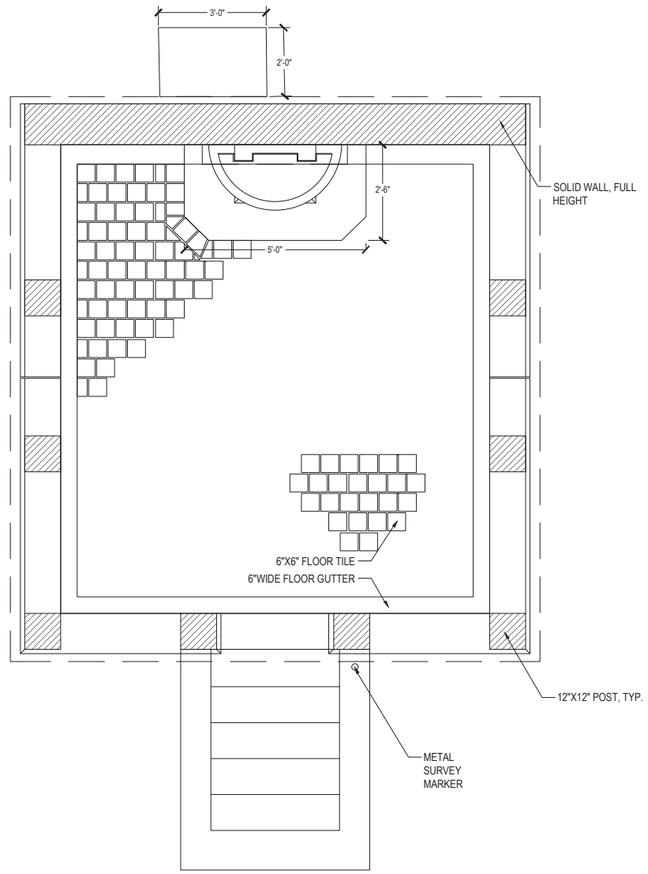




3 A9 INTERIOR FOUNTAIN ELEVATIONS



2 A9 SPRING HOUSE PLAN

SCALE (A) 4 0 4 8 SCALE OF FEET 1" = 4'–0"

DESIGNED: CJ DRAWN: LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 9	TITLE OF SHEET INTERIOR FOUNTAIN DETAILS PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 9 OF 17

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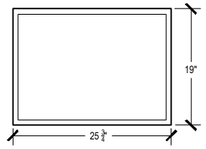
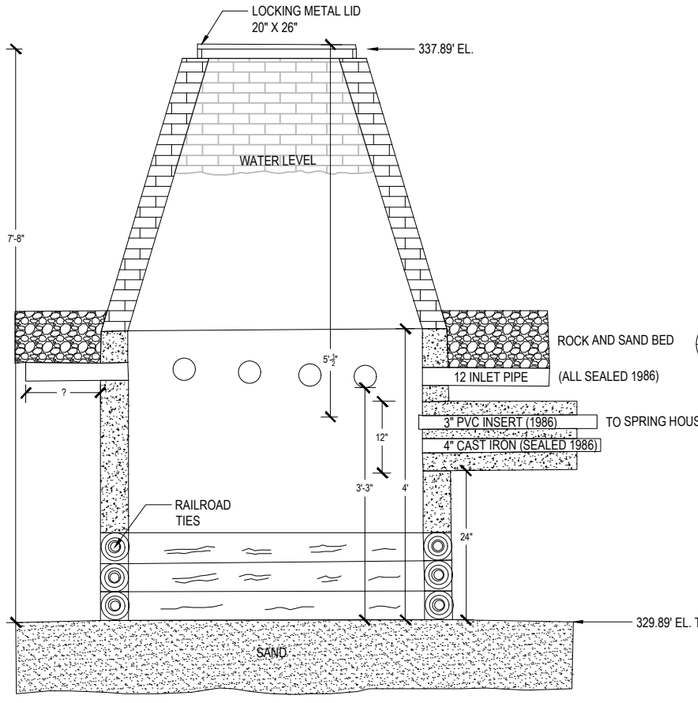
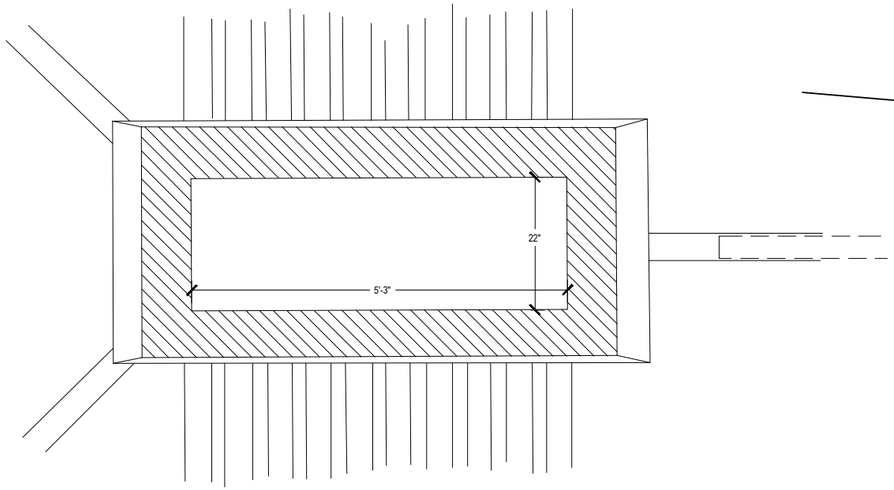
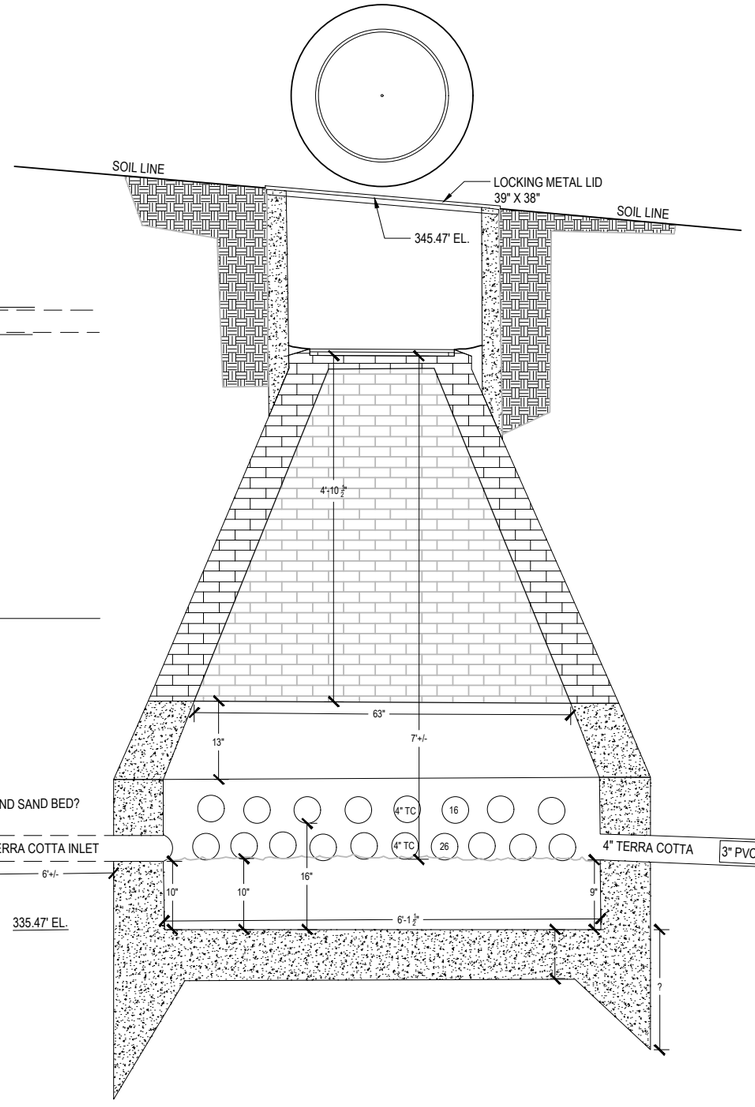


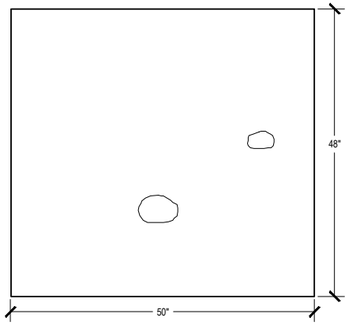




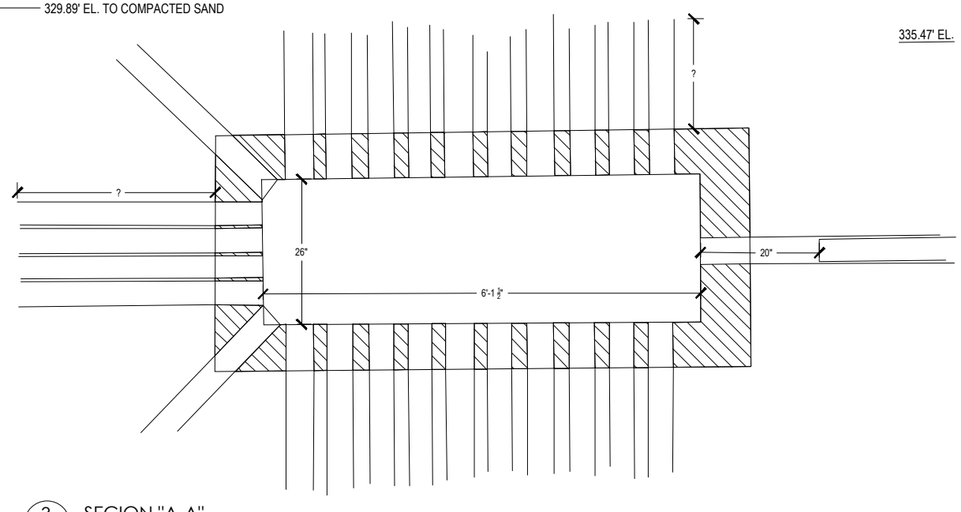
2 A10 SECION "B-B"



4 A10 NO. 1 SPRING



1 A10 NO. 2 SPRING



3 A10 SECION "A-A"

NOTE: DRAWINGS ON THIS SHEET TRACED FROM 1986 MEASURED DRAWINGS OF PROVIDENCE SPRING (SEE APPENDIX A-10)

SCALE A 1 0 1 2 1" = 1'-0"
SCALE OF FEET

DESIGNED: CJ CADD LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 10	TITLE OF SHEET CISTERNS PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE. INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 10 OF 17

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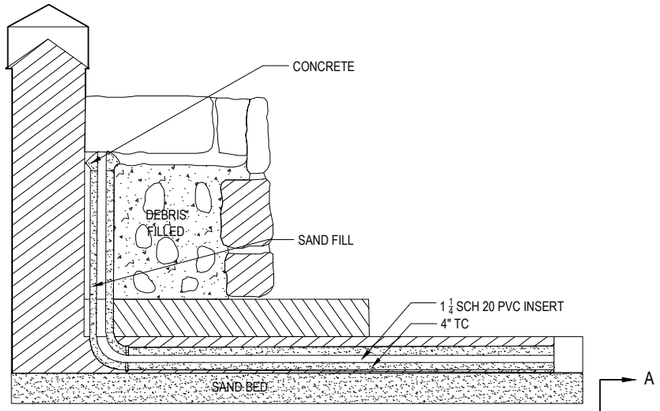
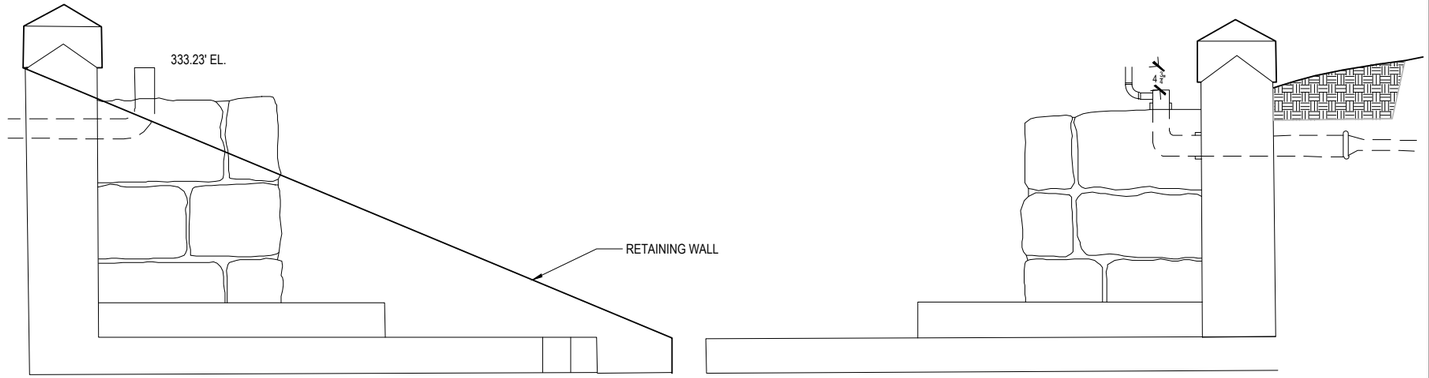
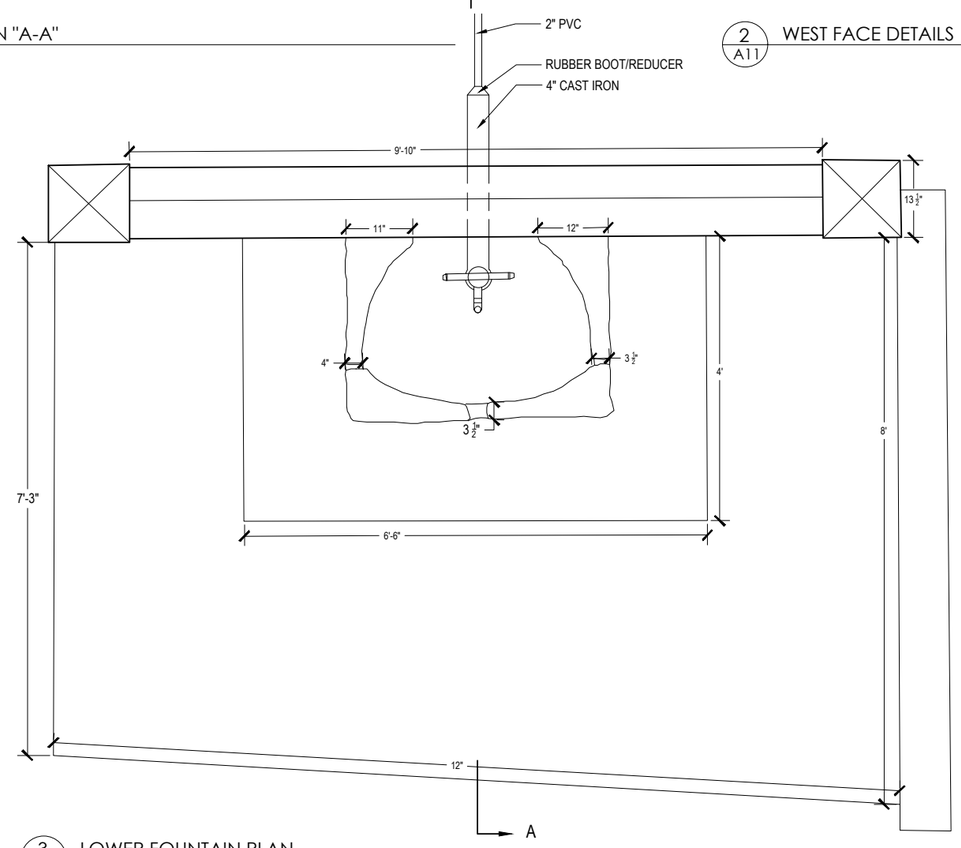


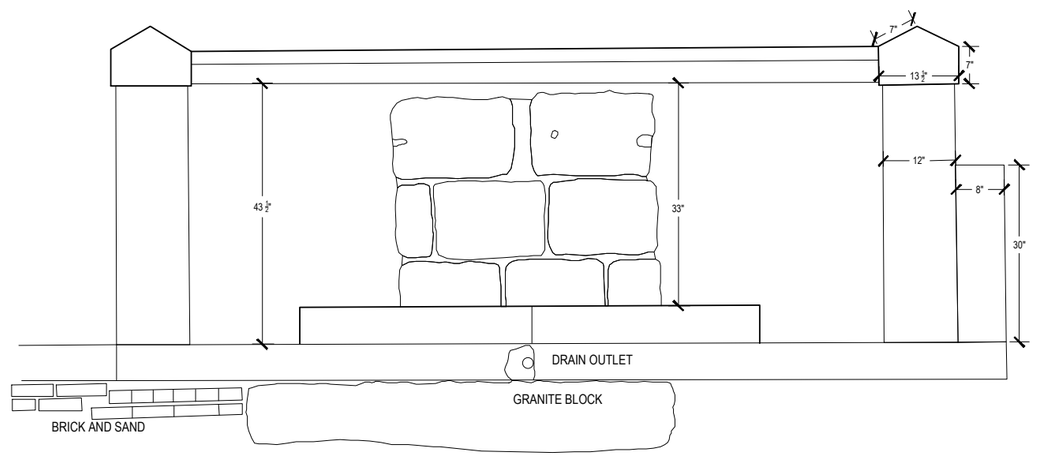
1 A11 SECTION "A-A"



2 A11 WEST FACE DETAILS



3 A11 LOWER FOUNTAIN PLAN
SCALE - 1" = 4'-0"



4 A11 SOUTH FACE DETAILS
SCALE - 1" = 4'-0"

NOTE: DRAWINGS ON THIS SHEET TRACED FROM 1986 MEASURED DRAWINGS OF PROVIDENCE SPRING (SEE APPENDIX A-10)

SCALE A 4 0 4 8
SCALE OF FEET
1" = 4'-0"

DESIGNED: CJ DRAWN: LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 11	TITLE OF SHEET LOWER FOUNTAIN PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE—ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489/175064 PMIS/PKG NO. 258006 SHEET 11 OF 17

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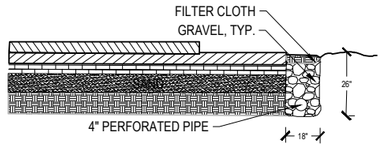
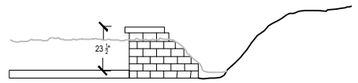
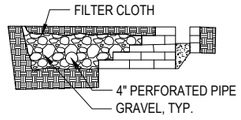


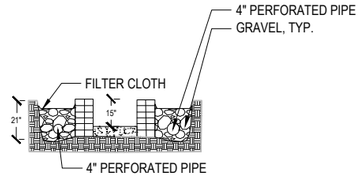
1 A12 SECTION "A-A" FRENCH DRAIN
SCALE - 1" = 1'-0"



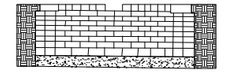
2 A12 SECTION "B-B"
SCALE - 1" = 1'-0"



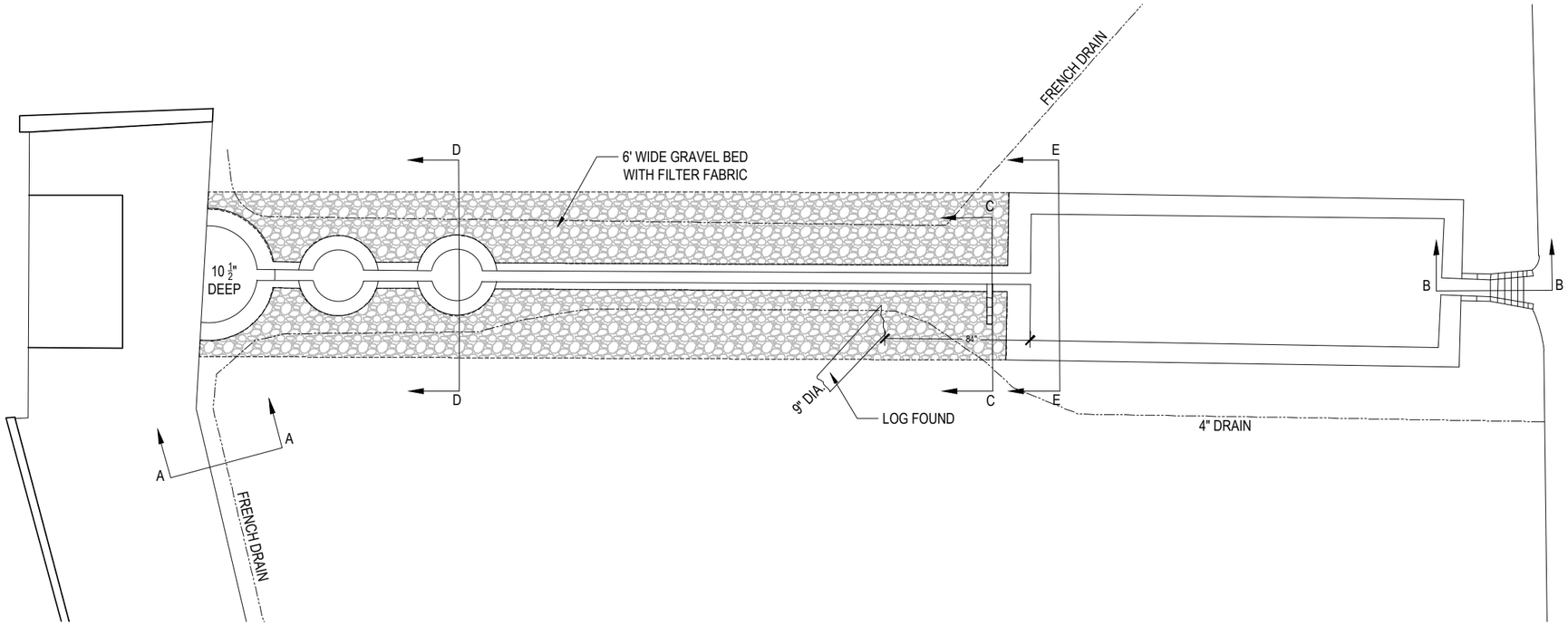
3 A12 SECTION "C-C"
SCALE - 1" = 1'-0"



4 A12 SECTION "D-D"
SCALE - 1" = 1'-0"



5 A12 SECTION "E-E"
SCALE - 1" = 4'-0"



6 A12 LOWER FOUNTAIN, RUNNEL AND REFLECTING POOL PLAN
SCALE - 1" = 2'-0"

DESIGNED: CJ CADD LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 12	TITLE OF SHEET BRICK RUNNEL AND REFLECTING POOL PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE—ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE. INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 12 OF 17

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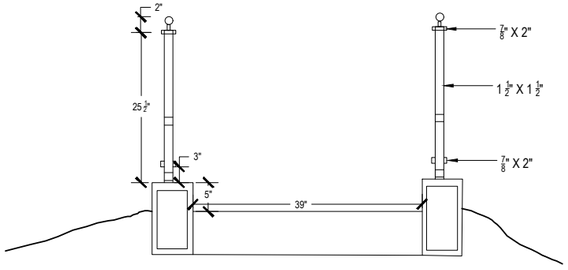
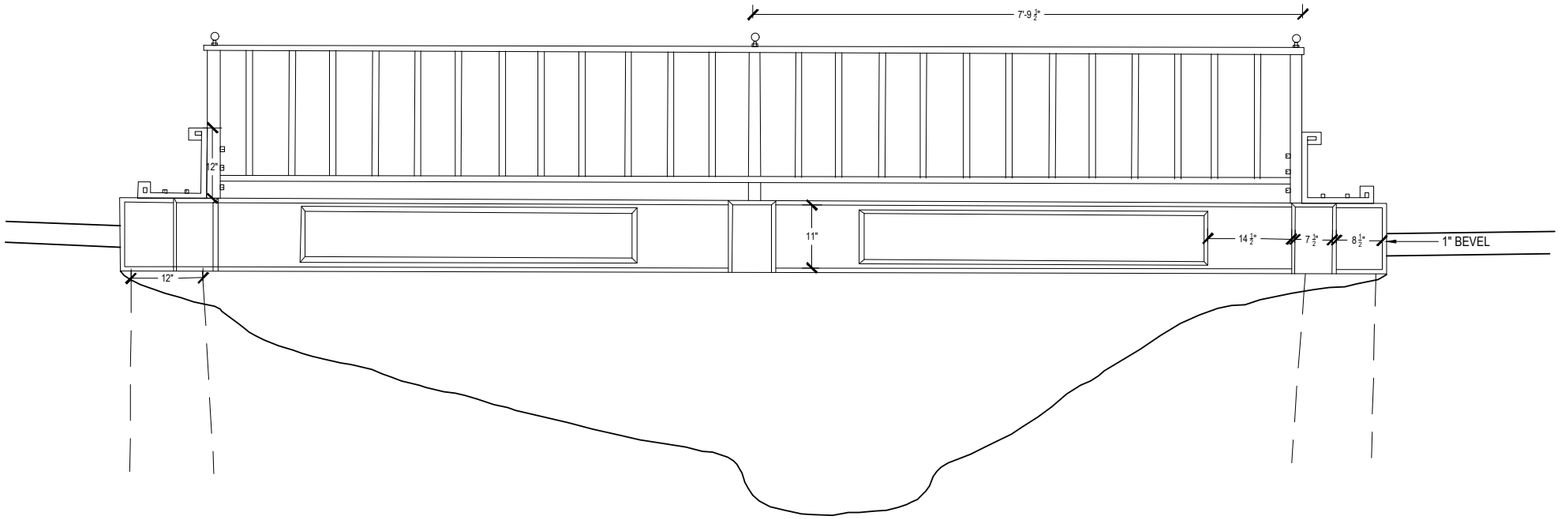


2 A13 FOOT BRIDGE - WEST ELEVATION



2 A13 FOOT BRIDGE - SOUTH ELEVATION

SCALE Ⓐ 1 0 1 2 SCALE OF FEET 1" = 1'-0"

DESIGNED: CJ PARD LR TECH. REVIEW: HPTC DATE: 04/13/2021	SUB SHEET NO. 13	TITLE OF SHEET FOOTBRIDGE PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE—ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 13 OF 17

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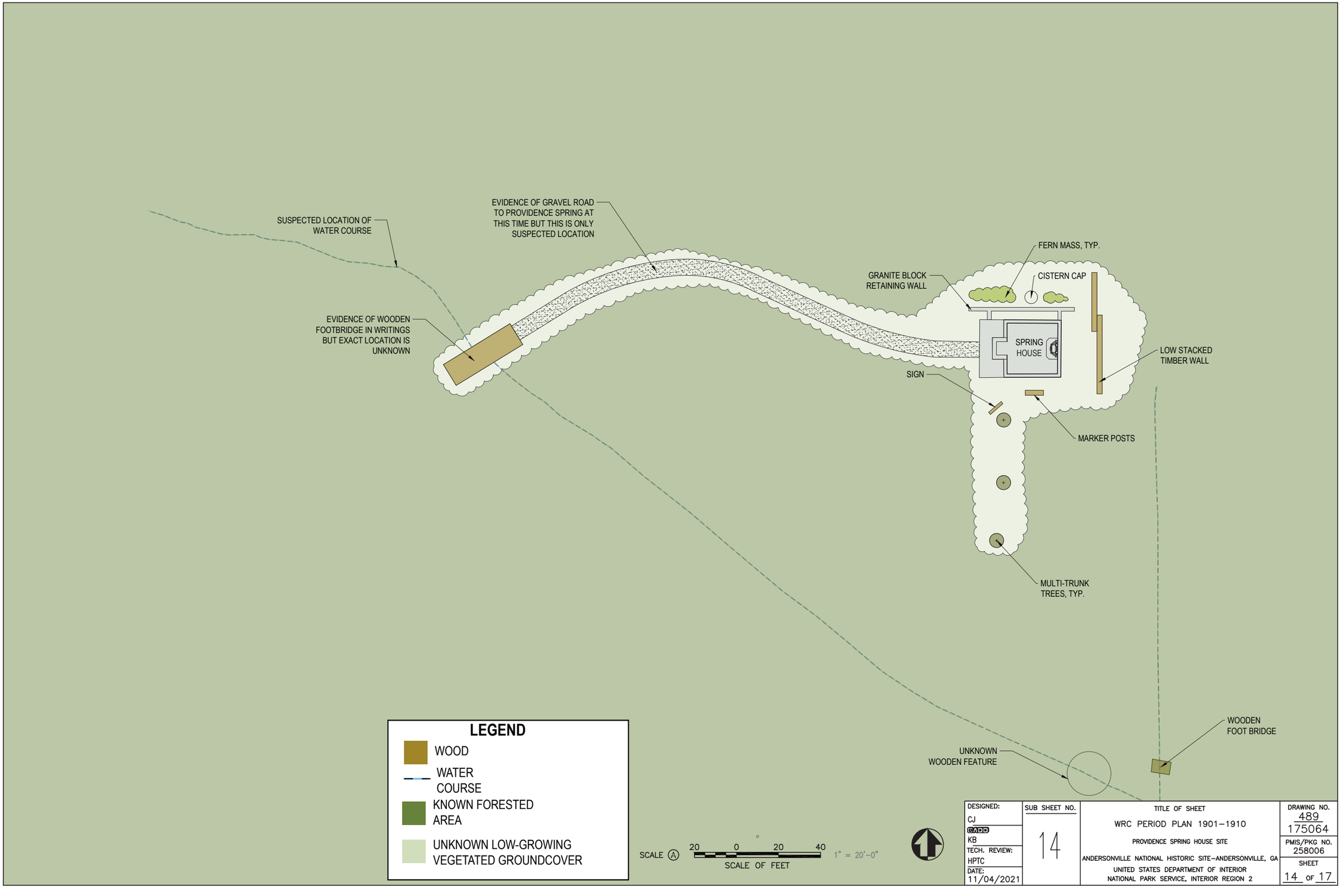

DESIGNED: CJ DRAWN: KB TECH. REVIEW: HPTC DATE: 11/04/2021	SUB SHEET NO. 14	TITLE OF SHEET WRC PERIOD PLAN 1901–1910 PROVIDENCE SPRING HOUSE SITE ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	DRAWING NO. 489 175064 PMIS/PKG NO. 258006 SHEET 14 OF 17

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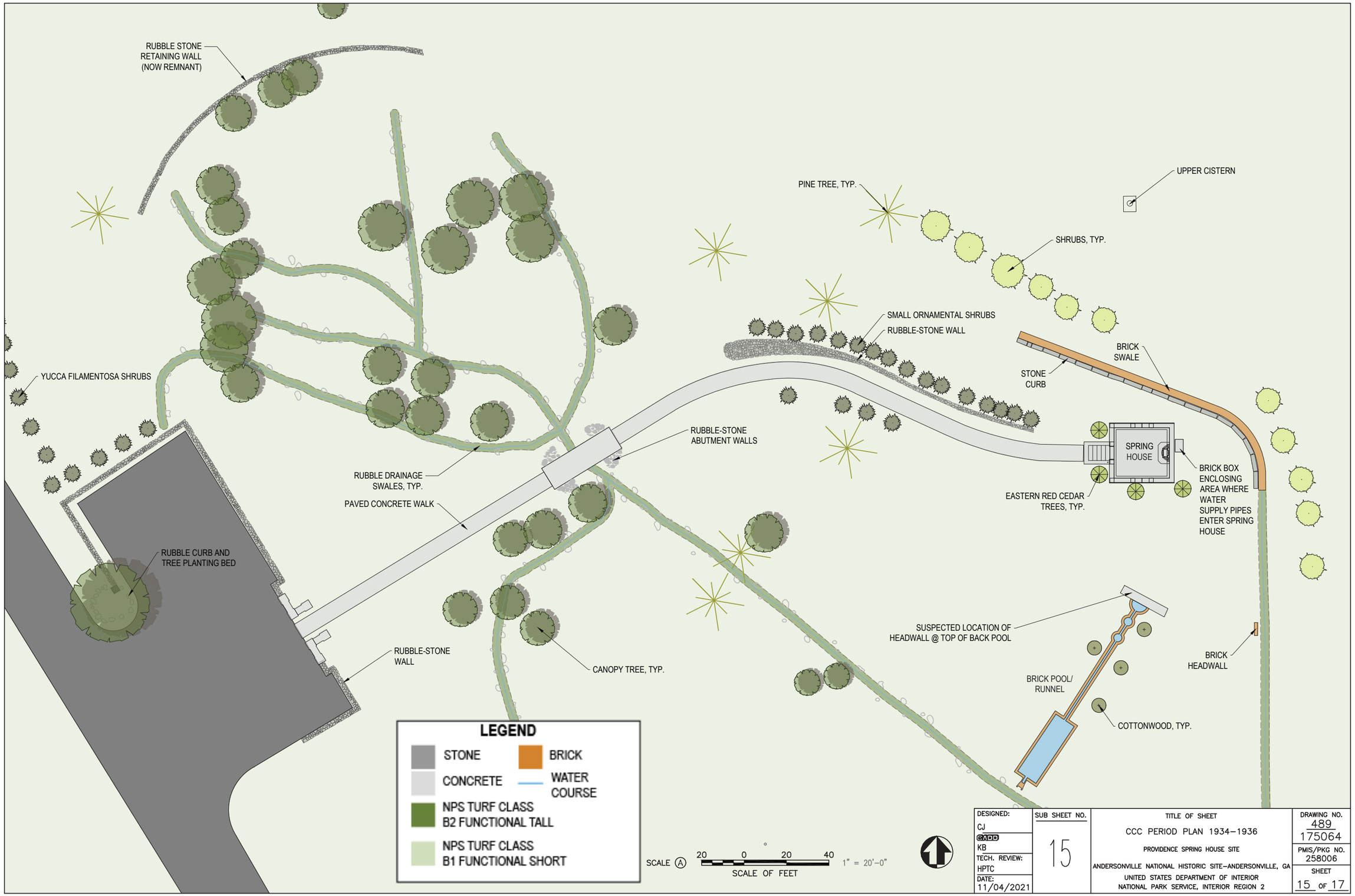

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TECH. REVIEW: HPTC		ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA	SHEET 15 OF 17
DATE: 11/04/2021		UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	

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UPPER CISTERN

RUBBLE-STONE WALL

MATURED ORNAMENTAL SHRUBS

BRICK SWALE

EASTERN RED CEDAR, TYP.

CONCRETE SWALES

STONE BLOCK CURB

LOWER CISTERN (SUSPECTED ADDITION IN 1941)

SPRING HOUSE

RUBBLE ABUTMENT WALL, POSSIBLY TRANSITIONED TO CONCRETE STUCCO COATING DURING ARMY ADMINISTRATION

RUBBLE-STONE WALL

CANOPY TREE, TYP.

SIGN

CONCRETE WALK, STEPS, RETAINING WALL AND LOWER FOUNTAIN ADDED DURING ARMY ADMINISTRATION)

ORNAMENTAL SHRUBS

PRUNED HEDGE

POSSIBLE CULVERT OR DISCARDED STONES

BRICK HEADWALL

COTTONWOOD TREES, TYP.

BRICK POOL/ RUNNEL

SIGN (PRIOR TO 1960)

WOOD AND IRON BENCHES

POSSIBLE BAMBOO MASS

CONCRETE FOOT BRIDGE

6' BRICK PATIO (INSTALLED IN 1960-61)

LEGEND

- STONE
- BRICK
- CONCRETE
- WATER COURSE
- NPS TURF CLASS B2 FUNCTIONAL TALL
- NPS TURF CLASS B1 FUNCTIONAL SHORT

SCALE A 20 0 20 40 SCALE OF FEET 1" = 20'–0"

DESIGNED: CJ	SUB SHEET NO. 16	TITLE OF SHEET: U.S. ARMY PERIOD PLAN 1937–1969	DRAWING NO. 489 175064
CADD KB		PROVIDENCE SPRING HOUSE SITE	PMIS/PKG NO. 258006
TECH. REVIEW: HPTC		ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA	SHEET 16 OF 17
DATE: 11/04/2021		UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	

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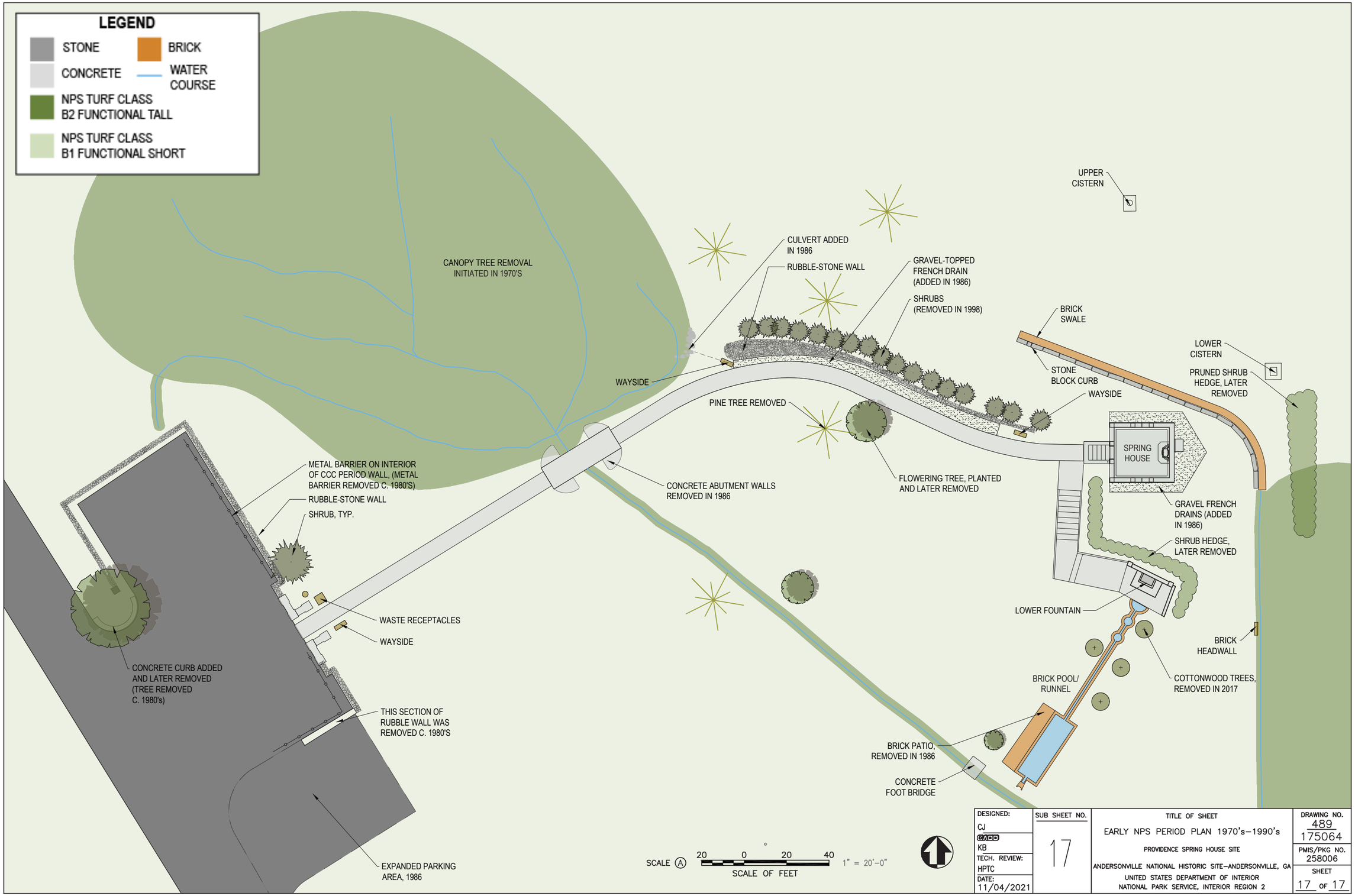

DESIGNED: CJ	SUB SHEET NO. 17	TITLE OF SHEET: EARLY NPS PERIOD PLAN 1970's–1990's	DRAWING NO. 489 175064
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TECH. REVIEW: HPTC		ANDERSONVILLE NATIONAL HISTORIC SITE–ANDERSONVILLE, GA	SHEET 17 OF 17
DATE: 11/04/2021		UNITED STATES DEPARTMENT OF INTERIOR NATIONAL PARK SERVICE, INTERIOR REGION 2	

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Appendix C: Resources for Treatment

C-1 Sheet 1 - RILEM Field Test Method

C-2 Sheet 2 - Siloxane PD Product Data Sheet

C-3 Sheet 3 - H100 Product Data Sheet

C-4 Sheet 4 - OH100 Product Data Sheet

C-5 Sheet 5 - Recommendations for Mortar Replacement Table

C-6 Sheet 6 - NPS Preservation Brief #1

C-7 Sheet 7 - NPS Preservation Brief #15

C-8 Sheet 8 - NPS Preservation Brief #29

C-9 Sheet 9 - NPS Preservation Brief #40

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MEASUREMENT OF WATER ABSORPTION UNDER LOW PRESSURE

Rilem Test Method - Test No. II.4

Introduction

RILEM (Reunion Internationale des Laboratoires D'essais et de Recherches sur les Materiaux et les Constructions), with headquarters in Paris, is the International Union of Testing and Research Laboratories for Materials and Structures. As with our American Society for Testing and Materials (ASTM), Technical Committees are formed within RILEM to develop standard methods for measuring properties and evaluating the performance and durability of many different building materials.

One such technical committee, Commission 25-PEM, developed tests to measure the deterioration of stone and to assess the effectiveness of treatment methods. The standard tests drafted by Commission 25-PEM fall within several categories, including methods for determining internal cohesion (III.), for measuring mechanical surface properties (IV.), and for detecting the presence and movement of water (II.). Within category II., is Test Method No. II.4, designed to measure the quantity of water absorbed by the surface of a masonry material over a definite period of time.

RILEM Test Method II.4 provides a simple means for measuring the rate at which water moves through porous materials such as masonry. The test can be performed at the site or in the laboratory and can be used to measure vertical or horizontal water transport. Water permeability measurements obtained in the laboratory can be used to characterize unweathered, untreated masonry. Measurements made at the site (or on samples removed for laboratory testing) can be used to assess the degree of change due to weathering that the material has undergone. Test Method II.4 can also be used to show a level of change in surface porosity delivered by a water-repellent treatment. A description of the equipment and procedure for conducting this test is provided in paragraphs below.

Theory

Because masonry building materials are porous, they are all somewhat permeable to water. The internal structure of a masonry material is a system of fine interconnected pores. Wetting by liquid water involves capillary conduction (suction) through this pore system, proceeding along both vertical and horizontal pathways. Moisture transport occurs when water in soils enter at the base of a structure or as rainwater through leaking gutters or rain on wall surfaces. (Under actual conditions, the amount of rain penetration depends on various conditions as well as on the composition and condition of the exposed surface.)

When liquid water comes into contact with a masonry surface, wetting proceeds through the material as a front. Accurate measurements of the advance of this wetting front made on a variety of masonry building materials have demonstrated that the characteristic wetting rate and pattern of each material are directly related to it capillary structure and port size distribution. In fact, rate constants have been measured for brick, limestone and other masonry materials. RILEM Test Method II.4 provides a simple method for measuring the volume of water absorbed by a material within a specified time period.

Equipment

The equipment necessary for measuring water absorption under low pressure is simple. The test can be performed at the site or in the laboratory with a test apparatus available in two forms. One is designed for application to vertical surfaces and measures horizontal transport of water. A second form is designed for application to horizontal surfaces and measures vertical transport.

Figure 1 illustrates the pipe-like apparatus designed for vertical surfaces. Its flat, circular brim (at the bottom end of the pipe) is affixed to the masonry surface by interposing a piece of putty. The open, bottom end of the pipe has an area of 4.9 cm^2. The vertical tube is graduated from 0 to 5 mL with each gradation representing an increment of 0.5 mL (It is therefore possible to estimate to 0.25 mL). The total height of the column of water applied to the surface, measured from the center point of the flat, circular brim to the topmost gradation, is 12 cm.

The apparatus designed for application to horizontal surfaces, similar to the one for vertical surfaces described above, is illustrated in Figure 2. The horizontal tube is graduated in the same way as the vertical tube. The total height of the column of water applied to the surface, measures from the flat, circular brim to the topmost gradation, is 13.4 cm.

Procedure

The testing apparatus is affixed by interposing a tape of putty between the flat, circular brim of the pipe and the surface of the masonry material. To ensure adhesion, manual pressure is exerted on the cylinder. Water is then added through the upper, open end of the pipe until the column reaches the "0" gradation mark. The quantity of water absorbed by the material during a specified period of time is read directly from the graduated tube. The periods of time appropriate for the test depend on the porosity of the material on which the measurement is being made; generally 5, 10, 15, 20, 30 and 60-minute intervals provide the most useful data. In many cases, it may be important to measure water absorption through the mortar joint as well as the surface of the brick (or natural stone) substrate.

Report

Results of the test measurements are presented in the form of a water absorption graph with the volume of water absorbed in milliliters reported as a function of time in minutes. The masonry surface tested must be mentioned in the report.

Applications

NEW CONSTRUCTION

Water has long been associated with deterioration processes affecting masonry materials. Its presence within the interior pore structure of masonry can result in physical destruction if the material undergoes wet/dry or freeze/thaw cycling. The latter is particularly damaging if the masonry material has a high clay mineral content. Perhaps of greater importance is the fact that the presence of moisture is a necessary precondition for many deterioration processes. Pollutant gasses are harmful when they are dissolved in water; fluorescence phenomena are dependent on the migration of salts dissolved in water; moisture is a requirement for the growth of biological organisms. Because of these factors, the water permeability of a masonry material can be related to its durability. Thus, results obtained using Test Method II.4 can be used to predict potential vulnerability of untreated, un-weathered masonry materials to water-related deterioration.

RILEM Test Method II.4 can be used to evaluate the performance of a water repellent treatment. A comparison of test results obtained on treated masonry samples with those obtained on untreated samples provides information about the degree of porosity reduction provided by the water repellent treatment.

EXISTING CONSTRUCTION

Test Method II.4 also provides useful information when carried out on weathered masonry surfaces. Water permeability of a material is affected when its surface is obscured by the presence of atmospheric soiling or biological growth, or when there are hygroscopic salts within the interior. The formation of a weathering crust due to mineralogical changes occurring on the exposed (weathered) surface may substantially affect water permeability measurements. By comparing data obtained on masonry that has been exposed to the elements with measurements made on un-weathered samples, it is possible to measure the degree of change that has occurred in surface porosity.

TYPICAL USE OF RILEM TUBES – COMPARATIVE TESTING

The best use for a Rilem tube would be for comparative measurements such as (1) before and after surface treatments, (2) comparing surface porosity at an area with interior moisture problems compared to an area without interior moisture problems, (3) comparing an area with surface efflorescence to a similar surface without efflorescence, (4) comparing porosity of building units to the porosity of the mortar joints, etc.

Note: A Rilem tube is used to provide a measurement related to the porosity/moisture absorption of a material and/or its surface. The measurement achieved by this process does not indicate a positive or negative condition but rather the rate of absorption at a specific location. Material that easily absorbs moisture typically allows for easy desorption. If rapid moisture absorption were a negative, none of the low fired soft brick structures with arcane lime mortars would still be standing. The viability and possible deterioration of a material is a more complex process and well beyond the simple fact of available moisture. In historic preservation, the Rilem test is typically used to show that surface porosity is not the problem.

(1) If it is determined that a treatment to reduce surface absorption is beneficial then a Rilem test before and after the surface treatment would indicate a relative differential measurement related to surface absorption.

(2) When surface porosity is being considered a possible source of interior moisture problems, applying the Rilem test method on the exterior surface of the related problem area provides a standard for testing other similar surfaces to determine if the problem area has a greater porosity. The Rilem test should be applied to exterior locations on the same building - on the same elevation exposure, with the same material, etc. - trying to match all of the same conditions as the problem area with the exception of no interior moisture problems. If the surface porosity measurements of the areas with no interior problem matches or are similar to the surface measurement of the problem area, it is a likely assumption that surface porosity is not the problem.

(3) When efflorescence is visible on the surface of the masonry material, it typically indicates that moisture has been traveling through the masonry substrate picking up soluble salts along the way and then depositing them on the surface where evaporation of moisture occurs. Visible surface efflorescence typically does not occur where the absorption condition is strictly a surface process. Not enough soluble salts are available within that absorption / desorption zone for efflorescence to accumulate. The area of efflorescence should be cleaned of the crystalline contamination in order for the Rilem adhesive to be able to secure the tube appropriately to the surface. Once that is achieved, a comparison of the absorption measurement at the efflorescence area compared to a non-efflorescence area can be undertaken. The existing elevated salt content in an area of efflorescence may increase water absorption in the surface and may also cause a visible ring of moisture to spread out from around the area where the Rilem tube is in contact with the wall.

(4) The traditional logic of building a masonry wall is that the mortar joints are more porous than the building units, i.e.: bricks, blocks, stone, etc. If a masonry wall has been re-pointed with a mortar that is harder and allows less moisture to migrate through it then the path of least resistance becomes the building units themselves. In these situations the surfaces of the bricks (or other masonry units) can be seen to deteriorate leaving the mortar joint proud (extending beyond the deteriorated surface of the masonry units). Using the Rilem test for measuring the surface porosity of the building units compared to the surface porosity of the mortar joint would be an appropriate application when these conditions are observed. This test may also be appropriate on proposed mortars prior to approving materials for a re-pointing project.

References

Amoroso, G. and Fassina, V. Stone Decay and Conservation. Amsterdam: Elsevier Science Publishers, 1983. (See especially Chapter 1, "Effects of water and soluble salts on stone decay".)

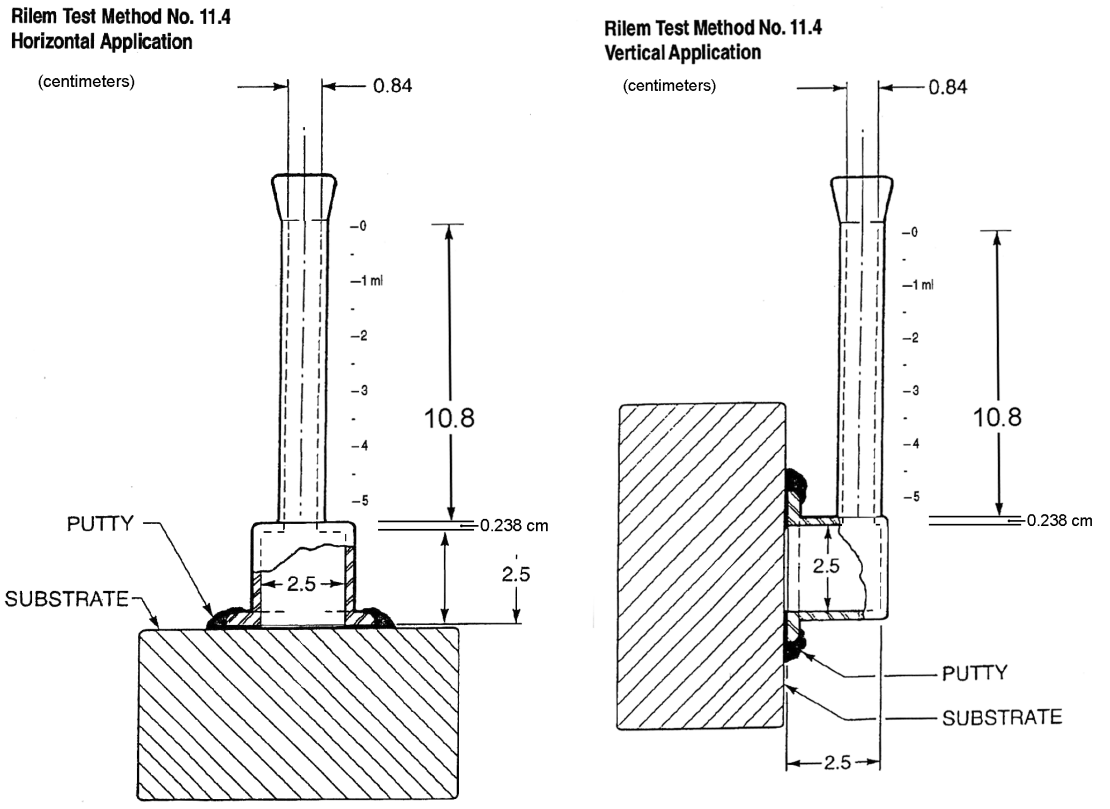
Hochman, Harry. "Measuring water permeability of masonry walls" (Technical Note N-1179). National Civil Engineering Laboratory, August 1971.

Sereda, P. J. and Feldman, R. H. "Wetting and Drying of Porous Materials" (Canadian Building Digest 130). Ottawa: National research Council of Canada, 1975.

Stambolov, T. and van Asperen de Boer, J.R.J. The Deterioration and Conservation of Porous Building Materials and Monuments. Rome: ICCROM, 1976.

Torraca, Giorgio. Porous Building Materials. Rome: ICCROM, 1981.

Original Document Compiled by Frances Gale, September, 1987.
Latest Modification and Edit by Bryan Blundell, PRG, Inc. 2015



Rilem Method - Revised - 2

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PROSOCO®

Sure Klean® Weather Seal

PROTECTIVE TREATMENTS

Siloxane PD

Sure Klean® Weather Seal Siloxane PD (predilute) is a ready-to-use, water-based silane/siloxane water repellent for concrete and most masonry and stucco surfaces. Siloxane PD will not impair the natural breathing characteristics of treated surfaces. It helps masonry resist cracking, spalling, staining and other damage related to water intrusion. Low odor and alkaline stable, Siloxane PD is ideal for field and in-plant application.

SAFETY INFORMATION

Always read full label and SDS for precautionary instructions before use. Use appropriate safety equipment and job site controls during application and handling.

24-Hour Emergency Information:
INFOTRAC at 800-535-5053

SEALANT • WATERPROOFING & RESTORATION INSTITUTE

Issued to: PROSOCO Inc.
Product: Sure Klean® Weather Seal Siloxane PD

ASTM D 6532: Water Absorption Reduction – Mortar 98.34%

ASTM C 67: Water Absorption Reduction – Brick 89.14%

ASTM C 140: Water Absorption Reduction – CMU 92.55%

ASTM D 6490: Water Vapor Transmission WVT (grains/h ft2) 1.81; Permeance 4.43

Validation Date: 2/15/18 – 2/14/23

No. 218-SPD223 *Copyright © 2018*

CLEAR PENETRATING VERTICAL WATER REPELLENT VALIDATION PROGRAM
www.swrionline.org

NOTE: The SWR Institute Validation Program uses standardized testing for validation purposes, including testing on CMU. PROSOCO **does not** recommend the use of Siloxane PD on CMU. Please reference the Substrate Chart on page 2.

ADVANTAGES

- **Penetrates deeply for long-lasting protection on vertical or horizontal surfaces.**
- **Service life is estimated at more than 10 years.**
- **Treated surfaces "breathe" – does not trap moisture.**
- **Water-based formula minimizes explosion and fire hazards compared to solvent-based water repellents.**
- **Appropriate for use on manufactured stone surfaces.**
- **Easy cleanup with Enviro Klean® 2010 All Surface Cleaner.**
- **Low odor for safer application to occupied buildings.**
- **Alkaline stable – suitable for new "green" concrete, 14–28 days old.**
- **Ready-to-use. No on-site dilution required.**

Limitations

- Will not keep water out of cracks, defects or open joints.
- Not recommended for below-grade application.
- Not suitable for application to synthetic resin paints, gypsum, or other non masonry surfaces.

REGULATORY COMPLIANCE

VOC Compliance

Sure Klean® Weather Seal Siloxane PD is compliant with the US Environmental Protection Agency's AIM VOC regulations. Visit www.prosoco.com/voccompliance to confirm compliance with individual district or state regulations.

Product Data Sheet
Weather Seal Siloxane PD

TYPICAL TECHNICAL DATA

FORM	Cloudy white liquid, odorless
SPECIFIC GRAVITY	0.996
pH	4–5
WT/GAL	8.29 lbs
ACTIVE CONTENT	7%
TOTAL SOLIDS	4% ASTM D 5095
VOC CONTENT	<30 g/L Low Solids Coating
FLASH POINT	>212° F (>100° C) ASTM D 3278
FREEZE POINT	32° F (0° C)
SHELF LIFE	1 year in tightly sealed, unopened container

PREPARATION

Protect people, vehicles, property, plants, windows and all non masonry surfaces from product, splash, residue, fumes and wind drift. Protect and/or divert foot and auto traffic.

Thoroughly clean the surface using the appropriate PROSOCO product. Clean newly constructed and repointed surfaces before application. Siloxane PD won't impair adhesion of most sealing and caulking compounds. Always test for compatibility.

Though Siloxane PD may be applied to slightly damp surfaces, best performance is achieved on clean, visibly dry and absorbent surfaces. Excessive moisture inhibits penetration, reducing the service life and performance of the treatment.

The top of walls need to be capped and made watertight prior to application.

Window Glass Protection

Protect window glass before use. Sure Klean® Strippable Masking is effective protection for use with this product. If protecting windows is impractical, follow these steps:

1. Clean window glass thoroughly before application to nearby concrete or masonry.
2. Don't use in wind or when air or surface temperatures are hotter than 95°F (35°C).
3. Try to keep Siloxane PD off the glass.
4. After treated surfaces have been protected from water for 6 hours, if product is on window glass, clean as soon as possible with soap and warm water. Alternatively use Enviro Klean® 2010 All Surface Cleaner to remove dried residues within 3–5 days.

Surface and Air Temperatures

Best surface and air temperatures are 40–95°F (4–35°C) during use and for 8 hours after. If freezing conditions exist before application, let masonry thaw. The water carrier may freeze at low temperatures or evaporate in high temperatures. Both conditions impair penetration and results. Cleanup is more difficult from surfaces hotter than 95°F (35°C).

Equipment

Recommended application is by high volume, low-pressure (<50 psi) spray. Fan spray tips are recommended to avoid atomization. Do not atomize/vaporize the material.

For small scale application, or when spray application is not appropriate, product may be applied using brush or roller. Contact Customer Care or your local PROSOCO representative for more information.

Recommended for these substrates. Always test. Coverage is in sq.ft./m. per gallon.

Substrate	*Type*	*Use?*	*Coverage*
Architectural Concrete Block*	Burnished Smooth Split-faced Ribbed	no no no no	N/A
Concrete	Brick* Tile Precast Panels◆ Pavers Cast-in-place◆	**yes** **yes** **yes** **yes** **yes**	150–200 sq.ft. 14–19 sq.m.
Fired Clay	Brick Tile Terra Cotta (unglazed) Pavers	**yes** **yes** **yes** **yes**	50–175 sq.ft. 5–16 sq.m.
Marble, Travertine, Limestone	Polished	no	N/A
	Unpolished	no	N/A
Granite	Polished	no	N/A
	Unpolished+	no	N/A
Sandstone	Unpolished	**yes**	75–125 sq.ft. 7–12 sq.m.
Slate	Unpolished+	no	N/A

*Weather Seal Blok-Guard® & Graffiti Control is a more appropriate product.

◆See specific application instructions for dense surfaces.

+PROSOCO® SLX100® or SL100 may be a more appropriate product.

Always test to ensure desired results.

Coverage estimates depend on surface texture and porosity.

Storage and Handling
Store in a cool, dry place. Always seal container after dispensing. Do not alter or mix with other chemicals. Published shelf life assumes upright storage of factory-sealed containers in a dry place. Maintain temperature of 45–100°F (7–38°C). Do not double stack pallets. Dispose of unused product and container in accordance with local, state and federal regulations.

APPLICATION
Read "Preparation" and the Safety Data Sheet before use.

ALWAYS TEST a small area of each surface to confirm suitability, coverage rates and desired results before starting overall application. Test with the same equipment, recommended surface preparation and application procedures planned for general application.

Dilution & Mixing
Apply as packaged. Do not dilute or alter.

Vertical Application Instructions
For best results, apply "wet-on-wet" to a visibly dry and absorbent surface.

Sprayer: Saturate from the bottom up, creating a 4–8 inch (15–20 cm) rundown below the spray contact point. Let the first application penetrate for 5–10 minutes. Re-saturate. Less will be needed for the second application.

Brush or Roller
Recommended for small scale application or when spray application is not appropriate. Contact PROSOCO for more information. Saturate uniformly. Let penetrate for 5–10 minutes. Brush out heavy runs and drips that don't penetrate.

Horizontal Application Instructions
Saturate in a single application. Use enough to keep the surface wet for 2–3 minutes before penetration. Broom out puddles until they soak in.

Dense Surface Application Instructions
Apply a single coat. Use enough to completely wet the surface without creating drips, puddles or rundown. Do not over apply. Test for application rate.

Drying Time
Treated surfaces dry to touch in 1 hour. Protect surfaces from rainfall for 6 hours following treatment. Protect from foot and vehicle traffic until visibly dry. Siloxane PD gains its water-repellency properties in 72 hours.

Cleanup
Clean tools, equipment, and over spray with soap and warm water.

Paint Adhesion
Always test to make sure paint sticks to treated surfaces. Improve adhesion before painting by pressure water-rinsing the treated surface, then letting it dry.

Some cementitious coatings, plaster, stucco, etc. may not adhere well to treated surfaces. Install them first and let them thoroughly cure before application. Always test to verify compatibility between Siloxane PD and other proposed surface treatments.

BEST PRACTICES
Surface should be clean, dry and absorbent before application. Clean soiled surfaces with the appropriate Sure Klean® or Enviro Klean® cleaner before application. Call Customer Care toll-free at 800-255-4255 for recommendations.

Recommended application for PROSOCO protective treatments is high volume, low-pressure (<50 psi) spray equipment with a fan-type spray tip and adjustable pressure to avoid atomization of the material. For small scale application, or when spray application is not appropriate, brushes or roller may be used. Contact Customer Care or your local representative for more information on brush/roller application.

Protect treated surfaces from rain for 6 hours following treatment.

ALWAYS TEST for best coverage rates and to confirm results before overall application. Test using the application instructions included herein. Let the test area dry thoroughly before inspection.

Never go it alone. If you have problems or questions, contact your local PROSOCO distributor or field representative. Or call PROSOCO technical Customer Care, toll-free at 800-255-4255.

WARRANTY

The information and recommendations made are based on our own research and the research of others, and are believed to be accurate. However, no guarantee of their accuracy is made because we cannot cover every possible application of our products, nor anticipate every variation encountered in masonry surfaces, job conditions and methods used. The purchasers shall make their own tests to determine the suitability of such products for a particular purpose.

PROSOCO, Inc. warrants this product to be free from defects. **Where permitted by law, PROSOCO makes no other warranties with respect to this product, express or implied, including without limitation the implied warranties of merchantability or fitness for particular purpose**. The purchaser shall be responsible to make his own tests to determine the suitability of this product for his particular purpose. PROSOCO's liability shall be limited in all events to supplying sufficient product to re-treat the specific areas to which defective product has been applied. Acceptance and use of this product absolves PROSOCO from any other liability, from whatever source, including liability for incidental, consequential or resultant damages whether due to breach of warranty, negligence or strict liability. This warranty may not be modified or extended by representatives of PROSOCO, its distributors or dealers.

CUSTOMER CARE

Factory personnel are available for product, environment and job-safety assistance with no obligation. Call 800-255-4255 and ask for Customer Care – technical support.

Factory-trained representatives are established in principal cities throughout the continental United States. Call Customer Care at 800-255-4255, or visit our web site at www.prosoco.com, for the name of the PROSOCO representative in your area.

PROSOCO®

Conservare®

MASONRY & STONE PRESERVATION

H100 Consolidation Treatment

Conservare® H100 Consolidation Treatment is a combination consolidation/water-repellent treatment for badly deteriorated stone that requires consolidation and protection from water. This ethyl silicate/silane treatment, modified with a silane water repellent, replaces the natural binding materials while protecting the treated surface from water-related deterioration.

Conservare® Consolidation Treatments are based on silicic ethyl esters. Their extremely small molecular structure enables them to penetrate deeply into deteriorated masonry surfaces, collecting at contact points between individual stone grains. An internal catalyst and atmospheric humidity then convert the liquid consolidant into a glass-like silicon dioxide (SiO^2) gel which binds the stone particles together.

Exhibiting chemical characteristics and thermal expansion/contraction characteristics which are virtually identical to that of natural stone, the newly deposited SiO^2 cementing matrix replaces the stone's natural cement which has been lost due to weathering influences.

Conservare® H100 may be used on most types of sandstone, limestone, cast stone, stucco, brick and terra-cotta. All patching and pointing materials should be in place before application of H100. Effective on unpolished marble, travertine and limestone that has been treated with Conservare® HCT.

SAFETY INFORMATION

Always read full label and SDS for precautionary instructions before use. Use appropriate safety equipment and job-site controls during application and handling.

24-Hour Emergency Information:
INFOTRAC at 800-535-5053

ADVANTAGES

- **One component – easy-to-use.**
- **Low viscosity allows deep penetration. Will not form hardened surface crust.**
- **The new binder is mineral, similar to the original stone. No synthetic polymers.**
- **Rapid tack free drying – no dirt attraction.**
- **Forms no by-products harmful to the masonry.**
- **Vapor permeable – treated surfaces "breathe."**
- **New binder is acid resistant – resists acid rain.**
- **Appropriate for use on most unpolished surfaces such as travertine, limestone and granite. Always test.**
- **Compatible with PROSOCO's Conservare® HCT consolidation treatment.**

Limitations

- Effective consolidation requires thorough laboratory and field pretesting. Contact PROSOCO for information on the recommended test programs.
- Limited shelf life – remains storage-stable for 12 months in sealed containers.
- Treated areas may bond to silicone and polyurethane molds (frequently used for casting replacement stone). Use a release agent to prevent mold from adhering to treated surface.
- Not suitable for some types of unpolished marble. Always test.
- Not suitable for use on polished surfaces, including marble, travertine, limestone or granite.
- Not for use on architectural concrete block.
- Will not prevent water penetration through structural cracks, defects or open joints.
- Not recommended for below-grade application.
- May not be suitable for sale in states and districts with more restrictive AIM VOC regulations. Available in regulation-exempt small container sizes. Call Customer Care at 800-255-4255 for assistance.

Product Data Sheet
Conserware® H100 Consolidation Treatment

REGULATORY COMPLIANCE

VOC Compliance

Conserware® H100 Consolidation Treatment is compliant with the US Environmental Protection Agency's AIM VOC regulations. Manufactured and marketed in compliance with USEPA AIM VOC regulations (40 CFR 59.403).

Visit www.prosoco.com/voc-compliance to confirm compliance with individual district or state regulations.

TYPICAL TECHNICAL DATA

FORM	Clear, colorless to slight yellow liquid with alcohol odor
SPECIFIC GRAVITY	0.936
pH	Not applicable
WT/GAL	7.79 lbs
ACTIVE CONTENT	100%
TOTAL SOLIDS	47% ASTM D 5095
VOC CONTENT	>400 g/L
FLASH POINT	110°F (43°C) ASTM D 3278
FREEZE POINT	<–22°F (<–30°C)
SHELF LIFE	1 year in tightly sealed, unopened container

THE IMPORTANCE OF PRETESTING

Since building materials differ in their nature and degree of deterioration, each conservation project poses unique problems and requirements. To gain a full understanding of the ongoing deterioration and determine necessary stabilization/conservation measures, a number of laboratory and field tests are required.

Include in the test area any previous repairs and patches, including aesthetic cementitious finishes. Different surface compositions may result in absorption and/or appearance differences.

Laboratory Testing

a. Evaluates the physical and chemical characteristics of the substrate(s) to confirm whether consolidation is possible.
b. Identifies the cause(s) of deterioration and surface preparation procedures necessary for conservation treatment.
c. Determines the most appropriate conservation agent(s) and field application procedures.

For more information on the recommended testing program, read the Conserware® Stone Testing Brochure and contact your PROSOCO representative to arrange a job-site visit.

On-Site Testing

Following lab testing, a test area should be cleaned and allowed to dry. An application of Conserware® H100 Consolidation Treatment is made following specific recommendations provided by the laboratory analysis. The job-site test area should be as large as possible and representative of the condition of the entire project.

The test area is necessary to confirm application procedures under job-site conditions and allow calculation of the masonry's consumption rate. The on-site tests also provide a visible sample of the effects of the treatment on actual job surfaces. Additional core samples can be taken from the test area and tested to verify depth of penetration and proper application procedures.

PREPARATION

Following lab and on-site testing, clean the building with the appropriate Sure Klean® or Enviro Klean® cleaner. In most cases, surface contaminants such as carbon crust, salts, pigeon droppings, mildew and atmospheric stains must be completely removed to assure thorough penetration of H100. (See NOTE below.) In addition, surface sealers and repellents which may have been applied must be thoroughly removed. Contact Customer Care at 800-255-4255 for additional cleaning recommendations.

NOTE: If pre-consolidation is necessary, further evaluation will be required to ensure that no undesirable reactions take place between the consolidation treatment and the surface contaminants which may interfere with further conservation measures, i.e. subsequent cleaning, general consolidation, patching/repair, etc.

Protect people, vehicles, property, metal, glass, plants, painted and all non masonry surfaces from product, splash, fumes and wind drift. Protect and/or divert pedestrian and auto traffic.

Ensure fresh air entry and cross ventilation during application and drying. Extinguish all flames, pilot lights and other potential sources of ignition during use and until all vapors are gone. When applying to exteriors of occupied buildings, make sure all windows, exterior intakes and air conditioning vents are covered and air handling equipment is shut down during application and until all vapors have dissipated.

Surface and Air Temperatures

Surface and air temperatures should be between 50-90°F (10-32°C) during application. Relative humidity should be greater than 40%.

Protect surface to be treated from direct sunlight for several hours before application. If possible, start treatment when surfaces are shaded. Keep surface temperature relatively cool to prevent too rapid evaporation of H100 and to ensure proper penetration. Do not apply during rain, to wet surfaces or when there is a chance of rain.

Equipment

Apply by low-pressure spray, brush or dipping. Larger surfaces should be treated using low-pressure spray equipment, small areas with spray tanks.

Mobile objects such as sculptures may be treated indoors by dipping or with the use of compresses. Contact Customer Care or your local PROSOCO sales manager for additional information.

Storage and Handling

Store in a cool, dry place away from potential ignition sources. Keep tightly closed when not dispensing. Published shelf life assumes upright storage of factory-sealed containers in a dry place. Maintain temperature of 45–100°F (7–38°C). Do not double stack pallets. Dispose of unused product and container in accordance with local, state and federal regulations.

APPLICATION

Read "Preparation" and the Safety Data Sheet before use.

Dilution & Mixing

Use as packaged. Do not dilute or alter. Stir or mix well before use.

Typical Coverage Rates

Coverage rates vary depending on the substrate and deterioration conditions. Laboratory and field testing are necessary to confirm desired results and application procedures.

Application Instructions

Ensure proper penetration and prevent crust formations by applying H100 in repeated applications referred to as "cycles." A cycle consists of three successive saturating applications at 5–15 minute intervals. Typical treatments involve two or three cycles (6–9 separate applications). Allow 20 to 60 minutes between cycles.

Laboratory testing will determine the optimum delay between applications and between cycles. Additional material should be applied until excess material remains visible on the surface for 60 minutes following the last application. Once this degree of saturation is achieved over the entire surface, the first treatment is complete.

Immediately flush excess surface materials using industrial grade MEK (methyl ethyl ketone) or mineral spirits. If a second treatment is necessary, allow two to three weeks curing time following first treatment.

NOTE: Laboratory testing will determine the absorption profile and conservation capacity of the substrate(s). From this information, the optimal delay between saturating coats, and dwell time between cycles will be prescribed. The work area should be limited to a size that can be treated within the prescribed time periods.

Proper timing of the application process will maximize penetration of the consolidation treatment. Deep penetration is critical to the long term benefits of any consolidation treatment.

Dry Time

Protect from rain for two days following application.

Cleanup

Clean tools and equipment immediately with mineral spirits, denatured alcohol or an equivalent cleaning solvent. Remove over spray and spills as soon as possible.

Post-Treatment

Excess material should be removed before application of repair materials. Areas properly treated with Conservare® H100 can receive PROSOCO's BMC® silicone emulsion paint after the consolidation procedures have been completed.

WARRANTY

The information and recommendations made are based on our own research and the research of others, and are believed to be accurate. However, no guarantee of their accuracy is made because we cannot cover every possible application of our products, nor anticipate every variation encountered in masonry surfaces, job conditions and methods used. The purchasers shall make their own tests to determine the suitability of such products for a particular purpose.

PROSOCO, Inc. warrants this product to be free from defects. **Where permitted by law, PROSOCO makes no other warranties with respect to this product, express or implied, including without limitation the implied warranties of merchantability or fitness for particular purpose**. The purchaser shall be responsible to make his own tests to determine the suitability of this product for his particular purpose. PROSOCO's liability shall be limited in all events to supplying sufficient product to re-treat the specific areas to which defective product has been applied. Acceptance and use of this product absolves PROSOCO from any other liability, from whatever source, including liability for incidental, consequential or resultant damages whether due to breach of warranty, negligence or strict liability. This warranty may not be modified or extended by representatives of PROSOCO, its distributors or dealers.

BEST PRACTICES

Since building materials differ in their nature and degree of deterioration, each conservation project poses unique problems and requirements. To gain a full understanding of the ongoing deterioration and determine necessary stabilization/ conservation measures, a number of laboratory and field tests are required.

Protect surface to be treated from direct sunlight for several hours before application. If possible, start treatment when surfaces are shaded.

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Additional material should be applied until excess material remains visible on the surface for 60 minutes following the last application. Once this degree of saturation is achieved over the entire surface, the first treatment is complete.

Never go it alone. If you have problems or questions, contact your local PROSOCO distributor or field representative. Or call PROSOCO technical Customer Care at 800-255-4255.

CUSTOMER CARE

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PROSOCO®

Conservare®

MASONRY & STONE PRESERVATION

OH100 Consolidation Treatment

Conservare® OH100 is a ready-to-use consolidation treatment that stabilizes masonry by replacing the natural binding materials lost due to weathering with silicon dioxide. When properly applied, OH100 penetrates deeply, does not form a dense surface crust, and retains the substrate's natural vapor permeability.

Conservare® Consolidation Treatments are based on silicic ethyl esters. Their extremely small molecular structure enables them to penetrate deeply into deteriorated masonry surfaces, collecting at contact points between individual stone grains. An internal catalyst and atmospheric humidity then convert the liquid consolidant into a glass-like silicon dioxide (SiO_2) gel which binds the stone particles together. Exhibiting chemical characteristics and thermal expansion/contraction characteristics which are virtually identical to that of natural stone, the newly deposited SiO_2 cementing matrix replaces the stone's natural cement which has been lost due to weathering influences.

In addition to the general consolidation of severely deteriorated masonries, Conservare® OH100 is an effective pretreatment for friable substrates that need to be strengthened before cleaning, patching or coating. OH100 may be used on most types of natural stone, concrete, stucco, brick, terra-cotta, etc.

Conservare® OH100 is effective on unpolished marble, travertine and limestone that has been treated with Conservare® HCT.

SAFETY INFORMATION

Always read full label and SDS for precautionary instructions before use. Use appropriate safety equipment and job-site controls during application and handling.

24-Hour Emergency Information:
INFOTRAC at 800-535-5053

ADVANTAGES

- **One component – easy-to-use. Strengthens deteriorated stone.**
- **Low viscosity allows deep penetration. Will not form hardened surface crust.**
- **The new binder is mineral, similar to the original stone. No synthetic polymers.**
- **Rapid tack free drying – no dirt attraction.**
- **Forms no by-products harmful to the masonry.**
- **Treated surfaces "breathe." Doesn't trap moisture.**
- **New binder is acid resistant – resists acid rain.**
- **Appropriate for use on most unpolished surfaces such as travertine, limestone and granite. Always test.**
- **Compatible with PROSOCO's Conservare® HCT consolidation treatment.**

Limitations

- Effective consolidation requires thorough laboratory and field pretesting. Contact PROSOCO for information on the recommended test programs.
- Limited shelf life. Remains storage stable for approximately 12 months in sealed containers.
- Treated areas may bond to silicone and polyurethane molds (frequently used for casting replacement stone). Use a release agent to prevent molding compounds from adhering to the treated surface.
- Not suitable for architectural concrete block and some types of unpolished marble. Always test.
- Not suitable for use on polished surfaces, including marble, travertine, limestone or granite.
- Will not prevent water penetration through structural cracks, defects or open joints.
- Not recommended for below-grade application.
- May not be suitable for sale in states and districts with more restrictive AIM VOC regulations. Available in regulation-exempt small container sizes. Call Customer Care at 800-255-4255 for assistance.

Product Data Sheet
Conservare® OH100 Consolidation Treatment

REGULATORY COMPLIANCE

VOC Compliance

Conservare® OH100 Consolidation Treatment is compliant with the US Environmental Protection Agency's AIM VOC regulations. Manufactured and marketed in compliance with USEPA AIM VOC regulations (40 CFR 59.403).

Visit www.prosoco.com/voc-compliance to confirm compliance with individual district or state regulations.

TYPICAL TECHNICAL DATA

FORM	Clear, colorless liquid
SPECIFIC GRAVITY	0.997
pH	Not applicable
WT/GAL	8.30 lbs
ACTIVE CONTENT	100%
TOTAL SOLIDS	43% ASTM D 5095
VOC CONTENT	>400 g/L
FLASH POINT	104°F (40°C)
FREEZE POINT	<–22°F (<–30°C)
SHELF LIFE	1 year in tightly sealed, unopened container

THE IMPORTANCE OF PRETESTING

Since building materials differ in their nature and degree of deterioration, each conservation project poses unique problems and requirements. To gain a full understanding of the ongoing deterioration and determine necessary stabilization/ conservation measures, a number of laboratory and field tests are required.

Include in the test area any previous repairs and patches, including aesthetic cementitious finishes. Different surface compositions may result in absorption and/or appearance differences.

Laboratory Testing

a. Evaluates the physical and chemical characteristics of the substrate(s) to confirm whether consolidation is possible.
b. Identifies the cause(s) of deterioration and surface preparation procedures necessary for conservation treatment.
c. Determines the most appropriate conservation agent(s) and field application procedures.

For more information on the recommended testing program, read the Conservare® Stone Testing Brochure and contact your PROSOCO representative to arrange a job-site visit.

On-Site Testing

Following lab testing, a test area should be cleaned and allowed to dry. An application of Conservare® OH100 Consolidation Treatment is made following specific recommendations provided by the laboratory analysis. The job-site test area should be as large as possible and representative of the condition of the entire project.

The test area is necessary to confirm application procedures under job-site conditions and allow calculation of the masonry's consumption rate. The on-site tests also provide a visible sample of the effects of the treatment on actual job surfaces. Additional core samples can be taken from the test area and tested to verify depth of penetration and proper application procedures.

PREPARATION

Following lab and on-site testing, clean the building with the appropriate Sure Klean® or Enviro Klean® product. In most cases, surface contaminants such as carbon crust, salts, pigeon droppings, mildew and atmospheric stains must be completely removed to assure thorough penetration of OH100. Surface sealers and repellents which may have been applied must be thoroughly removed. (See NOTE, below.) Contact Customer Care at (800) 255-4255 for additional cleaning recommendations.

NOTE: In cases where even the most sympathetic cleaning program would remove an unacceptable level of surface detail, OH100 may be applied to the soiled surface to pre-consolidate the stone. If such pre-consolidation is necessary, further evaluation will be required to ensure that no undesirable reactions take place between the consolidation treatment and the surface contaminants which may interfere with further conservation measures, i.e. subsequent cleaning, general consolidation, patching/repair, etc.

Protect people, vehicles, property, metal, glass, foliage, painted surfaces and all non masonry

surfaces from contact with product, fumes or wind drift. Protect and/or divert pedestrian and auto traffic.

Ensure fresh air entry and cross ventilation during application and drying. Extinguish all flames, pilot lights and other potential sources of ignition during use and until all vapors are gone. When applying to exteriors of occupied buildings, make sure all windows, exterior intakes and air conditioning vents are covered and air handling equipment is shut down during application and until all vapors have dissipated.

Surface & Air Temperatures

Surface and air temperatures should be between 50–90°F (10–32°C) during application. Relative humidity should be greater than 40%.

Protect surface to be treated from direct sunlight for several hours prior to beginning application. Excessive surface heating can be prevented by shading with awnings. When possible, initiate treatment when surfaces are shaded. Keep surface temperature relatively cool to prevent too rapid evaporation of OH100 and to ensure proper penetration. Do not apply during rain, to wet surfaces or when there is a chance of rain.

Equipment

Apply by low-pressure spray, brush or dipping. Larger surfaces should be treated using low-pressure spray equipment, small areas with spray tanks.

Mobile objects such as sculptures are best treated indoors by dipping or with the use of compresses. Contact Customer Care or your local sales manager for more information.

Storage and Handling

Store in a cool, dry place away from potential ignition sources. Keep tightly closed when not dispensing. Published shelf life assumes upright storage of factory-sealed containers in a dry place. Maintain temperature of 45–100°F (7–38°C). Do not double stack pallets. Dispose of unused product and container in accordance with local, state and federal regulations.

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Ensure proper penetration and prevent crust formations by applying OH100 in repeated applications referred to as "cycles." A cycle consists of three successive saturating applications at 5–15 minute intervals. Typical treatments involve two or three cycles (6–9 separate applications). Allow 20 to 60 minutes between cycles.

Laboratory testing will determine the optimum delay between applications and between cycles. Additional material should be applied until excess material remains visible on the surface for 60 minutes following the last application. Once this degree of saturation is achieved over the entire surface, the first treatment is complete.

Immediately flush excess surface materials using industrial grade MEK (methyl ethyl ketone) or mineral spirits. If a second treatment is necessary, allow two to three weeks curing time following first treatment.

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Proper timing of the application process will maximize penetration of the consolidation treatment. Deep penetration is critical to the long-term benefits of any consolidation treatment.

Dry Time

Protect from rain for two days following application.

Cleanup

Clean tools and equipment immediately with mineral spirits, denatured alcohol or an equivalent cleaning solvent. Remove over spray and spills as soon as possible.

Post-Treatment

Areas properly treated with Conservare® OH100 can receive stone repair materials, regrouting materials and PROSOCO's BMC® II silicone emulsion paint after the consolidation procedures have been completed.

After curing apply the appropriate Sure Klean® Weather Seal water repellent to ensure protection from further water damage.

WARRANTY

The information and recommendations made are based on our own research and the research of others, and are believed to be accurate. However, no guarantee of their accuracy is made because we cannot cover every possible application of our products, nor anticipate every variation encountered in masonry surfaces, job conditions and methods used. The purchasers shall make their own tests to determine the suitability of such products for a particular purpose.

PROSOCO, Inc. warrants this product to be free from defects. **Where permitted by law, PROSOCO makes no other warranties with respect to this product, express or implied, including without limitation the implied warranties of merchantability or fitness for particular purpose**. The purchaser shall be responsible to make his own tests to determine the suitability of this product for his particular purpose. PROSOCO's liability shall be limited in all events to supplying sufficient product to re-treat the specific areas to which defective product has been applied. Acceptance and use of this product absolves PROSOCO from any other liability, from whatever source, including liability for incidental, consequential or resultant damages whether due to breach of warranty, negligence or strict liability. This warranty may not be modified or extended by representatives of PROSOCO, its distributors or dealers.

BEST PRACTICES

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CUSTOMER CARE

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RECOMMENDATIONS FOR MORTAR REPLACEMENT

Note: Always use in-kind materials wherever historic mortar is present. Perform a mortar analysis before beginning any repointing project if details on historic mortar composition are unknown.

SITE FEATURE	MORTARED MATERIALS	JOINT THICKNESS	EXPOSURE	AGE	CURRENT MORTAR	NOTES	RECOMMENDED REPLACEMENT MORTAR
Spring House, interior fountain	Marble to granite, granite to granite	Approx. 1/8"	Flowing/standing water	Unknown	There are three different mortars total--a light, blonde color at the base of the marble tablet, where it rests on the brown granite lower basin; a grey mortar at places between the tablet and the Spring House interior walls; and a beige colored mortar elsewhere.	Existing mortar content is unknown but the mortar appears to have been replaced in the last twenty years. Given the age of this fountain, the original mortars were most likely a lime and sand based mortar.	A 1 part 3.5 NHL to 2.5 parts sand mortar mix is recommended in order to stand up to daily water. This hydraulic lime base mortar cures in the presence of moisture and should have no issue remaining in a constant state of hydration.
Spring House, interior fountain	Brass/copper to marble	Approx. 1/8"	Flowing water	Unknown	Unknown	This is the water outlet.	A 1 part 3.5 NHL to 2.5 parts sand mortar mix is recommended.
Spring House, interior floor	Ceramic tile to concrete mortar bed, ceramic tile to concrete perimeter floor drain, ceramic tile to marble base of the interior fountain	Approx. 1/4"	Foot traffic/outdoor elements	Unknown	Mortar appears very similar to concrete, but composition is unknown.	The mortar appears to be the same material as the foundation material for the floor.	A Type N mortar mix, 1 part white portland cement to 1 part lime to 6 parts sand mortar mix is recommended. Pigment should be added to the mortar, as necessary, to match existing mortar color.
Spring House, marble water table and lintels	Marble to marble, marble to granite	Approx. 1/4"	Outdoor elements	Predominantly historic with various areas of repointing dating to 2019.	Existing mortar appears to be historic in most places; the 2019 replacement mortar is composed of 1 part Argos Brand Type N "Beige" color mortar to 2 parts Sakrete Playsand, bagged.		A 1 part 3.5 NHL to 2.5 parts sand mortar mix is recommended.
Brick swale (north of Spring House)	Brick to brick; granite to granite; brick to granite	1/2" between bricks; larger between granite blocks; large gaps exist between brick and granite	Dry with periodic water flow	Circa 1980s	Mortar of unknown mix for brick; cementitious mix between granite to granite pieces, as well as at the gap between the granite curb and brick surface.	The granite pieces in the curb need to be re-set, can you suggest a maximum joint spacing and a joint compound between the granite pieces of the curb and between the curb and the brick section of the feature? Mortar for both applications or is something synthetic better at joint between curb and bricks?	A Type N mortar mix, 1 part white portland cement to 1 part lime to 6 parts sand mortar mix is recommended. Pigment should be added to the mortar, as necessary, to match existing mortar color.
Brick runnel and reflecting pool	Brick to brick	3/8"-1/2"	Flowing/standing water	2019	The mortar for all brick features is composed of 1 part Argos Brand Type N "Sahara" color mortar to 2 parts Sakrete Playsand, bagged.	Mortar work in 2019 was performed by HPTC. A mortar analysis was performed but the results are unknown. Documentation provided by ANDE states that HPTC determined this replacement mortar as the "best" mortar for the situation. The entire runnel was reconstructed during this project, and the reflecting pool was repointed.	A Type N mortar mix, 1 part white portland cement to 1 part lime to 6 parts sand mortar mix is recommended. Pigment should be added to the mortar, as necessary, to match existing mortar color.
Brick runnel and reflecting pool, intersection of upper pool in runnel, and lower fountain patio	Brick to stone with adjacent exposed-aggregate concrete	Approx.1/2"	Flowing/standing water	2019			A Type N mortar mix, 1 part white portland cement to 1 part lime to 6 parts sand mortar mix is recommended. Pigment can be added to the mortar, as necessary, to match existing mortar color. If a control joint exists between the stone and concrete, use a Dow Corning 756 SMS sealant.
Lower fountain patio	Expansion joints in exposed-aggregate concrete patio	1/4"-3/8" expansion joints	Outdoor elements	Unknown	Where material is lost in places, portland rich cement is used as a filler material.	Joints do not run through the slab, and most places have no mortar.	A Type N mortar mix, 1 part white portland cement to 1 part lime to 6 parts sand mortar mix is recommended. Pigment should be added to the mortar, as necessary, to match existing mortar color.
Lower fountain patio and retaining walls	exposed-aggregate concrete patio to vertical surface of adjacent concrete retaining walls	Approx. 1/2"-1"	Outdoor elements	Sealant less than 10 years old	Grey sealant, likely poly-based.	Existing sealant was installed within the last ten years; although the exact date, who performed the work, and the product composition are unknown. The sealant is deteriorating rapidly.	Use the Dow Corning 756 SMS sealant. This sealant is not recommended for joints over 1 1/4".
Concrete walks and patio	Typical (no aggregate) concrete to concrete	1/4"-3/8" expansion joints	Outdoor elements	Unknown	Grey sealant, likely poly-based.		Use the Dow Corning 756 SMS sealant. This sealant is not recommended for joints over 1 1/4".
Lower stone fountain	Granite blocks of fountain to concrete retaining wall	Approx. 1/2"-1"	Outdoor elements	Unknown	Grey sealant, likely poly-based.	Sealant appears to be the same sealer as at the lower patio to retaining walls.	Use the Dow Corning 756 SMS sealant. This sealant is not recommended for joints over 1 1/4".
Lower stone fountain	Granite blocks of fountain to granite blocks of fountain	Approx. 1/2"-5/8"	Outdoor elements	Unknown	A cementitious, unknown mix was used for areas of historic mortar; other areas are most likely composed of 1 part Argos Brand Type N "Beige" color mortar to 2 parts Sakrete Playsand, bagged.	In 2019, HPTC reset stones and repointed; mortar appears similar to repointed areas of the Spring House.	A 1 part 3.5 NHL to 2.5 parts sand mortar mix is recommended.
Lower stone fountain, base	Granite to exposed-aggregate concrete base	None	Outdoor elements	Unknown	None	The concrete base appears to have been poured directly up against the granite of the lower fountain feature.	Leave in place as long as no damage is noted. If damage becomes apparent, adding a sealant expansion joint is recommended. In this case, use the Dow Corning 756 SMS sealant. This sealant is not recommended for joints over 1 1/4".
Rubble-stone walls at parking lot	Rubble stone to rubble stone	Varies	Outdoor elements	Unknown	A relatively hard exposed-aggregate concrete mix; Portland-rich concrete.	It appears that the walls were historically held together with concrete that included aggregate. There was also a flat coating over the top surface of the walls, which remains intact in places. Repairs were done at various unknown times with Portland-rich cement.	A Type N mortar mix, 1 part portland cement to 1 part lime to 6 parts sand is recommended. The top should be covered with the same mortar. Match aggregate to historic aggregate.
Rubble-stone wall along main walkway to Spring House	Rubble stone to rubble stone	Varies	Outdoor elements	Unknown	A relatively hard exposed-aggregate concrete mix; Portland-rich concrete.	It appears that the walls were historically held together with a concrete that included aggregate. Repairs were done at various unknown times with Portland-rich cement.	A Type N mortar mix, 1 part portland cement to 1 part lime to 6 parts sand. Match aggregate to historic aggregate.

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1 PRESERVATION BRIEFS

Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings

Robert C. Mack, AIA
Anne Grimmer

U.S. Department of the Interior
National Park Service
Cultural Resources
Heritage Preservation Services

Inappropriate cleaning and coating treatments are a major cause of damage to historic masonry buildings. While either or both treatments may be appropriate in some cases, they can be very destructive to historic masonry if they are not selected carefully. Historic masonry, as considered here, includes stone, brick, architectural terra cotta, cast stone, concrete and concrete block. It is frequently cleaned because cleaning is equated with improvement. Cleaning may sometimes be followed by the application of a water-repellent coating. However, unless these procedures are carried out under the guidance and supervision of an architectural conservator, they may result in irrevocable damage to the historic resource.

The purpose of this Brief is to provide information on the variety of cleaning methods and materials that are available for use on the *exterior* of historic masonry buildings, and to provide guidance in selecting the most appropriate method or combination of methods. The difference between water-repellent coatings and waterproof coatings is explained, and the purpose of each, the suitability of their application to historic masonry buildings, and the possible consequences of their inappropriate use are discussed.

The Brief is intended to help develop sensitivity to the qualities of historic masonry that makes it so special, and to assist historic building owners and property managers in working cooperatively with architects, architectural conservators and contractors (Fig. 1). Although specifically intended for historic buildings, the information is applicable to all masonry buildings. This publication updates and expands *Preservation Brief 1: The Cleaning and Waterproof Coating of Masonry Buildings*. The Brief is not meant to be a cleaning manual or a guide for preparing specifications. Rather, it provides general information to raise awareness of the many factors involved in selecting cleaning and water-repellent treatments for historic masonry buildings.

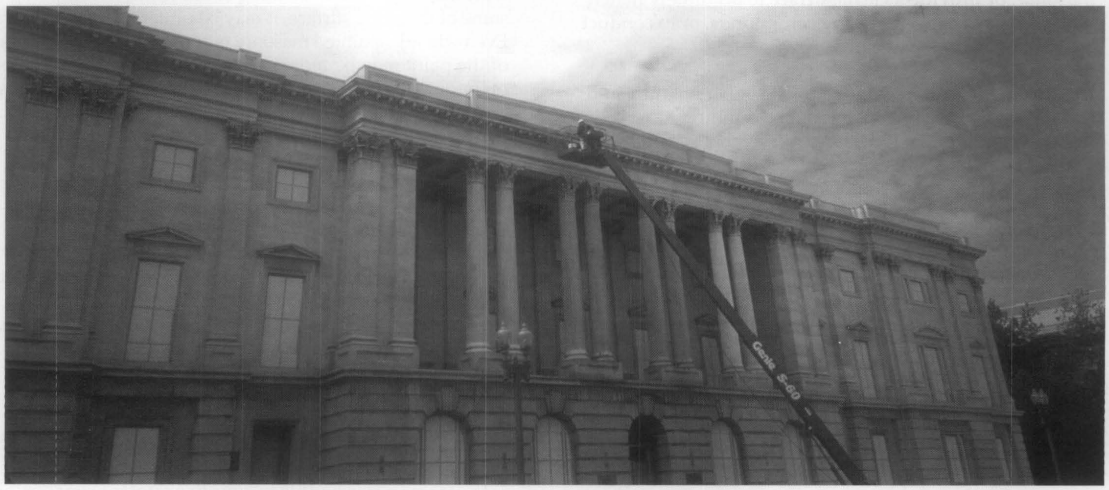

Figure 1. Low-to medium-pressure steam (hot-pressurized water washing), is being used to clean the exterior of the U.S. Tariff Commission Building, the first marble building constructed in Washington, D.C., in 1839. This method was selected by an architecural conservator as the "gentlest means possible" to clean the marble. Steam can soften heavy soiling deposits such as those on the cornice and column capitals, and facilitate easy removal. Note how these deposits have been removed from the right side of the cornice which has already been cleaned.

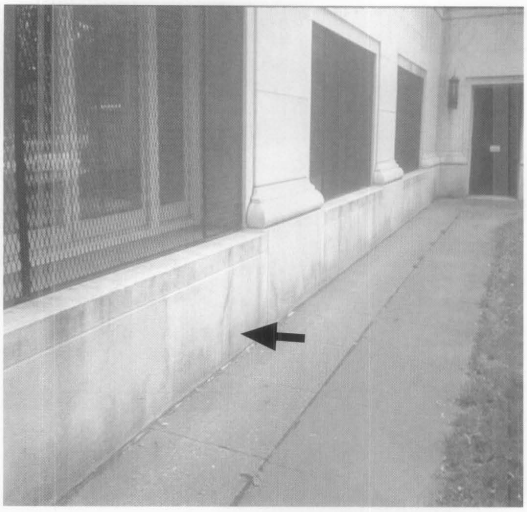

Figure 2. Biological growth as shown on this marble foundation can usually be removed using a low-pressure water wash, possibly with a non-ionic detergent added to it, and scrubbing with a natural or synthetic bristle brush.

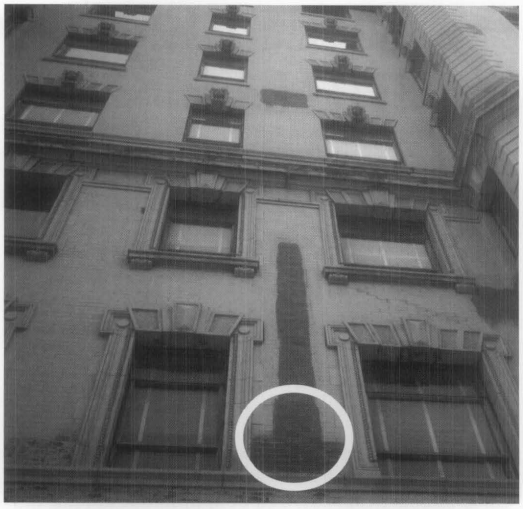

Figure 3. This small test area has revealed a red brick patch that does not match the original beige brick. This may explain why the building was painted, and may suggest to the owner that it may be preferable to keep it painted.

Preparing for a Cleaning Project

Reasons for cleaning. First, it is important to determine whether it is appropriate to clean the masonry. The objective of cleaning a historic masonry building must be considered carefully before arriving at a decision to clean. There are several major reasons for cleaning a historic masonry building: **improve the appearance of the building** by removing unattractive dirt or soiling materials, or non-historic paint from the masonry; **retard deterioration** by removing soiling materials that may be damaging the masonry; or **provide a clean surface** to accurately match repointing mortars or patching compounds, or to conduct a condition survey of the masonry.

Identify what is to be removed. The general nature and source of dirt or soiling material on a building must be identified to remove it in the *gentlest means possible* — that is, in the most effective, yet least harmful, manner. Soot and smoke, for example, require a different cleaning agent to remove than oil stains or metallic stains. Other common cleaning problems include biological growth such as mold or mildew, and organic matter such as the tendrils left on masonry after removal of ivy (Fig. 2).

Consider the historic appearance of the building. If the proposed cleaning is to remove paint, it is important in each case to learn whether or not unpainted masonry is historically appropriate. And, it is necessary to consider why the building was painted (Fig. 3). Was it to cover bad repointing or unmatched repairs? Was the building painted to protect soft brick or to conceal deteriorating stone? Or, was painted masonry simply a fashionable treatment in a particular historic period? Many buildings were painted at the time of construction or shortly thereafter; retention of the paint, therefore, may be more appropriate historically than removing it. And, if the building appears to have been painted for a long time, it is also important to think about whether the paint is part of the character of the historic building and if it has acquired significance over time.

Consider the practicalities of cleaning or paint removal. Some gypsum or sulfate crusts may have become integral with the stone and, if cleaning could result in removing some of the stone surface, it may be preferable not to clean. Even where unpainted masonry is appropriate, the retention of the paint may be more practical than removal in terms of long range preservation of the masonry. In some cases, however, removal of the paint may be desirable. For example, the old paint layers may have built up to such an extent that removal is necessary to ensure a sound surface to which the new paint will adhere.

Study the masonry. Although not always necessary, in some instances it can be beneficial to have the coating or paint type, color, and layering on the masonry researched before attempting its removal. Analysis of the nature of the soiling or of the paint to be removed from the masonry, as well as guidance on the appropriate cleaning method, may be provided by professional consultants, including architectural conservators, conservation scientists and preservation architects. The State Historic Preservation Office (SHPO), local historic district commissions, architectural review boards and preservation-oriented websites may also be able to supply useful information on masonry cleaning techniques.

Understanding the Building Materials

The construction of the building must be considered when developing a cleaning program because inappropriate cleaning can have a deleterious effect on the masonry as well as on other building materials. The masonry material or materials must be correctly identified. It is sometimes difficult to distinguish one type of stone from another; for example, certain sandstones can be easily confused with limestones. Or, what appears to be natural stone may not be stone at all, but cast stone or concrete. Historically, cast stone and architectural terra cotta were frequently used in combination with natural stone, especially for trim elements or on upper stories of a building where, from a distance, these substitute materials looked like real stone (Fig. 4). Other features on historic buildings that appear to be stone, such as decorative cornices, entablatures and window hoods, may not even be masonry, but metal.

Identify prior treatments. Previous treatments of the building and its surroundings should be researched and building maintenance records should be obtained, if available. Sometimes if streaked or spotty areas do not seem to get cleaner following an initial cleaning, closer inspection and analysis may be warranted. The discoloration may turn out not to be dirt but the remnant of a water-repellent coating applied long ago which has darkened the surface of the masonry over time (Fig. 5). Successful removal may require testing several cleaning agents to find something that will dissolve and remove the coating. Complete removal may not always be possible. Repairs may have been stained to match a dirty building, and cleaning may make these differences apparent. De-icing salts used near the building that have dissolved can migrate into the masonry. Cleaning may draw the salts to the surface, where they will appear as efflorescence (a powdery, white substance), which may require a second treatment to be removed. Allowances for dealing with such unknown factors, any of which can be a potential problem, should be included when investigating cleaning methods and materials. Just as more than one kind of masonry on a historic building may necessitate multiple cleaning approaches, unknown conditions that are encountered may also require additional cleaning treatments.

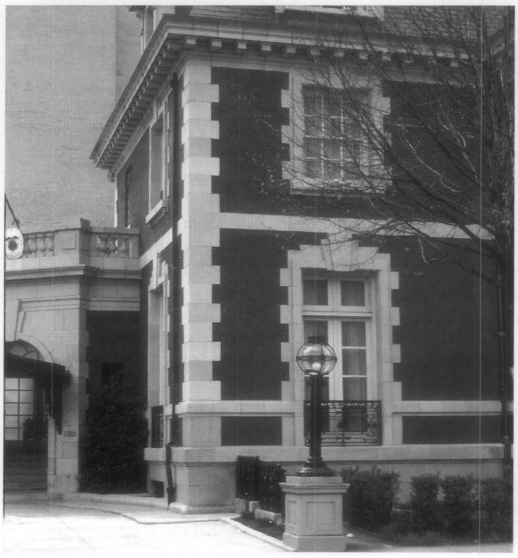

Figure 4. The foundation of this brick building is limestone, but the decorative trim above is architectural terra cotta intended to simulate stone.

Figure 5. Repeated water washing did not remove the staining inside this limestone porte cochere. Upon closer examination, it was determined to be a water-repellent coating that had been applied many years earlier. An alkaline cleaner may be effective in removing it.

Choose the appropriate cleaner. The importance of testing cleaning methods and materials cannot be over emphasized. Applying the wrong cleaning agents to historic masonry can have disastrous results. Acidic cleaners can be extremely damaging to acid-sensitive stones, such as marble and limestone, resulting in etching and dissolution of these stones. Other kinds of masonry can also be damaged by incompatible cleaning agents, or even by cleaning agents that are usually compatible. There are also numerous kinds of sandstone, each with a considerably different geological composition. While an acid-based cleaner may be safely used on some sandstones, others are acid-sensitive and can be severely etched or dissolved by an acid cleaner. Some sandstones contain water-soluble minerals and can be eroded by water cleaning. And, even if the stone type is correctly identified, stones, as well as some bricks, may contain unexpected impurities, such as iron particles, that may react negatively with a particular cleaning agent and result in staining. Thorough understanding of the physical and chemical properties of the masonry will help avoid the inadvertent selection of damaging cleaning agents.

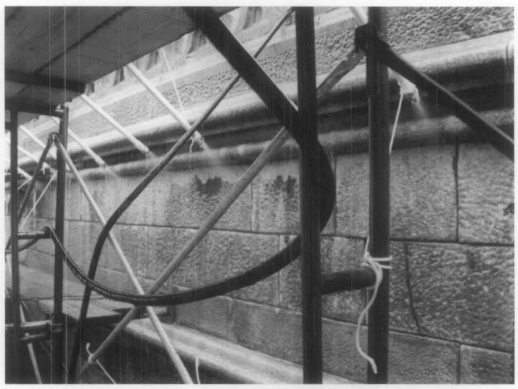

Figure 6. Timed water soaking can be very effective for cleaning limestone and marble as shown here at the Marble Collegiate Church in New York City. In this case, a twelve-hour water soak using a multi-nozzle manifold was followed by a final water rinse. Photo: Diane S. Kaese, Wiss, Janney, Elstner Associates, Inc., N.Y., N.Y.

Other building materials also may be affected by the cleaning process. Some chemicals, for example, may have a corrosive effect on paint or glass. The portions of building elements most vulnerable to deterioration may not be visible, such as embedded ends of iron window bars. Other totally unseen items, such as iron cramps or ties which hold the masonry to the structural frame, also may be subject to corrosion from the use of chemicals or even from plain water. The only way to prevent problems in these cases is to study the building construction in detail and evaluate proposed cleaning methods with this information in mind. However, due to the very likely possibility of encountering unknown factors, any cleaning project involving historic masonry should be viewed as unique to that particular building.

Cleaning Methods and Materials

Masonry cleaning methods generally are divided into three major groups: water, chemical, and abrasive. *Water methods* soften the dirt or soiling material and rinse the deposits from the masonry surface. *Chemical cleaners* react with dirt, soiling material or paint to effect their removal, after which the cleaning effluent is rinsed off the masonry surface with water. *Abrasive methods* include blasting with grit, and the use of grinders and sanding discs, all of which mechanically remove the dirt, soiling material or paint (and, usually, some of the masonry surface). Abrasive cleaning is also often followed with a water rinse. *Laser cleaning*, although not discussed here in detail, is another technique that is used sometimes by conservators to clean small areas of historic masonry. It can be quite effective for cleaning limited areas, but it is expensive and generally not practical for most historic masonry cleaning projects.

Although it may seem contrary to common sense, masonry cleaning projects should be carried out starting at the bottom and proceeding to the top of the building always keeping all surfaces wet below the area being cleaned. The rationale for this approach is based on the principle that dirty water or cleaning effluent dripping from cleaning in progress above will leave streaks on a dirty surface but will not streak a clean surface as long as it is kept wet and rinsed frequently.

Water Cleaning

Water cleaning methods are generally the *gentlest means possible*, and they can be used safely to remove dirt from all types of historic masonry.* There are essentially four kinds of water-based methods: soaking; pressure water washing; water washing supplemented with non-ionic detergent; and steam, or hot-pressurized water cleaning. Once water cleaning has been completed, it is often necessary to follow up with a water rinse to wash off the loosened soiling material from the masonry.

Soaking. Prolonged spraying or misting with water is particularly effective for cleaning limestone and marble. It is also a good method for removing heavy accumulations of soot, sulfate crusts or gypsum crusts that tend to form in protected areas of a building not regularly washed by rain. Water is distributed to lengths of punctured hose or pipe with non-ferrous fittings hung from moveable scaffolding or a swing stage that continuously mists the surface of the masonry with a very fine spray (Fig. 6). A timed on-off spray is another approach to using this cleaning technique. After one area has been cleaned, the apparatus is moved on to another. Soaking is often used in combination with water washing and is also followed by a final water rinse. Soaking is a very slow method — it may take several days or a week—but it is a very gentle method to use on historic masonry.

Water Washing. Washing with low-pressure or medium-pressure water is probably one of the most commonly used methods for removing dirt or other pollutant soiling from historic masonry buildings (Fig. 7). Starting with a very low pressure (100 psi or below), even using a garden hose, and progressing as needed to slightly higher pressure —generally no higher than 300-400 psi—is always the recommended way to begin. Scrubbing with natural bristle or synthetic bristle brushes—never metal which can abrade the surface and leave metal particles that can stain the masonry—can help in cleaning areas of the masonry that are especially dirty.

Water Washing with Detergents. Non-ionic detergents –which are not the same as soaps –are synthetic organic compounds that are especially effective in removing oily soil. (Examples of some of the numerous proprietary non-ionic detergents include Igepal by GAF, Tergitol by Union Carbide and Triton by Rohm & Haas.) Thus, the addition of a non-ionic detergent, or surfactant, to a low- or medium-pressure water wash can be a useful aid in the cleaning

*Water cleaning methods may not be appropriate to use on some badly deteriorated masonry because water may exacerbate the deterioration, or on gypsum or alabaster which are very soluble in water.

process. (A non-ionic detergent, unlike most household detergents, does not leave a solid, visible residue on the masonry.) Adding a non-ionic detergent and scrubbing with a natural bristle or synthetic bristle brush can facilitate cleaning textured or intricately carved masonry. This should be followed with a final water rinse.

Steam/Hot-Pressurized Water Cleaning. Steam cleaning is actually low-pressure hot water washing because the steam condenses almost immediately upon leaving the hose. This is a gentle and effective method for cleaning stone and particularly for acid-sensitive stones. Steam can be especially useful in removing built-up soiling deposits and dried-up plant materials, such as ivy disks and tendrils. It can also be an efficient means of cleaning carved stone details and, because it does not generate a lot of liquid water, it can sometimes be appropriate to use for cleaning interior masonry (Figs. 8-9).

Potential hazards of water cleaning. Despite the fact that water-based methods are generally the most gentle, even they can be damaging to historic masonry. Before beginning a water cleaning project, it is important to make sure that all mortar joints are sound and that the building is watertight. Otherwise water can seep through the walls to the interior, resulting in rusting metal anchors and stained and ruined plaster.

Some water supplies may contain traces of iron and copper which may cause masonry to discolor. Adding a chelating or complexing agent to the water, such as EDTA (ethylene diamine tetra-acetic acid), which inactivates other metallic ions, as well as softens minerals and water hardness, will help prevent staining on light-colored masonry.

Any cleaning method involving water should never be done in cold weather or if there is any likelihood of frost or freezing because water within the masonry can freeze, causing spalling and cracking. Since a masonry wall may take over a week to dry after cleaning, no water cleaning should be permitted for several days prior to the first average frost date, or even earlier if local forecasts predict cold weather.

Most essential of all, it is important to be aware that using water at too high a pressure, a practice common to "power washing" and "water blasting", is very abrasive and can easily etch marble and other soft stones, as well as some types of brick (Figs. 10-11). In addition, the distance of the nozzle from the masonry surface and the type of nozzle, as well as gallons per minute (gpm), are also important variables in a water cleaning process that can have a significant impact on the outcome of the project. This is why it is imperative that the cleaning be closely monitored to ensure that the cleaning operators do not raise the pressure or bring the nozzle too close to the masonry in an effort to "speed up" the process. The appearance of grains of stone or sand in the cleaning effluent on the ground is an indication that the water pressure may be too high.

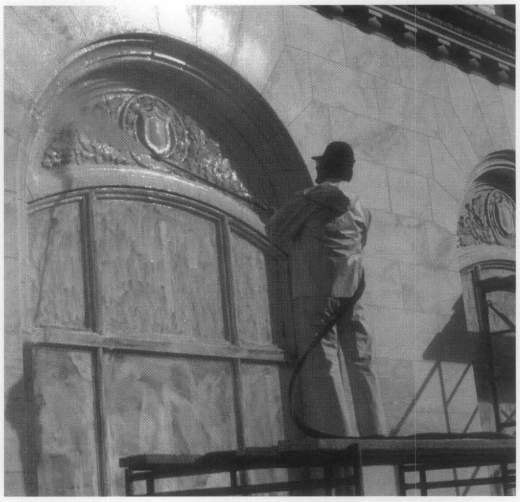

Figure 7. Glazed architectural terra cotta often may be cleaned successfully with a low-pressure water wash and hand scrubbing supplemented, if necessary, with a non-ionic detergent. Photo: National Park Service Files.

Chemical Cleaning

Chemical cleaners, generally in the form of proprietary products, are another material frequently used to clean historic masonry. They can remove dirt, as well as paint and other coatings, metallic and plant stains, and graffiti. Chemical cleaners used to remove dirt and soiling include **acids**, **alkalies** and **organic compounds.** Acidic cleaners, of course, should not be used on masonry that is acid sensitive. Paint removers are **alkaline**, based on **organic solvents** or other chemicals.

Chemical Cleaners to Remove Dirt

Both alkaline and acidic cleaning treatments include the use of water. Both cleaners are also likely to contain surfactants (wetting agents), that facilitate the chemical reaction that removes the dirt. Generally, the masonry is wet first for both types of cleaners, then the chemical cleaner is sprayed on at very low pressure or brushed onto the surface. The cleaner is left to dwell on the masonry for an amount of time recommended by the product manufacturer or, preferably, determined by testing, and rinsed off with a low- or moderate-pressure cold, or sometimes hot, water wash. More than one application of the cleaner may be necessary, and it is always a good practice to test the product manufacturer's recommendations concerning dilution rates and dwell times. Because each cleaning situation is unique, dilution rates and dwell times can vary considerably. The masonry surface may be scrubbed lightly with natural or synthetic bristle brushes prior to rinsing. After rinsing, pH strips should be applied to the surface to ensure that the masonry has been neutralized completely.

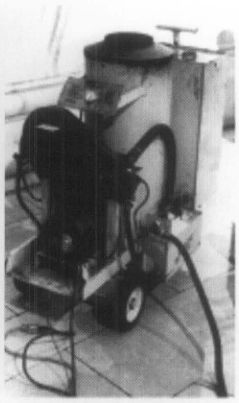

Figure 8. (Left) Low-pressure (under 100 psi) steam cleaning (hot-pressurized water washing), is part of the regular maintenance program at the Jefferson Memorial, Washington, D.C. The white marble interior of this open structure is subject to constant soiling by birds, insects and visitors. (Right) This portable steam cleaner enables prompt cleanup when necessary. Photos: National Park Service Files.

Acidic Cleaners. Acid-based cleaning products may be used on **non-acid sensitive** masonry, which generally includes: granite, most sandstones, slate, unglazed brick and unglazed architectural terra cotta, cast stone and concrete (Fig. 12). Most commercial acidic cleaners are composed primarily of hydrofluoric acid, and often include some phosphoric acid to prevent rust-like stains from developing on the masonry after the cleaning. Acid cleaners are applied to the pre-wet masonry which should be kept wet while the acid is allowed to "work", and then removed with a water wash.

Alkaline Cleaners. Alkaline cleaners should be used on **acid-sensitive** masonry, including: limestone, polished and unpolished marble, calcareous sandstone, glazed brick and glazed architectural terra cotta, and polished granite. (Alkaline cleaners may also be used sometimes on masonry materials that are not acid sensitive—after testing, of course—but they may not be as effective as they are on acid-sensitive masonry.) Alkaline cleaning products consist primarily of two ingredients: a non-ionic detergent or surfactant; and an alkali, such as potassium hydroxide or ammonium hydroxide. Like acidic cleaners, alkaline products are usually applied to pre-wet masonry, allowed to dwell, and then rinsed off with water. (Longer dwell times may be necessary with alkaline cleaners than with acidic cleaners.) Two additional steps are required to remove alkaline cleaners after the initial rinse. First the masonry is given a slightly acidic wash—often with acetic acid–to neutralize it, and then it is rinsed again with water.

Chemical Cleaners to Remove Paint and Other Coatings, Stains and Graffiti

Removing paint and some other coatings, stains and graffiti can best be accomplished with alkaline paint removers, organic solvent paint removers, or other cleaning compounds. The removal of layers of paint from a masonry surface usually involves applying the remover either by brush, roller or spraying, followed by a thorough water wash. As with any chemical cleaning, the manufacturer's recommendations regarding application procedures should always be tested before beginning work.

Alkaline Paint Removers. These are usually of much the same composition as other alkaline cleaners, containing potassium or ammonium hydroxide, or trisodium phosphate. They are used to remove oil, latex and acrylic paints, and are effective for removing multiple layers of paint. Alkaline cleaners may also remove some acrylic, water-repellent coatings. As with other alkaline cleaners, both an acidic neutralizing wash and a final water rinse are generally required following the use of alkaline paint removers.

Organic Solvent Paint Removers. The formulation of organic solvent paint removers varies and may include a combination of solvents, including methylene chloride, methanol, acetone, xylene and toluene.

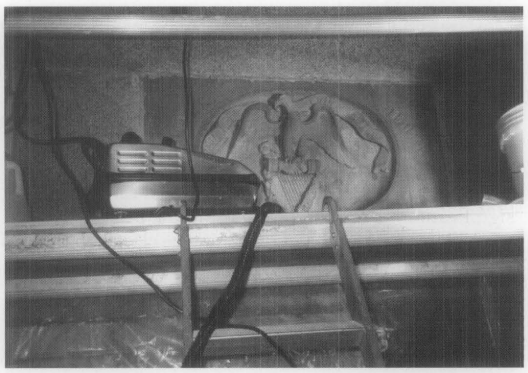

Figure 9. (Left) This small steam cleaner—the size of a vacuum cleaner—offers a very controlled and gentle means of cleaning limited, or hard-to-reach areas or carved stone details. (Right) It is particularly useful for interiors where it is important to keep moisture to a minumum, such as inside the Washington Monument, Washington, D.C., where it was used to clean the commemorative stones. Photos: Audrey T. Tepper.

Figure 10. High-pressure water washing too close to the surface has abraded and, consequently, marred the limestone on this early-20th century building.

Other Paint Removers and Cleaners. Other cleaning compounds that can be used to remove paint and some painted graffiti from historic masonry include paint removers based on N-methyl-2-pyrrolidone (NMP), or on petroleum-based compounds. Removing stains, whether they are industrial (smoke, soot, grease or tar), metallic (iron or copper), or biological (plant and fungal) in origin, depends on carefully matching the type of remover to the type of stain (Fig. 13). Successful removal of stains from historic masonry often requires the application of a number of different removers before the right one is found. The removal of layers of paint from a masonry surface is usually accomplished by applying the remover either by brush, roller or spraying, followed by a thorough water wash (Fig. 14).

Potential hazards of chemical cleaning. Since most chemical cleaning methods involve water, they have many of the potential problems of plain water cleaning. Like water methods, they should not be used in cold weather because of the possibility of freezing. Chemical cleaning should never be undertaken in temperatures below 40 degrees F (4 degrees C), and generally not below 50 degrees F. In addition, many chemical cleaners simply do not work in cold temperatures. Both acidic and alkaline cleaners can be dangerous to cleaning operators and, clearly, there are environmental concerns associated with the use of chemical cleaners.

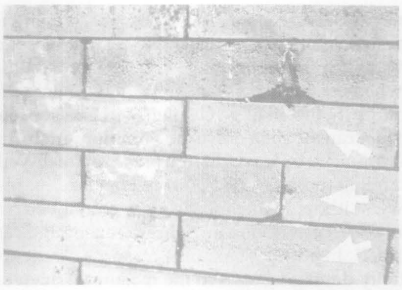

Figure 11. Rinsing with high-pressure water following chemical cleaning has left a horizontal line of abrasion across the bricks on this late-19th century row house.

If not carefully chosen, chemical cleaners can react adversely with many types of masonry. Obviously, acidic cleaners should not be used on acid-sensitive materials; however, it is not always clear exactly what the composition is of any stone or other masonry material. For, this reason, testing the cleaner on an inconspicuous spot on the building is always necessary. While certain acid-based cleaners may be appropriate if used as directed on a particular type of masonry, if left too long or if not adequately rinsed from the masonry they can have a negative effect. For example, hydrofluoric acid can etch masonry leaving a hazy residue (whitish deposits of silica or calcium fluoride salts) on the surface. While this efflorescence may usually be removed by a second cleaning—although it is likely to be expensive and time-consuming—**hydrofluoric acid** can also leave calcium fluoride salts or a colloidal silica deposit on masonry which may be impossible to remove (Fig. 15). Other acids, particularly **hydrochloric (muriatic) acid**, which is very powerful, should not be used on historic masonry, because it can dissolve lime-based mortar, damage brick and some stones, and leave chloride deposits on the masonry.

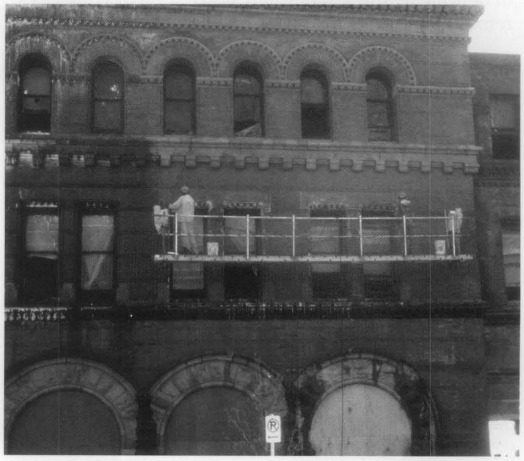

Figure 12. A mild acidic cleaning agent is being used to clean this heavily soiled brick and granite building. Additional applications of the cleaner and hand-scrubbing, and even poulticing, may be necessary to remove the dark stains on the granite arches below. Photo: Sharon C. Park, FAIA.

Alkaline cleaners can stain sandstones that contain a ferrous compound. Before using an alkaline cleaner on sandstone it is always important to test it, since it may be difficult to know whether a particular sandstone may contain a ferrous compound. Some alkaline cleaners, such as **sodium hydroxide (caustic soda or lye)** and **ammonium bifluoride**, can also damage or leave disfiguring brownish-yellow stains and, in most cases, should not be used on historic masonry. Although alkaline cleaners will not etch a masonry surface as acids can, they are caustic and can burn the surface. In addition, alkaline cleaners can deposit potentially damaging salts in the masonry which can be difficult to rinse thoroughly.

Abrasive and Mechanical Cleaning

Generally, abrasive cleaning methods are not appropriate for use on historic masonry buildings. Abrasive cleaning methods are just that—abrasive. Grit blasters, grinders, and sanding discs all operate by *abrading* the dirt or paint off the surface of the masonry, rather than *reacting* with the dirt and the masonry which is how water and chemical methods work. Since the abrasives do not differentiate between the dirt and the masonry, they can also remove the outer surface of the masonry at the same time, and result in permanently damaging the masonry. Brick, architectural terra cotta, soft stone, detailed carvings, and polished surfaces are especially susceptible to physical and aesthetic damage by abrasive methods. Brick and architectural terra cotta are fired products which have a smooth, glazed surface which can be removed by abrasive blasting or grinding (Figs. 18-19). Abrasively-cleaned masonry is damaged aesthetically as well as physically, and it has a rough surface which tends to hold dirt and the roughness will make future cleaning more difficult. Abrasive cleaning processes can also increase the likelihood of subsurface cracking of the masonry. Abrasion of carved details causes a rounding of sharp corners and other loss of delicate features, while abrasion of polished surfaces removes the polished finish of stone.

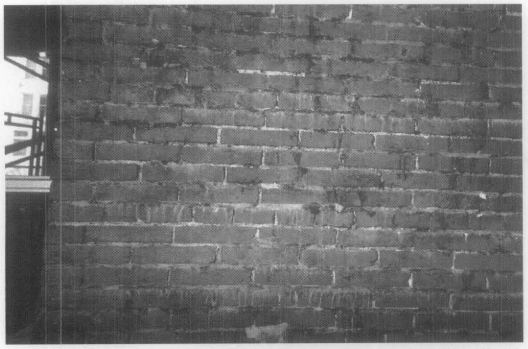

Figure 13. Sometimes it may be preferable to paint over a thick asphaltic coating rather than try to remove it, because it can be difficult to remove completely. However, in this case, many layers of asphaltic coating were removed through multiple applications of a heavy duty chemical cleaner. Each application of the cleaner was left to dwell following the manufacturer's reccommendations, and then rinsed thoroughly. (As much as possible of the asphalt was first removed with wooden scrapers.) Although not all the asphalt was removed, this was determined to be an acceptable level of cleanliness for the project.

Figure 14. Chemical removal of paint from this brick building has revealed that the cornice and window hoods are metal rather than masonry.

Mortar joints, especially those with lime mortar, also can be eroded by abrasive or mechanical cleaning. In some cases, the damage may be visual, such as loss of joint detail or increased joint shadows. As mortar joints constitute a significant portion of the masonry surface (up to 20 per cent in a brick wall), this can result in the loss of a considerable amount of the historic fabric. Erosion of the mortar joints may also permit increased water penetration, which will likely necessitate repointing.

Figure 15. The whitish deposits left on the brick by a chemical paint remover may have resulted from inadequate rinsing or from the chemical being left on the surface too long and may be impossible to remove.

Poulticing to Remove Stains and Graffiti

a

b

c

d

Figure 16. (a) The limestone base was heavily stained by runoff from the bronze statue above. (b) A poultice consisting of copper stain remover and ammonia mixed with fuller's earth was applied to the stone base and covered with plastic sheeting to keep it from drying out too quickly. (c) As the poultice dried, it pulled the stain out of the stone. (d) The poultice residue was removed carefully from the stone surface with wooden scrapers and the stone was rinsed with water. Photos: John Dugger.

Graffiti and stains, which have penetrated into the masonry, often are best removed by using a poultice. A poultice consists of an absorbent material or clay powder (such as kaolin or fuller's earth, or even shredded paper or paper towels), mixed with a liquid (solvent or other remover) to form a paste which is applied to the stain (Figs. 16-17). As it dries, the paste absorbs the staining material so that it is not redeposited on the masonry surface. Some commercial cleaning products and paint removers are specially formulated as a paste or gel that will cling to a vertical surface and remain moist for a longer period of time in order to prolong the action of the chemical on the stain. Pre-mixed poultices are also available as a paste or in powder form needing only the addition of the appropriate liquid. The masonry must be pre-wet before applying an alkaline cleaning agent, but not when using a solvent. Once the stain has been removed, the masonry must be rinsed thoroughly.

Figure 17. A poultice is being used to remove salts from the brownstone statuary on the facade of this late-19th century stone church. Photo: National Park Service Files.

Figure 18. The glazed bricks in the center of the pier were covered by a signboard that protected them being damaged by the sandblasting which removed the glaze from the surrounding bricks.

Figure 19. A comparison of undamaged bricks surrounding the electrical conduit with the rest of the brick facade emphasizes the severity of the erosion caused by sandblasting.

Abrasive Blasting. Blasting with abrasive grit or another abrasive material is the most frequently used abrasive method. *Sandblasting* is most commonly associated with abrasive cleaning. Finely ground silica or glass powder, glass beads, ground garnet, powdered walnut and other ground nut shells, grain hulls, aluminum oxide, plastic particles and even tiny pieces of sponge, are just a few of the other materials that have also been used for abrasive cleaning. Although abrasive blasting is not an appropriate method of cleaning historic masonry, it can be safely used to clean some materials. Finely-powdered walnut shells are commonly used for cleaning monumental bronze sculpture, and skilled conservators clean delicate museum objects and finely detailed, carved stone features with very small, micro-abrasive units using aluminum oxide.

A number of current approaches to abrasive blasting rely on materials that are not usually thought of as abrasive, and not as commonly associated with traditional abrasive grit cleaning. Some patented abrasive cleaning processes—one dry, one wet—use finely-ground glass powder intended to "erase" or remove dirt and surface soiling only, but not paint or stains (Fig. 20). Cleaning with baking soda (sodium bicarbonate) is another patented process. Baking soda blasting is being used in some communities as a means of quick graffiti removal. However, it should not be used on historic masonry which it can easily abrade and can permanently "etch" the graffiti into the stone; it can also leave potentially damaging salts in the stone which cannot be removed. Most of these abrasive grits may be used either dry or wet, although dry grit tends to be used more frequently.

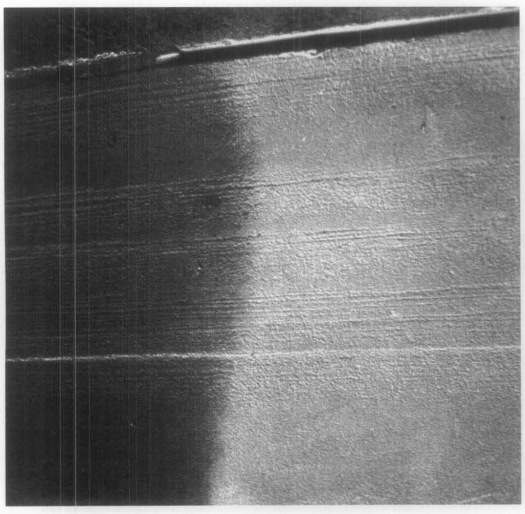

Figure 20. (Left) A comparison of the limestone surface of a 1920s office building before and after "cleaning" with a proprietary abrasive process using fine glass powder clearly shows the effectiveness of this method. But this is an abrasive technique and it has "cleaned" by removing part of the masonry surface with the dirt. Because it is abrasive, it is generally not recommended for large-scale cleaning of historic masonry, although it may be suitable to use in certain, very limited cases under controlled circumstances. (Right) A vacum chamber where the used glass powder is collected for environmentally safe disposal is a unique feature of this particular process. The specially-trained operators in the chamber wear protective clothing, masks and breathing equipment. Photos: Tom Keohan.

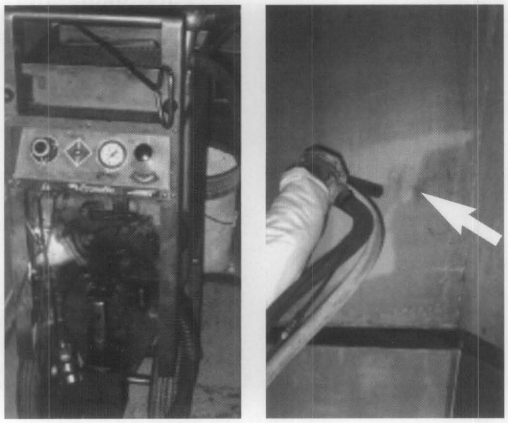

Figure 21. Low-pressure blasting with ice pellets or ice crystals (left) is an abrasive cleaning method that is sometimes recommended for use on interior masonry because it does not involve large amounts of water. However, like other abrasive materials, ice crystals "clean" by removing a portion of the masonry surface with the dirt, and may not remove some stains that have penetrated into the masonry without causing further abrasion (right). Photos: Audrey T. Tepper.

Ice particles, or pelletized dry ice (carbon dioxide or CO_2), are another medium used as an abrasive cleaner (Fig. 21). This is also too abrasive to be used on most historic masonry, but it may have practical application for removing mastics or asphaltic coatings from some substrates.

Some of these processes are promoted as being more environmentally safe and not damaging to historic masonry buildings. However, it must be remembered that they are abrasive and that they "clean" by removing a small portion of the masonry surface, even though it may be only a minuscule portion. The fact that they are essentially abrasive treatments must always be taken into consideration when planning a masonry cleaning project. *In general, abrasive methods should not be used to clean historic masonry buildings.* In some, very limited instances, highly-controlled, gentle abrasive cleaning may be appropriate on selected, hard-to-clean areas of a historic masonry building if carried out under the watchful supervision of a professional conservator. But, abrasive cleaning should never be used on an entire building.

Grinders and Sanding Disks. Grinding the masonry surface with mechanical grinders and sanding disks is another means of abrasive cleaning that should not be used on historic masonry. Like abrasive blasting, grinders and disks do not really clean masonry but instead grind away and abrasively remove and, thus, damage the masonry surface itself rather than remove just the soiling material.

Planning A Cleaning Project

Once the masonry and soiling material or paint have been identified, and the condition of the masonry has been evaluated, planning for the cleaning project can begin.

Testing cleaning methods. In order to determine the *gentlest means possible*, several cleaning methods or materials may have to be tested prior to selecting the best one to use on the building. Testing should always begin with the gentlest and least invasive method proceeding gradually, if necessary, to more complicated methods, or a combination of methods. All too often simple methods, such as low-pressure water wash, are not even considered, yet they frequently are effective, safe, and not expensive. Water of slightly higher pressure or with a non-ionic detergent additive also may be effective. It is worth repeating that these methods should always be tested prior to considering harsher methods; they are safer for the building and the environment, often safer for the applicator, and relatively inexpensive.

The level of cleanliness desired also should be determined prior to selection of a cleaning method. Obviously, the intent of cleaning is to remove most of the dirt, soiling material, stains, paint or other coating. A "brand new" appearance, however, may be inappropriate for an older building, and may require an overly harsh cleaning method to be achieved. When undertaking a cleaning project, it is important to be aware that some stains simply may not be removable. It may be wise, therefore, to agree upon a slightly lower level of cleanliness that will serve as the standard for the cleaning project. The precise amount of residual dirt considered acceptable may depend on the type of masonry, the type of soiling and difficulty of total removal, and local environmental conditions.

Cleaning tests should be carried out in an area of sufficient size to give a true indication of their effectiveness. It is preferable to conduct the test in an inconspicuous location on the building so that it will not be obvious if the test is not successful. A test area may be quite small to begin, sometimes as small as six square inches, and gradually may be increased in size as the most appropriate methods and cleaning agents are determined. Eventually the test area may be expanded to a square yard or more, and it should include several masonry units and mortar joints (Fig. 22). It should be remembered that a single building may have several types of masonry and that even similar materials may have different surface finishes. Each material and different finish should be tested separately. Cleaning tests should be evaluated only after the masonry has dried completely. *The results of the tests may indicate that several methods of cleaning should be used on a single building.*

When feasible, test areas should be allowed to weather for an extended period of time prior to final evaluation. A waiting period of a full year would be ideal in order to expose the test patch to a full range of seasons. If this is not possible, the test patch should weather for at least a month or two. For any building which is considered historically important, the delay is insignificant compared to the potential damage and disfigurement which may result from using an incompletely tested method. *The successfully cleaned test patch should be protected as it will serve as a standard against which the entire cleaning project will be measured.*

Environmental considerations. The potential effect of any method proposed for cleaning historic masonry should be evaluated carefully. Chemical cleaners and paint removers may damage trees, shrubs, grass, and plants. A plan must be provided for environmentally safe removal and disposal of the cleaning materials and the rinsing effluent before beginning the cleaning project. Authorities from the local regulatory agency—usually under the jurisdiction of the federal or state Environmental Protection Agency (EPA) should be consulted prior to beginning a cleaning project, especially if it involves anything more than plain water washing. This advance planning will ensure that the cleaning effluent or run-off, which is the combination of the cleaning agent and the substance removed from the masonry, is handled and disposed of in an environmentally sound and legal manner. Some alkaline and acidic cleaners can be neutralized so that they can be safely discharged into storm sewers. However, most solvent-based cleaners cannot be neutralized and are categorized as pollutants, and must be disposed of by a licensed transport, storage and disposal facility. Thus, it is always advisable to consult with the appropriate agencies before starting to clean to ensure that the project progresses smoothly and is not interrupted by a stop-work order because a required permit was not obtained in advance.

Vinyl guttering or polyethylene-lined troughs placed around the perimeter of the base of the building can serve to catch chemical cleaning waste as it is rinsed off the building. This will reduce the amount of chemicals entering and polluting the soil, and also will keep the cleaning waste contained until it can be removed safely. Some patented cleaning systems have developed special equipment to facilitate the containment and later disposal of cleaning waste.

Concern over the release of volatile organic compounds (VOCs) into the air has resulted in the manufacture of new, more environmentally responsible cleaners and paint removers, while some materials traditionally used in cleaning may no longer be available for these same reasons. Other health and safety concerns have created additional cleaning challenges, such as lead paint removal, which is likely to require special removal and disposal techniques.

Cleaning can also cause damage to non-masonry materials on a building, including glass, metal and wood. Thus, it is usually necessary to cover windows and doors, and other features that may be vulnerable to chemical cleaners. They should be covered with plastic or polyethylene, or a masking agent that is applied as a liquid which dries to form a thin protective film on glass, and is easily peeled off after the cleaning is finished. Wind drift, for example, can also damage other property by carrying cleaning chemicals onto nearby automobiles, resulting in etching of the glass or spotting of the paint finish. Similarly, airborne dust can enter surrounding buildings, and excess water can collect in nearby yards and basements.

Safety considerations. Possible health dangers of each method selected for the cleaning project must be considered before selecting a cleaning method to avoid harm to the

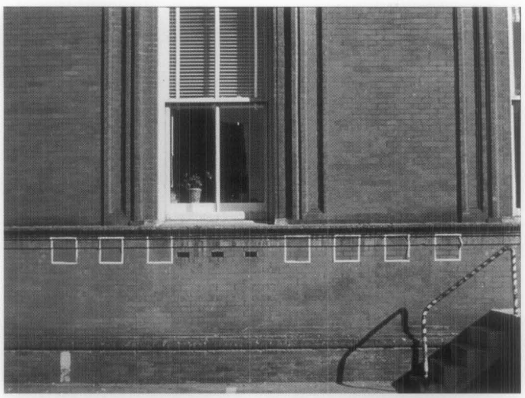

Figure 22. Cleaning test areas may be quite small at first and gradually increase in size as testing determines the "gentlest means possible". Photo: Frances Gale.

cleaning applicators, and the necessary precautions must be taken. The precautions listed in Material Safety Data Sheets (MSDS) that are provided with chemical products should always be followed. Protective clothing, respirators, hearing and face shields, and gloves must be provided to workers to be worn at all times. Acidic and alkaline chemical cleaners in both liquid and vapor forms can also cause serious injury to passers-by (Fig. 23). It may be necessary to schedule cleaning at night or weekends if the building is located in a busy urban area to reduce the potential danger of chemical overspray to pedestrians. Cleaning during non-business hours will allow HVAC systems to be turned off and vents to be covered to prevent dangerous chemical fumes from entering the building which will also ensure the safety of the building's occupants. Abrasive and mechanical methods produce dust which can pose a serious health hazard, particularly if the abrasive or the masonry contains silica.

Water-Repellent Coatings and Waterproof Coatings

To begin with, it is important to understand that waterproof coatings and water-repellent coatings are not the same. Although these terms are frequently interchanged and commonly confused with one another, they are completely different materials. **Water-repellent coatings** —often referred to incorrectly as "sealers", but which do not or should not seal— are intended to keep liquid water from penetrating the surface but to allow water vapor to enter and leave, or pass through, the surface of the masonry (Fig. 24). Water-repellent coatings are generally *transparent*, or clear, although once applied some may darken or discolor certain types of masonry while others may give it a glossy or shiny appearance. **Waterproof coatings** seal the surface from liquid water and from water vapor. They are usually *opaque*, or pigmented, and include bituminous coatings and some elastomeric paints and coatings.

Water-Repellent Coatings

Water-repellent coatings are formulated to be vapor permeable, or "breathable". They do not seal the surface completely to water vapor so it can enter the masonry wall as well as leave the wall. While the first water-repellent coatings to be developed were primarily acrylic or silicone resins in organic solvents, now most water-repellent coatings are water-based and formulated from modified siloxanes, silanes and other alkoxysilanes, or metallic stearates. While some of these products are shipped from the factory ready to use, other waterborne water repellents must be diluted at the job site. Unlike earlier water-repellent coatings which tended to form a "film" on the masonry surface, modern water-repellent coatings actually penetrate into the masonry substrate slightly and, generally, are almost invisible if properly applied to the masonry. They are also more vapor permeable than the old coatings, yet they still reduce the vapor permeability of the masonry. Once inside the wall, water vapor can condense at cold spots producing liquid water which, unlike water vapor, cannot escape through a water-repellent coating. The liquid water within the wall, whether from condensation, leaking gutters, or other sources, can cause considerable damage.

Water-repellent coatings are not consolidants. Although modern water repellents may penetrate slightly beneath the masonry surface, instead of just "sitting" on top of it, they do not perform the same function as a consolidant which is to "consolidate" and replace lost binder to strengthen deteriorating masonry. Even after many years of laboratory study and testing few consolidants have proven very effective. The composition of fired products such as brick and architectural terra cotta, as well as many types of building stone, does not lend itself to consolidation.

Some modern water-repellent coatings which contain a binder intended to replace the natural binders in stone that have been lost through weathering and natural erosion are described in product literature as both a water repellent and a consolidant. The fact that newer water-repellent coatings penetrate beneath the masonry surface instead of just forming a layer on top of the surface may indeed convey at least some consolidating properties to certain stones. However, a water-repellent coating cannot be considered a consolidant. In some instances, a water-repellent or "preservative" coating, if applied to already damaged or spalling stone, may form a surface crust which, if it fails, may exacerbate the deterioration by pulling off even more of the stone (Fig. 25).

Is a Water-Repellent Treatment Necessary?

Water-repellent coatings are frequently applied to historic masonry buildings for the wrong reason. They also are often applied without an understanding of what they are and what they are intended to do. And these coatings can be very difficult, if not impossible, to remove from the masonry if they fail or become discolored. Most importantly, the application of water-repellent coatings to historic masonry is usually unnecessary.

Figure 23. A tarpaulin protects and shields pedestrians from potentially harmful spray while chemical cleaning is underway on the granite exterior of the U.S. Treasury Building, Washington, D.C.

Most historic masonry buildings, unless they are painted, have survived for decades without a water-repellent coating and, thus, probably do not need one now. Water penetration to the interior of a masonry building is seldom due to porous masonry, but results from poor or deferred maintenance. Leaking roofs, clogged or deteriorated gutters and downspouts, missing mortar, or cracks and open joints around door and window openings are almost always the cause of moisture-related problems in a historic masonry building. **If historic masonry buildings are kept watertight and in good repair, water-repellent coatings should not be necessary.**

Rising damp (capillary moisture pulled up from the ground), or condensation can also be a source of excess moisture in masonry buildings. A water-repellent coating will not solve this problem either and, in fact, may be likely to exacerbate it. Furthermore, a water-repellent coating should never be applied to a damp wall. Moisture in the wall would reduce the ability of a coating to adhere to the masonry and to penetrate below the surface. But, if it did adhere, it would hold the moisture inside the masonry because, although a water-repellent coating is permeable to water vapor, liquid water cannot pass through it. In the case of rising damp, a coating may force the moisture to go even higher in the wall because it can slow down evaporation, and thereby retain the moisture in the wall.

Excessive moisture in masonry walls may carry waterborne soluble salts from the masonry units themselves or from the mortar through the walls. If the water is permitted to come to the surface, the salts may appear on the masonry surface as efflorescence (a whitish powder) upon evaporation. However, the salts can be potentially dangerous if they remain in the masonry and crystallize

Figure 24. Although the application of a water-repellent coating was probably not needed on either of these buildings, the coating on the brick building (above), is not visible and has not changed the character of the brick. But the coating on the brick column (below), has a high gloss that is incompatible with the historic character of the masonry.

beneath the surface as subflorescence. Subflorescence eventually may cause the surface of the masonry to spall, particularly if a water-repellent coating has been applied which tends to reduce the flow of moisture out from the subsurface of the masonry. Although many of the newer water-repellent products are more breathable than their predecessors, they can be especially damaging if applied to masonry that contains salts, because they limit the flow of moisture through masonry.

When a Water-Repellent Coating May be Appropriate

There are some instances when a water-repellent coating may be considered appropriate to use on a historic masonry building. Soft, incompletely fired brick from the 18th- and early-19th centuries may have become so porous that paint or some type of coating is needed to protect it from further deterioration or dissolution. When a masonry building has been neglected for a long period of time, necessary repairs may be required in order to make it watertight. If, following a reasonable period of time after the building has been made watertight and has dried out completely, moisture appears actually to be penetrating through the repointed and repaired masonry walls, then the application of a water-repellent coating may be considered *in selected areas only*. This decision should be made in consultation with an architectural conservator. And, if such a treatment is undertaken, it should not be applied to the entire exterior of the building.

Anti-graffiti or barrier coatings are another type of clear coating—although barrier coatings can also be pigmented—that may be applied to exterior masonry, but they are not formulated primarily as water repellents. The purpose of these coatings is to make it harder for graffiti to stick to a masonry surface and, thus, easier to clean. But, like water-repellent coatings, in most cases the application of anti-graffiti coatings is generally not recommended for historic masonry buildings. These coatings are often quite shiny which can greatly alter the appearance of a historic masonry surface, and they are not always effective (Fig. 26). Generally, other ways of discouraging graffiti, such as improved lighting, can be more effective than a coating. However, the application of anti-graffiti coatings may be appropriate in some instances on vulnerable areas of historic masonry buildings which are frequent targets of graffiti that are located in out-of-the-way places where constant surveillance is not possible.

Some water-repellent coatings are recommended by product manufacturers as a means of keeping dirt and pollutants or biological growth from collecting on the surface of masonry buildings and, thus, reducing the need for frequent cleaning. While this at times may be true, in some cases a coating may actually retain dirt more than uncoated masonry. Generally, the application of a water-repellent coating is not recommended on a historic masonry building as a means of preventing biological growth. Some water-repellent coatings may actually encourage biological growth on a masonry wall. Biological growth on masonry buildings has traditionally been kept at bay through regularly-scheduled cleaning as part of a maintenance plan. Simple cleaning of the masonry with low-pressure water using a natural- or synthetic-bristled scrub brush can be very effective if done on a regular basis. Commercial products are also available which can be sprayed on masonry to remove biological growth.

In most instances, a water-repellent coating is not necessary if a building is watertight. The application of a water-repellent coating is not a recommended treatment for historic masonry buildings unless there is a specific

Figure 25. The clear coating applied to this limestone molding has failed and is taking off some of the stone surface as it peels. Photo: Frances Gale.

problem which it may help solve. If the problem occurs on only part of the building, it is best to treat only that area rather than an entire building. Extreme exposures such as parapets, for example, or portions of the building subject to driving rain can be treated more effectively and less expensively than the entire building. Water-repellent coatings are not permanent and must be reapplied periodically although, if they are truly invisible, it can be difficult to know when they are no longer providing the intended protection.

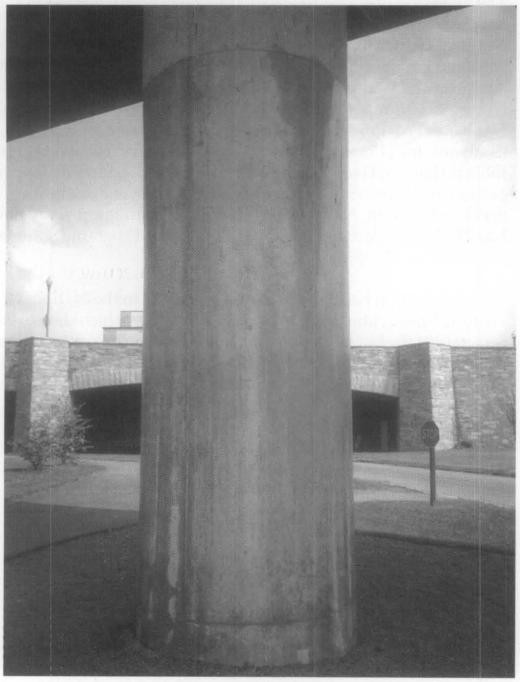

Figure 26. The anti-graffiti or barrier coating on this column is very shiny and would not be appropriate to use on a historic masonry building. The coating has discolored as it has aged and whitish streaks reveal areas of bare concrete where the coating was incompletely applied.

Testing a water-repellent coating by applying it in one small area may not be helpful in determining its suitability for the building because a limited test area does not allow an adequate evaluation of such a treatment. Since water may enter and leave through the surrounding untreated areas, there is no way to tell if the coated test area is "breathable." But trying a coating in a small area may help to determine whether the coating is visible on the surface or if it will otherwise change the appearance of the masonry.

Waterproof Coatings

In theory, waterproof coatings usually do not cause problems as long as they exclude all water from the masonry. If water does enter the wall from the ground or from the inside of a building, the coating can intensify the damage because the water will not be able to escape. During cold weather this water in the wall can freeze causing serious mechanical disruption, such as spalling.

In addition, the water eventually will get out by the path of least resistance. If this path is toward the interior, damage to interior finishes can result; if it is toward the exterior, it can lead to damage to the masonry caused by built-up water pressure (Fig. 27).

In most instances, waterproof coatings should not be applied to historic masonry. The possible exception to this might be the application of a waterproof coating to below-grade exterior foundation walls as a last resort to stop water infiltration on interior basement walls. **Generally, however, waterproof coatings, which include *elastomeric paints*, should almost never be applied above grade to historic masonry buildings.**

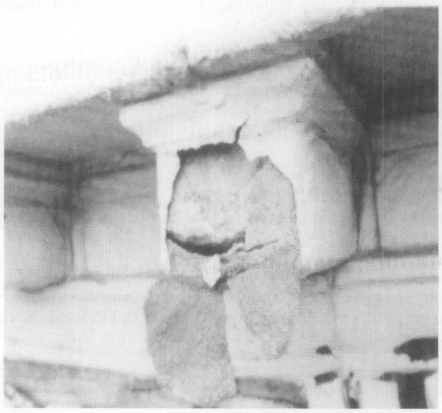

Figure 27. Instead of correcting the roof drainage problems, an elastomeric coating was applied to the already saturated limestone cornice. An elastomeric coating holds moisture in the masonry because it does not "breathe" and does not allow liquid moisture to escape. If the water pressure builds up sufficiently it can cause the coating to break and pop off as shown in this example, often pulling pieces of the masonry with it. Photo: National Park Service Files.

Summary

A well-planned cleaning project is an essential step in preserving, rehabilitating or restoring a historic masonry building. Proper cleaning methods and coating treatments, when determined necessary for the preservation of the masonry, can enhance the aesthetic character as well as the structural stability of a historic building. Removing years of accumulated dirt, pollutant crusts, stains, graffiti or paint, if done with appropriate caution, can extend the life and longevity of the historic resource. Cleaning that is carelessly or insensitively prescribed or carried out by inexperienced workers can have the opposite of the intended effect. It may scar the masonry permanently, and may actually result in hastening deterioration by introducing harmful residual chemicals and salts into the masonry or causing surface loss. Using the wrong cleaning method or using the right method incorrectly, applying the wrong kind of coating or applying a coating that is not needed can result in serious damage, both physically and aesthetically, to a historic masonry building. Cleaning a historic masonry building should always be done using the *gentlest means possible* that will clean, but not damage the building. It should always be taken into consideration before applying a water-repellent coating or a waterproof coating to a historic masonry building whether it is really necessary and whether it is in the best interest of preserving the building.

Selected Reading

Architectural Ceramics: Their History, Manufacture and Conservation. A Joint Symposium of English Heritage and the United Kingdom Institute for Conservation, September 22-25, 1994. London: English Heritage, 1996.

Ashurst, Nicola. *Cleaning Historic Buildings. Volume One: Substrates, Soiling & Investigation. Volume Two: Cleaning Materials & Processes.* London: Donhead Publishing Ltd., 1994.

Association for Preservation Technology. *Special Issue: Preservation of Historic Masonry.* Papers from the Symposium on Preservation Treatments for Historic Masonry: Consolidants, Coatings, and Water Repellents, New York, New York, November 11-12, 1994. *APT Bulletin.* Vol. XXVI, No. 4 (1995).

Grimmer, Anne E. *Preservation Brief 6: Dangers of Abrasive Cleaning to Historic Buildings.* Washington, D.C.: Preservation Assistance Division, National Park Service, U.S. Department of the Interior, 1979.

Grimmer, Anne E. *Keeping it Clean: Removing Exterior Dirt, Paint, Stains and Graffiti from Historic Masonry Buildings.* Washington, D.C.: Preservation Assistance Division, National Park Service, U.S. Department of the Interior, 1988.

Park, Sharon C., AIA. *Preservation Brief 39: Holding the Line: Controlling Unwanted Moisture in Historic Buildings.* Washington, D.C.: Heritage Preservation Services, National Park Service, U.S. Department of the Interior, 1996.

Powers, Robert M. *Preservation Tech Note, Masonry No. 3, "Water Soak Cleaning of Limestone".* Washington, D.C.: Preservation Assistance Division, National Park Service, U.S. Department of the Interior, 1992.

Sinvinski, Valerie. *"Gentle Blasting." Old-House Journal.* Vol. XXIV, No. 4 (July-August 1996), pp. 46-49.

Weaver, Martin E. *Conserving Buildings: A Guide to Techniques and Materials.* New York: John Wiley & Sons, Inc., 1993.

Weaver, Martin E. *Preservation Brief 38: Removing Graffiti from Historic Masonry.* Washington, D.C.: Preservation Assistance Division, National Park Service, U.S. Department of the Interior, 1995.

Winkler, E.M. *Stone in Architecture: Properties, Durability.* Third, completely revised and extended edition. Berlin, Germany: Springer-Verlag, 1997.

Acknowledgments

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The original version of *Preservation Brief 1: The Cleaning and Waterproof Coating of Masonry Buildings* was written by Robert C. Mack, AIA. It inaugurated the *Preservation Briefs* series when it was published in 1975.

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This publication has been prepared pursuant to the National Historic Preservation Act of 1966, as amended, which directs the Secretary of the Interior to develop and make available information concerning historic properties. Comments on the usefulness of this publication may be directed to: Sharon C. Park, FAIA, Chief, Technical Preservation Services Branch, Heritage Preservation Services Program, National Park Service, 1849 C Street, N.W., Suite NC200, Washington, D.C. 20240 (www2.cr.nps.gov/tps). This publication is not copyrighted and can be reproduced without penalty. Normal procedures for credit to the authors and the National Park Service are appreciated.

Front Cover: Chemical cleaning of the brick and architectural terra cotta frieze on the 1880s Pension Building, Washington, D.C. (now the National Building Museum), is shown here in progress. Photo: Christina Henry.

Photographs used to illustrate this Brief were taken by Anne Grimmer unless otherwise credited.

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15 PRESERVATION BRIEFS

Preservation of Historic Concrete

Paul Gaudette and Deborah Slaton

National Park Service
U.S. Department of the Interior
Heritage Preservation Services

Introduction to Historic Concrete

Concrete is an extraordinarily versatile building material used for utilitarian, ornamental, and monumental structures since ancient times. Composed of a mixture of sand, gravel, crushed stone, or other coarse material, bound together with lime or cement, concrete undergoes a chemical reaction and hardens when water is added. Inserting reinforcement adds tensile strength to structural concrete elements. The use of reinforcement contributes significantly to the range and size of building and structure types that can be constructed with concrete.

While early twentieth century proponents of modern concrete often considered it to be permanent, it is, like all materials, subject to deterioration. This Brief provides an overview of the history of concrete and its popularization in the United States, surveys the principal causes and modes of concrete deterioration, and outlines approaches to repair and protection that are appropriate to historic concrete. In the context of this Brief, historic concrete is considered to be concrete used in construction of structures of historical, architectural, or engineering interest, whether those structures are old or relatively new.

Brief History of Use and Manufacture

The ancient Romans found that a mixture of lime putty and pozzolana, a fine volcanic ash, would harden under water. The resulting hydraulic cement became a major feature of Roman building practice, and was used in many buildings and engineering projects such as bridges and aqueducts. Concrete technology was kept alive during the Middle Ages in Spain and Africa. The Spanish introduced a form of concrete to the New World in the first decades of the sixteenth century, referred to as "tapia" or "tabby." This material, a mixture of lime, sand, and shell or stone aggregate mixed with water, was placed between wooden forms, tamped, and allowed to dry in successive layers. Tabby was later used by the English settlers in the coastal southeastern United States.

The early history of concrete was fragmented, with developments in materials and construction techniques occurring on different continents and in various countries. In the United States, concrete was slow in achieving widespread acceptance in building construction and did not begin to gain popularity until the late nineteenth century. It was more readily accepted for use in transportation and infrastructure systems.

The Erie Canal in New York is an example of the early use of concrete in transportation in the United States. The natural hydraulic cement used in the canal construction was processed from a deposit of limestone found in 1818 near Chittenango, southeast of Syracuse. The use of concrete in residential construction was

Figure 1. The Sebastopol House in Seguin, Texas, is an 1856 Greek Revival-style house constructed of lime concrete. Lime concrete or "limecrete" was a popular construction material, as it could be made inexpensively from local materials. By 1900, the town had approximately ninety limecrete structures, twenty of which remain. Photo: Texas Parks and Wildlife Department.

Figure 2. Chatterton House was the home of the post trader at Fort Fred Steel in Wyoming, one of several forts established in the 1860s to protect the Union Pacific Railroad. The walls of the post trader's house were built using stone aggregate and lime, without cement. The use of this material presents special preservation challenges.

publicized in the second edition of Orson S. Fowler's *A Home for All* (1853) which described the advantages of "gravel wall" construction to a wide audience. The town of Seguin, Texas, thirty-five miles east of San Antonio, already had a number of concrete buildings by the 1850s and came to be called "The Mother of Concrete Cities," with approximately ninety concrete buildings made from local "lime water" and gravel (Fig. 1).

Impressed by the economic advantages of poured gravel wall or "lime-grout" construction, the Quartermaster General's Office of the War Department embarked on a campaign to improve the quality of building for frontier military posts. As a result, lime-grout structures were constructed at several western posts soon after the Civil War, including Fort Fred Steele and Fort Laramie, both in Wyoming (Fig. 2). By the 1880s, sufficient experience had been gained with unreinforced concrete to permit construction of much larger buildings. A notable example from this period is the Ponce de Leon Hotel in St. Augustine, Florida.

Extensive construction in concrete also occurred through the system of coastal fortifications commissioned by the federal government in the 1890s for the Atlantic, Pacific, and Gulf coasts. Unlike most concrete construction to that time, the special requirements of coastal fortifications called for concrete walls as much as 20 feet thick, often at sites that were difficult to access. Major structures in the coastal defenses of the 1890s were built of mass concrete with no internal reinforcing, a practice that was replaced by the use of reinforcing bars in fortifications constructed after about 1905.

The use of reinforced concrete in the United States dates from 1860, when S.T. Fowler obtained a patent for a reinforced concrete wall. In the early 1870s, William E. Ward built his own house in Port Chester, New York, using concrete reinforced with iron rods for all structural elements. Despite these developments, such construction remained a novelty until after 1880, when innovations introduced by Ernest L. Ransome made the use of reinforced concrete more practicable. Ransome made many contributions to the development of concrete construction technology, including the use of twisted reinforcing bars to improve bond between the concrete and the steel, which he patented in 1884. Two years later, Ransome introduced the rotary kiln to United States cement production. The new kiln had greater capacity and burned more thoroughly and uniformly, allowing development of a less expensive, more uniform, and more reliable manufactured cement. Improvements in concrete production initiated by Ransom led to a much greater acceptance of concrete after 1900.

The Lincoln Highway Association, incorporated in 1913, promoted the use of concrete in construction of a coast-to-coast roadway system. The goal of the Lincoln Highway Association and highway advocate Henry B. Joy was to educate the country in the need for good roads made of concrete, with an improved Lincoln

Figure 3. The Lincoln Highway Association promoted construction of a high quality continuous hard surface roadway across the country. The Boys Scouts of America installed concrete road markers along the Lincoln Highway in 1928.

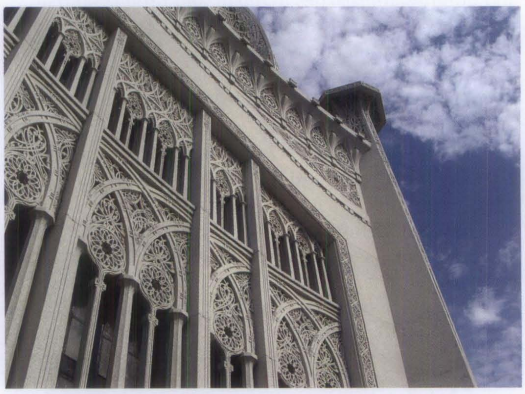


Figure 4. The highly ornamental concrete panels on the exterior facade of the Baha'i House of Worship in Wilmette, Illinois, illustrate the work of fabricator John J. Earley, known as "the man who made concrete beautiful."

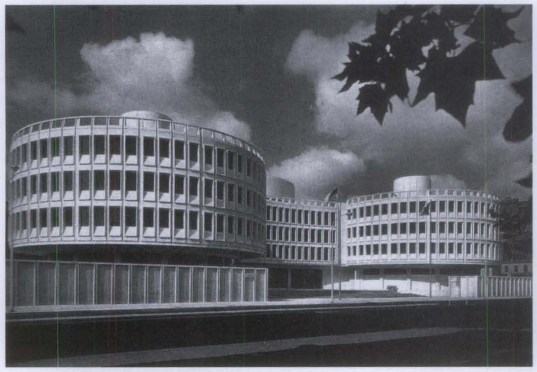


Figure 5. Following World War II, architects and engineers took advantage of improvements in concrete production, quality control, and advances in precast concrete to design structures such as the Police Headquarters building in Philadelphia, Pennsylvania, constructed in 1961. Photo: Courtesy of the Philadelphia Police Department.

Figure 6. The Bailey Magnet School in Jackson, Mississippi, was designed as the Jackson Junior High School by the firm of N.W. Overstreet & Town in 1936. The streamlined building exemplifies the applicability of concrete to creating a modern architectural aesthetic. Photo: Bill Burris, Burris/Wagnon Architects, P.A.

Highway as an example. Concrete "seedling miles" were constructed in remote areas to emphasize the superiority of concrete over unimproved dirt. The Association believed that as people learned about concrete, they would press the government to construct good roads throughout their states. Americans' enthusiasm for good roads led to the involvement of the federal government in road-building and the creation of numbered U.S. routes in the 1920s (Fig. 3).

During the early twentieth century, Ernest Ransome in Beverly, Massachusetts, Albert Kahn in Detroit, and Richard E. Schmidt in Chicago, promoted concrete for use in "Factory Style" utilitarian buildings with an exposed concrete frame infilled with expanses of glass. Thomas Edison's cast-in-place reinforced concrete homes in Union Township, New Jersey (1908), proclaimed a similarly functional emphasis in residential construction. From the 1920s onward, concrete began to be used with spectacular design results: examples include John J. Earley's Meridian Hill Park in Washington, D.C.; Louis Bourgeois' exuberant, graceful Baha'i Temple in Wilmette, Illinois (1920–1953), for which Earley fabricated the concrete (Fig. 4); and Frank Lloyd Wright's Fallingwater near Bear Run, Pennsylvania (1934). Continuing improvements in quality control and development of innovative fabrication processes, such as the Shockbeton method for precast concrete, provided increasing opportunities for architects and engineers. Wright's Guggenheim Museum in New York City (1959); Geddes Brecher Qualls & Cunningham's Police Headquarters building in Philadelphia, Pennsylvania (1961); and Eero Saarinen's soaring terminal building at Dulles International Airport outside Washington, D.C., and the TWA terminal at Kennedy Airport in New York (1962), exemplify the masterful use of concrete achieved in the modern era (Fig. 5).

Figure 7. Detailed bas reliefs as well as sculptures, such as this lion at the Bailey Magnet School, could be used as ornamentation on concrete buildings. Sculptural concrete elements were typically cast in molds.

Throughout the twentieth century, a wide range of architectural and engineering structures were built using concrete as a practical and cost-effective choice—and concrete also became valued for its aesthetic qualities. Cast in place and precast concrete were readily adapted to the Streamlined Moderne style, as exemplified by the Bailey Magnet School in Jackson, Mississippi, designed as the Jackson Junior High School by N.W. Overstreet & Town in 1936 (Figs. 6 and 7). The school is one of many concrete buildings designed and constructed under the auspices of the Public Works Administration. Recreational structures and landscape features also utilized the structural range and unique character of exposed concrete to advantage, as seen in Chicago's Lincoln Park Chess Pavilion, designed by Morris Webster in 1956 (Fig. 8), and the Ira C. Keller Fountain in Portland Oregon, designed by Lawrence Halprin in 1969 (Fig. 9). Concrete was also popular for building interiors, with ornamental features and exposed structural elements recognized as part of the design aesthetic (See Figs. 10 and 11 in sidebar).

Historic Interiors

The expanded use of concrete provided new opportunities to create dramatic spaces and ornate architectural detail on the interiors of buildings, at a significant cost savings over traditional construction practices. The architectural design of the Berkeley City Club in Berkeley, California, expressed Moorish and Gothic elements in concrete on the interior of the building (Fig. 10). Used as a woman's social club, the building was designed by noted California architect Julia Morgan and constructed in 1929. The vaulted ceilings, columns, and ornamental capitals of the lobby and the ornamental arches and beamed ceiling of the "plunge" are all constructed of concrete.

Figure 10. The Berkeley City Club has significant interior spaces and features of concrete construction, including the lobby and pool. Photos: Una Gilmartin (left) and Brian Kehoe (right), Wiss, Janney, Elstner Associates, Inc.

The historic character of a building's interior can also be conveyed in a more utilitarian manner in terms of concrete features and finishes (Fig. 11). The exposed concrete structure—columns, capitals, and drop panels—is an integral part of the character of this old commercial building in Minneapolis. In concrete warehouse and factory buildings of the early twentieth century, exposed concrete columns and formboard finish concrete slab ceilings are common features as seen in this warehouse, now converted for use as a parking garage and shops.

Figure 11. Whether in a circa 1925 office (left) or in a parking garage and retail facility (right), exposed concrete structures help characterize these building interiors. Photo: Minnesota Historical Society (left).

Concrete Characteristics

Concrete is composed of fine (sand) and coarse (crushed stone or gravel) aggregates and paste made of portland cement and water. The predominant material in terms of bulk is the aggregate. Portland cement is the binder most commonly used in modern concrete. It is commercially manufactured by blending limestone or chalk with clays that contain alumina, silica, lime, iron oxide and magnesia, and heating the compounds together to high temperatures. The hydration process that occurs between the portland cement and water results in formation of an alkali paste that surrounds and binds the aggregate together as a solid mass.

The quality of the concrete is dependent on the ratio of water to the binder; binder content; sound, durable, and well-graded aggregates; compaction during placement; and proper curing. The amount of water used in the mix affects the concrete permeability and strength. The use of excess water beyond that required in the hydration process results in more permeable concrete, which is more susceptible to weathering and deterioration. Admixtures are commonly added to concrete to adjust concrete properties such as setting or hardening time, requirements for water, workability, and other characteristics. For example, the advent of air entraining agents in the 1930s provided enhanced durability for concrete.

During the twentieth century, there was a steady rise in the strength of ordinary concrete as chemical processes became better understood and quality control measures improved. In addition, the need to protect embedded reinforcement against corrosion was acknowledged. Requirements for concrete cover over reinforcing steel, increased cement content, decreased water-cement ratio, and air entrainment all contributed to greater concrete strength and improved durability.

Mechanisms and Modes of Deterioration

Causes of Deterioration

Concrete deterioration occurs primarily because of corrosion of the embedded steel, degradation of the concrete itself, use of improper techniques or materials in construction, or structural problems. The causes of concrete deterioration must be understood in order to select an appropriate repair and protection system.

While reinforcing steel has played a pivotal role in expanding the applications of concrete in twentieth century architecture, corrosion of this steel has also caused deterioration in many historic structures. Reinforcing steel embedded in the concrete is normally surrounded by a passivating oxide layer that, when present, protects the steel from corrosion and aids in bonding the steel and concrete. When the concrete's normal alkaline environment (above a pH of 10) is compromised and the steel is exposed to water, water vapor, or high relative humidity, corrosion of the steel reinforcing takes place. A reduction in alkalinity results from carbonation, a process that occurs when the carbon dioxide in the atmosphere reacts with calcium hydroxide and moisture in the concrete. Carbonation starts at the concrete's exposed surface but may extend to the reinforcing steel over time. When carbonation reaches the metal reinforcement, the concrete no longer protects the steel from corrosion.

Figure 8. The Chess Pavilion in Chicago's Lincoln Park was designed by architect Morris Webster and constructed in 1956. The pavilion is a distinctive landscape feature, with its reinforced concrete cantilevered slab that provides cover for chess players.

Figure 9. The Ira C. Keller Fountain in Portland, Oregon, was designed by Lawrence Halprin and constructed in 1969. The fountain is constructed primarily of concrete pillars with formboard textures and surrounding elements, patterned with geometric lines, which facilitate the path of water. Photo: Anita Washko, Wiss, Janney, Elstner Associates, Inc.

Corrosion of embedded reinforcing steel may be initiated and accelerated if calcium chloride was added to the concrete as a set accelerator during original construction to promote more rapid curing. It may also take place if the concrete is later exposed to deicing salts, as may occur during the winter in northern climates. Seawater or other marine environments can also provide large amounts of chloride, either from inadequately washed original aggregate or from exposure of the concrete to seawater.

Corrosion-related damage to reinforced concrete is the result of rust, a product of the corrosion process of steel, which expands and thus requires more space in the concrete than the steel did at the time of installation. This change in volume of the steel results in expansive forces, which cause cracking and spalling of the adjacent concrete (Fig. 12). Other signs of corrosion of embedded steel include delamination of the concrete (planar separations parallel to the surface) and rust staining (often a precursor to spalling) on the concrete near the steel.

Lack of proper maintenance of building elements such as roofs and drainage systems can contribute to water-related deterioration of the adjacent concrete, particularly when concrete is saturated with water and then exposed to freezing temperatures. As water within the concrete freezes, it expands and exerts forces on the adjacent concrete. Repeated freezing and thawing can result in the concrete cracking and delaminating. Such damage appears as surface degradation, including severe scaling and micro-cracking that extends into the concrete. The condition is most often observed near the surface of the concrete but can also eventually occur deep within the concrete. This type of deterioration is usually most severe at joints, architectural details, and other areas with more surface exposure to weather. In the second half of the twentieth century, concrete has utilized entrained air (the incorporation of microscopic air bubbles) to provide enhanced protection against damage due to cyclic freezing of saturated concrete.

The use of certain aggregates can also result in deterioration of the concrete. Alkali-aggregate reactions—in some cases alkali-silica reaction (ASR)—occur when alkalis normally present in cement react with certain aggregates, leading to the development of an expansive crystalline gel. When this gel is exposed to moisture, it expands and causes cracking of the aggregate and concrete matrix. Deleterious aggregates are typically found only in certain areas of the country and can be detected through analysis by an experienced petrographer. Low-alkali cements as well as fly ash are used today in new construction to prevent such reactions where this problem may occur.

Problems Specifically Encountered with Historic Concrete

Materials and workmanship used in the construction of historic concrete structures, particularly those built before the First World War, sometimes present potential sources of problems. For example, where the aggregate consisted of cinder from burned coal or crushed brick,

Figure 12. The concrete lighthouse at the Kilauea Point Light Station, Kilauea, Kauai, Hawaii, was constructed circa 1913. The concrete, which was a good quality, high strength mix for its day, is in good condition after almost one hundred years in service. Deterioration in the form of spalling related to corrosion of embedded reinforcing steel has occurred primarily in areas of higher ornamentation such as projecting bands and brackets (see close-up photo).

the concrete tends to be weak and porous because these aggregates absorb water. Some of these aggregates can be extremely susceptible to deterioration when exposed to moisture and cyclic freezing and thawing. Concrete was sometimes compromised by inclusion of seawater or beach sand that was not thoroughly washed with fresh water, a condition more common with coastal fortifications built prior to 1900. The sodium chloride present in seawater and beach sand accelerates the rate of corrosion of the reinforced concrete.

Another problem encountered with historic concrete is related to poor consolidation of the concrete during its placement in forms, or in molds in the case of precasting. This problem is especially prevalent in highly ornamental units. Early twentieth century concrete was often tamped or rodded into place, similar to techniques used in forming cast stone. Poorly consolidated concrete often contains voids ("bugholes" or "honeycombs"), which can reduce the protective concrete cover over the embedded reinforcing bars, entrap water, and, if sufficiently large and strategically numerous, reduce localized concrete strength. Vibration technology has improved over time and flowability agents are also used today to address this problem.

A common type of deterioration observed in concrete is the effect of weathering from exposure to wind, rain, snow, and salt water or spray. Weathering appears as erosion of the cement paste, a condition more prevalent in northern regions where precipitation can be highly acidic. This results in the exposure of the aggregate particles on the exposed concrete surface. Variations may occur in the aggregate exposure due to differential erosion or dissolution of exposed cement paste. Erosion can also be caused by the mechanical action of water channeled over concrete, such as by the lack of drip grooves in belt courses and sills, and by inadequate drainage. In addition, high-pressure water when used for cleaning can also erode the concrete surface.

In concrete structures built prior to the First World War, concrete was often placed into forms in relatively short vertical lifts due to limitations in lifting and pouring techniques available at the time. Joints between different concrete placements (often termed cold joints or lift lines) may sometimes be considered an important part of the character of a concrete element (Fig. 13). However, wide joints may permit water to infiltrate the concrete, resulting in more rapid paste erosion or freeze-thaw deterioration of adjacent concrete in cold climates.

In the early twentieth century, concrete was sometimes placed in several layers parallel to the exterior surface. A base concrete was first created with formwork and then a more cement rich mortar layer was applied to the exposed vertical face of the

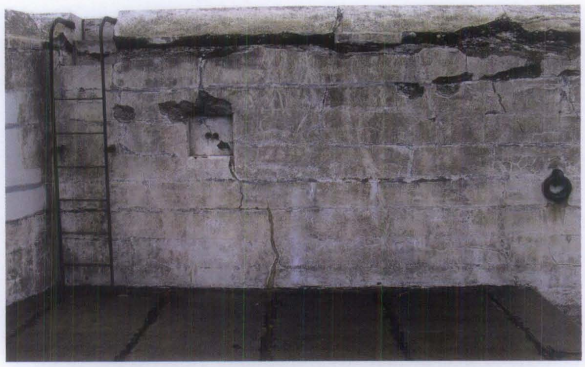


Figure 13. Fort Casey on Admiralty Head, Fort Casey, Washington, was constructed in 1898. The lift lines from placement of concrete are clearly visible on the exterior walls and characterize the finished appearance.

base concrete. The higher cement content in the facing concrete provided a more water-resistant outer layer and finished surface. The application of a cement-rich top layer, referred to in some early concrete publications as "waterproofing," was also used on top surfaces of concrete walls, or as the top layer in sidewalks. With this type of concrete construction, deterioration can occur over time as a result of debonding between layers, and can proceed very rapidly once the protective cement-rich layer begins to break down.

It is common for historic concrete to have a highly variable appearance, including color and finish texture. Different levels of aggregate exposure due to paste erosion are often found in exposed aggregate concrete. This variability in the appearance of historic concrete increases the level of difficulty in assessing and repairing weathered concrete.

Signs of Distress and Deterioration

Characteristic signs of failure in concrete include cracking, spalling, staining, and deflection. Cracking occurs in most concrete but will vary in depth, width, direction, pattern, and location, and can be either active or dormant (inactive). Active cracks can widen, deepen, or migrate through the concrete, while dormant cracks remain relatively unchanged in size. Some dormant cracks, such as those caused by early age shrinkage of the concrete during curing, are not a structural concern but when left unrepaired, can provide convenient channels for moisture penetration and subsequent damage. Random surface cracks, also called map cracks due to their resemblance to lines on a map, are usually related to early-age shrinkage but may also indicate other types of deterioration such as alkali-silica reaction.

Structural cracks can be caused by temporary or continued overloads, uneven foundation settling, seismic forces, or original design inadequacies. Structural cracks are active if excessive loads are applied to a structure, if the overload is continuing, or if settlement is ongoing. These cracks are dormant if the temporary overloads have been removed or if differential settlement has stabilized. Thermally-induced cracks result from stresses produced by the expansion and contraction of the concrete during temperature changes. These cracks frequently occur at the ends or re-entrant corners of older concrete structures that were built without expansion joints to relieve such stress.

Spalling (the loss of surface material) is often associated with freezing and thawing as well as cracking and delamination of the concrete cover over embedded reinforcing steel. Spalling occurs when reinforcing bars corrode and the corrosion by-products expand, creating high stresses on the adjacent concrete, which cracks and is displaced. Spalling can also occur when water absorbed by the concrete freezes and thaws (Fig. 14). In addition, surface spalling or scaling may result from the improper finishing, forming, or other surface

Figures 14. Layers of architectural concrete that have debonded (spalled) from the surface were removed from a historic water tank during the investigation performed to assess existing conditions. Photos: Anita Washko, Wiss, Janney, Elstner Associates, Inc.

phenomena when water-rich cement paste (laitance) rises to the surface. The resulting weak material is vulnerable to spalling of thin layers, or scaling. In some cases, spalling of the concrete can diminish the load-carrying capacity of the structure.

Deflection is the bending or sagging of structural beams, joists, or slabs, and can be an indication of deficiencies in the strength and structural soundness of concrete. This condition can be produced by overloading, corrosion of embedded reinforcing, or inadequate design or construction, such as use of low-strength concrete or undersized reinforcing bars.

Staining of the concrete surface can be related to soiling from atmospheric pollutants or other contaminants, dirt accumulation, and the presence of organic growth. However, stains can also indicate more serious underlying problems, such as corrosion of embedded reinforcing steel, improper previous surface treatments, alkali-aggregate reaction, or efflorescence, the deposition of soluble salts on the surface of the concrete as a result of water migration (Fig. 15).

Planning for Concrete Preservation

The significance of a historic concrete building or structure—including whether it is important for its architectural or engineering design, for its materials and construction techniques, or both—guides decision making about repair and, if needed, replacement methods. Determining the causes of deterioration is also central to the development of a conservation and repair plan. With historic concrete buildings, one of the more difficult challenges is allowing for sufficient time during the planning phase to analyze the concrete, develop mixes, and provide time for adequate aging of mock-ups for matching to the original concrete.

An understanding of the original construction techniques (cement characteristics, mix design, original intent of assembly, type of placement, precast versus cast in place, etc.) and previous repair work performed on the concrete is important in determining causes of existing deterioration and the susceptibility of the structure to potential other types of deterioration. For example, concrete placed in short lifts (individual concrete placements) or constructed in precast segments will have numerous joints that can provide entry points for water infiltration. Inappropriate prior repairs, such as installation of patches using an incompatible material, can affect the future performance of the concrete. Such prior repairs may require corrective work.

As with other preservation projects, three primary approaches are usually considered for historic concrete structures: ***maintenance***, ***repair***, or ***replacement***. Maintenance and repair best achieve the preservation goal of minimal intervention and the greatest retention of existing historic fabric. However, where elements of the building are severely deteriorated or where inherent problems with the material lead to ongoing failures, replacement may be necessary.

During planning, information is gathered through research, visual survey, inspection openings, and laboratory studies. The material should then be reviewed by professionals experienced in concrete deterioration to help evaluate the nature and causes of the concrete problems, to assess both the short-term and long-term effects of the deterioration, and to formulate proper repair approaches.

Condition Assessment

A condition assessment of a concrete building or structure should begin with a review of all available documents related to original construction and prior repairs. While plans and specifications for older concrete buildings are not always available, they can be an invaluable resource and every attempt should be made to find them. They may provide information on the composition of the concrete mix or on the type and location of reinforcing bars. If available, documents related to past repairs should also be reviewed to understand how the repairs were made and to help evaluate their anticipated performance and service life. Archival photographs can also provide a valuable source of information about original construction.

Figure 15. Evidence of moisture movement through concrete is apparent in the form of mineral deposits on the concrete surface. Cyclic freezing and thawing of entrapped moisture, and corrosion of embedded reinforcement, have also contributed to deterioration of the concrete column on this fence at Crocker Field in Fitchburg, Massachusetts, designed by the Olmsted Brothers.

A visual condition survey will help identify and evaluate the extent, types, and patterns of distress and deterioration. The American Concrete Institute offers several useful guides on how to perform a visual condition survey of concrete. Generally, the condition assessment begins with an overall visual survey, followed by a close-up investigation of representative areas to obtain more detailed information about modes of deterioration.

A number of nondestructive testing methods can be used in the field to evaluate concealed conditions. Basic techniques include sounding with a hand-held hammer (or for horizontal surfaces, a chain) to help identify areas of delamination. More sophisticated techniques include impact-echo testing (Fig. 16), ground penetrating radar, pulse velocity, and other methods that characterize concrete thickness and locate voids or delaminations. Magnetic detection instruments are used to locate embedded reinforcing steel and can be calibrated to identify the size and depth of reinforcement. Corrosion measurements can be taken using copper-copper sulfate half-cell tests or linear polarization techniques to determine the probability or rate of active corrosion of the reinforcing steel.

To further evaluate the condition of the concrete, samples may be removed for laboratory study to determine material components and composition, and causes of deterioration. Samples need to be representative of existing conditions but should be taken from unobtrusive locations. Laboratory studies of the concrete may include petrographic evaluation following ASTM C856, *Practice for Petrographic Examination of Hardened Concrete*. Petrographic examination, consisting of microscopical studies performed by a geologist specializing in the evaluation of construction materials, is performed to determine air content, water-cement ratio, cement content, and general aggregate characteristics. Laboratory studies can also include

chemical analyses to determine chloride content, sulfate content, and alkali levels of the concrete; identification of deleterious aggregates; and determination of depth of carbonation. Compressive strength studies can be conducted to evaluate the strength of the existing concrete and provide information for repair work. The laboratory studies provide a general identification of the original concrete's components and aggregates, and evidence of damage due to various mechanisms including cyclic freezing and thawing, alkali-aggregate reactivity, or sulfate attack. Information gathered through laboratory studies can also be used to help develop a mix design for the repair concrete.

Cleaning

As with other historic structures, concrete structures are cleaned for several reasons: to improve the appearance of the concrete, as a cyclical maintenance measure, or in preparation for repairs. Consideration should first be given to whether the historic concrete structure needs to be cleaned at all. If cleaning is required, then the gentlest system that will be effective should be selected.

Three primary methods are used for cleaning concrete: water methods, abrasive surface treatments, and chemical surface treatments. Low-pressure water (less than 200 psi) or steam cleaning can effectively remove surface soiling from sound concrete; however, care is required on fragile or deteriorated surfaces. In addition, water and steam methods are typically not effective in removing staining or severe soiling. Power washing with high-pressure water is sometimes used to clean or remove coatings from sound, high-strength concrete, but high-pressure water washing is generally damaging to and not appropriate for concrete on historic structures.

When used with proper controls and at very low pressures (typically 35 to 75 psi), microabrasive surface treatments using very fine particulates, such as dolomitic limestone powder, can sometimes clean effectively. However, microabrasive cleaning may alter the texture and surface reflectivity of concrete. Some concrete can be damaged even by fine particulates applied at very low pressures.

Figure 16. Impact echo testing is performed on a concrete structural slab to help determine depth of deterioration. In this method, a short pulse of energy is introduced into the structure and a transducer mounted on the impacted surface of the structure receives the reflected input waves or echoes. These waves are analyzed to help identify flaws and deterioration within the concrete.

Chemical surface treatments can clean effectively but may also alter the appearance of the concrete by bleaching the concrete, removing the paste, etching the aggregate, or otherwise altering the surface. Detergent cleaners or mild, diluted acid cleaners may be appropriate for removal of staining or severe soiling. Cleaning products that contain strong acids such as hydrochloric (muriatic) or hydrofluoric acid, which will damage concrete and are harmful to persons, animals, site features, and the environment, should not be used.

For any cleaning process, trial samples should be performed prior to full-scale implementation. The intent of the cleaning program should not be to return the structure to a like new appearance. Concrete can age gracefully, and as long as soiling is not severe or deleterious, many structures can still be appreciated without extensive cleaning.

Methods of Maintenance and Repair

The maintenance of historic concrete often is thought of in terms of appropriate cleaning to remove unattractive dirt or soiling materials. However, the implementation of an overall maintenance plan for a historic structure is the most effective way to help protect historic concrete. For examples, the lack of maintenance to roofs and drainage systems can promote water related damage to adjacent concrete features. The repeated use of deicing salts in winter climates can pit the surface of old concrete and also may promote decay in embedded steel reinforcements. Inadequate protection of concrete walls adjacent to driveways and parking areas can result in the need for repair work later on.

The maintenance of historic concrete involves the regular inspection of concrete to establish baseline conditions and identify needed repairs. Inspection tasks involve monitoring protection systems, including sealant joints, expansion joints, and protective coatings; reviewing existing conditions for development of distress such as cracking and delaminations; documenting conditions observed; and developing and implementing a cyclical repair program.

Sealants are an important part of maintenance of historic concrete structures. Elastomeric sealants, which have replaced traditional oil-resin based caulks for many applications, are used to seal cracks and joints to keep out moisture and reduce air infiltration. Sealants are commonly used at windows and door perimeters, at interfaces between concrete and other materials, and at attachments to or through walls or roofs, such as with lamps, signs, or exterior plumbing fixtures.

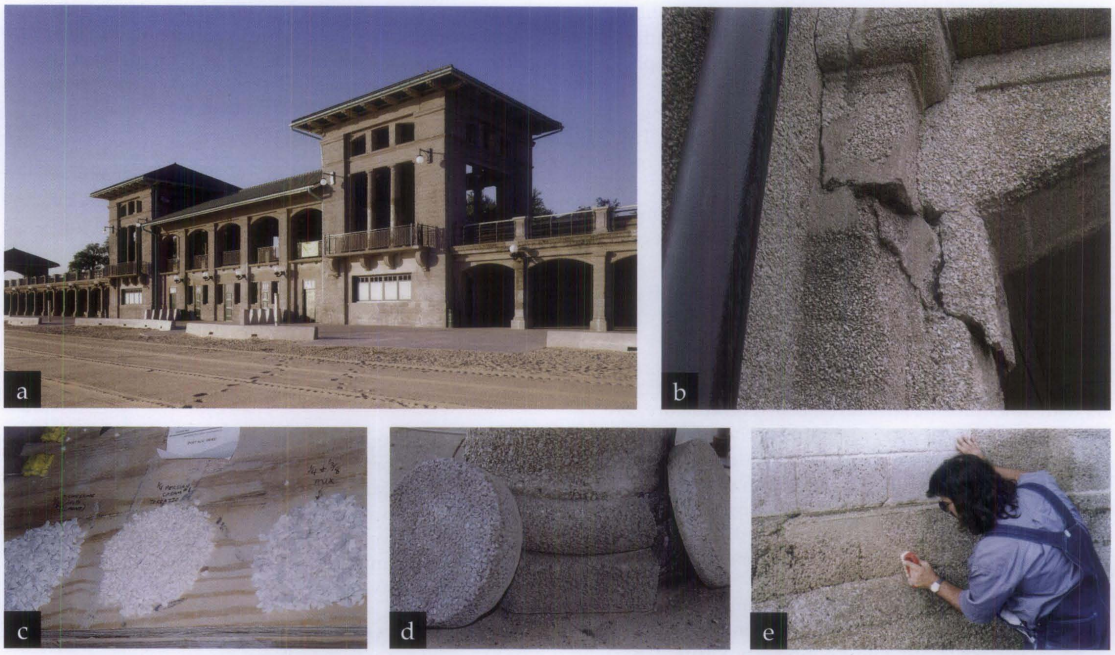


Figure 17. (a) The 63rd Street Beach House was constructed on the shoreline of Chicago in 1919. The highly exposed aggregate concrete of the exterior walls of the beach house was used for many buildings in the Chicago parks as an alternative to more expensive stone construction. Photo: Leslie Schwartz Photography. (b) Concrete deterioration included cracking, spalling, and delamination caused by corrosion of embedded reinforcing steel and concrete damage due to cyclic freezing and thawing. (c) Various sizes and types of aggregates were reviewed for matching to the original concrete materials. (d) Mock-ups of the concrete repair mix were prepared for comparison to the original concrete. Considerations included aggregate type and size, cement color, proportions, aggregate exposure, and surface finish. (e) The craftsman finished the surface to replicate the original appearance in a mock-up on the structure. Here, he used a nylon bristle brush to remove loose paste and expose the aggregate, creating a variable surface to match the adjacent original concrete.

Where used for crack repairs on historic facades, the finished appearance of the sealant application must be considered, as it may be visually intrusive. In some cases, sand can be broadcast onto the surface of the sealant to help conceal the repair.

Urethane and polyurethane sealants are often used to seal joints and cracks in concrete structures, paving, and walkways; these sealants provide a service life of up to ten years. High-performance silicone sealants also are often used with concrete, as they provide a range of movement capabilities and a service life of twenty years or more. Some silicone sealants may stain adjacent materials, which may be a problem with more porous concrete, and may also tend to accumulate dust and dirt. The effectiveness of sealants for sealing joints and cracks depends on numerous factors including proper surface preparation and application. Sealants should be examined as part of routine maintenance inspections, as these materials deteriorate faster than their substrates and must be replaced periodically as a part of cyclical maintenance.

Repair of historic concrete may be required to address deterioration because the original design and construction did not provide for long-term durability, or to facilitate a change in use of the structure. Examples include increasing concrete cover to protect reinforcing steel and reducing water infiltration into the structure by repair of joints. Any such improvements must be thoroughly evaluated for compatibility with the original design and appearance. Care is required in all aspects of historic concrete repair, including surface preparation; installation of formwork; development of the concrete mix design; and concrete placement, consolidation, and curing.

An appropriate repair program addresses existing distress and reduces the rate of future deterioration, which in many cases involves moisture-related issues. The repair program should incorporate materials and methods that are sympathetic to the existing materials in character and appearance, and which provide good long-term performance. In addition, repair materials should age and weather similarly to the original materials. In order to best achieve these goals, concrete repair projects should be divided into three phases: development of trial repair procedures, trial repairs and evaluation, and production repair work.

For any concrete repair project, the process of investigation, laboratory analysis, trial samples, mock-ups, and full-scale repairs allows ongoing refinement of the repair work as well as implementation of quality-control measures. The trial repair process provides an opportunity for the owner, architect, engineer, and contractor to evaluate the concrete mix design and the installation and finishing techniques for the repairs from both technical and aesthetic standpoints. The final repair materials and procedures should match the original concrete in appearance while meeting the established criteria for durability. Information gathered through trial repairs and mock-ups is invaluable in refining the construction documents prior to the start of the overall repair project (Fig. 17).

Surface Preparation

In undertaking surface preparation for historic concrete repair, care must be taken to limit removal of existing material while still providing an appropriate substrate for repairs. This is particularly important where ornamentation and fine details are involved. Preparation for localized repairs usually begins with removal of the loose concrete to determine the general extent of the repair, followed by saw-cutting the perimeter of the repair area. The repair area should extend beyond the area of concrete deterioration to a sufficient extent to provide a sound substrate. When repairing concrete with an exposed aggregate or other special surface texture, a sawcut edge may be too visually evident. To hide the repair edge, techniques such as lightly hand-chipping the edge of the patch may be used to conceal the joint between the original concrete and the new repair material. The depth to which the concrete needs to be removed may be difficult to determine without invasive probing in the repair area. Removal of concrete should typically extend beyond the level of the reinforcing steel, if present, so that the patch encapsulates the reinforcing steel, which provides mechanical attachment for the repair.

If the concrete was originally of lower strength and quality, the assessment of present soundness is more difficult. Deteriorated and unsound concrete is typically removed using pneumatic chipping hammers. Removal of concrete in historic structures is better controlled by using smaller chipping hammers or hand tools. The area of the concrete to be repaired and the exposed reinforcing steel are then cleaned, usually by careful sandblast and air blast procedures applied only within the repair area. Adjacent original concrete surfaces should be protected during this work. In some cases, project constraints such as dust control may limit the ability to thoroughly clean the concrete and steel. For example, it may be necessary to use needle scaling (a small pneumatic impact device) and wire brushing instead of sandblasting.

Supplemental steel may be needed when existing reinforcing steel is severely deteriorated, or if reinforcing steel is not present in repair areas. Exposed existing reinforcing and other embedded steel elements can be cleaned, primed, and painted with a corrosion-inhibiting coating. The patching material should be reinforced and mechanically attached to the existing concrete. Reinforcement materials used in repairs most often include mild steel, epoxy-coated steel, or stainless steel, depending on existing conditions.

Formwork and Molds

Special formwork is needed to recreate ornamental concrete features—which may be complex, in high relief, or architecturally detailed—and to provide special surface finishes such as wood form board textures. Construction of the formwork itself requires particular skill and craftsmanship. Reusable forms can be used for concrete ornamentation that is repeated across a building facade, or precast concrete elements may be used to replace missing or unrepairable architectural features. Formwork for ornamental concrete is often created using a four-step process: a casting of the original concrete is taken; a plaster replica of the unit is prepared; a mold or form is made from the plaster replica; and a new concrete unit is cast. Custom formwork and molds are often the work of specialty companies, such as precasters and cast stone fabricators.

The process of forming architectural features or special surface textures is particularly challenging if early age stripping (removal of formwork early in the concrete curing process) is needed to perform surface treatment on the concrete. Timing for formwork removal is related to strength gain, which in turn is partly dependent on temperature and weather conditions. Early age removal of formwork in highly detailed concrete can lead to damage of the new concrete that has not yet gained sufficient strength through curing.

Selection of Repair Materials and Mix Design

Selection and design of proper repair materials is a critical component of the repair project. This process requires evaluation of the performance, characteristics, and limitations of the repair materials, and may involve laboratory testing of proposed materials and trial repairs. The materials should be selected to address the specific type of repair required and to be compatible with special characteristics of the original concrete. Some modern repair materials are designed to have a high compressive strength and to be impermeable. Even though inherently durable, these newer materials may not be appropriate for use in repairing a low strength historic concrete.

The concrete's durability, or resistance to deterioration, and the materials and methods selected for repair depend on its composition, design, and quality of workmanship. In most cases, a mix design for durable replacement concrete should use materials similar to those of the original concrete mix. Prepackaged materials are often not appropriate for repair of historic concrete. The concrete patching material can be air entrained or polymer-modified if subject to exterior exposure, and should incorporate an appropriate selection of aggregate and cement type, and proper water content and water

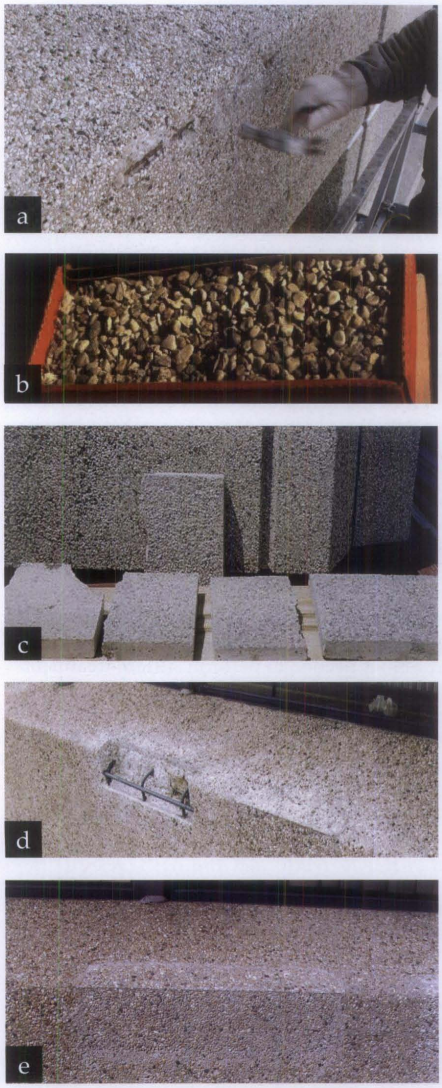


Figure 18. (a) Exposed aggregate precast concrete is sounded with a hammer to detect areas of deterioration. Corrosion of the exposed reinforcing steel bar has led to spalling of the adjacent concrete. (b) Samples of aggregate considered for use in repair concrete are compared to the original concrete materials in terms of size, color, texture, and reflectance. (c) Various sample panels are made using the selected concrete repair mix design for comparison to the original concrete on the building, and the mix design is adjusted based on review of the samples. (d) After removal of the spall, the concrete surface is prepared for installation of a formed patch. (e) Prior to placement of the concrete, a retarding agent is brush-applied to the inside face of the formwork to slow curing at the surface. After the concrete is partially cured, the forms are removed and the surface of the concrete is rubbed to remove some of the paste and expose the aggregate to match the original concrete.

to cement ratio. Some admixtures, including polymer modifiers, may change the appearance of the concrete mix. Design of the concrete patching material should address characteristics required for durability, workability, strength gain, compressive strength, and other performance attributes. During installation of the repair, skilled workmanship is required to ensure proper mixing procedures, placement, consolidation, and curing.

Matching and Repair Techniques for Historic Concrete

Repair measures should be selected that retain as much of the original material as possible, while providing for removal of an adequate amount of deteriorated concrete to provide a sound substrate for a durable repair. The installed repair must visually match the existing concrete as closely as possible and should be similar in other aspects such as compressive strength, permeability, and other characteristics important in the mix design of the concrete (Fig. 18).

Understanding the original construction techniques often provides opportunities in the design of repairs. For example, joints between the new and old concrete can be hidden in changes in surface profile and cold joints. The required patching mix for the concrete to be used in the repair will likely need to be specially designed to replicate the appearance of the adjacent historic concrete. A high level of craftsmanship is required for finishing of historic concrete, in particular to create the sometimes inconsistent finish and variation in the original concrete in contrast to the more even appearance required for most non-historic repairs.

To match the various characteristics of the original concrete, trial mixes should be developed. These mixes need to take into account the types and colors of aggregates and paste present in the original concrete. Different mixes may be needed because of variations in the appearance and composition of the historic concrete. The trials should utilize different forming and finishing techniques to achieve the best possible match to the original concrete. Initial trials should first take place on site but off the structure. The mix designs providing the best match are then installed as trial repairs on the structure, and assessed after they have cured.

Achieving compatibility between repair work and original concrete may be difficult, especially given the variability often present in historic concrete materials and finishes. Formed rather than trowel-applied patch repairs are recommended for durability, as forming permits better ranges of mix ingredients (such as coarse aggregates) and improved consolidation as compared to trowel-applied repairs. Parge coatings usually are not recommended as they do not provide as durable repair as formed concrete. However, in some cases parge coatings may be appropriate to match an original parged surface treatment. Proper placement and finishing of the repair are important to obtain a match with the original concrete. To minimize problems associated with rapid curing of concrete, such as surface cracking, it is important to use proper curing methods and to allow for sufficient time.

Hairline cracks that show no sign of increasing in size may often be left unrepaired. The width of the crack and the amount of movement usually limits the selection of crack repair techniques that are available. Although it is difficult to determine whether cracks are moving or non-moving, and therefore most cracks

should be assumed to be moving, it is possible to repair non-moving cracks by installation of a cementitious repair mortar matching the adjacent concrete. It is generally desirable not to widen cracks prior to the mortar application. Repair mortar containing sand in the mix may be used for wider cracks; unsanded repair mortar may be used for narrower cracks.

When it is desirable to re-establish the structural integrity of a concrete structure involving dormant cracks, epoxy injection repair has proven to be an effective procedure. Such a repair is made by first sealing the crack on both sides of a wall or structural member with epoxy, polyester, wax, tape, or cement slurry, and then injecting epoxy through small holes or ports drilled in the concrete. Once the epoxy in the crack has hardened, the surface sealing material may be removed; however, this type of repair is usually quite apparent. Although it may be possible to inject epoxy without leaving noticeable residue, this process is difficult and, in general, the use of epoxy repairs in visible areas of concrete on historic structures is not recommended.

Active structural cracks (which move as loads are added or removed) and thermal cracks (which move as temperatures fluctuate) must be repaired in a manner that will accommodate the anticipated movement. In some more extreme cases, expansion joints may have to be introduced before crack repairs are undertaken. Active cracks may be filled with sealants that will adhere to the sides of the cracks and will compress or expand during crack movement. The design, detailing, and execution of sealant repairs require considerable attention, or they will detract from the appearance of the historic building. The routing and cleaning of a crack, and installation of an elastomeric sealant to prevent water penetration, is used to address cracks where movement is anticipated. However, unless located in a concealed area of the concrete, this technique is often not acceptable for historic structures because the repair will be visually intrusive (Fig. 19). Other approaches, such as installation of a cementitious crack repair, may need to be considered even though this type of repair may be less effective or have a shorter service life than a sealant repair.

Replacement

If specific components of historic concrete structures are beyond repair, replacement components can be cast to match historic ones. Replacement of original concrete should be carefully considered and viewed as a method of last resort. In some cases, such as for repeated ornamental units, it may be more cost-effective to fabricate precast concrete units to replace missing elements. The forms created for precast or cast-in-place units can then be used again during future repair projects.

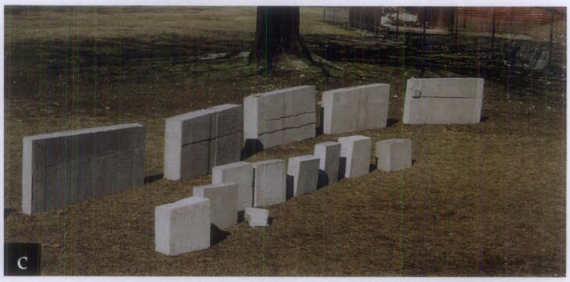
Careful mix formulation, placement, and finishing are required to ensure that replacement concrete units will match the historic concrete. There is often a tendency to make replacement concrete more consistent in appearance than the original concrete. The consistency can be in stark contrast with the variability of the original concrete

Figure 19. A high-speed grinder ia used to widen a crack in preparation for installation of a sealant. This process is called "routing." After the crack is prepared, the sealant is installed to prevent moisture infiltration through the crack. Although sealant repairs can provide a durable, watertight repair for moving cracks, they tend to be very visible.

due to original construction techniques, architectural design, or differential exposure to weather. Trial repairs and mock-ups are used to evaluate the proposed replacement concrete work and to refine construction techniques (Fig 20).

Protection Systems

Coatings and Penetrating Sealers. Protection systems such as a penetrating sealers or film forming coating are often used with non-historic structures to protect the concrete and increase the length of the service life of concrete repairs. However, film-forming coatings are often inappropriate for use on a historic structure, unless the structure was coated historically. Film-forming coatings will often change the color and appearance of a surface, and higher build coatings can also mask architectural finishes and ornamental details. For example, the application of a coating on concrete having a formboard finish may hide the wood texture of the surface. Pigmented film-forming coatings are also typically not appropriate for use over exposed aggregate concrete, where the uncoated exposed surface contributes significantly to the historic character of



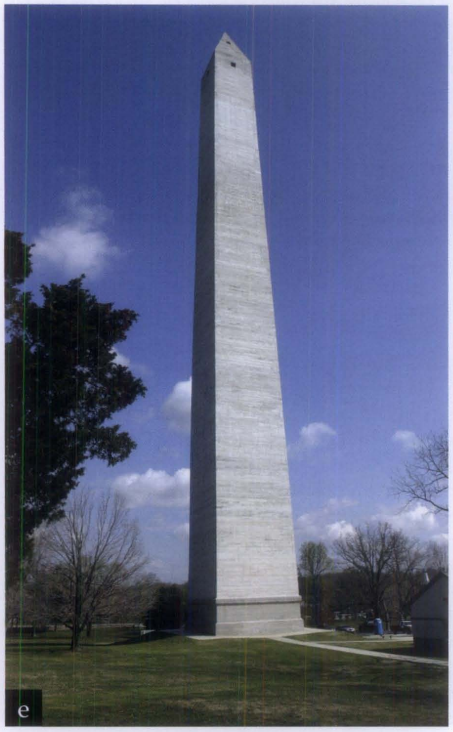


Figure 20. (a) The Jefferson Davis Memorial in Fairview, Kentucky, constructed from 1917–1924, is 351 feet tall and constructed of unreinforced concrete. The walls of the memorial are 8 feet thick at the base and 2 feet thick at the top of the wall. Access to the monument for investigation was provided by rappelling techniques, while ground supported and suspended scaffolding was used to access the exterior during repairs. (b) The concrete was severely deteriorated at isolated locations, with spalling and damage from cyclic freezing and thawing of entrapped water. In addition, previous repairs were at the end of their service life and removal of deteriorated concrete and failed previous repairs was required. Light duty chipping hammers were used to avoid damage to adjacent material when removing deteriorated concrete to the level of sound concrete. (c) Field samples were performed to match the color, finish, and texture of the original concrete. A challenge in matching of historic concrete is achieving variability of appearance. (d) The completed surface after repairs exhibits intentional variability of the concrete surface to match the appearance of the original concrete. Some formwork imperfections that would normally be removed by finishing were intentionally left in place, to replicate the highly variable finish of the original concrete. (e) The Jefferson Davis Memorial after completion of repairs in 2004. Photo e: Joseph Lenzi, Senler, Campbell & Associates, Inc.

concrete. In cases where the color of a substrate needs to be changed, such as to modify the appearance of existing repairs, an alternative to pigmented film-forming coatings is the use of pigmented stains.

Many proprietary clear, penetrating sealers are currently available to protect concrete substrates. These products render fine cracks and pores within the concrete hydrophobic; however, they do not bridge or fill cracks. Clear sealers may change the appearance of the concrete in that treated areas become more visible after rain in contrast to the more absorptive areas of original concrete. Once applied, penetrating sealers cannot be effectively removed and are therefore considered irreversible. They should not be used on historic concrete without thorough prior consideration. However, clear penetrating sealers provide an important means of protection for historic concrete that is not of good quality and can help to avoid more extensive future repairs or replacement. Thus they are sometimes appropriate for use on historic concrete. Once applied, these sealers will require periodic re-application.

Waterproofing membranes are systems used to protect concrete surfaces such as roofs, terraces, plazas, or balconies, as well as surfaces below grade. Systems range from coal tar pitch membranes used on older buildings, to asphalt or urethane-based systems. On historic buildings, membrane systems are typically used only on surfaces that were originally protected by a similar system and surfaces that are not visible from grade. Waterproofing membranes may be covered by roofing, paving, or other architectural finishes.

Laboratory and field testing is recommended prior to application of a protection system or treatment on any concrete structure; testing is even more critical for historic structures because many such treatments are not reversible. As with other repairs, trial samples are important to evaluate the effectiveness of the treatment and to determine whether it will harm the concrete or affect its appearance.

Cathodic Protection. Corrosion is an electrochemical process in which electrons flow between cathodic (positively charged) and anodic (negatively charged) areas on a metal surface; corrosion occurs at the anodes. Cathodic protection is a technique used to control the corrosion of metal by making the whole metal surface the cathode of an electrochemical cell. This technique is used to protect metal structures from corrosion and is also sometimes used to protect steel reinforcement embedded in concrete. For reinforced concrete, cathodic protection is typically accomplished by connecting an auxiliary anode to the reinforcing so that the entire reinforcing bar becomes a cathode. In sacrificial anode (passive) systems, current flows naturally by galvanic action between the less noble anode (such as zinc) and the cathode. In impressed-current (active) systems, current is impressed between an inert anode (such as titanium) and the cathode. Cathodic protection is intended to reduce the rate of corrosion of embedded steel in concrete, which in turn reduces overall deterioration. Protecting embedded steel from corrosion helps to prevent concrete cracking and spalling.

Impressed-current cathodic protection is the most effective means of mitigating steel corrosion and has been used in practical structural applications since the 1970s. However, impressed-current cathodic protection systems are typically the most costly to install and require substantial ongoing monitoring, adjustment, and maintenance to ensure a proper voltage output (protection current) over time. Sacrificial anode cathodic protection dates back to the 1800s, when the hulls of ships were protected using this technology. Today many industries utilize the concept of sacrificial anode cathodic protection for the protection of steel exposed to corrosive environments. It is less costly than an impressed-current system, but is somewhat less effective and requires reapplication of the anode when it becomes depleted.

Re-alkalization. Another technique currently available to protect concrete is realkalization, which is a process to restore the alkalinity of carbonated concrete. The treatment involves soaking the concrete with an alkaline solution, in some cases forcing it into the concrete to the level of the reinforcing steel by passage of direct current. These actions increase the alkalinity of the concrete around the reinforcement, thus restoring the protective alkaline environment for the reinforcement. Like impressed-current cathodic protection methods, it is costly. Other corrosion methods are also available but have a somewhat shorter history of use.

Careful evaluation of existing conditions, the causes and nature of distress, and environmental factors is essential before a protection method is selected and implemented. Not every protection system will be effective on each structure. In addition, the level of intrusion caused by the protection system must be carefully evaluated before it is used on a historic concrete structure.

Summary

In the United States, concrete has been a popular construction material since the late nineteenth century and recently has gained greater recognition as a historic material. Preservation of historic concrete requires a thorough understanding of the causes and types of deterioration, as well as of repair and replacement materials and methods. It is important that adequate time is allotted during the planning phase of a project to provide for trial repairs and mock-ups in order to evaluate the effectiveness and aesthetics of the repairs. Careful design is essential and, as with other preservation efforts, the skill of those performing the work is critical to the success of the repairs. The successful repair of many historic concrete structures in recent years demonstrates that the techniques and materials now available can extend the life of such structures and help ensure their preservation.

Selected Reading

American Concrete Institute. *Guide for Making a Condition Survey of Concrete in Service*. ACI Committee 201, ACI 201.1R-92.

American Concrete Institute. *Guide to Evaluation of Concrete Structures before Rehabilitation*. ACI Committee 364, ACI 364.1R-07.

American Concrete Institute. *Concrete Repair Guide*. ACI Committee 546, ACI 546R-04.

American Concrete Institute. *Guide for Evaluation of Existing Concrete Buildings*. ACI Committee 437, ACI 437R-03.

Childe, H.L. *Manufacture and Uses of Concrete Products and Cast Stone*. London: Concrete Publications Limited, 1930.

Collins, Peter. *Concrete: The Vision of a New Architecture*. New York, New York: Faber and Faber, 1959.

Cowden, Adrienne B., comp. *Historic Concrete: An Annotated Bibliography*. Washington, D.C.: National Park Service, 1993.

Komandant, August E. *Contemporary Concrete Structures*. New York, New York: McGraw Hill, 1972.

Erlemann, Gustav G. "Steel Reinforcing Bar Specification in Old Structures." *Concrete International*, April 1999, 49–50.

Federal Highway Administration. *Guide to Nondestructive Testing of Concrete*. FHWA Publication Number FHWA-SA-97-105.

Gaudette, Paul E. "Special Considerations in Repair of Historic Concrete." *Concrete Repair Bulletin*, January/February 2000, 12–13.

Jester, Thomas C., ed. *Twentieth Century Building Materials*. New York, New York: McGraw-Hill, 1995.

Johnson, Arne P., and Seung Kyoung Lee. "Protection Methods for Historic Concrete at Soldier Field." *Preserve and Play: Preserving Historic Recreation and Entertainment Sites*. Washington, D.C.: Historic Preservation Education Foundation, National Council for Preservation Education, and National Park Service, 2006.

Macdonald, Susan, ed. *Concrete: Building Pathology*. Osney Mead, Oxford, U.K.: Blackwell Science, 2003.

McGovern, Martin S. "A Clear View of Sealers." *Concrete Construction*, January 2000, 53–58.

Morton, W. Brown III, Gary L. Hume, Kay D. Weeks, H. Ward Jandl, and Anne E. Grimmer. *The Secretary of the Interior's Standards for Rehabilitation & Illustrated Guidelines for Rehabilitating Historic Buildings*. Washington, D.C.: National Park Service, 1983, reprinted 1997.

"Repairing Cracks." *Concrete Repair Digest*, August/September 1992, 160–164. Condensed from ACI document 224.1R-93.

Slaton, Deborah. "Cleaning Historic Concrete." *Concrete Repair Bulletin*, January/February 2000, 14–15.

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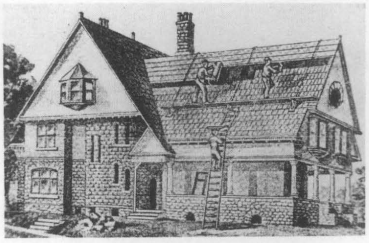

The Repair, Replacement, and Maintenance of Historic Slate Roofs

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National Park Service
Cultural Resources
Heritage Preservation Services

Introduction

Slate is one of the most aesthetically pleasing and durable of all roofing materials. It is indicative at once of the awesome powers of nature which have formed it and the expertise and skill of the craftsman in hand-shaping and laying it on the roof. Installed properly, slate roofs require relatively little maintenance and will last 60 to 125 years or longer depending on the type of slate employed, roof configuration, and the geographical location of the property. Some slates have been known to last over 200 years. Found on virtually every class of structure, slate roofs are perhaps most often associated with institutional, ecclesiastical, and government buildings, where longevity is an especially important consideration in material choices. In the slate quarrying regions of the country, where supply is abundant, slate was often used on farm and agricultural buildings as well.

Because the pattern, detailing, and craftsmanship of slate roofs are important design elements of historic buildings, they should be repaired rather than replaced whenever possible. The purpose of this Preservation Brief is to assist property owners, architects, preservationists, and building managers in understanding the causes of slate roof failures and undertaking the repair and replacement of slate roofs. Details contributing to the character of historic slate roofs are described and guidance is offered on maintenance and the degree of intervention required at various levels of deterioration.

The relatively large percentage of historic buildings roofed with slate during the late nineteenth and early twentieth centuries means that many slate roofs, and the 60 to 125 year life span of the slates most commonly used, may be nearing the end of their serviceable lives at the end of the twentieth century. Too often, these roofs are being improperly repaired or replaced with alternative roofing materials, to the detriment of the historic integrity and appearance of the structure. Increased knowledge of the characteristics of slate and its detailing and installation on the roof can lead to more sensitive interventions in which original material is preserved and the building's historic character maintained. Every effort should be made to replace deteriorated slate roofs with new slate and to develop an effective maintenance and repair program for slate roofs that can be retained.

History of Slate Use in the United States

Although slate quarrying was not common in the United States until the latter half of the nineteenth century, slate roofing is known to have been used prior to the Revolution. Archeological excavations at Jamestown, Virginia, have unearthed roofing slate in strata dating from 1625-1650 and 1640-1670. Slate roofs were introduced in Boston as early as 1654 and Philadelphia in 1699. Seventeenth century building ordinances of New York and Boston recommended the use of slate or tile roofs to ensure fireproof construction.

In the early years of the Colonies, nearly all roofing slate was imported from North Wales. It was not until 1785 that the first commercial slate quarry was opened in the United States, by William Docher in Peach Bottom Township, Pennsylvania. Production was limited to that which could be consumed in local markets until the middle of the nineteenth century. Knowledge of the nation's abundant stone resources was given commercial impetus at this time by several forces, including a rapidly growing population that demanded housing, advances in quarrying technology, and extension of the railroad system to previously inaccessible markets. Two additional factors helped push the slate industry to maturity: the immigration of Welsh slate workers to the United States and the introduction of architectural pattern and style books (Figure 1). Slate production increased dramatically in the years following the Civil War as quarries were opened in Vermont, New York, Virginia, and Lehigh and Northampton Counties, Pennsylvania. By 1876, roofing slate imports had all but dried up and the United States became a net exporter of the commodity.

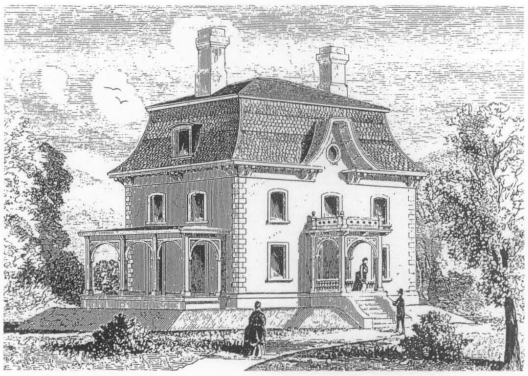


Figure 1. Architectural pattern books of the mid-nineteenth century awakened Americans to the availability and quality of slate for roofing purposes by incorporating slate roofs in their designs. Design XX, "A French Roof House," in A. J. Downing's Victorian Cottage Residences *is shown.*

The U.S. roofing slate industry reached its highest point in both quantity and value of output in the period from 1897 to 1914. In 1899, there were over 200 slate quarries operating in 13 states, Pennsylvania historically being the largest producer of all. The decline of the U.S. roofing slate industry began c.1915 and resulted from several factors, including a decline in skilled labor for both the fabrication and installation of slate and competition from substitute materials, such as asphalt shingles, which could be mass produced, transported and installed at a lower cost than slate. Only recently, with the increasing popularity of historic preservation and the recognition of the superiority of slate over other roofing materials, has slate usage begun to increase.

The Character and Detailing of Historic Slate Roofs

During some periods of architectural history, roof design has gone far beyond the merely functional and contributed much to the character of buildings. Roofs, by their compelling forms, have defined styles and, by their decorative patterns and colors, have imparted both dignity and beauty to buildings. The architectural styles prevalent during the latter half of the nineteenth and early twentieth centuries placed strong emphasis on prominent roof lines and greatly influenced the demand for slate. Slate, laid in multi-colored decorative patterns, was particularly well suited to the Mansard roofs of the Second Empire style, the steeply pitch roofs of the Gothic Revival and High Victorian Gothic styles, and the many prominent roof planes and turrets associated with the Queen Anne style. The Tudor style imitated the quaint appearance of some English slates which, because of their granular cleavage, are thick and irregular. These slates were often laid in a graduated pattern, with the largest slates at the eaves and the courses diminishing in size up the roof slope, or a textural pattern (Figure 2). Collegiate Gothic style buildings, found on many university campuses, were often roofed with slate laid in a graduated pattern.

The configuration, massing, and style of historic slate roofs are important design elements that should be preserved. In addition, several types of historic detailing were often employed to add visual interest to the roof, essentially elevating the roof to the level of an ornamental architectural element. When repairing or replacing a slate roof, original details affecting its visual character should be retained.

Before repairing or replacing an existing slate roof, it is important to document the existing conditions and detailing of the roof using written, visual, and physical evidence so that original features can be identified and preserved. Documentation should continue through the repair or replacement process as significant details, long obscured, are often rediscovered while carrying out these activities. Local histories, building records, old receipts and ledgers, historic photographs, sketches, and paintings, shadow lines and nail hole patterns on the roof deck, and bits of historic material left over from previous interventions (often found in eave cavities) are all useful sources of information which can be of help in piecing together the original appearance of the roof. Size, shape, color, texture, exposure, and coursing are among the most important characteristics of the original slates which should be documented and matched when repairing or replacing an historic slate roof.

Historically, three types of slate roofing—standard, textural, and graduated—were available according to the architectural effect desired. Standard grade slate roofs were most common. These are characterized by their uniform appearance, being composed of slates approximately 3/16″ (0.5cm) thick, of consistent length and width, and having a smooth cleavage surface. Thirty different standard sizes were available, ranging from 10″ (25cm) × 6″ to 24″ × 14″ (15cm × 61cm × 35cm). The slates were laid to break joints and typically had square ends and uniform color and exposure. Patterned and polychromatic roofs were created by laying standard slates of different colors and shapes on the roof in such a way as to create sunbursts, flowers, sawtooth and geometric designs, and even initials and dates (Figure 3). On utilitarian structures, such as barns and sheds, large gaps were sometimes left between each slate within a given course to reduce material and installation costs and provide added ventilation for the interior (Figure 4).

Figure 2. The quaint character of this Tudor style residence is derived, in part, from its textural roof.

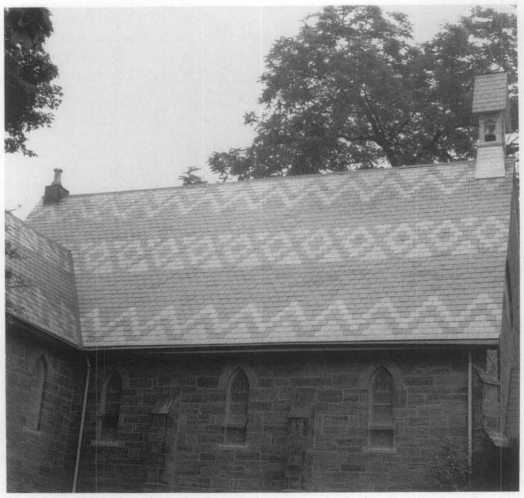


Figure 3. A sawtooth geometric design composed of red, green, and black slates makes this roof the most visually important feature of the building.

Textural slate roofs incorporate slates of different thicknesses, uneven tails, and a rougher texture than standard slates. Textural slate roofs are perhaps most often associated with Tudor style buildings where slates of different colors are used to enhance the effect.

Graduated slate roofs were frequently installed on large institutional and ecclesiastical structures (Figure 5). The slates were graduated according to thickness, size, and exposure, the thickest and largest slates being laid at the eaves and the thinnest and smallest at the ridge. Pleasing architectural effects were achieved by blending sizes and colors.

Detailing at the hips, ridges and valleys provided added opportunity to ornament a slate roof. Hips and ridges can be fashioned out of slate according to various traditional schemes whereby the slates are cut and overlapped to produce a watertight joint of the desired artistic effect. Traditional slate ridge details are the saddle ridge, strip saddle ridge, and comb ridge, and for hips, the saddle hip, mitered hip, Boston hip, and fantail hip (Figure 6). A more linear effect was achieved by covering the ridges and hips with flashing called "cresting" or "ridge roll" formed out of sheet metal, terra cotta, or even slate (Figure 7). Snow guards, snow boards, and various types of gutter and rake treatments also contributed to the character of historic slate roofs (Figure 8).

Two types of valleys were traditionally employed, the open valley and the closed valley. The open valley is lined with metal over which slates lap only at the sides. Closed valleys are covered with slate and have either a continuous metal lining or metal flashing built in with each course. Open valleys are easier to install and maintain, and are generally more watertight than closed valleys. Round valleys are a type of closed valley with a concave rather than V-shaped section (Figure 9). Given the broader sweep of the round valley, it was not uncommon for roofers to interweave asphalt saturated felts rather than copper sheet in the coursing in order to cut costs.

Figure 4. Widely spaced open slating was often used on utilitarian structures where ventilation was desirable. It provided an interesting texture and visual pattern to often plain structures.

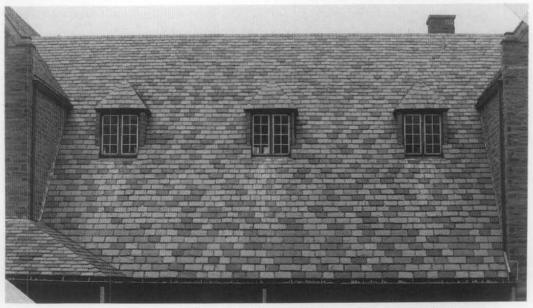


Figure 5. This graduated slate roof is composed of large, thick slates at the eave which are reduced in size and thickness as the slating progresses to the ridge.

Although principally associated with graduated and textural slate roofs, round valleys were infrequently employed due to the difficulty and expense of their installation.

Common types of sheathing used include wood boards, wood battens, and, for fireproof construction on institutional and government buildings, concrete or steel (Figure 10). Solid wood sheathing was typically constructed of tongue and groove, square edged, or shiplapped pine boards of 1″ (2.5 cm) or 1 1/4″ (3 cm) nominal thickness. Boards from 6″ (15 cm) to 8″ (20 cm) wide and tongue and groove boards were generally preferred as they were less likely to warp and curl.

Wood battens, or open wood sheathing, consisted of wood strips, measuring from 2″ (5 cm) to 3″ (7.5 cm) in width, nailed to the roof rafters. Spacing of the battens depended on the length of the slate and equaled the exposure. Slates were nailed to the batten that transected its mid-section. The upper end of the slate rested at least 1/2″ (1.25 cm) on the batten next above. Open wood sheathing was employed primarily on utilitarian, farm, and agricultural structures in the North and on residential buildings in the South where the insulating value of solid wood sheathing was not a strict requirement. To help keep out dust and wind driven rain on residential buildings, mortar was often placed along the top and bottom edge of each batten, a practice sometimes referred to as torching.

Various Roofing Details

Figure 6. Hips are formed at the external angle of two roofing slopes. In (a), the hips at both the roof and the dormer are covered with metal. Note also the open valley and the built-in gutter. In (b), the dormer hip slates have been laid in a fantail pattern to help shed water. Note also the metal ridge cap.

Figure 7. Ridge caps and cresting can be elaborate. Ridges are formed at the long horizontal juncture of two roofing slopes and capping protects this joint from moisture. In (a), a terra cotta capping with a decorative profile complements the finial over the various roof peaks. In (b), the mansard roof has a decorative iron cresting at the break between the lower and the upper roof slopes.

Figure 8. Eave details include snow guards, snow boards, gutter treatments. Snow guards are generally used in areas where ice and snow accumulate to avoid dangerous slides from the roof. In (a) the snow guards are set in two staggered rows above a pole gutter. In (b), the copper wire snow guards are set more frequently up a very steep gable.

Figure 9. Valleys are formed at the internal angle of two roofing slopes. Flashing is often placed under the slate to increase moisture protect at this vulnerable joint. Shown in (a) is a closed valley where the slates are held tight to the valley line. (b) illustrates of a round valley where the transition between the two slopes is a continuous curve. It requires careful workmanship and an experienced roofer.

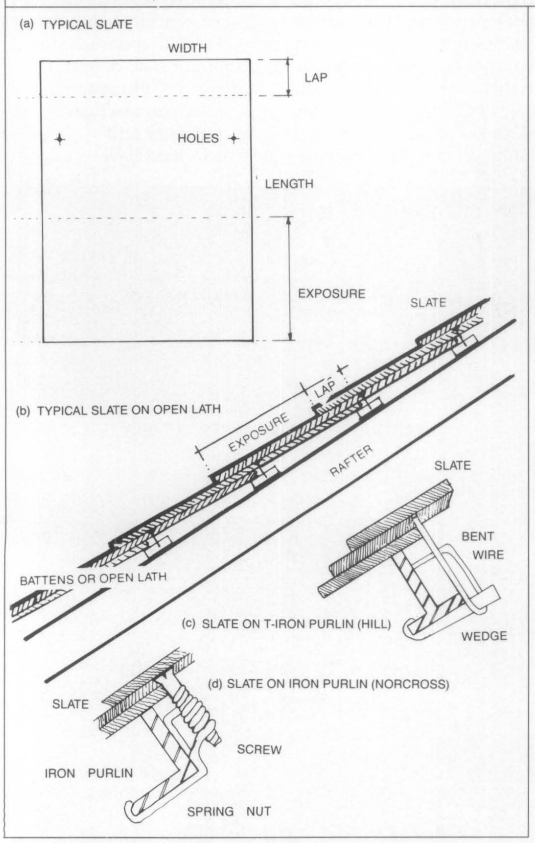


Figure 10. (a) shows a typical slate; exposure may be calculated by subtracting the headlap from the total length of the slate and dividing by two. Slates were typically nailed either to closed wooden decking or to open laths (b). In the late 19th century, with the concern for fireproof construction, special fasteners were developed to secure slate to steel purlins (c) 1881 patent to James G. Hill; (d) 1889 patent to Orlando W. Norcross).

Steel angles substituted for the wood battens in fireproof construction. The slates were secured using wire wrapped around the steel angle, where it was twisted-off tight. Alternately, any of a variety of special fasteners patented over the years could have been used to attach the slate to the steel angle (Figure 10). On roofs with concrete decks, slates were typically nailed to wood nailing strips embedded in the concrete.

Beginning in the late nineteenth century, asphalt saturated roofing felt was installed atop solid wood sheathing. The felt provided a temporary, watertight roof until the slate could be installed atop it. Felt also served to cushion the slates, exclude wind driven rain and dust, and ease slight unevenness between the sheathing boards.

Slate was typically laid in horizontal courses starting at the eaves with a standard headlap of 3″ (7.5 cm) (Figure 10). Headlap was generally reduced to 2″ (5 cm) on Mansard roofs and on particularly steep slopes with more than 20″ (50 cm) of rise per 12″ (30 cm) of run. Conversely, headlap was increased to 4″ (10 cm) or more on low pitched roofs with a rise of 8″ (20 cm) or less per 12″ (30 cm) of horizontal run. The minimum roof slope necessary for a slate roof was 4″ (10 cm) of rise per 12″ (30 cm) of run.

Where Does Slate Come From?

Slate is a fine grained, crystalline rock derived from sediments of clay and fine silt which were deposited on ancient sea bottoms. Superimposed materials gradually consolidated the sedimentary particles into bedded deposits of shale. Mountain building forces subsequently folded, crumpled, and compressed the shale. At the same time, intense heat and pressure changed the original clays into new minerals such as mica, chlorite, and quartz. By such mechanical and chemical processes bedded clays were transformed, or metamorphosed, into slate, whole

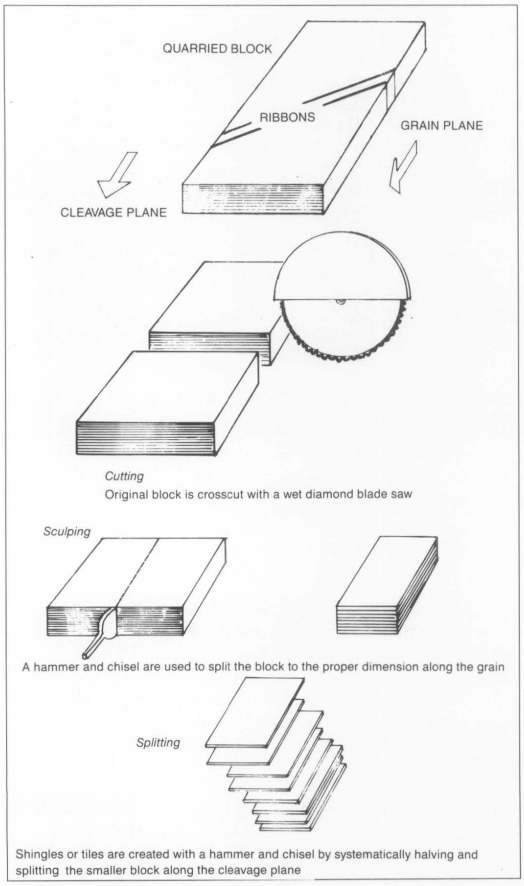


Figure 11. Slate roofing tiles or shingles are still manufactured using traditional methods brought to this country by Welsh immigrants in the nineteenth century. Shown above are the first 3 steps of cutting, sculping and splitting. Once the rough slate tile is made it is trimmed and punched for holes.

geologic ages being consumed in the process. Slates vary in composition, structure, and durability because the degree to which their determinant minerals have been altered is neither uniform nor consistent.

The adaptation of slate for roofing purposes is inextricably linked to its genesis. The manufacturing processes of nature have endowed slate with certain commercially amenable properties which have had a profound influence on the methods by which slate is quarried and fabricated (Figure 11), as well as its suitability for use as a roofing tile.

Slate roofing tiles are still manufactured by hand using traditional methods in a five step process: cutting, sculping, splitting, trimming, and hole punching. In the manufacturing process, large, irregular blocks taken from the quarry are first cut with a saw across the grain in sections slightly longer than the length of the finished roofing slate. The blocks are next sculped, or split along the grain of the slate, to widths slightly larger than the widths of finished slates. Sculping is generally accomplished with a mallet and a broad-faced chisel, although some types of slate must be cut along their grain. In the splitting area, the slightly oversized blocks are split along their cleavage planes to the desired shingle thickness. The splitter's tools consist of a wooden mallet and two splitting chisels used for prying the block into halves and repeating this process until the desired thinness is reached (Figure 12). The last two steps involve trimming the tile to the desired size and then punching two nail holes toward the top of the slate using a formula based on the size and exposure of the slate.

Minerals, the building blocks of rocks, through their characteristic crystalline structures define the physical properties of the rocks which they compose. Slate consists of minerals that are stable and resistant to weathering and is, therefore, generally of high strength, low porosity, and low absorption. The low porosity and low absorption of slate mitigate the deleterious action of frost on the stone and make it well adapted for roofing purposes. The two most important structural properties of slate are cleavage and grain.

The metamorphic processes of geologic change necessary to produce slate are dependent upon movements in the earth's crust and the heat and pressure generated thereby. For this reason, slate is found only in certain mountainous regions. The most economically important slate deposits in this country lie in the Mid-Atlantic and Northeastern states transversed by or bordering on the Appalachian Mountain chain. Variations in local chemistry and conditions under which the slate was formed have

Figure 12. In the splitting area, the slightly oversized blocks are split along their cleavage planes. The splitter's tools consist of a wooden mallet and splitting chisels. The process of halving the split portions is repeated until a tile or shingle of appropriate thinness is obtained.

Figure 13. Paper thin lamination can be seen flaking off of this weathered, 120 year piece of Pennsylvania Hard-Vein slate.

produced a wide range of colors and qualities and ultimately determine the character of the slate found in these areas.

Slate is available in a variety of colors. The most common are grey, blue-grey, black, various shades of green, deep purple, brick red, and mottled varieties. The presence of carbonaceous matter, derived from the decay of marine organisms on ancient sea floors, gives rise to the black colored slates. Compounds of iron generate the red, purple, and green colored slates.

Generally, the slates of Maine, Virginia, and the Peach Bottom district of York County, Pennsylvania are deep blue-black in color. Those of Virginia have a distinctive lustrous appearance as well due to their high mica content. The slates of Lehigh and Northampton Counties, Pennsylvania, are grayish-black in color. Green, red, purple, and mottled slates derive from the New York-Vermont district. The slate producing region of New York, which centers around Granville and Middle Granville, is particularly important because it contains one of the few commercial deposits of red slate in the world.

Slates are also classified as fading or unfading according to their color stability. Fading slates change to new shades or may streak within a short time after exposure to the atmosphere due to the presence of fine-grained disseminated pyrite. For example, the "weathering green" or "sea-green" slates of New York and Vermont are grayish green when freshly quarried. Upon exposure, from 20% to 60% of the slates typically weather to soft tones of orange-brown, buff, and gray while the others retain their original shade. Slates designated as unfading maintain their original colors for many years.

Color permanence generally provides no indication of the durability of slate. Rather, time has shown that the Vermont and New York slates will last about 125 years; Buckingham Virginia slates 175 years or more; and Pennsylvania Soft-Vein slates in excess of 60 years; Pennsylvania Hard-Vein slates and Peach Bottom slates, neither of which is still quarried, had life spans of roughly 100 and at least 200 years respectively. The life spans provided should be used only as a general guide in determining whether or not an existing slate roof is nearing the end of its serviceable life.

Ribbons are visible as bands on the cleavage face of slate and represent geologic periods during which greater amounts of carbonaceous matter, calcite, or coarse quartz particles were present in the sediment from which the slate was formed. Ribbons typically weather more and were most common in Pennsylvania slate quarries. As they were not as durable as clear slates, ribbon slate is no longer manufactured for roofing purposes. Mottled grey slates from Vermont are the closest match for Pennsylvania ribbon slate available today.

In recent years, slates from China, Africa, Spain and other countries have begun to be imported into the United States, primarily for distribution on the West Coast. The use of imported slates should probably be limited to new construction since their colors and textures often do not match those of U.S. slate.

Deterioration of Slate and Slate Roofs

The durability of a slate roof depends primarily on four factors: the physical and mineralogical properties of the slate; the way in which it is fabricated; installation techniques employed; and, regular and timely maintenance. The first three of these factors are examined below. The maintenance and repair of slate roofs are discussed in later sections of this Brief.

The natural weathering of roofing slate manifests itself as a slow process of chipping and scaling along the cleavage planes (Figure 13). Paper thin laminations flake off the surface of the slate and the slate becomes soft and spongy as the inner layers begin to come apart, or delaminate. The nature of the sound given off by a slate when tapped with one's knuckles or slating hammer is a fair indication of its condition. High-grade slate, when poised upon the fingertips and struck, will emit a clear, solid sound. Severely weathered slates are much less sonorous, and give off a dull thud when tapped.

The weathering of slate is chiefly due to mineral impurities (primarily calcite and iron sulfides) in the slate which, in concert with alternating wet/dry and hot/cold cycles, react to form gypsum (Figure 14). Because gypsum

Figure 14. The white blotches on these Pennsylvania Soft-Vein slates indicate areas where gypsum is leaching out onto the surface of the slates.

Figure 15. View of the underside of slates laid on open sheathing shows that delamination and flaking is just as bad or worse on the underside of slates as on the exposed surface. This is why most slates cannot be flipped over for reuse.

molecules take up about twice as much volume as calcite molecules, internal stresses result from the reaction, causing the slate to delaminate. This type of deterioration is as prominent on the underside of the roof as on the exposed surface due to the leaching and subsequent concentration of gypsum in this area (Figure 15). Consequently, deteriorated roofing slates typically cannot be flipped over and re-used.

The chemical and physical changes which accompany slate weathering cause an increase in absorption and a decrease in both strength and toughness. The tendency of old, weathered slates to absorb and hold moisture can lead to rot in underlying areas of wood sheathing. Such rot can go undetected for long periods of time since, often, there is no accompanying leak. Due to their loss of strength, weathered slates are more prone to breakage, loss of corners, and cracking.

Slates with low calcite content tend to weather slowly. Dense slates, with low porosity, likewise decay slower than slates with equal calcite, but with a greater porosity. The pitch of a roof can also affect its longevity. The steeper the pitch, the longer the slate can be expected to last as water will run off faster and will be less likely to be drawn under the slates by capillary action or driven under by wind forces. Spires and the steep slopes of Mansard roofs often retain their original slate long after other portions of the roof have been replaced. Areas of a roof subject to concentrated water flows and ice damming, such as along eaves and valleys, also tend to deteriorate more rapidly than other areas of the roof.

Mechanical agents, such as thermal expansion and contraction and the action of frost, are subordinate in the weathering of slate, coming into play only after the slate has been materially altered from its original state by the chemical transformation of calcite to gypsum. The more rapid deterioration of slates found on roof slopes with the most severe exposure to the sun, wind, and rain (typically, but not always, a southern exposure) may be attributable to the combined result of the deleterious effects of impurities in the slate and mechanical agents. Atmospheric acids produce only negligible deterioration in roofing slate.

It is difficult to assess the procedures by which a piece of slate has been fabricated without visiting the quarry and observing the process first hand. The location and size of nail holes, grain orientation, the condition of corners, and the number of broken pieces are all things which may be observed in a shipment of slate to judge the quality of its fabrication. Nail holes should be clean and with a shallow countersink on the face of the slate for the nail head; grain oriented along the length of the slate; and, corners left whole. An allowance for 10% breakage in shipment is typically provided for by the quarry.

Installation problems often involve the improper nailing and lapping of slates. The nailing of slates differs from that of other roofing materials. Slate nails should not be driven tight as is the case with asphalt and wood shingles. Rather, they should be set such that the slate is permitted to hang freely on the nail shank. Nails driven too far will crack the slate and those left projecting will puncture the overlying slate (Figure 16). Nail heads left exposed accelerate roof deterioration by providing a point for water entry. Non-ferrous slater's nails, such as solid copper or stainless steel, should always be used since plain steel and galvanized nails will usually rust out long before the slate itself begins to deteriorate. The rusting of nineteenth century cut nails is a common cause of slate loss on historic roofs.

When joints are improperly broken (i.e., when slates lap the joints in the course below by less than 3″ [7.5 cm]), it is possible for water to pass between the joints, through the nail holes and ultimately to the underlying felt, where it will cause deterioration and leaks to develop. Insufficient headlap can also result in leaks as water entering the joints between slates may have a greater tendency to be wind blown beyond the heads of the slates in the course below.

Occasionally, individual slates are damaged. This may be caused by falling tree limbs, ice dams in gutters, valleys, and chimney crickets, the weight of a workman walking on the roof, or a naturally occurring fault in the slate unit. Whatever the form of damage, if it is caught soon enough, the roof can usually be repaired or selectively replaced and deterioration mitigated.

The ability to lay slate properly so as to produce a water-tight and aesthetically pleasing roof requires training, much practice, and the right tools (Figure 17). The

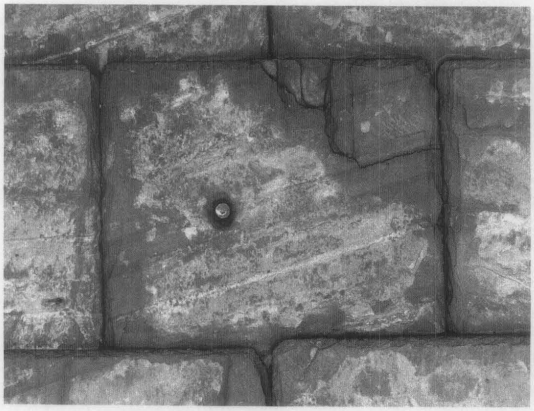


Figure 16. Detail view of a slate which has been punctured by the head of a nail used to secure the slate in the course below. Likely, the nail was not hammered in far enough when originally installed.

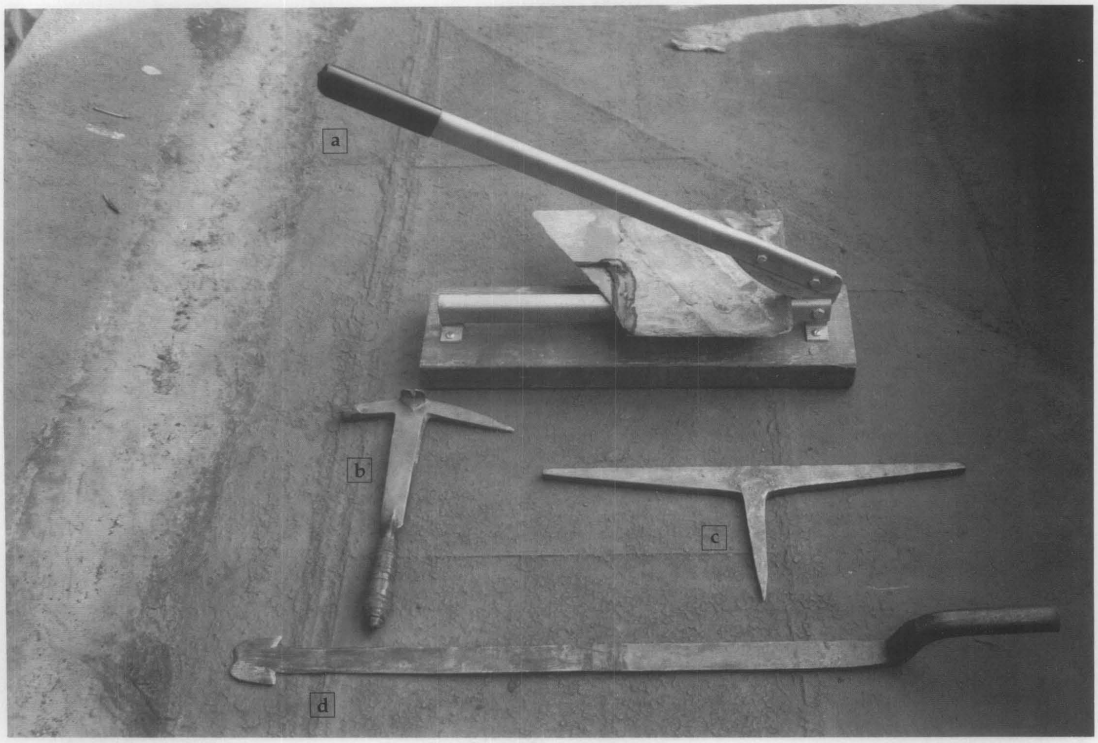


Figure 17. Slater's Tools. The cutter (a) is used to trim slate edges; the slate hammer (b) is used for hammering nails, trimming, cutting and punching holes in slates, and pulling roofing nails; the steak (c) is a T-shaped piece of iron upon which the slater places the edge of a slate to be trimmed; and the ripper (d) is slid under the slates to pull out the nails.

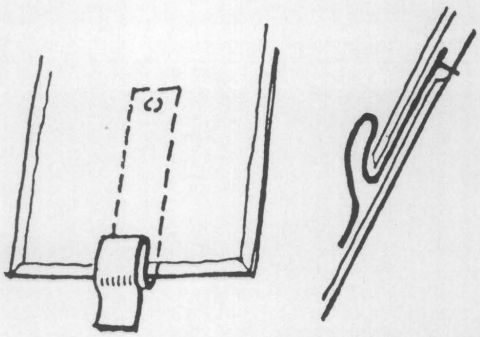
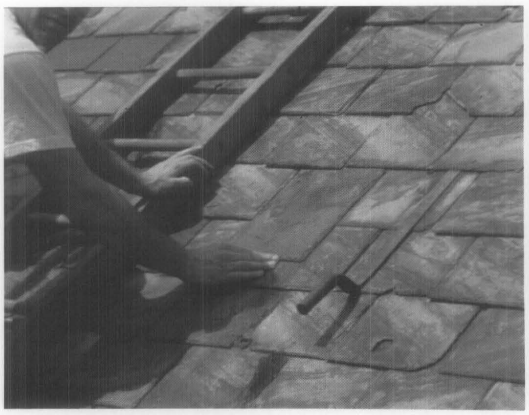


Figure 18. A method of securing replacement slates is shown. The copper strip is nailed to the roof sheathing just above the head of the slate in the course below. The replacement slate is then inserted and the copper tab folded over its tail. This type of repair is not recommended for northern climates where snow and ice can cause the copper tab to fold over, allowing the replacement slate to slide out of position as occurred here on the left.

Repair Sequence

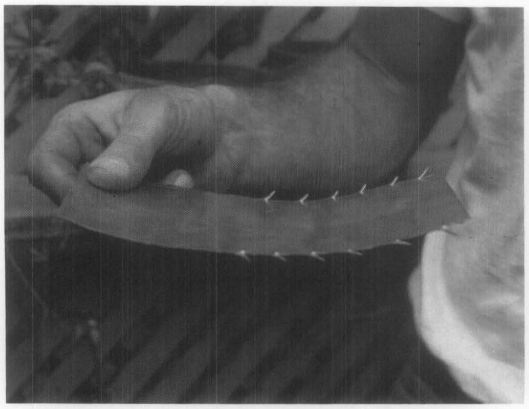
(a) A ripper is used to remove the nails from the deteriorated slate.



(b) A replacement slate is slid into place.

(c) A new slate is secured in place with a copper nail.

(d) A copper bib is formed to protect the newly created nail hole.



(e) The bib is cut along its edges and bent into a concave shape to create a friction fit.

(f) The slate hammer is used to push the bib in place over the nail head.

Figure 19. Above is a repair sequence for replacing a damaged slate.

10

The installation and repair of slate roofs should be entrusted only to experienced slaters.

Repairing Slate Roofs

Broken, cracked, and missing slates should be repaired promptly by an experienced slater in order to prevent water damage to interior finishes, accelerated deterioration of the roof and roof sheathing, and possible structural degradation to framing members (Figures 18 and 19).

The damaged slate is first removed by cutting or pulling out its nails with a ripper. If steel cut nails, rather than copper nails, were used in laying the roof, adjacent slates may be inadvertently damaged or displaced in the ripping process, and these, too, will have to be repaired. If the slate does not slide out by itself, the pointed end of the slate hammer can be punched into the slate and the slate dragged out. A new slate, or salvaged slate, which should match the size, shape, texture, and weathered color of the old slate, is then slid into place and held in position by one nail inserted through the vertical joint between the slates in the course above and approximately one inch below the tail of the slate two courses above. To prevent water penetration through the newly created nail hole, a piece of copper with a friction fit, measuring roughly 3″ (7.5 cm) in width and 8″ (20 cm) in length, is slid lengthwise under the joint between the two slates located directly above the new slate and over the nail. Alternate methods for securing the replacement slate include the use of metal hooks, clips, and straps that are bent over the tail end of the slate. The application of roofing mastic or sealants to damaged slates should *not* be considered a viable repair alternative because these materials, though effective at first, will eventually harden and crack, thereby allowing water to enter (Figure 20). Mastic also makes future repairs more difficult to execute, is unsightly, and, when applied to metal flashings, accelerates their corrosion.

When two or more broken slates lie adjacent to each other in the same course, or when replacing leaky valley flashings, it is best to form pyramids (i.e., to remove a diminishing number of slates from higher courses) to keep the number of bibs required to a minimum. When re-installing the slates, only the top slate in each pyramid will need a bib. Slates along the sides of the pyramid will receive two nails, one above the other, along the upper part of its exposed edge.

When many slates must be removed to effect a repair, the sheathing should be checked for rotted areas and projecting nails. Plywood is generally not a good replacement material for deteriorated wood sheathing due to the relative difficulty of driving a nail through it (the bounce produced can loosen adjacent slates). Instead, new wood boards of similar width and thickness to those being replaced should be used. Because the nominal thickness of today's dimension lumber is slightly thinner than that produced in the past, it may be necessary to shim the new wood boards so that they lie flush with the top surface of adjacent existing sheathing boards. Pressure treated lumber is not recommended due to its tendency to shrink. This can cause the slates to crack and become displaced.

To permit proper re-laying of the slate, the new roof sheathing must be of smooth and solid construction. At least two nails should be placed through the new boards at every rafter and joints between the ends of the boards should occur over rafters. Insufficient nailing will cause the boards to be springy, making nailing of the slates difficult and causing adjacent slates to loosen in the process. Unevenness in the sheathing will show in the finished roof surface and may cause premature cracking of the slate. Roof sheathing in valleys and along hips, ridges, and eaves may be covered with waterproof membrane underlayment rather than roofing felt for added protection against leakage.

In emergency situations, such as when severe hurricanes or tornadoes blow numerous slates off the roof, a temporary roof covering should be installed immediately after the storm to prevent further water damage to the interior of the building and to permit the drying out process to begin. Heavy gauge plastic and vinyl tarpaulins are often used for this purpose, though they are difficult to secure in place and can be blown off in high winds. Roll roofing, carefully stitched in to areas of the remaining roof, is a somewhat more functional solution that will allow sufficient time to document the existing roof conditions, plan repairs, and order materials (Figure 21).

Slate roof repair is viable for localized problems and damaged roofs with reasonably long serviceable lives remaining. If 20% or more of the slates on a roof or roof slope are broken, cracked, missing, or sliding out of position, it is usually less expensive to replace the roof than to execute individual repairs. This is especially true of older roofs nearing the end of their serviceable lives

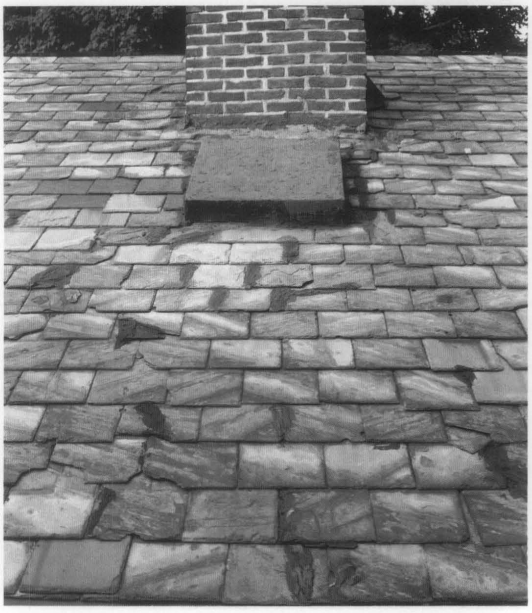


Figure 20. This roof has been poorly repaired numerous times in the past. The installation of mastic to seal out moisture has only exacerbated the problem. A timely repair and good maintenance could have extended the life of this roof.

Figure 21. As a result of hurricanes and other disasters, it may be necessary to temporarily stabilize a roof until materials can be obtained and a qualified roofing contractor hired. Heavy roofing felt was stitched into this slate roof to stop moisture penetration until matching slate was obtained for repair. Significant slate roofs should not be stripped off and replaced with asphalt shingles. Photograph courtesy of the National Park Service.

because even the most experienced slater will likely damage additional slates while attempting repairs. Depending on the age of the slate, its expected serviceable life, and the cause(s) of deterioration, it may or may not be cost effective to salvage slates. Where deteriorated nails or flashings are the cause of the roof failure, salvage of at least some slates should be possible for use in repairs. When salvaging slates, each must be sounded to discover cracks and faults and the degree to which it has weathered. It is usually wise to salvage slates when only a portion of the roof is to be replaced. In this way, the salvaged slates may be used for future repairs to the remaining sections of the roof.

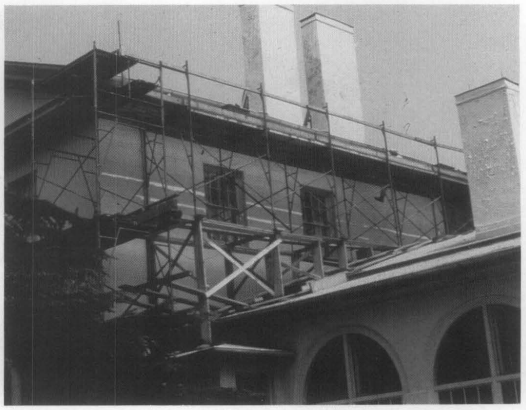
The Replacement of Deteriorated Roofs

Historic slate roofs should be repaired rather than replaced whenever possible. Before replacing a slate roof, check for isolated damage, corroded and worn flashings, leaky gutters, poor ventilation in the attic, and other possible sources of moisture. All too often slate roofs are mistakenly replaced when, in fact, they could have been effectively repaired. Deciding whether an historic slate roof should be repaired or replaced can be difficult and each roof must be judged separately (see guidance in shaded box on page 16).

If repair is not possible and a new slate roof must be installed, it is important to remember that more than just the replacement of the slate is involved (Figure 22). The old slate should be removed to prevent overloading of the roof timbers. Stripping should be done in sections, with felt installed, to avoid exposing the entire sub-roof to the weather. In the process, rotted wood sheathing should be replaced and the roof timbers checked for signs of stress, including deflection, cracking, and twisting. If such conditions are found, a structural engineer experienced in working with older buildings should be consulted. Other repairs, such as chimney repointing, which may require access to the roof should be completed before the new roof is put on.

Drawings and specifications for a new slate roof should be prepared by a restoration architect, especially if the project is going to be competitively bid or if the roof is particularly complex. Standard specifications, like those published in 1926 by the National Slate Association may be used as a basis for developing specifications appropriate for a particular project. The specifications and drawings should contain all the information necessary to replicate the original appearance of the roof as closely as possible. Certain changes may have to be accepted, however, since several types of slate once prominent in this country, such as ribbon slate, are no longer quarried. It is wise to

(a) Historic documentation was necessary to determine the historic configuration.

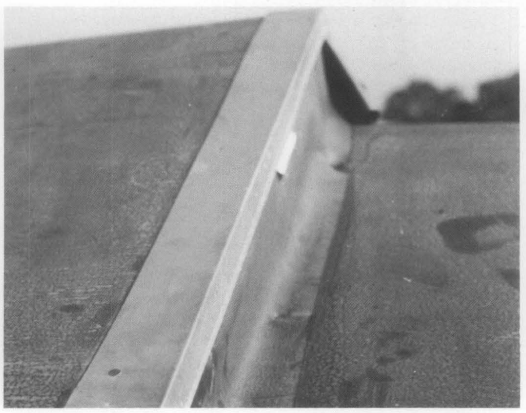


(b) Scaffolding was installed early to document existing conditions to determine extent of work.

(c) Slate was removed in sections to avoid stress on timber framing.

(d) Deteriorated sheathing was replaced and rafter tails were reinforced.

(e) Roofing felt was installed over decking; a rubberized membrane was used selectively at the eaves and under some flashing.



(f) Lead coated copper flashing was installed throughout. Seen is the offset between the portico roof and the main roof in progress.

Figure 22. Installing a new roof involves more than just slate. Above is a sequence of views of the roof replacement at Arlington House. Photographs courtesy of the National Park Service. (Sequence continued on page 14.)

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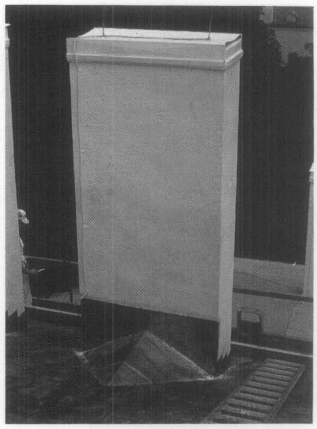

(g) Masonry chimneys were repaired and metal crickets were fabricated at the chimneys.

(h) This installation pattern allows the slates to be laid in courses leaving a temporary path of travel to avoid stepping on installed slates.

(i) Although the gutters and snow boards were the last elements installed, their support brackets were installed as the slates were laid.

anticipate the replacement of older roofs so that proper planning can be undertaken and financial resources set aside, thereby, reducing the likelihood of rash last minute decisions.

Roofing slate is sold by the square in the United States. One square is enough to cover 100 square feet (13.3 square meters) of plain roof surface when laid with a standard headlap of 3" (7.5cm). When ordering slate, considerable lead time should be allowed as delivery may take anywhere from 4 to 12 weeks and even as long as 1 year for special orders. Orders for random widths of a particular slate can generally be filled more quickly than orders for fixed widths. Once on site, slates should be stored on edge, under cover on pallets.

A roof and its associated flashings, gutters, and downspouts function as a system to shed water. Material choices should be made with this in mind. For example, use a single type of metal for all flashings and the rainwater conductor system to avoid galvanic action. Choose materials with life spans comparable to that of the slate, such as non-ferrous nails. Use heavier gauge flashings or sacrificial flashings in areas that are difficult to access or subject to concentrated water flows.

Flashings are the weakest point in any roof. Given the permanence of slate, it is poor economy to use anything but the most durable of metals and the best workmanship for installing flashings. Copper is one of the best flashing materials, and along with terne, is most often associated with historic slate roofs. Copper is extremely durable, easily worked and soldered, and requires little maintenance. Sixteen-ounce copper sheet is the minimum weight recommended for flashings. Lighter weights will not endure the erosive action of dust and grit carried over the roof by rain water. Heavier weight, 20 oz. (565 grams) or 24 oz. (680 grams), copper should be used in gutters, valleys, and areas with limited accessibility. Lead coated copper has properties similar to copper and is even more durable due to its additional lead coating. Lead coated copper is often used in restoration work.

Terne is a less desirable flashing material since it must be painted periodically. Terne coated stainless steel (TCS) is a modern-day substitute for terne. Although more difficult to work than terne, TCS will not corrode if left unpainted; a great advantage, especially in areas that are difficult to access.

Once a metal is chosen, it is important to use it throughout for all flashings, gutters, downspouts, and metal roofs. Mixing of dissimilar metals can lead to rapid corrosion of the more electronegative metal by galvanic action. Where flashings turn up a vertical surface, they should be covered with a cap flashing. Slates which overlap metal flashings should be nailed in such a manner as to avoid puncturing the metal. This may be accomplished by punching a second hole about 2" (5cm) above the existing hole on the side of the slate not overlapping the metal flashing. It is important that holes be punched from the back side of the slate. In this way, a shallow countersink is created on the face of the slate in which the head of the nail may sit.

◄ *Continuation of the roof repair sequence of Arlington House from page 13.*

Figure 23. Slate roofs should not be walked on if at all possible. For large projects, lifts can be used to inspect roofs periodically to assess maintenance needs. Photograph courtesy of the National Park Service.

The use of artificial, mineral fiber slate is not recommended for restoration work since its rigid appearance is that of a man-made material and not one of nature. Artificial slates may also have a tendency to fade over time. And, although artificial slate costs less than natural slate, the total initial cost of an artificial slate roof is only marginally less than a natural slate roof. This is because all the other costs associated with replacing a slate roof, such as the cost of labor, flashings, and tearing-off the old roof, are equal in both cases. Over the long term, natural slate tends to be a better investment because several artificial slate roofs will have to be installed during the life span of one natural slate roof.

Clear roof expanses can be covered by an experienced slater and one helper at the rate of about two to three squares per day. More complex roofs and the presence of chimneys, dormers, and valleys can bring this rate down to below one square per day. One square per day is a good average rate to use in figuring how long a job will take to complete. This takes into account the installation of flashings and gutters and the set-up and break-down of scaffolding. Tear-off of the existing roof will require additional time.

Maintenance

Given the relatively high initial cost of installing a new slate roof, it pays to inspect its overall condition annually and after severe storms. For safety reasons, it is recommended that building owners and maintenance personnel carry out roof surveys from the ground using binoculars or from a cherry picker (Figure 23). Cracked, broken, misaligned, and missing slates and the degree to which delamination has occurred should be noted, along with failed flashings (pin holes, open seams, loose and misaligned elements, etc.) and broken or clogged downspouts. A roof plan or sketch and a camera can aid in recording problems and discussing them with contractors. In the attic, wood rafters and sheathing should be checked for water stains and rot. Critical areas are typically near the roof plate and at the intersection of roof planes, such as at valleys and hips. Regular maintenance should include cleaning gutters at least twice during the fall and once in early spring, and replacing damaged slates promptly. Every five to seven years inspections should be conducted by professionals experienced in working with slate and steep slopes. Good record keeping, in the form of a log book and the systematic filing of all bills and samples, can help in piecing together a roof's repair history and is an important part of maintenance.

As part of regular maintenance, an attempt should be made to keep foot traffic off the roof. If maintenance personnel, chimney sweeps, painters, or others must walk on the roof, it is recommended that ladders be hooked over the ridge and that the workmen walk on the ladders to better distribute their weight. If slates are to be walked on, it is best to wear soft soled shoes and to step on the lower-middle of the exposed portion of the slate unit.

Conclusion

Slate roofs are a critical design feature of many historic buildings that cannot be duplicated using substitute materials (Figure 24). Slate roofs can, and should be, maintained and repaired to effectively extend their serviceable lives. When replacement is necessary, details contributing to the appearance of the roof should be retained. High quality slate is still available from reputable quarries and, while a significant investment, can be a cost effective solution over the long term.

Further Reading

Copper And Brass Research Association. *Copper Flashings.* 2nd ed. New York: Copper And Brass Research Association, 1925.

Dale, T. Nelson, and others. *Slate In The United States,* Bulletin 586. Washington, D.C.: U.S. Department of the Interior, United States Geological Survey, 1914.

Heim, David. "Roofing With Slate." *Fine Homebuilding,* No. 20 (April/May 1984): 38–43.

Levine, Jeffrey S. "Slate Roofs For Historic Religious Buildings." *Inspired.* Philadelphia: Philadelphia Historic Preservation Corporation, 1987.

"Slate Quarrying and Shingle Manufacture." *Fine Homebuilding,* No.71 (Jan. 1992): 64–68.

McKee, Harley J. "Slate Roofing." *APT Bulletin,* Vol. 2, Nos. 1–2 (1970): 77–84.

National Slate Association. *Slate Roofs.* 1925. Reprint. Fair Haven, Vermont: Vermont Structural Slate Co., Inc., 1977.

Pierpont, Robert N. "Slate Roofing." *APT Bulletin,* Vol. 19, No. 2 (1987): 10–23.

Sweetser, Sarah M. "Roofing for Historic Buildings." *Preservation Briefs,* No. 4. Washington, D.C.: U.S. Department of the Interior, Technical Preservation Services Division, 1975.

Repair/Replacement Guideline

The following guideline is provided to assist in the repair/replace decision making process:

1. Consider the age and condition of the roof versus its expected serviceable life given the type of slate employed.
2. Calculate the number of damaged and missing slates. Is the number less than about 20%? Is the roof generally in good condition? If so, the roof should be evaluated for repair rather than replacement. Also, keep in mind that the older a roof becomes, the more maintenance it will likely require.
3. Determine if there are active leaks and what their source may be. Do not assume the slates are leaking. Gutters, valleys and flashings are more likely candidates. "False leaks" can be caused by moisture condensation in the attic due to improper ventilation.
4. Check the roof rafters and sheathing for moisture stains. Poke an awl into the wood to determine if it is rotted. Remember that very old, delaminating slates will hold moisture and cause adjacent wood members to deteriorate even if there are no apparent leaks.
5. Are many slates sliding out of position? If so, it may be that ferrous metal fasteners were used and that these are corroding, while the slates are still in good condition. Salvage the slates and re-lay them on the roof. If the slates have worn around the nails holes, it may be necessary to punch new holes before re-laying them.
6. Consider the condition of the roof's flashings. Because slate is so durable, metal flashings often wear out before the slate does. Examine the flashings carefully. Even the smallest pinhole can permit large quantities of water to enter the building.
7. Is the deterioration of the slate uniform? Often this is not the case. It may be that only one slope needs replacement and the other slopes can be repaired. In this way, the cost of replacement can be spread over many years.
8. Press down hard on the slates with your hand. Sound slates will be unaffected by the pressure. Deteriorated slates will feel brittle and will crack. Tap on slates that have fallen out or been removed. A full, deep sound indicates a slate in good condition, while a dull thud suggests a slate in poor condition.
9. Are new slates readily available? Even if replacement is determined to be necessary, the existing roof may have to be repaired to allow time for documentation and the ordering of appropriate replacement slates.

Figure 24. Although slate replacement roofs are expensive, the superiority of materials and craftsmanship will give years of continued service. If amortized over the life of the roof, the replacement cost can be very reasonable. Photograph courtesy of the National Park Service.

Note: measurements in this publication are given in both U.S. Customary System and International (Metric) System for comparative purposes. Metric conversions are in some cases approximate and should not be relied upon in preparing technical specifications.

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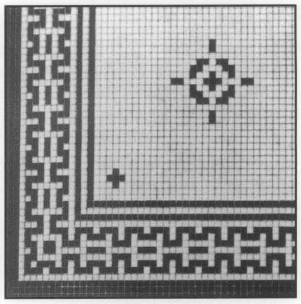
Cover Photograph: A portion of an advertisement for Slatington-Bangor Slate Syndicate (Slatington, PA) which appeared in the July 1910 issue of Building Age *(Vol.32 No.7).*

40 PRESERVATION BRIEFS



Preserving Historic Ceramic Tile Floors

Anne E. Grimmer and Kimberly A. Konrad

U.S. Department of the Interior
National Park Service
Cultural Resources
Heritage Preservation Services

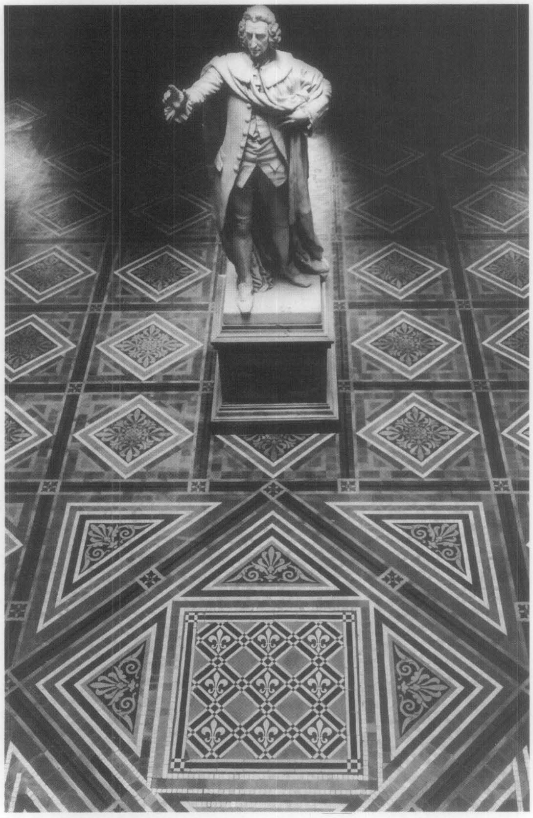


Figure 1. Minton encaustic tile floor, 3rd floor, Patent Office Building (now the National Portrait Gallery), Washington, D.C. Originally constructed between 1836-40 under the supervision of Robert Mills, the upper floors of this portion of the building were restored and redecorated in 1877 in the "Modern Renaissance style" by Cluss & Shulze, Architects, after a disastrous fire. Photo: Jack E. Boucher, HABS Collection.

With a tradition that dates to ancient civilizations, ceramic* tile flooring can be found in a variety of settings in diverse cultures and structures, including residential buildings ranging from large apartment buildings to small private houses, institutional buildings such as government offices and schools, and religious buildings such as cathedrals and mosques. Historically, its widespread use may be attributed to the fact that a readily available natural material—clay—could be converted by a relatively simple manufacturing process—baking or firing—into a very durable, long-lasting and attractive floor tile that is easy to maintain. Ceramic floor tiles exhibit a versatility of colored glazes and decoration, and they range from the plainest terra cotta tiles to highly decorated individual ceramic tiles and elaborately patterned tile floors. Their modularity, as standardized units, make them easy to fit into different sized spaces which also explains much of the popularity of ceramic floor tiles throughout history (Fig. 1).

This Brief begins with an overview of ceramic tiles as a traditional flooring material. It includes an explanation of the various kinds of historic floor tiles used in the United States and how they were made. General guidance is given on preservation treatments, focusing on maintenance, and, when necessary, selective replacement of damaged floor tiles. The Brief is intended to provide owners and managers of historic properties with an understanding of the significance and historical background of ceramic floor tiles, and a basic awareness of maintenance techniques and various deterioration problems to which tile floors are especially prone. In the case of significant historic ceramic tile floors, a professional conservator of ceramics should be consulted to advise in matters of repair, restoration or conservation. Historically, ceramic tiles were used on walls as wainscotting, on fireplace hearths and fireplace surrounds, and even on furniture, as well as for flooring. However, because floor tiles are subject to greater damage and deterioration, they are the primary emphasis of this Brief. Highlights include: a short history of ceramic floor tiles; a description of ceramic tile types; a summary of traditional installation methods; maintenance techniques; and guidance on repair and replacement.

The Tile-Making Process

Clay is an earthen material, moldable or plastic when wet, non-plastic when dry, and permanently hard when baked or fired. It is widely distributed geographically, and often found mixed with sand in soils of a loam type—a mixture of clay, silt and sand. Relatively pure clay is not usually a surface deposit, although, in some cases, it may be exposed by erosion. Clay types vary throughout the world, and even within a region. Each type of clay possesses a unique combination of special properties such as plasticity, hardness and lightness, as well as color and texture, which makes some clays better suited for one kind of ceramic than another. The correct clay mixture needed for a particular purpose can be created by blending clays and adding other materials, but using the wrong type of clay can result in expensive production problems such as crazing (the formation of tiny cracks in a tile glaze) or warping of the tile itself. Traditionally, chalky clays have been preferred for many kinds of ceramic tiles, in part because they produce, when fired, a white body which is desirable for decorating. Other materials can be added, including grog (or ground-up fired clay) that helps aerate the clay and prevents warping, speeds firing and reduces shrinking, or calcined flint, to harden it.

There are several methods used for making ceramic tiles: extrusion; compaction or *dust-pressing*; cutting from a sheet of clay; or molded in a wooden or metal frame. Quarry tiles are extruded, but most ceramic floor tiles, including traditional encaustic, geometric and ceramic "mosaic" tiles are made from refined and blended ceramic powders using the compaction method, known as dust-pressing. Encaustic tiles, which were made by dust-pressing, are unique in that their designs are literally "inlaid"into the tile body, rather than surface-applied. Once formed, tiles are dried slowly and evenly to avoid warpage, then fired in a special kiln that controls high, even heat at temperatures up to 1200°C (or approximately 2500°F) for 30-40 hours. Higher temperatures produce denser tiles with harder glazes. Most ceramic tiles require only one firing to achieve low porosity and become vitrified or glasslike, but some, especially highly decorated tiles, are fired more than once. Non-vitreous and semi-vitreous tiles are fired at lower temperatures and are much more porous.

Historical Background

Historically, the use of ceramic floor tiles goes back to the fourth millennium B.C. in the Near and Far East. The Romans introduced tile-making in Western Europe as they occupied territories. However, that art was eventually forgotten in Europe for centuries until the 12th century when Cistercian monks developed a method of making encaustic floor tiles with inlaid patterns for cathedral and church floors. But, this skill was again lost in the 16th century following the Reformation. Except for finely decorated wall tiles made in Turkey and the Middle East, and Delft tiles made in Holland in the 17th century, ceramic floor tiles were not made again in Europe until almost the mid-19th century.

The modern tile industry was advanced by Herbert Minton in 1843 when he revived the lost art of encaustic tile-making in England. The industry was further revolutionized in the 1840s by the "dust-pressing" method which consisted of compressing nearly dry clay between two metal dies. Dust-pressing replaced tile-making by hand with wet clay, and facilitated mechanization of the tile-making industry. Throughout the rest of the 19th century, dust-pressing enabled faster and cheaper production of better quality floor tiles in a greater range of colors and designs. In the 1850s encaustic tiles were selected for such important structures as the new Palace at Westminster in London, and Queen Victoria's Royal Residence on the Isle of Wight. By the latter part of the 19th century, despite the fact that encaustic tiles were still quite expensive, they had become a common flooring material in many kinds of buildings.

Development of the Tile Industry in America. Although plain, undecorated ceramic tiles were traditionally a common flooring material in many parts of the Americas, especially in Latin and South America, ceramic floor and roof tiles were probably not made in the North American Colonies until the late-16th or early-17th century. It was, however, in the Victorian era that ceramic tile flooring first became so prevalent in the United States. The production of decorative tiles in America began about 1870 and flourished until about 1930.

Like so many architectural fashions of the day, the popularity of ceramic tile floors in America was greatly influenced by the noted architect and critic, Andrew Jackson Downing. In his book *The Architecture of Country Houses,* published in 1850, Downing recommended encaustic floor tiles for residential use because of their practicality, especially in vestibules and entrance halls.

The 1876 Philadelphia Centennial Exposition, with its European and even a few American exhibits of decorative floor tile, was a major factor in popularizing ceramic tile floors in the U.S. Initially, most ceramic tiles—other than purely utilitarian floor tiles—were imported from England, and their relatively high cost meant that only wealthy Americans could afford them. However, when English tile companies realized the potential for profitable export, they soon established agents in major U.S. cities to handle their

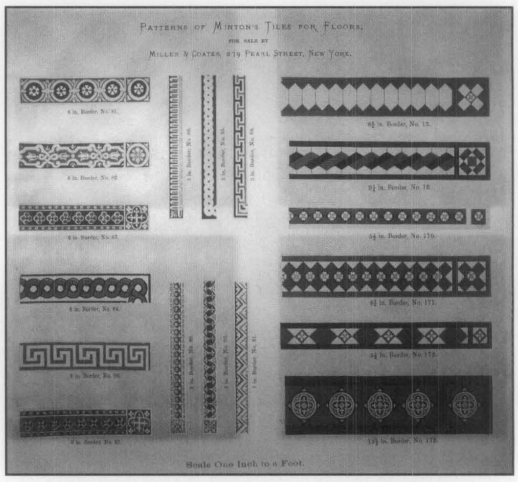
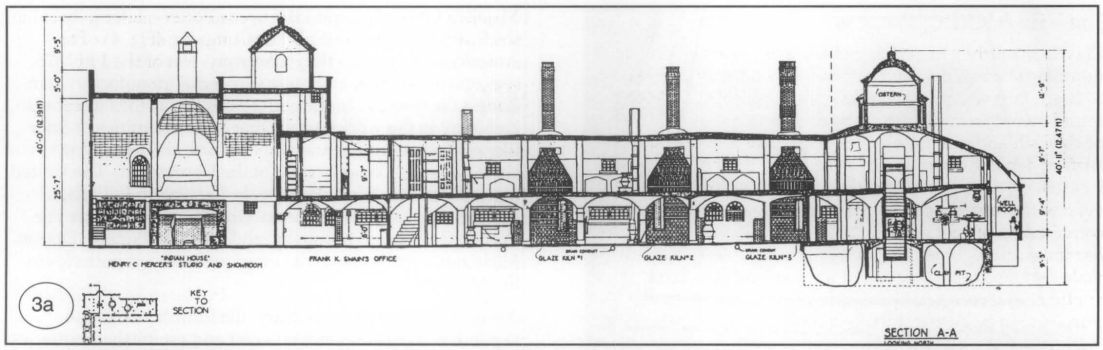
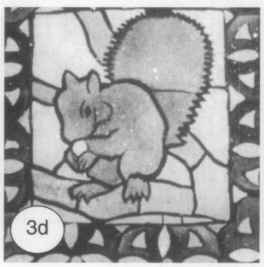
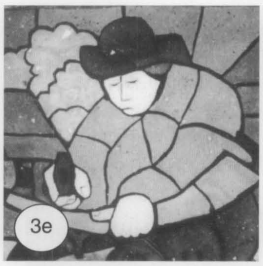
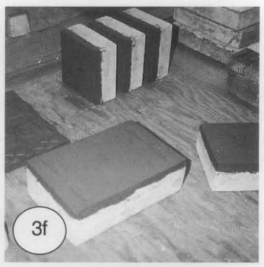


Figure 2. In the 19th century, Minton tiles were sold from this catalogue to American clients—including the Architect of the Capitol—by Miller & Coates, 279 Pearl Street, New York. Photo: David W. Look, AIA.









American business (Fig. 2). The English near monopoly actually stimulated the growth of the U.S. tile industry in the 1870s resulting in sharply decreased English imports by 1890.

The location of potteries and ceramic tile factories is dependent upon the ready availability of suitable ball clay (clay that balled or held together), kaolin (a white clay used as a filler or extender), and feldspar (a crystalline mineral), and an accessible market. Since the cost of shipping the manufactured products tended to restrict profitable sales to limited areas, this usually determined whether a factory would succeed. Although the United States Pottery in Bennington, Vermont, is known to have made encaustic tiles as early as 1853, the Pittsburgh Encaustic Tile Company (later the Star Encaustic Tiling Company), was the first successful American tile company, and is generally considered the first to manufacture ceramic tile in the U.S. on a commercial basis beginning in 1876.

At least 25 ceramic tile companies were founded in the United States between 1876 and 1894. In the East, several notable tile firms that were established in this period flourished in the Boston area, such as the Chelsea Keramic Art Works, the Low Art Tile Works, and the Grueby Faience Company. Other East Coast companies organized in the late-19th and early-20th century included the International Tile & Trim Company, in Brooklyn, New York; the Trent Tile Company, Providential Tile Company, Mueller Mosaic Tile Company, and the Maywood Tile Company, all in New Jersey; and the Moravian Pottery and Tile Works in Doylestown, Pennsylvania (Fig. 3).

Many factories were also established in the Midwest—in Indiana, Michigan, and, especially, in Ohio. In the last quarter of the 19th century, the town of Zanesville, Ohio, was the largest center for pottery and tile-making in the world. Some of the factories in Zanesville included: Ohio Encaustic Tile Company; Mosaic Tile Company; Zanesville

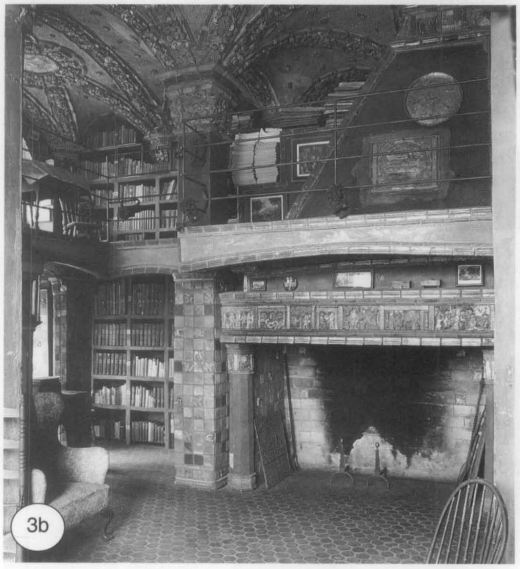


Figure 3. (a) The Moravian Pottery and Tile Works, a National Historic Landmark in Doylestown, PA, was designed in the Spanish Mission style and constructed by Henry Chapman Mercer over a period of years from 1911-1917. Tiles were manufactured primarily by hand in keeping with Mercer's Arts and Crafts ideals. (b) Mercer's tiles, seen here in the library, were used throughout his house, Fonthill. (c-e) One of Mercer's most important commissions was the floor of the Pennsylvania State Capitol in Harrisburg. (f) The factory closed in 1930 after Mercer's death, but resumed tile-making in 1974. New tiles are dated and made in the traditional way. (a) Drawing: Leslie S. Claytor, Benita C. Welch, Isabel C. Yang, HAER Collection; (b) Photo: Jack E. Boucher, HABS Collection; (c-e) Photos: Courtesy, Mercer Museum, The Bucks County Historical Society; (f) Photo: Anne Grimmer.

Figure 4. The tiled Presidential Seal in the courtyard of the Pension Building (now the National Building Museum), Washington, D.C., was installed in honor of President William McKinley's second inauguration in 1901. The "heavy Damask design," resembling fabric, that was used to decorate the tiles, indicates they were probably manufactured by The Mosaic Tile Company, Zanesville, Ohio, which first introduced this design. Photo: Kimberly A. Konrad.

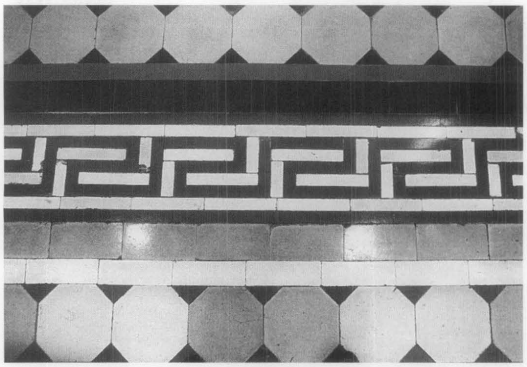


Figure 5. Geometric tiles made by the American Encaustic Tiling Company, also in Zanesville, were installed in the corridors of the Pension Building in 1888, several years after the building's completion. Photo: Kimberly A. Konrad.

Figure 6. The Los Angeles Union Passenger Terminal features ceramic tile floors in the Art Deco-style. Photo: HABS Collection.

Majolica Company; and J.B. Owens Pottery, later to become the Empire Floor and Wall Tile Company (Fig. 4). The American Encaustic Tiling Company, established in 1876, was one of the first, and most successful manufacturers in Zanesville (Fig. 5). In the early 1930s it was the largest tile company in the world, producing large quantities of floor tile, plain and ornamental wall tile, and art tile until it closed about 1935, as a result of the Depression. The United States Encaustic Tile Company, Indianapolis, Indiana; Rookwood Pottery, Cincinnati, Ohio; Cambridge Art Tile Works, Covington, Kentucky; and Pewabic Pottery, Detroit, Michigan, were some of the other well-known potteries in the Midwest.

Around the turn of the century, the industry began to expand as tilemakers moved West and established potteries there. Joseph Kirkham started the ceramic tile industry on the West Coast in 1900 when he set up the Pacific Art Tile Company in Tropico, California, after his company in Ohio was destroyed by fire. In 1904 the company became the Western Art Tile Company, surviving for five years until it went out of business in 1909. During the early-20th century, other companies were founded in Southern California, in and around Los Angeles (Fig. 6). Batchelder & Brown, in particular, of Pasadena (later Batchelder-Wilson in Los Angeles), was well-known for its Arts and Crafts-style tiles in the teens and 1920s. By the early 1940s California had become one of the leading producers of tile, especially faience, in the U.S. (Fig. 7) .

Ceramic engineers, potters and artists not only moved frequently from one pottery to another, but often struck out on their own and established new factories when dissatisfied with a former employer. Also, it was not uncommon for one company to reuse a defunct factory or purchase another pottery business, change the name and increase the product line. As a result, many of the companies in existence today are descendants of the early pioneering firms.

Changes in the Tile Industry. The majority of ceramic floor tile made in the U.S. before 1890 was encaustic, but various factories gradually began to develop and produce other kinds of tiles. The Trent Tile Company, among others, started to manufacture both white and colored ceramic mosaic tiles by the mid-1890s (Fig. 8). White vitreous wall tile became available, as well as more decorative tiles with colored glazes, such as the variegated faience glazes intended to give a more hand-crafted appearance that were originated by the Grueby Faience and Tile Company in 1894, and soon adopted by other potteries (Fig. 9).

In the 19th and early-20th century, many ceramic tile firms had their own engraving departments, while some used commercial designs supplied by professional printers. Well-known designers were often commissioned to work on specific product lines for a particular firm. These designers worked for one firm after another which resulted in similar designs being produced by different companies. (Historic ceramic floor tiles were usually identified by a manufacturer's or designer's mark on the back, if they were marked at all.) By the latter part of the 19th century ready-mixed glazes and colors were also available. This was a great advantage for potters who, prior to this, had to mix their own colors and glazes.

During the 20th century, the floor tile industry continued to evolve as much as it had in the previous century. Modern

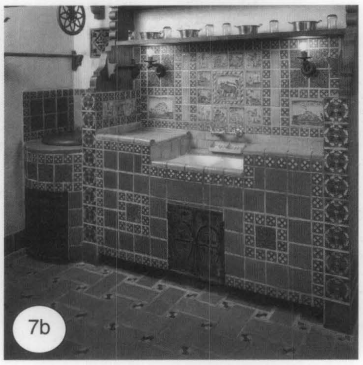


Figure 7. "Scotty's Castle" in Death Valley, California, was built over a 10-year period, beginning in 1922. Many of the rooms, the salon (a), as well as the kitchen (b), have tile floors. Some are composed of both local, California-made tiles, and Spanish tiles. Photos: Jack E. Boucher, HABS Collection.

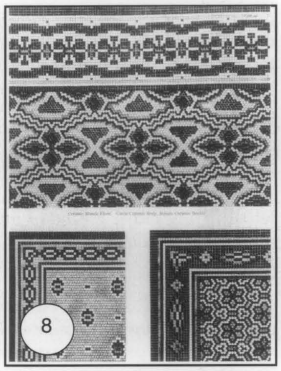


*Figure 8. The Trent Tile Company advertised its "Ceramic Mosaic Floor" tiles in the 1906 edition of **"Sweet's" Indexed Catalogue of Building Construction.** Photo: Sharon C. Park, AIA.*

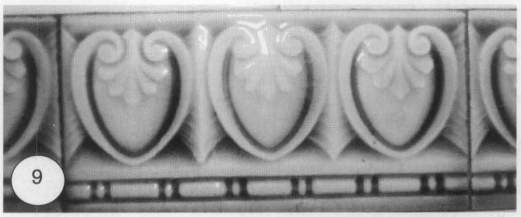


Figure 9. Beginning in the late-19th century, a decorative frieze with a relief design, such as this classical egg and dart motif, was often added to highlight plain ceramic wall tile. Photo: Kimberly A. Konrad.

methods of production employed sophisticated machinery, new materials and decorating techniques. In the years following World War II, there were many advances in the industry. Commercially manufactured dust-pressed tiles, which had previously required more than 70 hours just in the kiln, could be made in less than two hours from the raw material stage to finished tiles, boxed and ready to ship. Dried, unglazed tiles were sprayed with colored glaze evenly and automatically as conveyors carried the tiles into the tunnel kilns, and the extrusion process ensured that the tiles were cut to a uniform thickness and size. The changes and developments in the production of floor tile brought forth a wide range of shapes and sizes, along with new colors, glazes and decorating techniques.

After the turn of the century, fewer encaustic floor tiles were used, particularly in residential architecture. The introduction of ceramic mosaic floor tiles was a factor in their decline (Fig. 10). The development of rubber interlocking floor tiles in 1894, along with other, more resilient, flooring materials, was instrumental in the decreased popularity not only of encaustic tiles, but also other ceramic tile flooring. These new materials were not only cheaper, they were not as fragile; they were also lighter and thinner, and easier to install.

Ceramic mosaic tiles remained in common use through the 1930s in part because an innovative development had made laying such small tiles easier. The tiles were pre-mounted in decorative patterns on 12" x 12" sheets of paper, and sold ready to lay in cement. This greatly simplified the tile setter's work, and no doubt was a significant factor in the increased popularity of ceramic mosaic tiles. Sophisticated mosaic floor designs became common in entrance foyers of public and private buildings (Fig. 11). Small, white, unglazed tiles in round, square, octagonal or hexagonal shapes were promoted for their sanitary qualities, particularly for bathroom floors, while larger, rectangular, white, glazed tiles were used for bathroom walls or wainscotting. Colored tiles were also popular, especially for bathrooms, and even kitchens (Fig. 12). Quarry tile, which was larger and thicker than other ceramic floor tile of this period, was often used in public buildings, as well as for entrance halls, small studies, libraries, dining rooms and even living rooms in private homes. But, by the 1930s, the fashion for art tile had diminished to the point where floor tiles were, for the most part, generally regarded as primarily utilitarian, as opposed to important decorative elements.

Ceramic Floor Tile Types

The **thickness** of historic ceramic floor tiles varied considerably according to their intended use and when they were made. Floor tiles were thicker and harder than wall or ceiling tiles. Stove tiles, meant to retain the heat of the stove, were sometimes as much as several inches thick. Medieval floor tiles were usually one inch thick; encaustic tiles of the Victorian era tended to be slightly thinner. Modern, 20th-century tiles, with the exception of some art pottery tiles, are the thinnest, as a result of modern

Figure 10. Ceramic mosaic tile floors were practical for structures like this Bath House, Hot Springs, Arkansas (1914-1915). Photo: Jack E. Boucher, HABS Collection.

manufacturing methods. The backs of most, but not all, ceramic floor tiles are covered with raised (or sometimes recessed) ridges, circles or squares which help to increase the bonding capability of the tile.

Unglazed and Glazed Tiles

Ceramic floor tiles can generally be divided into two types: **unglazed** and **glazed. Unglazed** tiles include: quarry tiles; encaustic and geometric tiles; and ceramic mosaic tiles, which can be either glazed or unglazed. Most other ceramic floor tiles are **glazed.**

Unglazed Tiles

Quarry tiles are the most basic type of historic ceramic floor tile (Fig. 13). Originally made from quarried stone, they are machine-made using the extrusion process. Quarry tiles are unglazed, semi-vitreous or vitreous, and essentially are square or rectangular slabs of clay baked in a kiln. The colors of quarry tiles are natural earthen shades of gray, red and brown determined by the clay and, to some extent, the temperature and duration of firing. Quarry tiles, which range from 1/4" to 1/2" in thickness, are available in square and rectangular shapes in sizes that include 3", 4-1/4", 6" (one of the most common sizes), 9" and 12" squares; 6" x 12", 6" x 9", 4-1/4" x 9", 3" x 6", and 3" x 9" rectangles; and 4" x 8" hexagon shapes. (Pavers or paver tiles are a simpler, and tend to be somewhat cruder, version of quarry tiles. Like quarry tiles, they are usually unglazed, but slightly thicker. Machine-made pavers are either semi-vitreous or vitreous, and generally formed by dust-pressing, although sometimes are extruded. Hand-made pavers which are common in Mexico and southern Europe are non-vitreous.)

Encaustic tiles are a type of traditional unglazed—yet decorative—floor tile, manufactured by the dust-pressed method. Whereas most ceramic tiles are surface-decorated or decorated with impressed or embossed designs created by a mold, encaustic tiles are unique in that their decorative designs are not on the surface, but are inlaid patterns created as part of the manufacturing process. First, a thin, approximately 1/4" layer of fine, almost powder-dry, clay was pressed into a mold with a relief design at the bottom which formed a depression in the face of the tile. A second, thicker layer of coarser clay was laid over the first layer, then covered with another layer of fine clay. This "sandwich" helped prevent warping and ensured that the body of the tile was strong and had a fine, smooth surface. The layers of clay "dust" were compacted by presses, after which the mold was inverted and the die removed, thus producing a tile with an indented or intaglio pattern on top. After the tile dried, colored slip (liquid white clay colored with dyes), was poured to fill in the intaglio pattern. Each color had to dry before another color of slip was added. The recessed area was overfilled to allow for shrinkage, and after drying for several days, and before firing, the excess slip was scraped off the surface by a rotating cutter that created a flat, although not completely smooth, face. Problems might arise during the firing. Due to the dissimilar rates of contraction of the different clays, the inlaid clay could shrink too much and fall out of the tile recesses; or, the tile could be stained by the different pigments used for the design if impure or unstable (Fig. 14).

By the 1840s, encaustic tiles were made entirely with almost-dry clay using the dust-pressed method. This served to

Figure 11. Ceramic mosaic tiles were used decoratively on the entrance floor of this early-20th century school building. Photo: Kimberly A. Konrad.

eliminate the possibility of staining the body of the tile with other colors and permitted the use of more colors on a single tile. Thus, an encaustic tile can sometimes be dated according to the complexity and the number of colors in its pattern. Red tiles with white figurative patterns were generally the earliest, followed by brown and buff colored tiles. In the 1860s, blue tiles with yellow or buff patterns were popular, succeeded by more subtle color schemes featuring a "chocolate" red with a soft grey. By 1860, up to six colors were used in a single tile to form a pattern. Toward the end of the century, white encaustic tiles with a black or gold design were common, as well as tiles with complicated color patterns of white, black, gold, pink, green and blue. Encaustic tiles were decorated with traditional as well as original designs. Some, particularly intricate, designs were painted on the surface of the tile with opaque colored glazes, instead of being inlaid (Fig. 15). Most major tile manufacturers sold many of the same pre-formed encaustic floor tile patterns through catalogues. Encaustic tiles were produced in a variety of sizes, mostly square or octagonal in shape, and almost any design could be custom-made for a special purpose or to fit a particular space. Historic, 19th-century encaustic tiles were generally slightly less than 1" thick, about 15/16." Cheaper tiles of lesser quality were also made of clay or cement. These designs

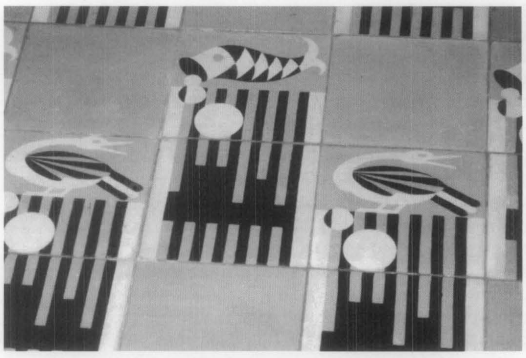


Figure 12. These colorful (yellow, black and white), and boldly patterned Art Deco-style ceramic tiles were made in France. Ernest Hemingway's wife, Pauline, brought them back to the U.S. in the 1930s and had them installed in a bathroom in their house in Key West, Florida. Photo: Susan Escherich.

Figure 13. Quarry tiles were used in the corridors on many of the upper floors of the U.S. Department of the Interior Building (1935-1936). They were laid in a pattern identical to the more expensive marble floor tiles that were used in the public spaces. Photo: Brooks Photographers, HABS Collection.

resembled those commonly found on encaustic tiles but applied as a transfer printed pattern, or using a multi-color lithographic or silkscreen process. These are still manufactured and popular in many parts of the world (Fig. 16).

Smaller, single-colored versions of encaustic tiles that, when assembled together form a geometric pattern, are called **geometric tiles** in England. However, in the United States they are generally not differentiated from encaustic tiles. Based on the geometric segments of a six-inch square, they were typically rectangular, square, triangular or hexagonal in shape, and about the same thickness as patterned encaustic tiles (Fig. 17). Geometric tiles were especially well suited for decorative borders, and a wide variety of floor designs could be created with their many shapes, sizes and colors—either alone or combined with patterned encaustic tiles. The cost of producing geometric tiles was much less than of encaustic tiles because each tile involved only one type of clay and one color. By the end of the 19th century, over 60 different shapes and sizes of geometric tiles were available in up to ten colors, including buff, beige or tan, salmon, light grey, dark grey, red, chocolate, blue, white and black.

Ceramic mosaic tiles are essentially smaller versions of geometric tiles (usually no larger than 2-1/4", and no thicker than 1/4") ranging in size from 1/2" to 2 3/16", in square, rectangular or oblong, hexagonal, pentagonal and trapezoidal shapes. Both vitreous and semi-vitreous mosaic tiles were available, unglazed in solid or variegated colors with a matte finish, or glazed in unlimited colors. Single, one-piece tiles were also fabricated to give the appearance of multiple mosaic pieces. This was achieved with a mold, which gave the appearance of recessed mortar joints separating individual "mosaics" (Fig. 18).

Glazed Tiles

With the exception of quarry tiles, encaustic tiles, and some mosaic tiles, most ceramic floor tiles are decorated with a glaze. While unglazed tiles derive their color solely from the clay, or from oxides, dyes or pigments added to the clay, the color of glazed tiles is provided by the glaze, either shiny or matte. Some potteries specialized in certain kinds of glazes and were famous for them. The earliest and most common method of clay tile decoration made use of tin-glazes which were essentially transparent lead glazes. Tiles were either dipped into the glaze or the glaze was brushed on the tile surface. Glazes were generally made with white lead, flint, or china clays ground up and mixed with finely ground metallic oxides that provided the color. Colored glazes were commonly known as "enamels". Colors included blue derived from cobalt, green from copper, purple from manganese, yellow from antimony and lead, and reds and browns from iron. An opaque glaze was created by adding tin oxide.

Laying Ceramic Tile Floors

19th Century Techniques. Aside from the use of improved tools and modern materials, installation methods have changed little since the mid-19th century. M. Digby Wyatt, an architect for one of the major 19th century encaustic tile manufacturers in Britain, Maw & Co., described this procedure for laying encaustic and geometric tiles in 1857:

First, either an even layer of bricks, a 2-1/2" bed of concrete of quicklime and gravel, or a mixture of Portland cement and clean sharp sand was laid to prepare a solid foundation for the tiles. If the tiles were to be laid over an existing wooden floor, the floor boards had to be pulled up, sawn into short lengths and fitted between the joists. Concrete filled in the spaces and made the base flush with the upper face of the joists, and created a level surface finished within 1" of the finished floor line. A layer of

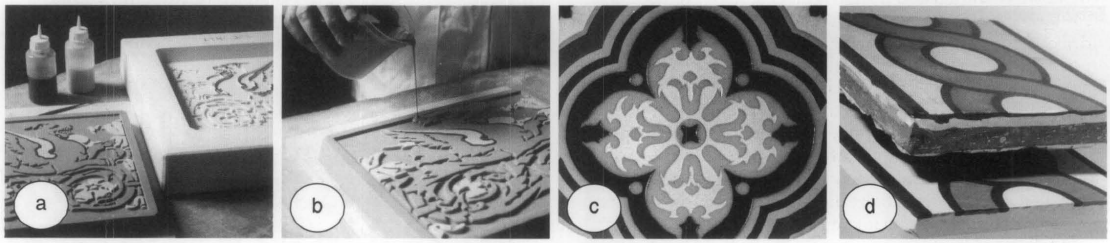


*Figure 14. **Making encaustic tiles**. When finished, a reproduction encaustic tile resembles a historic tile, but the reproduction process is quite different from the traditional method. Designs for reproduction tiles are recreated by a computer from drawings of the original tile. (a) The computer image of the design is transferred to, and machine-cut into, a Plaster of Paris mold. Plastic, buff-colored clay is pressed into the mold to form the main body of the tile, and left to dry for 24 hours. (b) Colored slip, or liquid clay, is poured into the indented portions of the tile to create the pattern. (Each color of slip must dry before another color can be poured.) (c) After drying, and before firing, excess slip is scraped off, leaving the surface of the tile smooth, but the slip-filled areas still slightly recessed. (d) A side view of the 19th-century tile at the top of the photograph clearly shows the 3-layer clay "sandwich," as well as the 2 colors of slip that form the inlaid design. The new tile, below, is slightly thinner and is made from only 1 layer of clay. Photos: (a-b) H&R Johnson Tiles Ltd.; (c-d) Wayne Firth, Office of the Architect of the Capitol.*

Figure 15. The detailed features of the portrait on this round tile in the U.S. Capitol were painted on the surface of the tile rather than inlaid. Photo: David W. Look, AIA.

cement mortar was then laid on top. This allowed the tiles to fit in the same amount of space as the floorboards they replaced.*

Before laying the tiles, skirting boards or shoe moldings were to be removed, and replaced after the tiles were laid. This eliminated having to cut the outer tiles to fit exactly, and resulted in a neater appearance.

Next, the floor design was marked off with mason's string or chalk lines which divided the space into equal quadrants. The first section to be laid out was defined by two parallel strips of wood, or guide pieces, about 4" wide. A level thickness of cement was spread between these strips. The tiles, thoroughly soaked in water, were laid in the cement and leveled with a straight-edge. The foundation had to be kept wet while the tiles were being laid. Small strips of wood temporarily placed at right angles to the guide pieces helped keep elaborate patterns straight.

When the bed was hard, the joints were filled with pure cement mortar—sometimes colored with lamp black, red ochre or other natural pigments—mixed to the consistency of cream. Excess mortar was wiped off the tiles with a piece of flannel or sponge.

**The traditional practice of sawing the original floor boards and fitting them between the joists, still used today to maintain a low finished floor profile, has resulted in numerous cracked tiles and other failures. Instead, a better approach is to leave the existing floor boards, if they are in good shape, and install a cementitious backer board (CBU) available in thicknesses ranging from 1/4" to 5/8" as the setting bed for the tiles.*

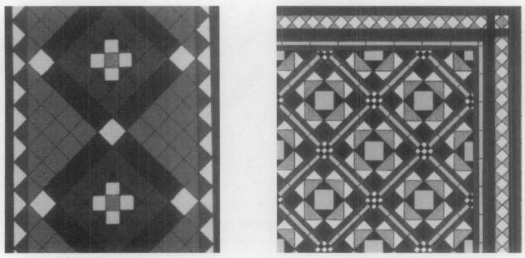


Figure 17. Shown here are typical geometric tile patterns popular in the late-19th century, as illustrated in ***Decorative Tile Designs in Full Color.*** *Selected and arranged by Carol Belanger Grafton. NY: Dover Publications, Inc., 1992, pp. 73, 83.*

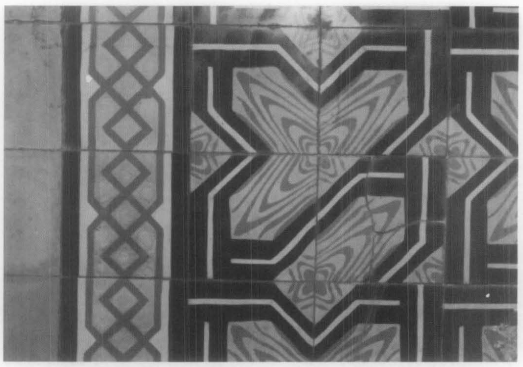


Figure 16. Historic cement floor tiles in a house at 103 Calle San Jose, Old San Juan, Puerto Rico, feature a design intended to resemble wood parquet. (Note the mismatched repair.) Photo: Jack E. Boucher, HABS Collection.

A newly-laid tile floor could not be walked on for 4-6 days until the cement hardened properly. Occasional washing would remove the saline scum that often appeared on the surface right after the tiles were laid.

20th Century Techniques. Almost 50 years later, in 1904, the Tile Manufacturers of the United States of America published *Suggestions for Setting Tile* with the intent of bringing tile-laying up to a uniform standard. This guidance was very similar to that given by Wyatt. But, there were some differences, such as using hollow clay tile as a foundation material and heavy tar paper when laying tile over a wooden floor to protect the floor boards from the moisture of the mortar mix. Emphasis was placed on using the best quality cement, sand, and purest water to obtain a durable tile floor. Soaking the tiles before setting was no longer necessary, but using stiffer mortar was suggested to prevent it from rising up between the tiles.

Tile-laying methods changed somewhat more later in the 20th century, mostly due to the availability of new materials and techniques. By the 1920s small ceramic mosaic tiles were manufactured as 12" square sheets held together by a face-mounted paper "skin." This made it possible to lay the 12" square of tiles as a unit rather than each of the small tiles individually. Mounting the tiles directly in the cement resulted in a very strong bond. But the face-mounted paper obscured the tiles from view making it difficult for the tile-setter to see if the tiles were being laid straight. The fact that the paper was not removed until after the tiles were firmly set in the cement bond coat further complicated

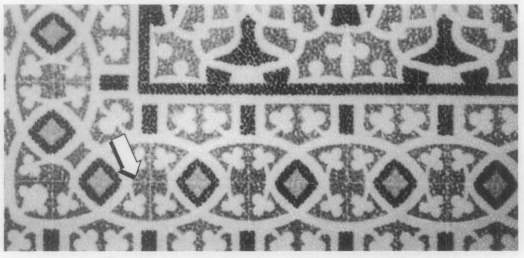


Figure 18. One-piece tiles were made with a mold that created the appearance of mortar joints and individual mosaics, as illustrated in ***Decorative Tile Designs in Full Color.*** *Selected and arranged by Carol Belanger Grafton. NY: Dover Publications, Inc., 1992, p. 87.*

Figure 19. Regular maintenance treatments for the historic quarry tile floors in the U.S. Department of the Interior, shown here in a side corridor, include: stripping and waxing once a year; weekly spraying and buffing with a commercial "floor finish revitalizer/cleaner" that is slip resistant; and dust mopping or damp mopping 4 times a week. Photo: Brooks Photographers, HABS Collection.

realignment of crooked tiles. This paper "skin" was eventually replaced with a fabric mesh backing. This permitted the tiles to be aligned as soon as the moisture from the bond coat loosened the mesh from the back of the tile; it also allowed a single tile to be cut away from the mesh and repositioned immediately. Although the fabric mesh made tile setting faster, sometimes it also resulted in a weaker bond by reducing the contact area between the backs of the tiles and the bond coat.

Following World War II, different methods of preparing a foundation for a ceramic tile floor were developed to be more compatible with new materials, such as reinforced concrete, expanded wire mesh, polyethylene and waterproof plywood. New adhesives and grouts also facilitated tile installation, and an increased variety of epoxy and cement mortars allowed for different setting bed thicknesses. But today, after half a century of practical application, some of these "new" materials, such as plywood, particle board, oriented strand boards and other wood panels, are no longer recommended for use with ceramic tile.

Mortar beds are lighter, more flexible, and much thinner than they were previously, having shrunk from several inches to as thin as 3/32". A greater variety of materials are used for setting ceramic floor tiles, including bonding agents and waterproof membranes. Basic installation methods have not changed significantly, but they vary according to the type of subfloor on which the tile is to be laid. While the same concerns for level underlayment and strong adhesion exist, advancement has occurred mostly in the increased speed and ease of laying the tiles.

Historic Ceramic Floor Tile: Preservation and Maintenance

Before undertaking any work more complicated than regular maintenance or a very simple repair on a significant historic ceramic tile floor, or on any historic tile floor where serious damage has occurred, it is recommended that a professional conservator of ceramics, an historical architect, an architectural historian, or a chemist with particular knowledge and experience in this field be consulted. This will ensure that all future work, whether it be regularly-scheduled maintenance or more technical and specialized repair and restoration, is done in accordance with the Secretary of the Interior's *Standards for the Treatment of Historic Properties.*

Cleaning Methods. Ceramic tiles are essentially a practical, low-maintenance flooring material. Yet, even glazed tiles are somewhat porous, and can get dirty and stained, especially in heavy traffic areas or where oil, fat, and grass stains are likely to occur. Although heavily soiled areas may be difficult or impossible to clean completely, in most instances, cleaning ceramic tile floors is relatively easy. Cleaning should always begin with the gentlest means possible, which may be as simple as warm water. Regular maintenance should include sweeping, or preferably dry or damp mopping or vacuuming to reduce grit. Tiles can usually be cleaned with a non-soap-based household floor cleaner, such as one of the commercial products intended for cleaning ceramic tile floors available on the market.

All cleaning and stain-removal products should always be tested on a small, inconspicuous area before using. Abrasive cleaners (including powdered cleansers and even "mildly" abrasive creams) and mechanical equipment can damage and wear away the protective surface, as well as the decorative design on the tiles, and should not be used on ceramic tile floors. Generally, acid-based cleaning solutions should also not be used on ceramic tile floors because they can damage the complex silicates in a glaze. However, there are some acid-based cleaners specially formulated for cleaning and removing coatings from ceramic tile floors that may be acceptable, but even these must be used with caution. Sometimes an acid-based cleaner may, in fact, be needed to remove discoloration or staining caused by lime or cement mortar. But, it should be tested first, used with caution, and applied only to a thoroughly wetted tile floor from which excess water has been removed. Pre-wetting a ceramic tile floor before cleaning is a good policy to observe with all cleaners. The water saturates the porous tile and prevents chemicals or other cleaning agents from penetrating into the tile body. Floor tiles should be always rinsed thoroughly after cleaning.

Figure 20. The surfaces of these late-19th century encaustic tiles have become worn and much of the pattern has been lost after more than 100 years of use. Photo: Anne Grimmer.

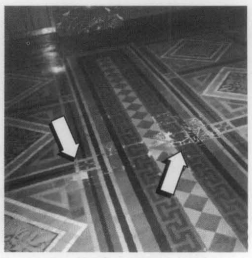


Figure 21. These cracked geometric tiles may have been damaged by the repeated passage of heavy equipment over the floor. Photo: Anne Grimmer.

Plastic pot-scrubbers may be effective in loosening and removing superficial dirt without abrading the glazed or vitrified surface of the tiles. Stubborn asphalt or oil stains, scuff marks, or soiling can sometimes be removed with ammonia or one of the household spray products intended for cleaning kitchen or bathroom tiles. If necessary, a solvent may be applied carefully to pre-wetted tiles, but it should not be left on the surface for an extended amount of time as it may cause discoloration. If possible, a stain should always be identified first in order to select the material best-suited to remove it.

Organic growth, such as mold or mildew, can be eliminated with a dilute solution of household bleach and a neutral household detergent, or a dilute (5-10%) solution of tri-sodium phosphate (TSP). After applying either of these solutions, it may be necessary to scrub the floor with a natural bristle or nylon brush, and then rinse with clear water. Even a dilute bleach solution should not be left on a ceramic tile floor for more than a few minutes, since the alkali in the bleach can lead to the formation of a white efflorescent deposit. Efflorescence (a whitish haze of water-soluble salts) may stain and streak the tile, or may even cause minor spalling around the joints.

Regular maintenance of a ceramic tile floor should always begin with vacuuming to remove loose dirt and grit. Then, a mild cleaning solution may be applied and left on the floor for 10-15 minutes, without letting it dry on the tiles. Heavily soiled areas may be scrubbed with a natural bristle or nylon brush to loosen dirt from the tile surface. Finally, the floor should be thoroughly rinsed with clean, clear water, preferably twice, and dried with terry cloth towels, if necessary. Any proprietary cleaning product should always be used in accordance with the manufacturer's directions (Fig. 19).

Protective Coatings. In most instances, traditional ceramic tile floors probably would not have been treated or given a protective coating other than wax. In the 19th century, some encaustic tile floors were treated with linseed oil, but this is not a practice recommended today because linseed oil tends to attract dirt and discolors as it ages. Most historic ceramic tile floors simply acquired a natural "polish" or sheen through use. Because the surface of ceramic tiles is already protected with a fired skin or a glaze, an additional protective coating should generally not be needed.

Opinions differ concerning the use of protective coatings, penetrating sealers, or waxes on ceramic tile floors, and, especially, on historic ceramic tile floors. If properly applied and regularly cleaned, a coating can sometimes be an effective maintenance treatment, but only on interior floors. However, if not adequately or properly maintained, rather than facilitating maintenance of ceramic tile floors in high traffic areas, such coatings may tend to emphasize traffic patterns as they wear away or become scratched. Some coatings may also peel in spots, or cause tile to appear hazy or cloudy if the coating is not applied in accordance with the manufacturer's specifications, or if the tiles are not perfectly clean when the coating is applied. Furthermore, applying such a coating may actually increase maintenance costs, since a coating requires periodic removal and renewal. The frequent removal of a coating can also damage a ceramic tile floor if it is carried out with harsh chemicals or abrasive mechanical equipment. If any coating is considered, a traditional coating, such as floor wax, may be the most suitable. Wax is easy to remove when it becomes worn, and does not impart a high, potentially inappropriate, gloss to the surface.

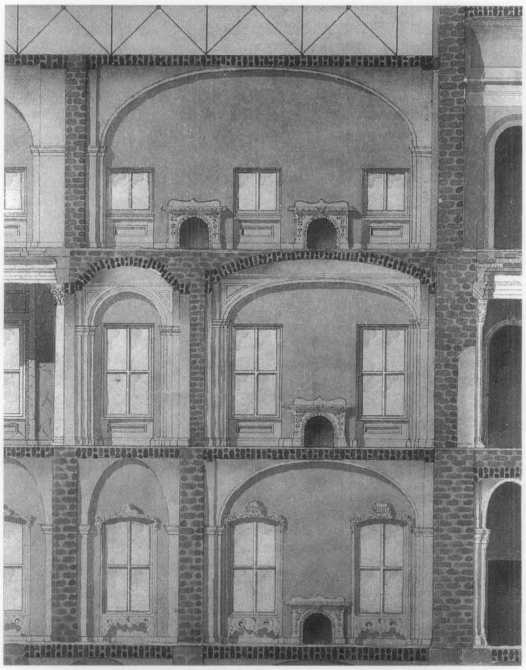


Figure 22. Original section drawing of the 2nd and 3rd floors of the House of Representatives Wing of the U.S. Capitol shows how Montgomery C. Meigs ensured the durability of the encaustic tile floors that were laid in the 1850s. He specified that the 3/4" tiles be laid on top of 1/2 to 3/4" mud (or mortar), which, in turn, was to be laid over a coal tar membrane on top of 3" of brick over an air space of 4-6". Photo: Wayne Firth, Office of the Architect of the Capitol.

On the other hand, a penetrating sealer, or *impregnator*, may be worth considering to protect patterned encaustic tiles, or painted or printed tiles featuring a design that might be worn off, particularly in public buildings with a high volume of foot traffic. For example, some manufacturers of new, reproduction encaustic tiles recommend applying a penetrating sealer to the replacement tiles, as well as to the historic tiles. Impregnators do not change the color of the tile surface and, unlike some penetrating sealers, are completely invisible after they have been applied. They can reduce the porosity or water absorption of the tile surface, and provide some protection for the tile (and the grout) against staining. This may be particularly useful on light-colored floors. Whether to apply an impregnator to an historic ceramic tile floor, and what type or product to use, are decisions that should generally made in consultation with a conservator or ceramic tile specialist. *It may also be necessary to comply with certain safety standards and friction requirements of the ADA (Americans with Disabilities Act). The ADA Guidelines recommend "a static coefficient of friction" of 0.6 for level surfaces and 0.8 for ramps. This may require the application of a non-slip sealer or wax to historic ceramic tile floors in some public buildings.*

Despite the non-traditional shiny finish they may impart to a floor surface, two-part, acrylic-based coating systems are commonly used today on historic ceramic tile floors in many public buildings, primarily because they facilitate easy maintenance. If it is decided that a sealer is to be used, a product with a matte or dull finish may be preferable, or more appropriate, for a historic ceramic tile floor than one with a high-gloss.

In some cases, temporary protection may be the best approach until a better solution is found. Non-permanent protection for an historic ceramic tile floor may be as simple as using floor mats at doors or in heavy traffic areas.

Historic Ceramic Floor Tile: Damage and Deterioration Problems

Loss of Tile Surface and Pattern. Ceramic tiles are among the most durable of historic flooring materials, but natural wear and a certain amount of deterioration or damage is inevitable. Some tiles, such as dense, close-textured quarry tiles and ceramic mosaic tiles, resist abrasion and stain absorption very well. But many others, especially patterned encaustic and geometric tiles, are extremely susceptible to abrasion. Heavy traffic can also result in uneven wear, or even cupping, in certain areas of tile floors that get more use than others, such as doorway entrances. The particular clay mix, or the dye or pigment used to color the clay, can also affect the hardness and durability of individual tiles or an entire ceramic tile floor (Fig. 20).

Tile Glaze Failure. Occasionally some glazes can become pitted or powdery as they age. Lead glazes used in the 19th century, which were fired at low temperatures, deteriorated relatively quickly. Glazes have different physical properties from the fired clay tile body itself, and as a result may sometimes crack or craze. Unless the crazing visibly extends into the porous clay of the tile body beneath, this is not generally a serious material failure; however, dirt entering these cracks cannot be removed, and will discolor the tile. If the crazing penetrates through the glaze, it may increase the water absorption of the tile.

Tile Breakage. Ceramic floor tiles are very susceptible to damage and breakage caused when something heavy is dropped. Repeated passage of heavy objects, or carts, over a floor can also crack and break ceramic tiles, as well as heavy vibration from outside traffic (Fig. 21).

Moisture Damage to Tile. Ceramic tile floors have been traditionally viewed as highly waterproof systems that do not require protection from moisture. In reality, however, this is not true. Water-related problems are one of the most common causes for the deterioration and failure of historic tile floors, particularly in bathrooms and other rooms where there is a lot of moisture. Water that is allowed to sit in areas around shower stalls and bathtubs can eventually damage grout and mortar, and loosen tiles. Some of the more porous kinds of tiles that are not as hard-fired may actually begin to powder or spall if subjected to constant moisture.

Loose, Cracked, Broken or Unbonded Tile due to Mortar Failure. The durability of ceramic tile floors depends to a great extent on a sound mortar bed and sound mortar joints. The wrong mortar type or mortar that is inadequately mixed can also spell trouble for a ceramic tile floor. Failure of a tile floor system laid over a subfloor is often the result of weakened or deteriorated grout or mortar which allows the tiles to become loose. Mortar may also be weakened or loosened by cleaning solutions that are too strong.

Proper tile-laying technique includes the use of a material that will allow for some movement of the tiles. Traditionally, a layer of asphalt (replaced by a layer of plastic or building paper in more modern construction) was inserted to separate the base and the bedding underneath (Fig. 22). This prevents bonding between the base and the bed, and allows for some "relative" movement. It is intended to prevent the ceramic tile floor from arching or ridging, a condition in which single or entire rows of tiles can pop up to relieve tension and separate completely from the bed. When this happens, the condition will probably require taking up and relaying many or all of the tiles.

Tile Damage or Loss caused by Systems Update. The installation of new plumbing, electrical and HVAC systems, or the attachment of new fixtures and furnishings, may be one of the most common sources of damage to an historic ceramic tile floor. Earlier remodeling projects to remove old pipes or to replace "out-dated" bathroom fixtures may have resulted in the loss of floor tiles (Fig. 23). Different shapes and sizes of new fixtures, equipment or pipes may have exposed previously untiled areas that have been inappropriately patched with cement. Careless workers and insensitive installations can also result in damage, breakage or removal of historic floor tiles. All of these conditions will require matching replacement tile.

Historic Ceramic Floor Tile: Repair and Replacement

The Secretary of the Interior's Standards for the Treatment of Historic Properties emphasize the retention and preservation of historic building material. Preservation and repair treatments are always preferable to replacement.

Mortar Joint Repair. Deteriorated mortar joints and loose mortar or grout can generally be repaired. First, the entire floor should be checked for loose tiles that need to be regrouted. Damaged mortar should be carefully removed by hand and the joints wetted or a bonding agent applied in preparation for regrouting. When making mortar repairs, it is important to use grout that matches the old in color and consistency as closely as possible.

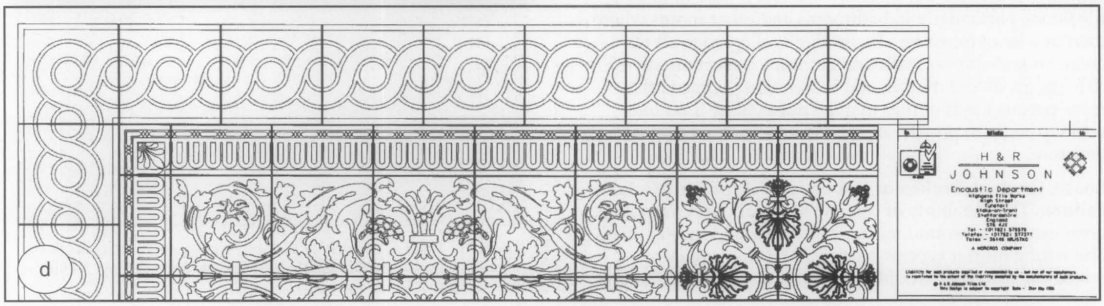
Figure 23. These non-matching tiles are inappropriate replacements for original tiles that were damaged during bathroom remodeling. Photo: Anne Grimmer.

(a-b) Above: By the mid-1970s, many of the patterns in the encaustic tile floors had become faint, and some had completely worn off in the most heavily trafficked areas. (c) Below left: Damaged areas of the floor had been patched with salvaged pieces of tile that fit, but did not match. Photos: Wayne Firth, Office of the Architect of the Capitol.

Figure 24. ***U.S. Capitol Restoration Project.*** *Restoration of the historic ceramic tile flooring at the U.S. Capitol is one of the most extensive on-going undertakings of this kind in the U.S. When the Office of the Architect of the Capitol contacted H&R Johnson-Richards, the manufacturer of Minton Hollins tiles, regarding restoration of the tile floors in preparation for the American Bicentennial, the company was unaware of the extent of original Minton encaustic and geometric floor tiles in the U.S. Capitol building. Montgomery C. Meigs, Supervising Engineer, and Architect of the Capitol Extension, Thomas U. Walter, specified Minton encaustic tiles for the floors in the two wings that were added to the Capitol. The tiles were ordered from the factory in England through Miller & Coates, a Minton supplier in New York City, and installed in the 1850s.*

When the project was initiated, the intent was to replace only those tiles that were severely damaged or worn. Removing and replacing selected sections of the tile floor in their entirety was determined to be a better approach because of the difficulty of removing one tile without damaging adjacent tiles in good condition, in addition to the difficulty of matching new and old tiles which are slightly different in color, pattern and thickness. This means that sometimes tiles in good condition may have to be removed, but they are salvaged and stored for future reuse.

Before ordering the reproduction tiles, each section of the Capitol floor was drawn and photo-documented. The condition of all the tiles was evaluated based on a rating of one to four (excellent, good, damaged, or, in need of replacement), and color-coded accordingly. Every tile that needed to be replaced was individually numbered and photographed with dimensional, color and grey scales.



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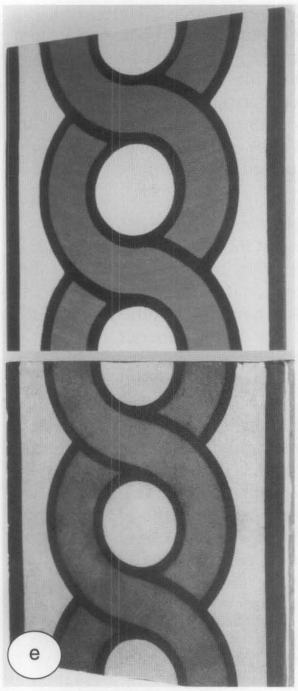

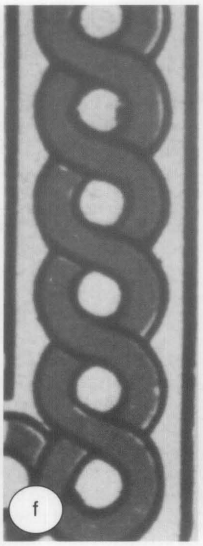

(e) The top tile is a new reproduction of the historic tile below. (f) This design is identified as No. 84 in Miller & Coates' Minton Tile Catalogue (detail Figure 2). (g) What might appear to be an inappropriate repair with non-matching modern tile in the center of the star is, in reality, a neatly executed patch to serve as temporary in-fill for the reproductions that have been ordered. (h) Shown below is a restored section of the Capitol floor. Photos: (e,g,h) Wayne Firth, Office of the Architect of the Capitol; (f) David W. Look, AIA.

(d) Since the early-20th century, making encaustic tiles had, again, become a lost art. Thus, H&R Johnson-Richards not only had to learn how encaustic tiles had been made historically, but, also, how to reproduce them. After studying old records of the early tile manufacturers, the company began reproducing tiles using modern-day computer-assisted technology (CAD/CAM). Drawing: H&R Johnson Tiles Ltd.; Photo: Wayne Firth, Office of the Architect of the Capitol.

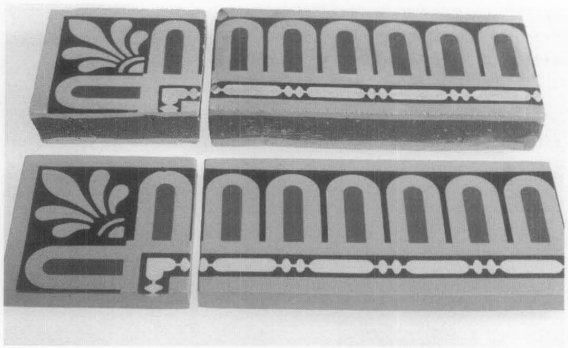

Figure 25. This comparison of an original, historic encaustic tile (top) with a reproduction encaustic tile (bottom) reveals an obvious difference in thickness, but only a slight difference in the design. Photo: Wayne Firth, Office of the Architect of the Capitol.

Tile Repair. Trying to remove one tile can endanger surrounding tiles. Thus, it may be better to preserve and retain an original historic tile that is only slightly damaged, rather than replace it. Sometimes cracks may be repaired, or a corner or piece of tile that has broken off may be reattached, using an epoxy glue, or grout. If a tile is chipped or a small corner or edge is missing, a carefully executed patch of epoxy—mixed with colored enamel, or mortar tinted to blend with the tile, may be less conspicuous than trying to replace every tile that has even the slightest damage. And, it is a better preservation treatment.

In limited instances, glaze failure or surface powdering of ceramic floor tiles may sometimes be treated successfully by a conservator with a specially formulated, solvent-based, mineral densifying agent (such as silicic acid), followed by a siloxane sub-surface repellent, applied 24 hours later. Under the right circumstances, such a treatment can harden and bind the surface, and lower the absorbency of the tile, and still maintain the vapor transmission. But this is a highly complex undertaking and should only be attempted by a conservator after appropriate testing. Not only are these chemicals highly toxic and dangerous to handle, but if used improperly, they can cause greater damage to the tile!

Tile Replacement. When an individual tile or a larger portion of an historic ceramic tile floor is missing or so severely damaged that it cannot be repaired, or if it has become a safety hazard, then it should be replaced. When a ceramic tile floor has deteriorated as a result of long term wear and abrasion, or from settlement or vibration damage to the setting bed, there are a number of factors that need to be considered before choosing a preservation treatment. If damage to tiles is the result of more than normal wear and tear, the source of the problem needs to be identified, and the problem corrected before replacing the damaged tiles.

Successful replacement not only depends on the availability of matching tiles, but on the condition of the substrate on which the tiles are laid. Before installing the replacement tiles, any problems, such as settlement or vibration, will have to be addressed, and the height of the new setting bed may have to be adjusted for the thickness of the new tiles.

Selective Replacement of Individual Tiles. This cautious approach, typically an attempt to replace only the most seriously damaged tiles, is often taken or considered when only a small number of tiles are involved. Unless old, matching tiles can be found and reused, replacement often requires specially fabricated reproduction tiles. In some instances, individual historic tiles that are damaged may be replaced with matching tiles salvaged from other, less prominent areas of the floor or from other buildings. This is most feasible if the tiles to be replaced are either plain, and easy to match, or decorated with a common historic floor tile pattern.

In order to replace damaged tiles, it can be helpful to identify the manufacturer and the approximate date of the tiles, if possible. However, many mass-produced tiles are not marked and give little or no information as to their origin, although stylistic similarities with other marked tiles may sometimes provide a clue as to the manufacturer. Some decorating firms seldom signed their work, while many firms made bisque tiles (plain, unglazed, once-fired tiles) for other companies, as well as their own use. Identifying marks will generally be found on the back of the tile. A mark impressed or molded into the back of the tile may give the name or initials of the company which made the tile or the bisque; sometimes a printed or painted mark indicates if it was decorated by a different company, or artist. Historic building records and construction documents may provide information about the tile company or supplier. Catalogues of the period may also be useful in identifying the tile manufacturer of unmarked tiles.

Replacing a single damaged tile is based on the ability to remove only the deteriorated tile without harming surrounding tiles. Attempts to remove one or several damaged tiles often fail because a hammer and chisel are used. The shock of the blows to the tile being removed travels through the grout into surrounding tiles and cracks them. To avoid damaging good tiles, all the grout around the tile must be removed. This is best accomplished by an experienced tile installer using a hand tool called a grout saw or, for grout joints wider than 3/8", a dry-cutting diamond blade, mounted in an angle grinder or circular saw.

Other difficulties may be encountered when selectively replacing damaged tiles with reproduction tiles. New tiles, especially encaustic tiles, may be different in thickness and, sometimes, despite the attention to detail of the reproduction process, slightly different in color and design from historic tiles. This can cause both visual and physical problems, especially if the replacements are being laid in a piecemeal fashion.

If the setting bed does not have enough mortar to grip and hold the tile, one new tile laid among the originals will eventually come loose. If the new and old tiles are different thicknesses, the setting bed in which the new tiles are laid must be at a different height to create a level finished surface. In addition, the two levels of setting beds may be of different composition; one may be harder, stronger and less flexible than the other. This may also lead to problems, since the setting bed foundation should act and respond as a unit to the load and stresses placed upon it.

Sectional Replacement of Tiles. In some instances, the best approach may be to remove a complete section of damaged original tiles and replace that section of floor in its entirety with new reproduction tiles. Advantages of this method include the ability to lay a level setting bed, as well as achieving a finished product that is uniform in color and pattern match. Although this approach may involve

replacing more original tiles with reproduction tiles than may be absolutely necessary, original tiles that remain in good condition can be saved to be reused in other sections where only a few tiles are damaged. This technique is generally most appropriate either when the section being replaced is the most damaged portion of the floor, or is in a relatively inconspicuous location and the tiles that are removed will supply enough salvaged pieces to permit in-kind repair of a more visually prominent area (Fig. 24).

When laying a section of reproduction tiles, it may be a good idea to use contemporary materials and installation methods such as expansion joints or flexible expansion material. One of the major causes of ceramic floor tile installation failure and cracked, broken or disbonded tiles is the lack of expansion joints. Expansion joints were sometimes used in laying historic ceramic tile floors, and these are frequently the ones that have survived in the best condition. Many preservation contractors hesitate to use conventional expansion joint filler materials because of their limited range of colors. However, there are new flexible sealants in a wide range of colors that are available in either sanded or unsanded textures to match the surrounding grout joints. As a result, the expansion joints are almost invisible. A bonding agent may also be considered—if recommended by the tile manufacturer—and any drawings provided by the manufacturer should be used to guide the installation.

Each preservation technique has advantages and disadvantages that the historic property owner or manger should take into consideration before deciding which one is best suited to the particular flooring problem. For example, slight differences in the shape, size, color and the pattern between the old and the new tiles are frequently encountered. If replacing an entire section, the slightest difference in size and dimension between the original tiles and the reproduction tiles, even if it is as small as 1/8" or 1/16", can mean that the new section of tile will not fit inside an existing border (Fig. 25). Even though drawings and photos are provided to the manufacturer, there may be some variation in the design and pattern size on the new tiles. Thus, they may not align perfectly with the original tiles, and as a result the section of the floor that has been replaced may be quite conspicuous.

Summary

Historic ceramic tiles are a common flooring material in many different kinds of small, as well as large, private and public, structures throughout the United States. Whether plain, or decoratively patterned, traditional ceramic floor tiles are important in defining the character of historic buildings. Although ceramic floor tiles are a practical material, they are also fragile, and can be easily damaged by improper installation techniques, insensitive remodeling, harsh cleaning methods, and even regular daily use. Preserving them requires careful day-to-day maintenance. This should begin with using gentle, non-abrasive methods and materials to clean them, and, in some instances, using an appropriate coating or impregnator to protect them.

Some historic ceramic tile floors, due to their manufacturer, their unique design, or their location in a certain room or within a particular building, may have greater significance than those that are purely utilitarian. Such floors should be accorded special care, and a ceramics conservator or preservation specialist should always be consulted to prepare responsible maintenance plans and to provide guidance concerning repair treatments and replacement techniques for them.

Unless an historic ceramic tile floor is extensively damaged with many missing and broken tiles and, therefore, potentially hazardous, it may be preferable to leave it alone. An unevenly worn floor surface, worn colors or patterns on the tiles, or slight cracks, chips, or scratches in the tiles themselves does not necessarily mean that the tiles should be replaced. Such relatively minor imperfections seldom detract from the character of an historic ceramic tile floor. They may, in fact, impart character, and be less noticeable or obtrusive than replacement of a single tile or a larger section with new tiles that do not match the originals exactly. Each situation should be evaluated on its own basis before selecting the preservation approach best suited to the project.

Selected Reading

Austwick, Jill. The Decorated Tile: *An Illustrated History of English Tile-making and Design.* New York: Scribners, 1980.

Barnard, Julian. *Victorian Ceramic Tiles.* Greenwich, CT: New York Graphic Society Ltd., 1972.

Bruhn, Thomas P. *American Decorative Tiles, 1870-1930.* Storrs, CT: William Benton Museum of Art, 1979.

Byrne, Michael. *Setting Tile.* Newtown, CT: The Taunton Press, 1995.

Decorative Tile Designs in Full Color. Selected and arranged by Carol Belanger Grafton. New York: Dover Publications, Inc., 1992.

Fidler, John. "Protective Custody: John Fidler examines the options on caring for brick, tile or stone floors." *Traditional Homes.* (August 1989), pp. 112-115.

Furnival, William James. *Leadless Decorative Tiles, Faience & Mosaic.* Stone, Staffordshire: W.J. Furnival, 1904.

Lavenberg, George N. *Ceramic Tile Manual.* Los Angeles: Building News, 1986.

Massey, James C., and Shirley Maxwell. "Decorative Tile: Art for the Victorian and Arts and Crafts Home." *Old-House Journal.* Vol. XIX, No. 2 (March/April 1991), pp. 54-58.

Massey, James C., and Shirley Maxwell. "The Ceramic Circus." *Old-House Journal.* Vol. XXIII, No. 2 (March/April 1995), pp. 46-51.

Riley, Noel. *Tile Art: A History of Decorative Ceramic Tiles.* London: The Apple Press, 1987.

Rosenstiel, Helene Von, and Gail Caskey Winkler. *Floor Coverings for Historic Buildings: A Guide to Selecting Reproductions.* Washington, D.C.: The Preservation Press, 1988.

Taylor, Joseph A. *"Ceramic Tiles in Commerce."* BR Building Renovation. (Fall 1994), pp. 45-48.

The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings. Kay D. Weeks and Anne E. Grimmer. Washington, D.C.: U.S. Department of the Interior, National Park Service, Cultural Resource Stewardship and Partnerships, Heritage Preservation Services, 1995.

Tunick, Susan. *American Decorative Tiles.* Sponsored by Assopiastrelle (Association of Italian Ceramic Tile and Refractories Manufacturers), and coordinated by D. Grosser and Associates, Ltd., New York (1991).

Vandenburgh, Jayne M., IBD. "Restoring the Ohio State Senate Building: An American Tile Classic Returns." *Tile Design and Installation.* Vol. 8, No. 1 (January 1995), pp. 32-35.

Wyatt, M. Digby. *Specimens of Geometric Mosaic Manufactured by Maw & Co. of Benthall, near Broseley.* London: M. Digby Wyatt, 1857.

Some Sources for Replacement Tiles

There are a number of companies that offer standard lines of reproduction tiles, while others focus on custom work. Some new lines of reproduction tile attempt to be exact replicas of original tiles from the late-19th and early-20th century, while others are modern interpretations or adaptations of traditional designs, and may not be appropriate as replacement tiles in a preservation or restoration project. For additional sources see: "Traditional Building's Ceramic Tile SourceList," *Traditional Building*, Vol. 9, No. 4 (July/August 1996), pp. 92-93.

Designs in Tile
P.O. Box 358
Mt. Shasta, CA 96067
Custom-made reproduction art tile.

Fulper Tile
P.O. Box 373
Yardley, PA 19067
Reopened factory reproduces historic tiles using original Arts and Crafts-period glazes.

H&R Johnson Tiles Ltd.
Head Office: Highgate Tile Works
Tunstall, Stoke-on-Trent
England ST6 4JX
U.S. Office: Johnson USA Inc.
P.O. Box 2335
Farmingdale, NJ 07727
Stock and custom reproductions of Minton Hollins encaustic and geometric tiles.

L'Esperance Tile Works
237 Sheridan Avenue
Albany, NY 12210
Custom-made encaustic, geometric, mosaic and other traditional ceramic tiles.

Moravian Pottery and Tile Works
Swamp Road
Doylestown, PA 18901
Reproduction tiles based on Henry Chapman Mercer's original designs.

Motawi Tileworks
33 North Staebler Road, Suite 2
Ann Arbor, MI 48103
Reproduction tiles in Arts and Crafts, Art Nouveau and other styles.

Native Tile and Ceramics
4230 Glencoe Avenue
Marina Del Rey, CA 90292
Reproduction decorative tiles in Southern California tradition of Craftsman, Mission, Art Deco and other styles.

Original Style
Stovax Ltd.
Falcon Road, Sowton Industrial Estate
Exeter, Devon
England EX2 7LF
Reproduction ceramic tiles from 1750-1902.

Pewabic Pottery, Inc.
10125 East Jefferson Avenue
Detroit, MI 48214
Reopened factory reproduces original tile designs and glazes.

Terra Designs Tileworks
241 East Blackwell Street
Dover, NJ 07801
Mosaic tessarae experts, and reproduction of historic ceramic tiles.

Tile Guild
2840 East 11th Street
Los Angeles, CA 90023
Reproduction of traditional Spanish, Portuguese, Dutch, Italian and English tiles.

Tile Restoration Center, Inc.
3511 Interlake N.
Seattle, WA 98103
Reproduction of Arts and Crafts-period tiles.

Helpful Organizations

The American Institute for Conservation of Historic and Artistic Works (AIC)
1717 K Street, N.W., Suite 301
Washington, DC 20006

Ceramic Tile Institute of America, Inc.
12061 Jefferson Boulevard
Culver City, CA 90030-6212

Friends of Terra Cotta, Inc.
771 West End Avenue, 10E
New York, NY 10025

Tile Council of America
P.O. Box 1787
Clemson, SC 29633

Tile Heritage Foundation
P. O. Box 1850
Healdsburg, CA 95448

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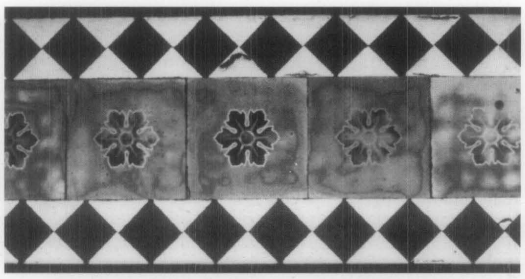

*Ceramic: Any product manufactured from a nonmetallic mineral (such as clay), by firing at high temperatures.

*Cover Logo: "Ceramic Mosaic and Vitreous Floor Tile." American Encaustic Tiling Company, Ltd., Zanesville, Ohio. **"Sweet's" Indexed Catalogue of Building Construction.** NY, NY: The Architectural Record Co., 1906. Photo: Sharon C. Park, AIA.*

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U.S. Department of the Interior

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