

Arlington National Cemetery Millennium Project Final Environmental Assessment



Lead Agency:
Arlington National Cemetery
Cooperating Agency:
U.S. National Park Service

June 2013



US Army Corps
of Engineers®
Norfolk District

APPENDIX B:

Cultural Resources

Summary of Information and Consultations for National Historic Preservation Act Section 106 Compliance, ANC Millennium Project

John H. Haynes
U.S. Army Corps of Engineers
Norfolk District
Norfolk, Virginia
9 May 2013

Forward

This document is intended as a management summary of six studies done specifically of historic resources within the direct or indirect areas of potential effect of the Millennium Project, as well as reports on adjacent areas and other information. These give detailed information and analyses and should be consulted for detailed review. Major references are given at the end of this summary.

Identification of Historic Properties

The reports and consultations listed under the “Chronology of Millennium Project Section 106 Surveys and Consultations” result in the following properties in the Area of Potential Effects (APE) of the Arlington National Cemetery (ANC) Millennium Project:

Direct (Physical) APE:

Archaeological Resources – No National Register of Historic Places (NRHP) eligible archaeological sites in the APE: 44AR0043, 46, 47, and 49 are within the APE, but not eligible for listing in the NRHP (Haynes 2012b, Carmody and Blondino 2012).

Architectural Resources – No historic properties in the APE, the Old Warehouse (Maintenance Yard), Section 29 Footbridges, and Headstone Drainage Features have been determined (DHR File #2012-0390) not eligible for listing in the NRHP (Haynes 2012a, Smith et al. 2012)

Landscape Resources –

Historic Properties

- **Forested Areas in Section 29 contributing to Arlington House**, some over 235 years old and other stands regenerated since the Custis-Lee (i.e., Civil War) period, amounting to a total of 20.7 acres¹ were identified as contributing to Arlington House (Millis et al. 1998). These areas appear identical to those which had been mapped in the 1980 NRHP nomination (Seagraves et al. 1980) as part of the boundary for the Arlington House listing; however, no historic boundary justification was given in the nomination, and the description is simply National Park Service (NPS) land adjacent to Arlington House. The acreage given for the property at the time does not match the map (Figure 1), the apparent acreage mapped being 24.82 (including 4.19 encompassing the house and associated buildings), and that stated on the nomination of 27.91

acres. In 2002 NPS retroceded 12 acres to ANC, which included 8.23 acres¹ of the forest identified as contributing to the Arlington House NRHP listing by the Virginia Department of Historic Resources (DHR) concurred with these recommendations (letter Cara Metz [DHR] to Audrey Calhoun [NPS] 30 September 1999 [DHR file 95-1353-F]). Of the 20.7 acres¹, less than 2.63 acres of the younger, Post-Civil War forest would be impacted by the Millennium Project.

- **Boundary Wall** – This is a contributing element of the ANC historic district landscape, dating to the first decades of the cemetery (Smith et al. 2012).

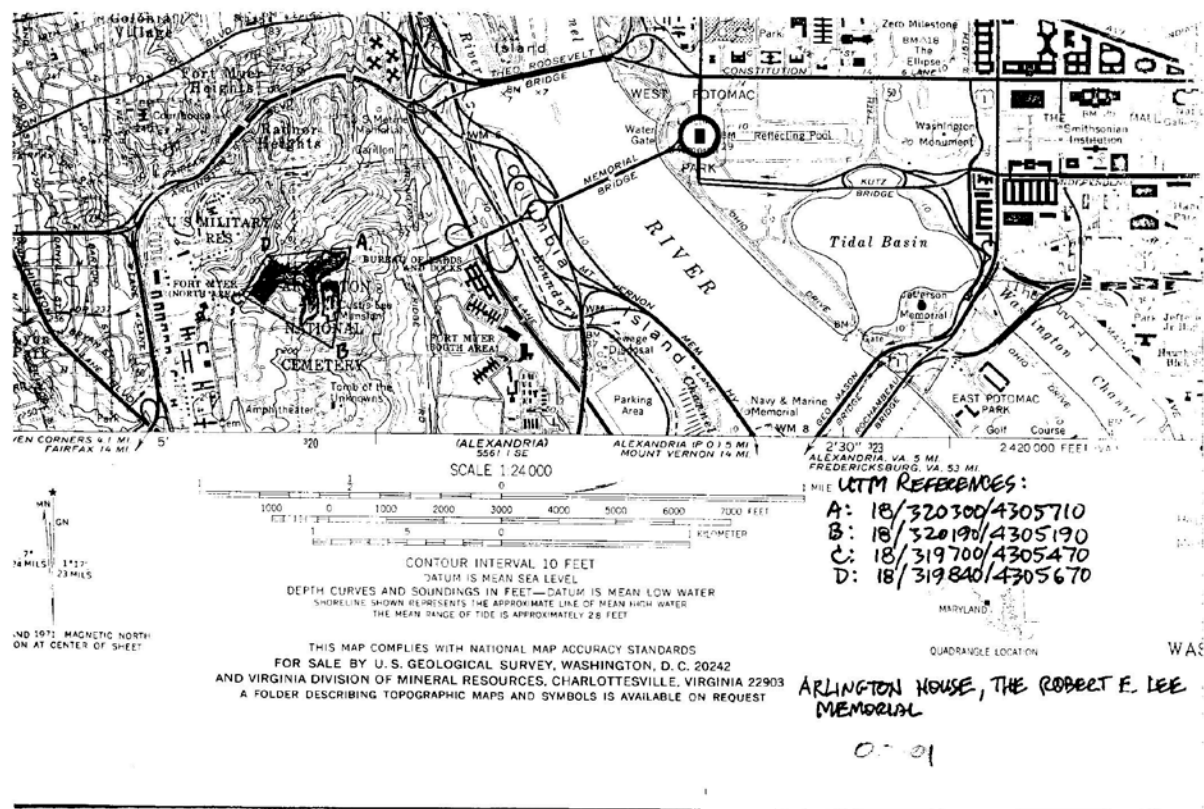


Figure 1 - Boundary Map for Arlington House NRHP Nomination Form (Seagraves, et al. 1980)

Non-Historic Properties

- **Fort Myer Picnic Area** – This is not contributing to the ANC historic district landscape (Smith et al. 2012) under Criterion C and was not identified as contributing to the Fort Myer historic district in a recent survey (Versar 2011), and Batzli's (1998:62) recommendation for its inclusion in the Fort Myer historic district gives inadequate justification.

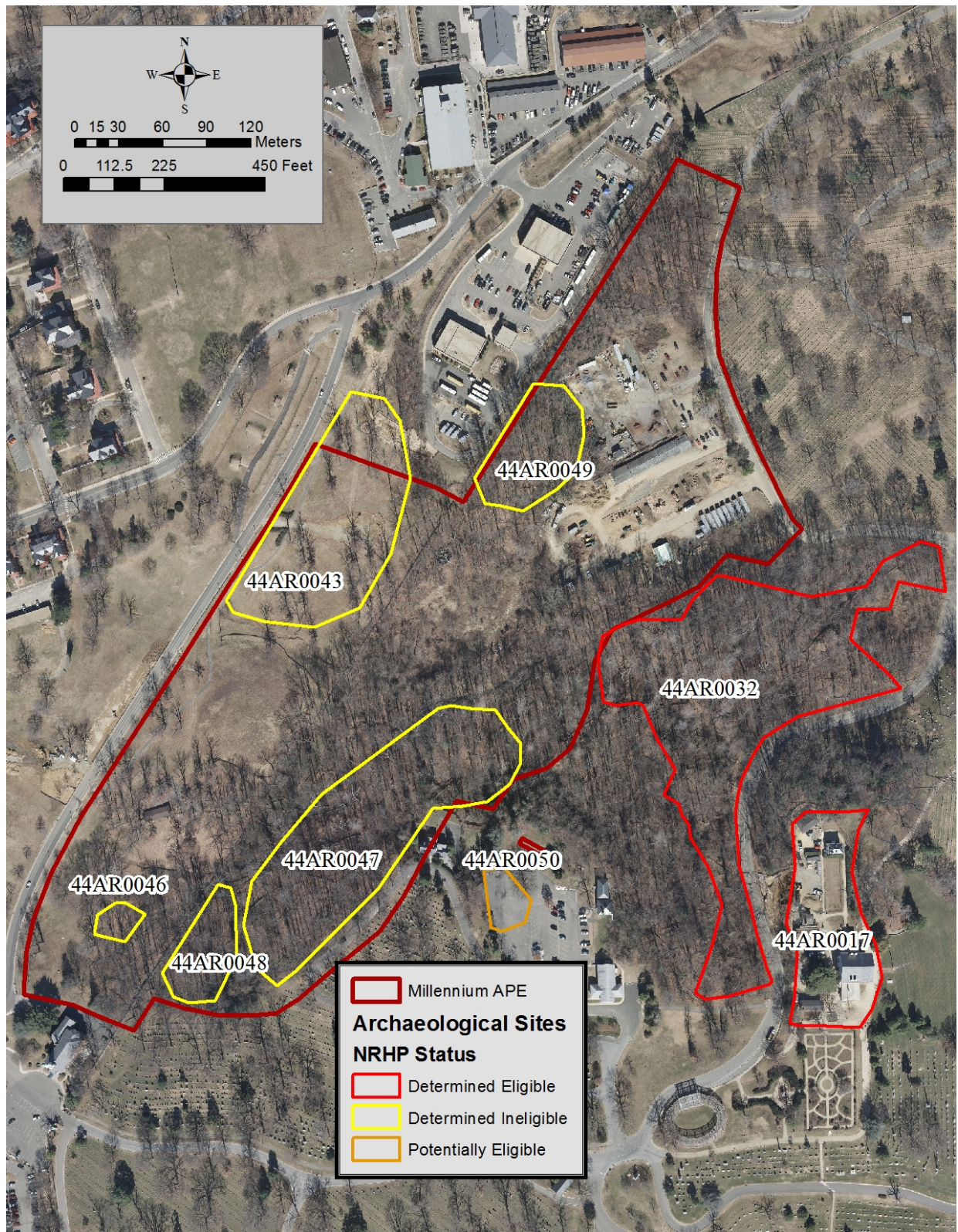


Figure 2 - Archaeological Sites in and Near the Millennium Project Area

Indirect (Visual) Effects APE

Architectural Resources

- **Old Post Chapel**, Fort Myer, recommended contributing under Criterion A as a property of Fort Myer NRHP historic district expansion (Versar 2011)
- **Fort Myer Historic District** – Residences on Moore Lane and Lee Avenue (listed as contributing)

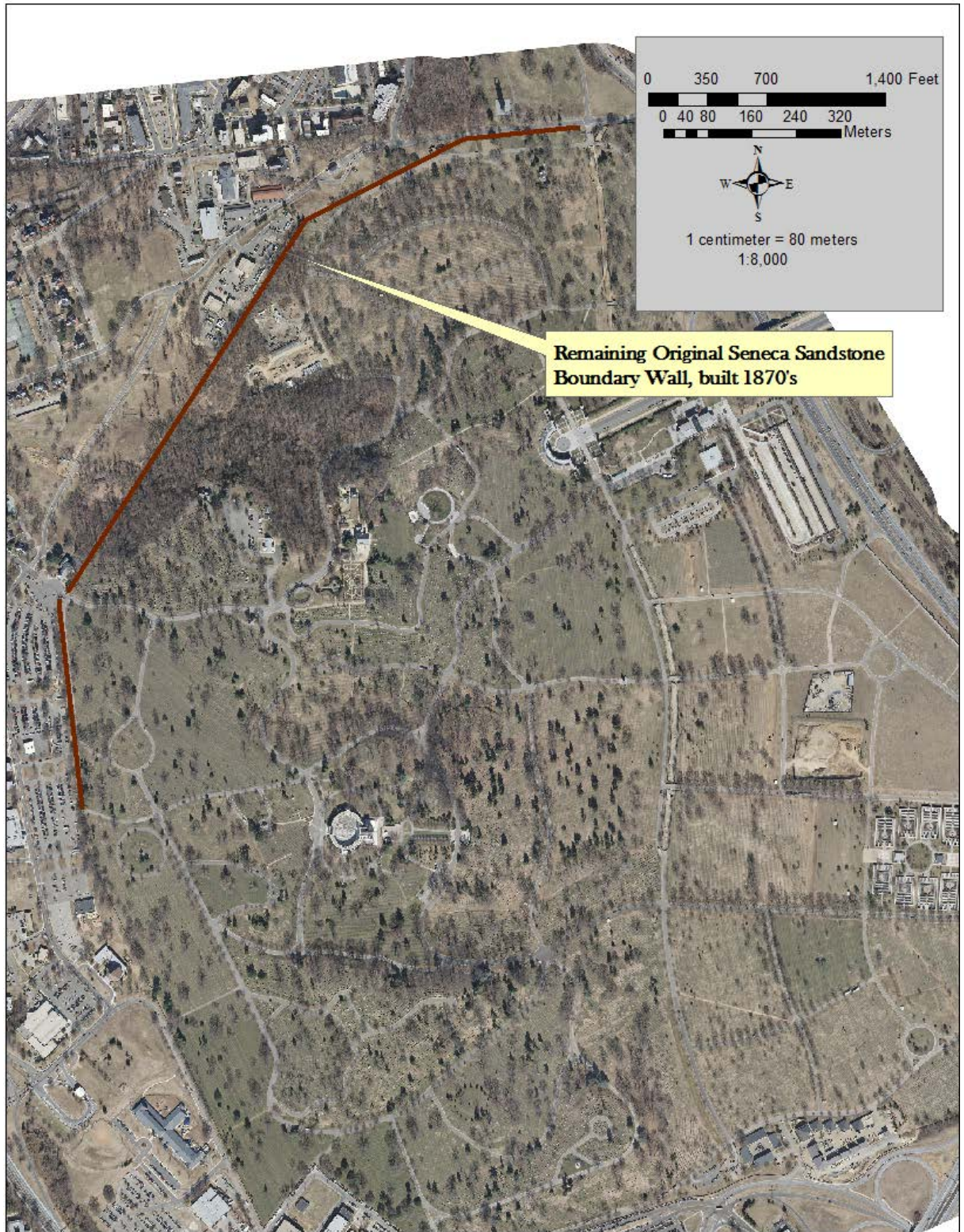


Figure 3 Location of 5653 ft. ANC Boundary Wall

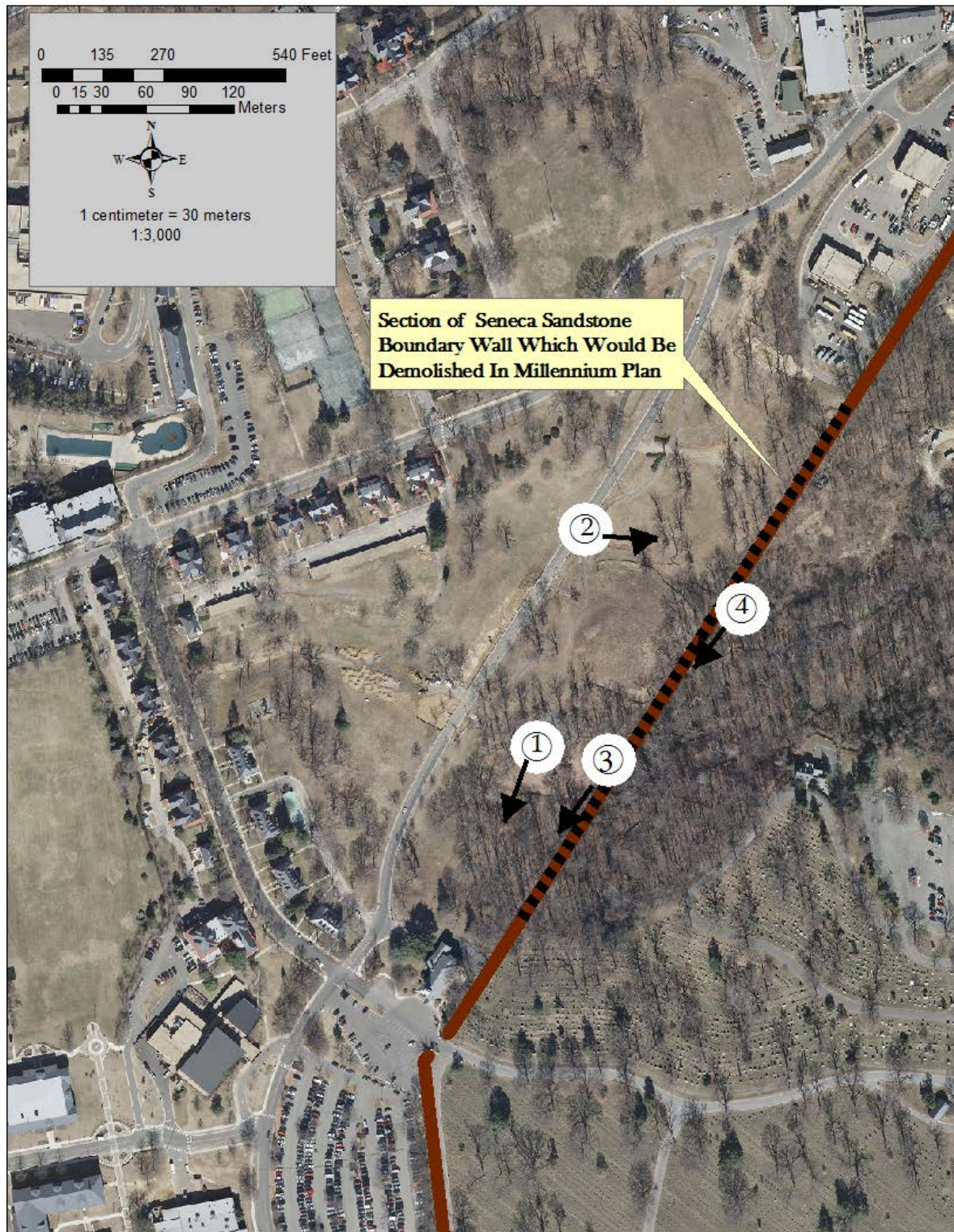


Figure 4 Section of ANC Boundary Wall Affected by the Millennium Project, and Locations and Orientations of Photos in Figure 5



Figure 5 Images of the ANC Boundary Wall in the Millennium APE

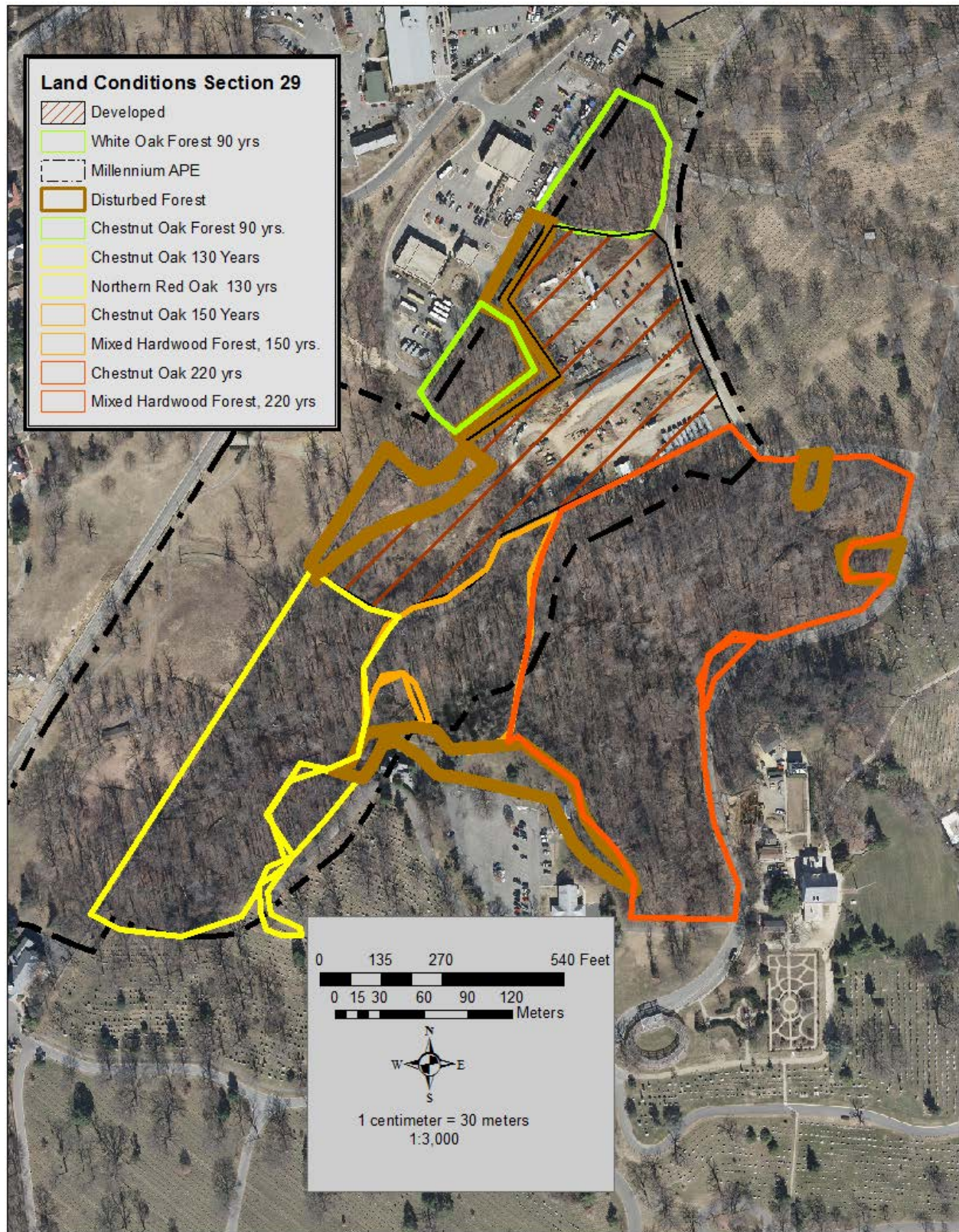


Figure 6 Forest Areas in Section 29 - Disturbed and 90 year old stands were not recommended as contributing to the landscape (estimated ages as of 1998).

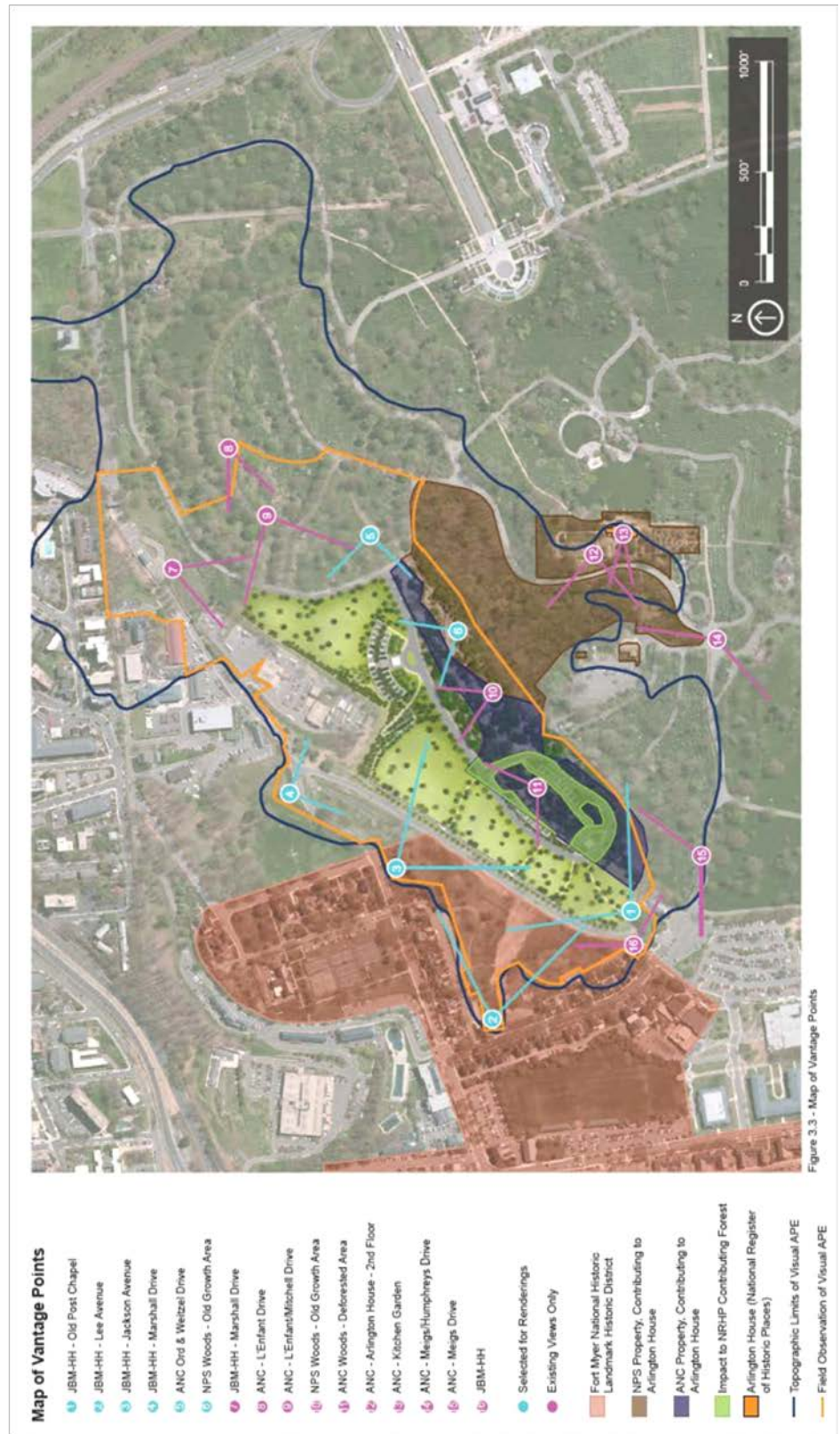


Figure 7 Visual Area of Potential Effect (Hassan and Cavanaugh 2013)

Landscapes

- **ANC historic district landscape** (Smith et al. 2012)
- **Arlington House landscape** (Millis et al. 1998)
- **Fort Myer historic district landscape** (Batzli 1998, Versar 2011)

Assessment of Adverse Effects to Historic Properties

Adverse Effects:

- **ANC historic district**, adverse effects to the contributing landscape element **Seneca Sandstone Boundary Wall**, 1225¹feet of out of approximately 5653 feet of the remaining original Boundary Wall would be demolished. Other portions of Seneca Sandstone boundary wall have been reconstructed as the cemetery expanded in the late 19th and into the mid-20th centuries. About 10% of the Boundary Wall which would be demolished has fallen down. Other sections have been partially buried by sedimentation.
- **ANC historic district/Arlington House**, adverse affects to the historic landscape element **Section 29 forests**, consisting of 20.7 acres¹ of forest contributing to Arlington House NRHP listing of which less than 2.63 acres would be cleared (Figure 8). Of the forest stands categorized as 90, 130, 150, and 220 year old (Figure 6) stands in the 1998 forestry survey (Millis et al. 1998), the 90 year old stands and part of a 130 year old stands (now 145 year old) would be cleared. Stands 90 years old or less at the time of the study were not recommended as contributing to Arlington House. The older growth stands, now 165 and 235 years old, would not be directly (physically) affected. Arlington House itself and immediate grounds and buildings would not be affected directly or indirectly.

¹ Specified in the Final Design, sheet LS-301

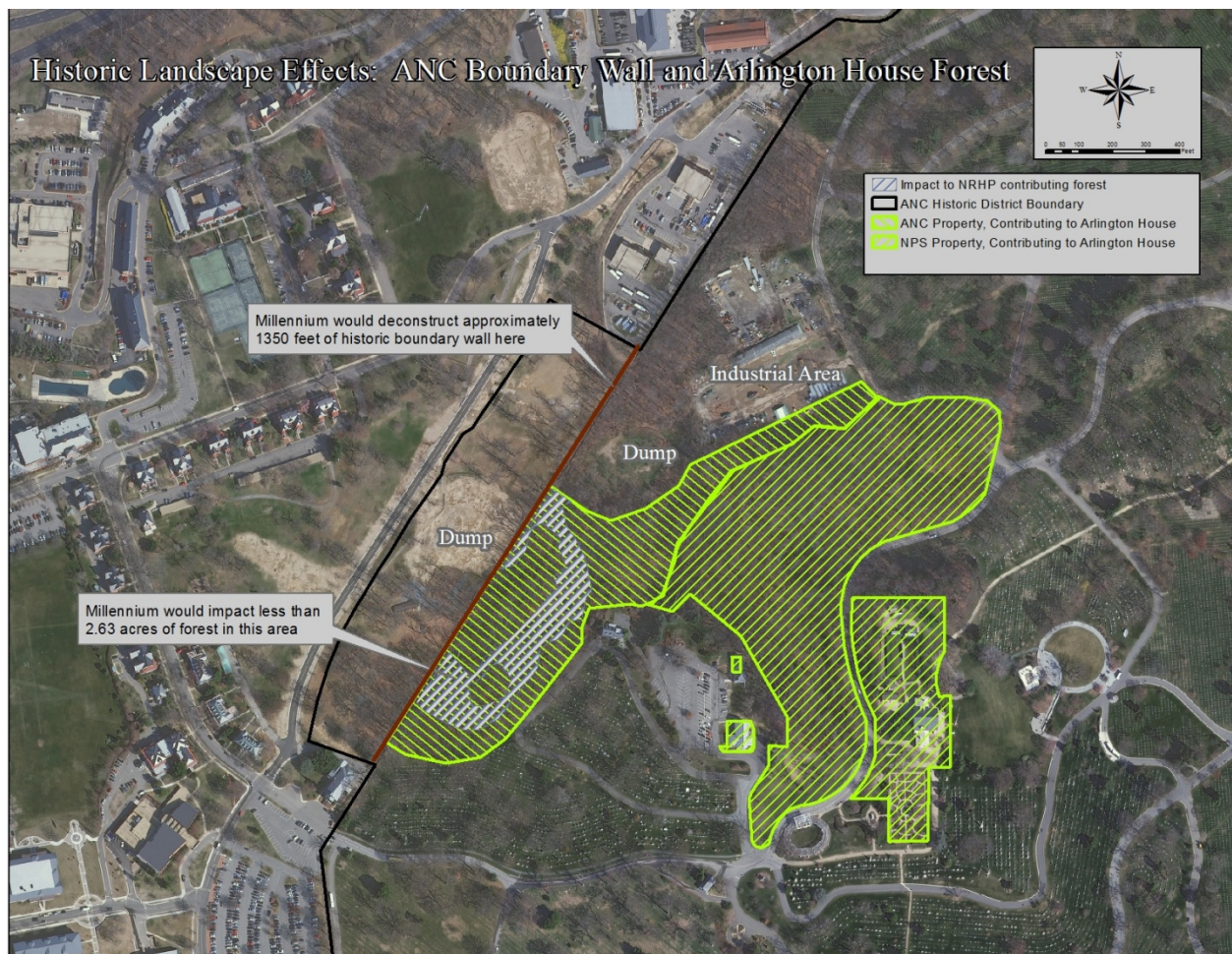


Figure 8 - Boundaries of Arlington House NRHP listing and contributing forest area which would be impacted by the Millennium Project.

Non-Adverse Effects:

Visual effects are discussed in Hassan and Cavanaugh (2013), illustrated with maps, photographs, and architectural renderings supporting their assessment of effects.

- **ANC historic district, general landscape design and contributing monuments**, no adverse effects, the proposed project design has been developed to be compatible with the ANC landscape, and a buffer of trees has been retained on the southeastern side of the APE protecting the viewshed of Section 1. Most of the area where the Millennium Project proposes substantial landform modification is outside of Section 29 in the tract ceded by Fort Myer, and there has been substantial landform modification on about half of the Millennium Project area in the 20th century (Figure 9).
- **Fort Myer Old Post Chapel**, no adverse effects, the proposed project design is compatible with the historic setting of the Old Post Chapel
- **Fort Myer historic district residences**, no adverse effects, the proposed project design is not intrusive on the viewshed due to distance, topography, and boundary wall design

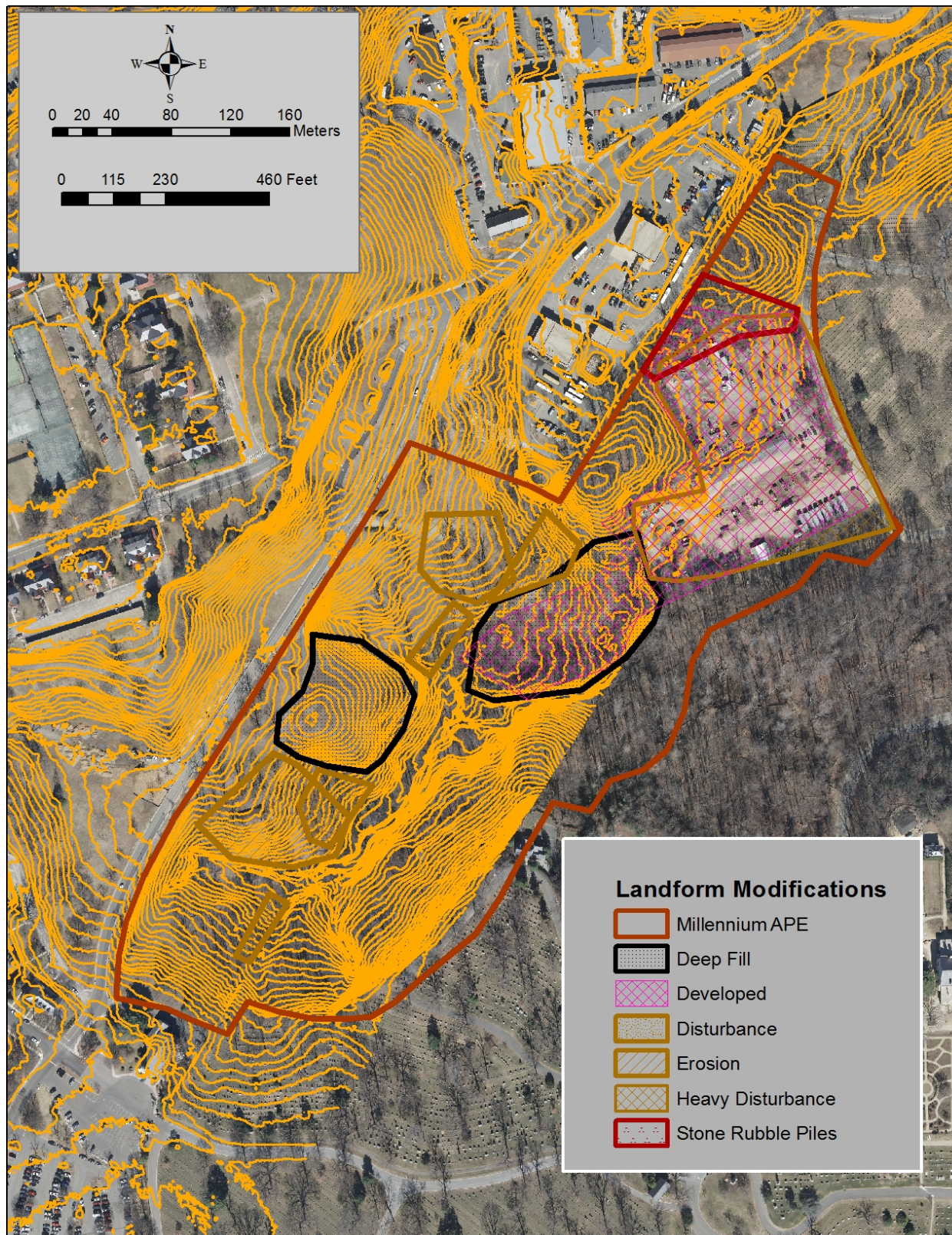


Figure 9 - Existing Landform Modifications in the Millennium Project Area

- **Fort Myer historic district contributing landscapes**, no adverse effects, the proposed project design is not intrusive on the viewshed due to distance, topography, and boundary wall design
- **Arlington House**, no adverse physical or visual effects to the house and associated buildings due to the retention of the 90% NRHP contributing forest buffer closest to Arlington House. There would be physical effects to about 1/10 of the forest contributing to Arlington House as mentioned above; however, the historic setting of that portion of the NRHP contributing forest has been altered by existing past effects. These include the maintenance yard (industrial area), and two soil dump areas (Figure 8). Therefore the visual effects to the NRHP contributing forest have been evaluated as non-adverse, while the physical effects are termed adverse.

Resolution of Adverse Effects

Adverse effects to the ANC historic district landscape were identified. These were to the Boundary Wall in Section 29, and forest in Section 29. Mitigation measures to resolve the adverse effects have been incorporated into the proposed project design, as follows:

- **Boundary Wall:** The Millennium Project design includes a new boundary wall which will incorporate salvaged material from the existing boundary wall and materials stockpiled from previously demolished parts of the boundary wall. Documentation comparable to the Historic American Buildings Survey Level II (same but without large format photography) is also proposed.
- **Section 29 forest contributing to the Arlington House NRHP listing:** The proposed project design preserves most of the forest in Section 29 with the exception of areas immediately adjacent and west of Wampakin Creek. Discussions with NPS, SHPO, and Arlington County resulted in identifying three public involvement projects as mitigation measures: 1) volunteer of species, 2) relocation of rare species, and 3) invasive plant species management program for the area. Plantings have been added to the revised design in the areas where the Section 29 forest would be cleared to further mitigate impacts to the ANC historic district landscape.

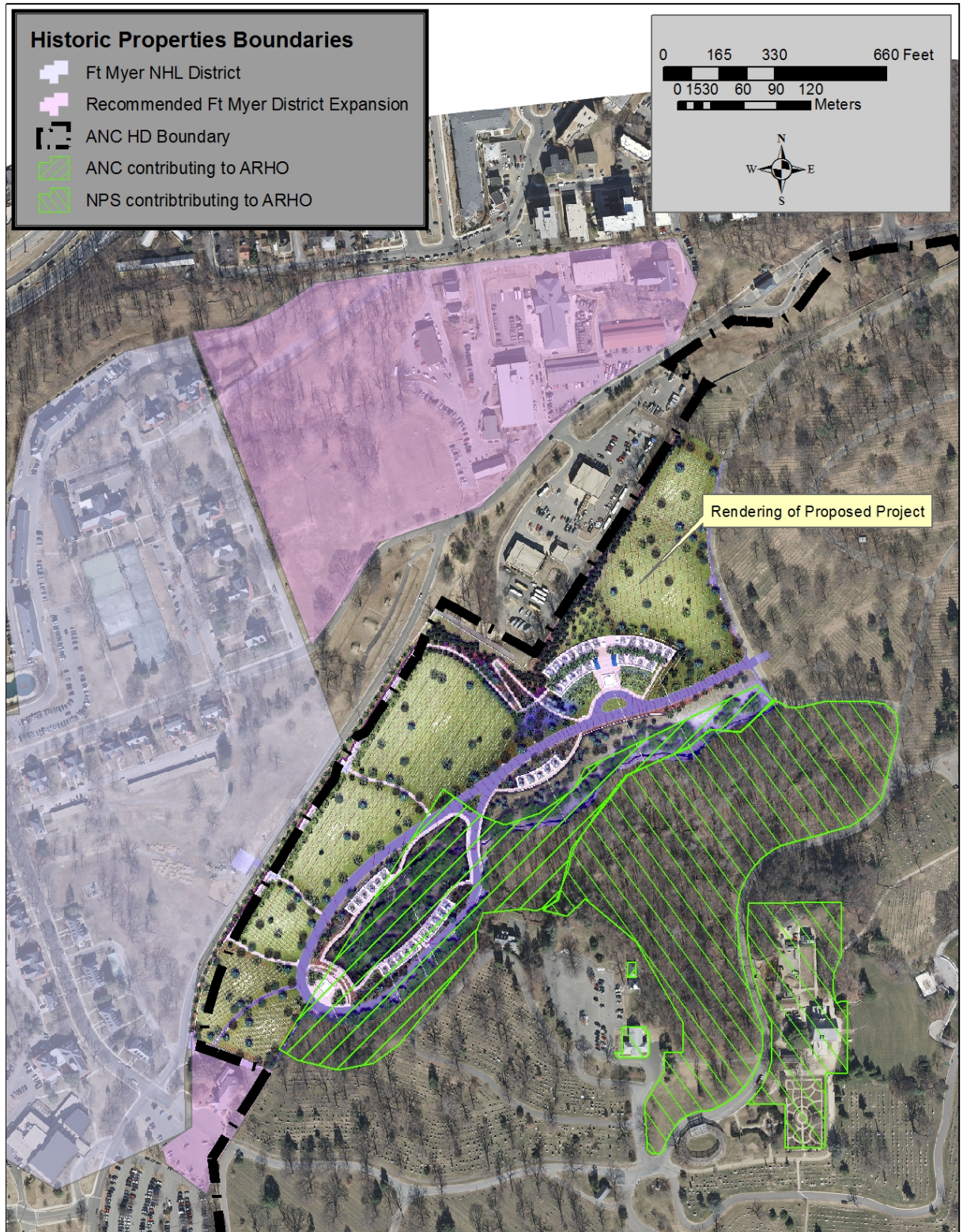


Figure 10 - Historic Property Boundaries near the Millennium Project (other than ANC)

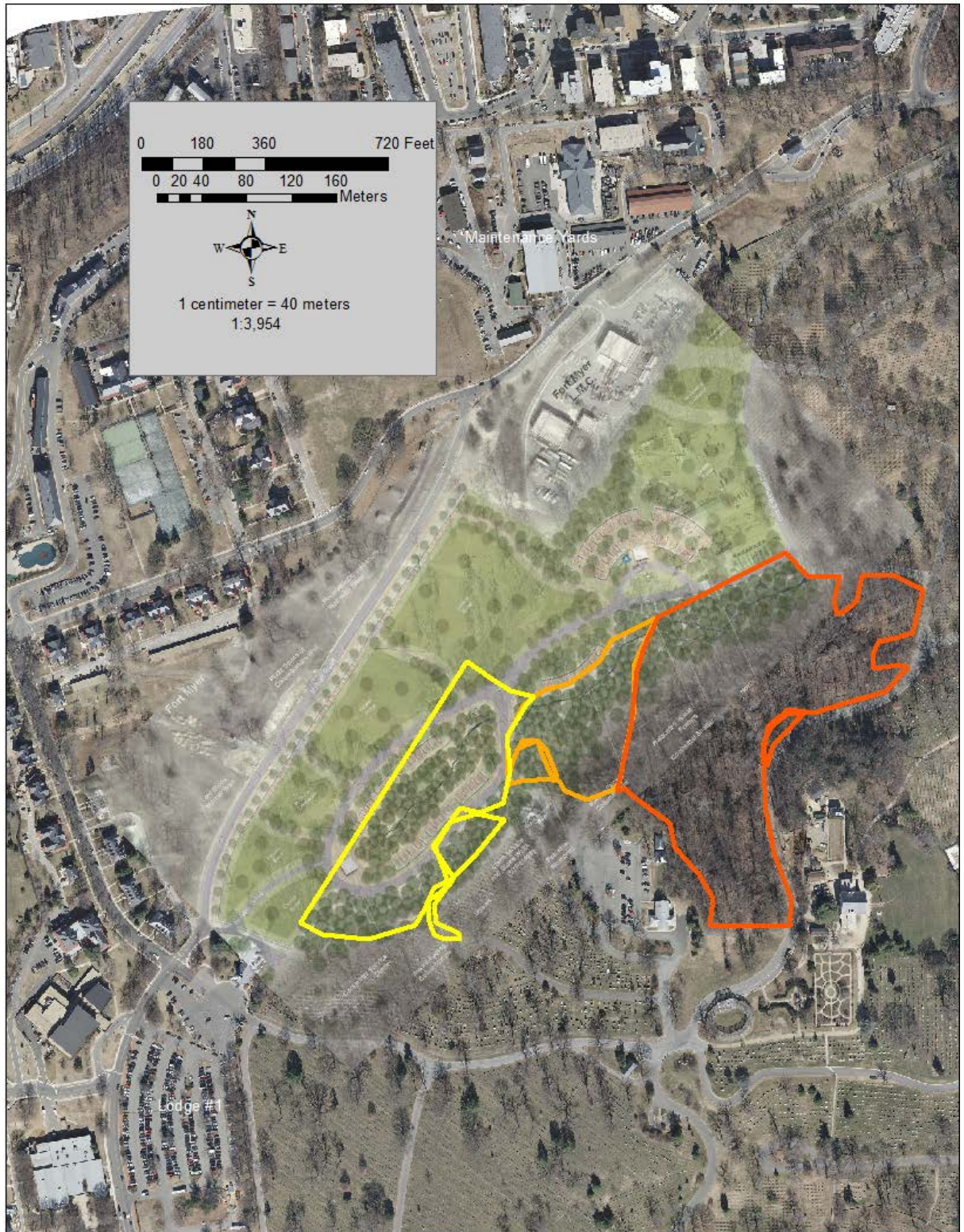


Figure 11 - Millennium Project and Contributing Forest Areas (Yellow = 145 year old, Orange = 150 year old, Red = 235+ year old, current ages)

¹Clarification of forest Acreage Numbers

Throughout this study the figure of 20.7 acres for the forested landscape contributing to Arlington House has been used. This figure is the total of the forest stands identified as contributing in the cultural landscape survey (Millis et al. 1998) conducted for the retrocession of a portion of Section 29 from NPS to ANC (Figure 1). This area is slightly larger than the approximate boundary of the Arlington House NRHP listed property as drawn on the NRHP nomination map (Figure 2), and as that was interpreted in the (Figure 3). The proportion of the 20.7 acres forested area transferred to ANC was platted based on old land survey data, and has only recently been accurately surveyed. The estimated portions of the 20.7 acres of forest contributing to Arlington House used in the report are 8.6 of ANC and 12.1 of NPS. More accurately, this should be a total of 19.76 contributing - 8.23 of ANC and 11.53 of NPS (Figure 4). Discrepancies with previous numbers due to 1) inexact location of ANC/NPS boundary, now corrected per recent survey; 2) inclusion of the .95 acre portion of 235 year old stand on ANC land with the rest of it as contributing , whereas the cultural landscape survey recommended this as not contributing.

Forest Contributing to Arlington House **NRHP listing (Millis et al. 1998)**

Individual stands

Agency	Age	Acres
ANC	145	5.56
ANC	145	0.55
ANC	165	1.84
ANC	165	0.28
NPS	235	10.62
NPS	235	0.18
NPS	235	0.73
Total Contributing		19.76

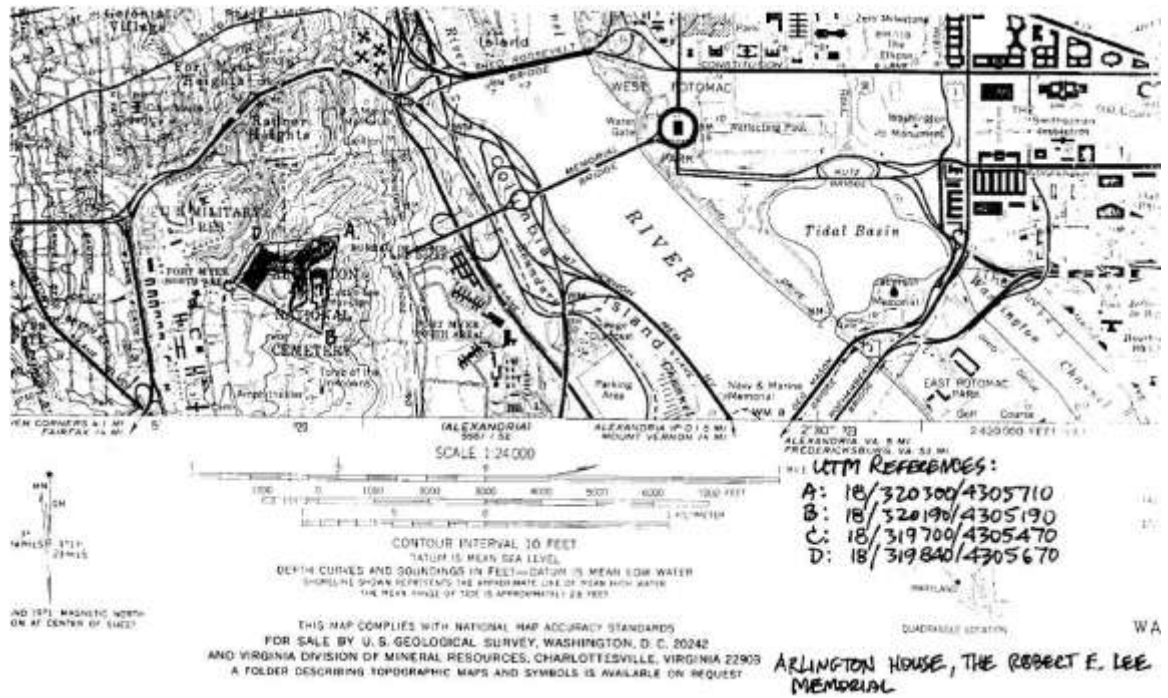


Figure 1 - Map included in Arlington House NRHP nomination

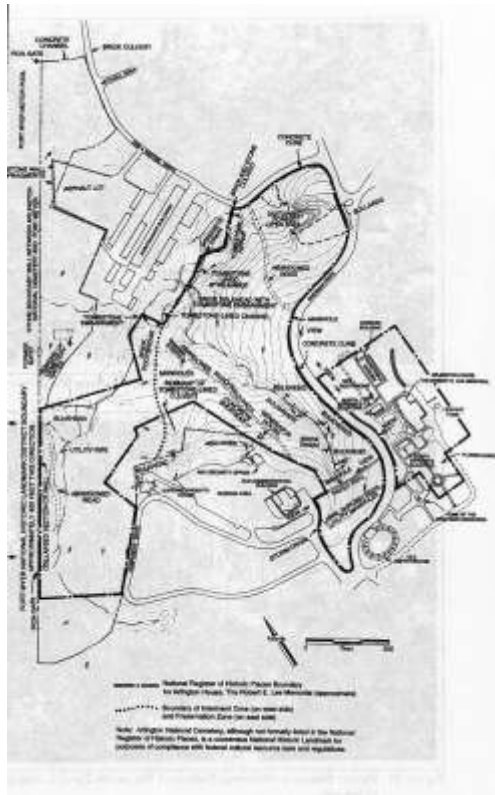


Figure 2 - NRHP Boundary (Millis et al. 1998)

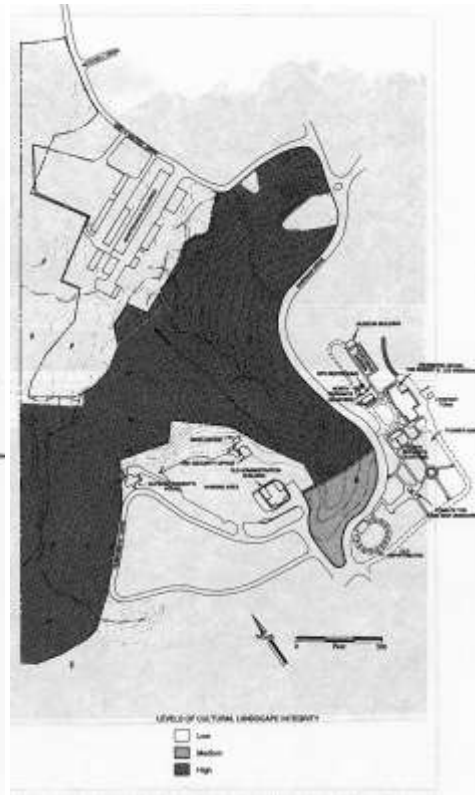


Figure 3 Landscape integrity - Millis et al. 1998



Figure 4 - Arlington House NRHP areas and Millennium Project impacts.

-

Chronology of Millennium National Historic Preservation Act, Section 106 Surveys and Consultations

1991 November— Custer (KFS) Phase I archaeology survey on BRAC areas in Fort Myer, includes north half of Fort Myer Annex in Millennium Project area, prehistoric site there recommended for further work, but site is not recorded; no review on file.

1998 June— Batzli, (USACE ERDC-CERL) historic landscape survey of Fort Myer, recommends the Old Post Chapel and Picnic Area as landscapes contributing to the Fort Myer Historic District. Very little justification is given for the inclusion of the Picnic Area other than that McNair Road follows the route of the late 19th-early 20th century electric railway. The Fort Myer NRHP nomination is not updated and there is no boundary increase of the district, and no review of the report known.

1998 September - Millis et al. (Garrow and Associates) Archaeological, architectural, and historic landscape surveys of Section 29.

- The archaeological survey records all of Section 29 except disturbed areas in and near the Maintenance Yard as one large site, 44AR0032 consisting of six loci, 5 prehistoric and 1 historic. They recommend the entire site as NRHP eligible.
- Architectural survey of buildings and structures in Section 29 finds these to not be eligible or contributing to Arlington House.
- The landscape survey evaluates the forest in Section 29 for age and composition, identifying an area of old growth forest maintained since the establishment of Arlington House and forming an aesthetically recognized back drop to the mansion. This area falls within the current NPS property lines. Other areas are evaluated as having been cut over during the Civil War or more recently. Those growing since the Civil War are recommended as eligible along with the old growth area near Arlington House. The areas grown since the Civil War are not visible from Arlington House, but are recommended as contributing to Arlington House in the report.

The Virginia Department of Historic Resources reviews the report and supports the recommendations except for the prehistoric components of 44AR0032 (Letter Cara Metz VDHR to Audrey F. Calhoun NPS, 30 September 1999). Neither Arlington National Cemetery nor USACE are copied on this letter, a copy of which was recently furnished by the NPS.

2005 November 25— ANC sends initial consultation letter to VDHR (letter John C. Metzler ANC to Kathleen S. Kilpatrick VDHR, 25 November 2005, includes preliminary historic properties assessment by USACE Baltimore District based on previous surveys listed above).

2009 June 23 – ANC sends letter to consulting parties indicating that the identification of historic properties on the Millennium Project area of potential effect has been identified, requests response by 8 July 2009 if parties wish to participate in Section 106. (letter dated 23 June 2009, John C. Metzler to Michael Leventhal, Arlington County; Audrey F. Calhoun, NPS; Donald Klima, ACHP; Nancy Witherall, NCPC; Frederick J. Lindstrom, CFA; Kathleen S. Kilpatrick VDHR; Deanna Beacham, Virginia Council on Indians;

2009 July 21 – Michael Leventhal, Arlington County Historic Preservation Coordinator sends comments on draft Memorandum of Agreement to USACE Baltimore District (letter 21 July 2009, Michael Leventhal to Scott Watson, USACE).

2009 July 23 Letter from ACHP to ANC indicating they do not elect to participate in Section 106 for the Millennium Project (Letter, 23 July 2009 Raymond Wallace, ACHP to John C. Metzler, ANC)

2009 July 29 Letter from Marc Holma VDHR to John C. Metzler ANC responding to consultation letter and “Arlington National Cemetery Millennium Project Initial Historic Properties Summary” makes the following recommendations, noting that SHPO has 30 days to respond per 36 C.F.R. § 800

- Invite non-resident federal Indian tribes with “ancestral connects” to participate
- Requests two bound archival copies of 1998 (Batzli) Fort Myer historic landscape survey to evaluate the recommendation that the Picnic Area contributes to the Ft. Myer historic district
- Concurs with Millis et al. (1998) that the forest in Section 29 dating to the Custis-Lee period of occupation contributes to Arlington House
- States that DHR has reviewed Whipple Field (Ft. Myer) and the Old Warehouse Area (ANC) for previous projects and concluded that neither was eligible for the National Register
- Requests copies of the Phase II report for the site in the Fort Myer Pasture/Picnic Area (later recorded as 44AR0043)
- Questions whether there has been Phase I survey in the southwestern portion of the Fort Myer Picnic Area, and recommends Phase I survey if it has not been.

2010 April 1 Letter from Marc Holma VDHR to John C. Metzler, review of Phase II archaeological report on 44AR0043 concurs with recommendation that the site is not eligible.

2010 October – Katz (Louis Berger Group, Inc.) Final Phase II archaeological survey report on 44AR0043 – this project records the site identified in the (Custer) 1991 survey in the north half of the Fort Myer Annex, and conducts further archaeological investigations. Very little archaeological materials were found and the site is recommended as not NRHP eligible. VDHR concurred that 44AR0043 is not NRHP eligible (letter Marc Holma VDHR to John C. Metzler ANC 1 April 2010).

2011 – Versar, Inc. Joint Base Myer-Henderson Hall and Fort McNair Integrated Cultural Resource Management Plan – This document includes a detailed historic context and historic resources inventory of Fort Myer, which recommends expansion of the National Historic Landmark Historic District (NHL) and beyond that expansion of a historic district eligible for the NRHP, if not at the NHL

level. Recommendations include the expansion of the NHL historic district to include the 'Lower Post' near Wright Gate, and the inclusion of the Old Post Chapel as contributing the NRHP district. They do not include the Fort Myer Picnic Area, by this time transferred to ANC, as contributing to the Fort Myer District.

2011 September – Millennium Project, 1st Design Charrette

2011 November - Louis Berger Group/USACE Baltimore District draft ANC Integrated Cultural Resources Plan (ICRMP).

2012 January USACE Norfolk District assumes support role for Arlington National Cemetery cultural resource issues

2012 -February USACE Engineer Research and Development Center, Construction Engineering Research Laboratory begins survey ANC NRHP nomination and revised ICRMP.

2012 March – Invitation to consult on cultural resources issues including ICRMP, PA, and expansion projects is sent from Army National Cemeteries Program to:

Government Agencies:

- *Advisory Council on Historic Preservation
- **National Park Service
- **Commission on Fine Arts
- **National Capital Planning Commission
- * Virginia Department of Historic Resources
- **Arlington County Planning

Federally Recognized Indian Tribes:

Absentee-Shawnee Tribe of Indians of Oklahoma
Cayuga Nation
Delaware Tribe of Indians
Eastern Shawnee Tribe of Oklahoma
Oneida Indian Nation
*^xOneida Tribe of Indians of Wisconsin
Onondaga Indian Nation
Saint Regis Mohawk Tribe
Seneca-Cayuga Tribe of Oklahoma
Seneca Nation of New York
Shawnee Tribe
Tonawanda Band of Seneca Indians of New York
Tuscarora Nation
Cherokee Nation
*⁺Eastern Band of Cherokee Indians
United Keetoowah Band of Cherokee Indians
Catawba Indian Tribe

Non-Governmental Organizations:

*Virginia Council on Indians
Preserve Virginia
Arlington County Historical Society
*National Trust for Historic Preservation
*Historical Society of Washington D.C.

*Responded and consultations continue
**Participated in design charrettes for Millennium
**Sent ICRMP draft, no comments returned, no enquiries made on expansion projects
+Notification of no interest

2012 March – Phase I archaeological field survey for unsurveyed areas and supplemental survey for Millennium Project by USACE Norfolk District (report: Haynes 2012b).

2012 April – Reconnaissance of headstone features in Section 29, determination of not eligible (report: Haynes 2012a)

2012 May – Millennium Project, 2nd Design Charrette

2012 September – ANC historic district NRHP nomination submitted to VDHR, Arlington County, and the National Trust for Historic Preservation

2012 September – Phase II archaeological evaluation of site 44AR0046 by Dovetail Cultural Resource Group (report: Carmody and Blondino 2012)

2012 October - Phase I archaeological survey of Chaffee Place parking lot, site of storm water management measures associated with the Millennium project by USACE (report: Appendix B in Haynes 2012b).

2012 November 13 – Copies of reports and consultation letter sent by USACE to SHPO, NPS, JBM-HH, NTHP, and Arlington County.

2012 December 10 – Site meeting with USACE, ANC, SHPO, JBM-HH, NPS, NTHP, and Arlington County

2013 January 15 – Meeting with Jacobs design team, USACE, ANC, SHPO, NPS, and Arlington County to review design development and discuss possible design changes

2013 February 4 – Millennium 65% design review conference with Jacobs design team, USACE, ANC, SHPO, NPS, JBM-HH and Arlington County

2013 March 11 – Inter-agency Section 106 meeting with Jacobs design team, USACE, ANC, SHPO, NPS, JBM-HH, CFA, NCPC and Arlington County in attendance

2013 March 16 – Public Information Meeting and Site Tour

2013 March 25 – Letter Marc Holma (DHR) to Daniel Delahaye (ANC) RE: Additional Archaeological Survey and Evaluations for the Arlington National Cemetery Millennium Project, Arlington County, Virginia, concurs with recommendations of archaeological survey reports.

Reports

The following reports, cited above, are available in electronic format. Contact John Haynes, USACE Norfolk District, at john.h.haynes@usace.army.mil for an electronic transfer.

Batzli, Samuel A.

1998 *Fort Myer, Virginia: Historic Landscape Inventory*. US Army Corps of Engineers, Construction Engineering Research Laboratories. Champaign, Illinois.

Carmody, Michael and Joseph R. Blondino

2012 *Phase II Archaeological Testing and Assessment of Site 4AR0046, Arlington County, Virginia*. Dovetail Cultural Resource Group I, Inc., Fredericksburg, Virginia.

Custer, Jay F.

1991 *Draft Phase I Archeological Investigations, BRAC Project Areas, Fort Myer, Arlington County, Virginia*. Prepared for the Baltimore District, U.S. Army Corps of Engineers, by KFS Historic Preservation Group and Kise, Franks and Straw, Philadelphia.

1992 *Phase I Archeological Investigations, BRAC Project Areas, Fort Myer, Arlington County, Virginia*. Prepared for the Baltimore District, U.S. Army Corps of Engineers, by KFS Historic Preservation Group and Kise, Franks and Straw, Philadelphia.

Hassan, Hany and Jill S. Cavanaugh

2013 *Millennium Project, Arlington National Cemetery Visual Effects Study*. Prepared by Hany Hassan and Jill S. Cavanaugh, Beyer, Blinder, Belle Architects and Planners, Washington, D.C.

Haynes, John H.

2012a *Reconnaissance of Headstone Drains and Footbridges in Section 29 of Arlington National Cemetery/Arlington House*. US Army Corps of Engineers, Norfolk District, Norfolk, Virginia.

2012b *Additional Archaeological Survey and Evaluations for the Arlington National Cemetery Millennium Project, Arlington County, Virginia*. US Army Corps of Engineers, Norfolk District, Norfolk, Virginia.

Katz, Gregory

2010 *Phase II Evaluation of Site 44AR0043 at the Former Fort Myer Picnic Area, Arlington National Cemetery, Virginia*. Prepared by Louis Berger Group, Washington D.C., for the Baltimore District, U.S. Army Corps of Engineers.

Millis, Heather, Jeff Holland, Todd Cleveland, and Bill Nethery

1998 *Cultural Investigations at Section 29 at Arlington House, the Robert E. Lee Memorial, Arlington County, Virginia*. Garrow & Associates, Inc., Chapel Hill, North Carolina.

Seagraves, Anna, Ann Fuqua, and Nicholas Veloz

1980 National Register of Historic Places Inventory - Nomination Form: Arlington House. National Register of Historic Places, National Park Service, Washington, D.C.

Smith, Adam, Meagan W. Tooker, and Susan I. Enscoe

2012 *Historic Resources Inventory for Arlington National Cemetery, Arlington, Virginia*. US Army Corps of Engineers, Engineer Research and Development Center, Champaign, Illinois.

Versar, Inc.

2011 *Integrated Cultural Resources Management Plan for Fort Myer Henderson Hall, Virginia and Fort McNair, District of Columbia, 2011-2015*. Versar, Inc., Springfield, Virginia.



United States Army
Corps of Engineers
Norfolk District

Visual Effects Study, Arlington National Cemetery

Millennium Project, Arlington County, VA

26 April 2013

DHR File No: 2008-1022

JACOBS

in association with
Beyer Blinder Belle Architects & Planners LLP and Sasaki Associates, Inc.

Table of Contents

Part 1 - Introduction and Project Description2

Project Background.....2

Project Definition2

Access and Site Improvements.....3

Topography3

Fort Myer Historic District (NHL)4

Arlington National Cemetery (ANC)4

Arlington House.....4

Arlington House Contributing Forest.....4

Impacts to the Arlington House Contributing Forest from the Millennium Project7

Part 2 - Task Objective and Methodology8

Purpose of the Task8

Task Objective.....8

Task Methodology8

Part 3 - Viewsheds Analysis9

Map of Adjacent Historic Properties9

Topographic Limits of Viewshed.....10

Viewsheds Overview.....11

Map of Vantage Points12

View 1: JBM-HH - Old Post Chapel13

View 2: JBM-HH - Lee Avenue.....14

View 3: JBM-HH - Jackson Avenue15

View 4: JBM-HH - Marshall Drive.....16

View 5: ANC Ord & Weitzel Drive17

View 6: Arlington House Contributing Forest, NPS Old Growth Area18

View 7: Arlington House Contributing Forest, ANC Property East19

View 8: Arlington House Contributing Forest, ANC Property Central.....20

View 9: Arlington House Contributing Forest, ANC Property West21

View 10: JBM-HH - Marshall Drive.....22

View 11: ANC - L’Enfant Drive.....22

View 12: ANC - L’Enfant/Mitchell Drive23

View 13: ANC - Arlington House - 2nd Floor23

View 14: Arlington House - Kitchen Garden.....24

View 15: ANC - Meigs/Humphreys Drive24

View 16: ANC - Meigs Drive.....25

View 17: JBM-HH.....25

Part 4 - Project Summary and Recommendations26

Summary26

Recommendations27

References.....27

Appendix28



Part 1 - Introduction and Project Description

Project Background

Arlington National Cemetery (ANC) is our Nation's most revered national cemetery. More than three million people visit ANC annually, many coming to pay final respects at grave side services. ANC performs up to 27 to 30 funeral services some days. The ANC Millennium project will provide subsequent burial space and supporting facilities to support the ongoing mission of ANC:

"On behalf of the American people, lay to rest those who have served our nation with dignity and honor, treating their families with respect and compassion, and connecting guests to the rich tapestry of the cemetery's living history, while maintaining these hallowed grounds befitting the sacrifice of all those who rest here in quiet repose."

The Millennium Site will be developed to increase burial space at ANC. According to the Final Design submitted 4/05/13, construction includes casket burial sections, in-ground sites for ashes, and both columbarium niche courts and niche walls. The site will include two (2) assembly areas for service participants including Committal Service Shelters for service participants. Building and site element construction shall be suitable for the environment and complement the architectural theme and considerations of the National Cemetery at Arlington. Supporting facilities include water fountains, waterlines, sanitary sewer, storm drainage, underground electrical and communications/information systems, stream restoration, landscaping, retaining walls, perimeter fencing, vehicle and pedestrian access roads and walks, and security systems.

Project Definition

Objectives of the Millennium Project include the following:

- Provide additional interment capacity to Arlington National Cemetery
- Create an environment in which the built environment conveys the respect and honor to those who served in the Armed Forces, and
- Provide a place of peace and reflection for their families, loved ones, and visitors.

The Millennium project is located on a 27-acre site consisting of Section 29 of the existing ANC and the old picnic grounds of Joint Base Myer / Henderson Hall (JBM-HH). As proposed in the Final Design submittal, the project will provide at least 27,242 new burial spaces, including:

Components	Burial Spaces (First Interment)
In-ground full casket traditional spaces	1,252
In-ground full casket crypt spaces	6,272
In-ground custom or oversize spaces	146
In-ground site for cremation remains	3,242
Columbarium Niches	16,330
Total	27,242

In-ground full casket traditional spaces are provided in one section of undisturbed soil in a 5' x 10' grid. In addition, the in-ground full casket burial spaces will be provided by pre-placed concrete crypts in two sections in a 3' x 8' grid, each with room for two full-size caskets placed in a double-depth fashion. In-ground custom or oversize spaces are included and vary by location, ranging from 5' to 8' in width to accommodate unusual burial requirements. In-ground spaces for cremation remains consist of undisturbed soil in a 5' x 5' grid. Two columbarium types are proposed: Inward-Facing Columbarium Courts and the Perimeter Columbarium Wall.

Other Features and Amenities:

- Two (2) Committal Shelters
- Roadway and Maintenance Drive
- Stream Restoration and Reforestation
- JBM-HH Perimeter Wall / Gate and Jogging Path / Streetlight Relocation
- Utility Relocations and Extensions
- Pedestrian Sidewalks / Stairs
- Water Features at Columbarium A
- Site Furniture, including benches, waste receptacles, etc.
- One (1) Unisex Restroom
- Storage Area and Informational Kiosk

Access and Site Improvements

Access to the site will be provided from the northeast only, connecting to Ord & Weitzel Drive and the existing ANC ceremonial route from the Old Post Chapel. Access for individuals with disabilities will be provided from the main access roadway to the columbaria - turf areas are not fully accessible. In addition, three (3) buildings (10,797 Total SF) will be demolished.

Topography

The proposed Millennium project consists of modifications to the existing stream bed, topographical changes to accommodate new structures, the introduction of a new vehicular road, the introduction of a series of meandering paths, and the planting of additional trees at selected locations throughout the site (ANC 2013). The objective of the landscape design is to minimize the amount of cut and fill and to preserve as many mature trees as possible surrounding the stream bed while enhancing the contemplative nature of the Millennium Site within the overall aesthetic of ANC (ANC 2013).

Fort Myer Historic District (NHL)

JBM-HH holds a central place in the history of the United States Army as numerous significant individuals and events are associated with the post. Part of the installation is listed as a Historic District in the National Register of Historic Places and was designated a National Historic Landmark (NHL) in 1972 (USACE 1998).

Arlington National Cemetery (ANC) National Register of Historic Places (NRHP) Eligible District

ANC is the country's premier national cemetery and the final resting place of numerous people who have played a role in our country's history. With its period of significance from 1864 to the present, ANC retains its integrity and significance relative to several NRHP Criterion (USACE 2012) including:

- Criteria A and B – Association with important events or persons
- Criterion C – Construction



The ANC boundary is also the boundary of the ANC NRHP eligible historic district; while the Millennium Project area is within that boundary it is a non-contributing area as it has not been developed for cemetery use yet (USACE 2013).

Arlington House

Arlington House, the Robert E. Lee Memorial, was the home of Robert E. Lee and his family prior to the Civil War but has played a significant role in American History beyond just this purpose in the past 200 years. The Arlington House served as a plantation estate and home to 63 slaves, a monument honoring George Washington, a military headquarters, a community for emancipated slaves and a national cemetery (NPS 2001 and 2013). Today, it is under the jurisdiction of the National Park Service and is on the NRHP.

Arlington House Contributing Forest

When George Washington Parke Custis inherited the property in 1802, most of the hillsides, except those sloping down toward the river were covered with large oaks, hickories and chestnuts. To farm the estate, clearing began to the east toward the river. Custis started with a more modest house at a prominent location at the top of the hill with views east toward Washington over a pastoral landscape with the backdrop of dense forested area to the west. This forested area included the ravine west of the house which was unsuitable for farming due to the steep slopes.

The earliest sketch extant (NPS 2001, Illustration 17) of the expanded Arlington House in 1824 shows the more open landscape at the front with the house backed by a forest, a design approach which was common to English estates at that time. The wooded backdrop was a key feature of the design of the estate. "The dark trees provided a beautiful, imposing backdrop to the pale colored classical architecture of Arlington House – a characteristic of the estate commented on throughout its history." (NPS 2001).

During the Civil War thousands soldiers occupied the grounds and the forested area lost many trees. In addition, the construction of a fort northwest of the house further reduced the forested area. The landscape of meadows and forest was of course transformed beginning in 1864 with the burial of Union soldiers. Despite the impact of the Civil War on the Arlington Estate, the wooded ravine behind the house remained largely intact because the steep slopes were unusable. In the early twentieth century, the Arlington House Contributing Forest remained intact until the construction of the stable, greenhouses and parking west of the house.

Today, this forested area is located east of the Millennium site and consists of an old growth area that dates back approximately 235 years and relatively younger area that dates back 145-165 years. The latter did not survive the Civil War but has since grown back to visually resemble the 1864-1966 period of significance for the historic landscape design of ANC (ANC 2013). The area of old growth is under the jurisdiction of NPS whereas the area that dates back 145-165 years is under the administrative control of the ANC. A 20.7 acre portion of both areas contribute to the historic significance of the Arlington House and is referenced herein as the Arlington House Contributing Forest.

Figure 2.1 is taken from the Environmental Assessment (ANC 2013) and delineates these areas. Both areas are considered to contribute to the historic landscape of Arlington House. The area of old growth corresponds to the portion of Section 29 retained by NPS whereas the area of forest proposed for removal occupies other portions of Section 29 that are not retained by NPS (ANC 2013).



Figure 2.1 - Delineation of Areas Within Arlington Woods (ANC 2013)

Impacts to the Arlington House Contributing Forest from the Millennium Project

The proposed ANC Millennium project would add interments to the cemetery along the JBM-HH border. Most of these new internments are in the existing open meadow landscape along the JBM-HH border of the cemetery. Where the proposed plan extends east to engage the stream corridor, new construction is much less dense with intervening green spaces and the layout is fit to the topography. Retaining walls are located to preserve existing grades and trees, particularly along the stream corridor and along the drive on the south edge where the ANC Millennium project abuts the Arlington House Contributing Forest. All disturbed areas between the columbaria and committal area and the road are planted to create a native forest succession landscape to blend in with the forested area.

The ANC Millennium project locates new columbaria in the ravine west of Arlington House that are below the elevation of Arlington House. The new planting of the forest succession landscape between columbaria near the bottom of the ravine will, over time, make these columbaria a distinctive feature at the western edge of the Arlington House Contributing Forest. It will be an area where the Arlington House Contributing Forest is integrated with the cemetery landscape. Just as in the past, the steep slopes that rise from the ravine today remain unusable and wooded.

The forested area delineated in Figure 2.1 has been modified and adjusted since the Civil War to meet new demands. Today the land between JBM-HH and the cemetery includes the storage and service areas for the cemetery and open meadows. The proposed Millennium project reclaims some of this land for internments and also redefines the edges and boundaries of the Arlington House Contributing Forest within the cemetery while preserving the green backdrop to Arlington House. It is important to note that the implementation of the Millennium project will not require the removal of any portion of the NPS area and less than 2.63 acres of the ANC portion of the forested area.

Part 2 - Task Objective and Methodology

Purpose of the Task

A defined Visual Area of Potential Effect (APE) for the Millennium Project has been established to assess the extent of visual effects to adjacent historic properties:

- Fort Myer Historic District (NHL)
- Arlington House, the Robert E. Lee Memorial (NRHP listed)
- Arlington National Cemetery Historic District (NRHP eligible)
- Arlington House Contributing Forest (a contributing feature to the ANC historic district)

The Visual APE for the project has been delineated to include those areas from which the post-construction landscape and structures would be visible. This task provides several views from within the APE and provides existing conditions photographs and proposed renderings of the Millennium Project expansion from those viewpoints. The existing views were taken in winter and during the early Spring (between January and March 2013) prior to the appearance of any foliage. The renderings delineate a mid to long term vision of the completed project based on the Final Design submittal, showing approximately 600 programmed new trees planted at full maturity.

Due to the topography in and around the Millennium site, the areas from which the project would be visible are limited. Areas to the west and southwest are located slightly uphill from the Millennium site and are not constrained by forested area so views toward the site are unobstructed and direct. Conversely, views from the northeast and southeast toward the Millennium site are constrained by the Arlington House Contributing Forest forested area and the topographical crown visible in Figure 3.2. Renderings of the appearance of the completed Millennium Project from selected vantage points will support the assessment of the nature of the visual effects to determine if they are adverse or not adverse with regard to Section 106 of the National Historic Preservation Act.

Task Objective

The renderings, along with a supporting narrative that describe the general assessment of the visual impact, support the assessment of the nature of the visual effects.








Task Methodology

The project team and consulting parties identified several locations in and around JBM-HH and the ANC from which the completed Millennium Project may be visible following construction. These locations were chosen based on their sight lines toward the project site and their proximity to historic resources and/or cultural landscapes.

Photographs of the existing vantage points were taken between January and March 2013 at points identified in the Scope of Work dated January 14, 2013, and subsequently added in early March 2013. The timing of the photography yielded favorable views with sparse vegetative cover, as the majority of trees are deciduous. Similar views toward the site would not have been possible during the spring, summer, and fall as the views toward the Millennium Site would be nearly fully obscured by trees. The viewpoint for each photograph was recorded in the field and transcribed onto a map. That map was then used to georeference each vantage point. Then, in the parametric three dimensional (3D) computer model of the proposed build alternative, a camera was placed at the approximate location of each photograph and exact views were generated that were identical to the views from which the existing photographs were taken.

Part 3 - Viewsheds Analysis

Map of Adjacent Historic Properties

-  Arlington National Cemetery Boundary
-  JBM-HH Boundary
-  NPS Boundary
-  Millenium Project Boundary
-  Arlington House NRHP Boundary
-  Arlington House (National Register of Historic Places)
-  Fort Myer Historic District (NHL)

Sources:

Arlington National Cemetery, (Including Soldiers' And Airmen's Home National Cemetery), Integrated Cultural Resources Management Plan, 2013 To 2018.

Arlington House, Robert E. Lee Memorial Cultural Landscape Report. Volume I. National Park Service, 2001.

Fort Myer, Virginia. General Site Map. Available at: <http://mdwhome.mdw.army.mil/>



Figure 3.1 - Map of Adjacent Historic Properties

Topographic Limits of Viewshed

Sources
dem_bare_1m_washington_box14_tile2.tif;
a bare earth digital elevation model from 2008
Lidar; 2011 aerial imagery (51869.sid).

The elevation data for the observation area
was created using elevation contour lines from
ANC_JBMHH.gdb (geodatabase) to the project
perimeter. An additional 5-foot elevation was
added to represent average human view height.
The model was generated using the elevations
of the current Millennium Project design.

The map and all the data shown are in the NAD
1983, State Plane Virginia North and Feet.

Methodology
The DEM was projected from WGS 1984, UTM
Zone 18 North, to NAD 1983, State Plane
Virginia North and feet. The viewshed model
was run using ArcGIS 10.1 with the 3D Analysis
extension. The viewshed geoprocessing tool
was run with the reprojected DEM input and the
observation locations.

It should be noted that the DEM used for this
view shed was a 2008 bare earth elevation model
and does not take into consideration the existing
forest or existing built environment.

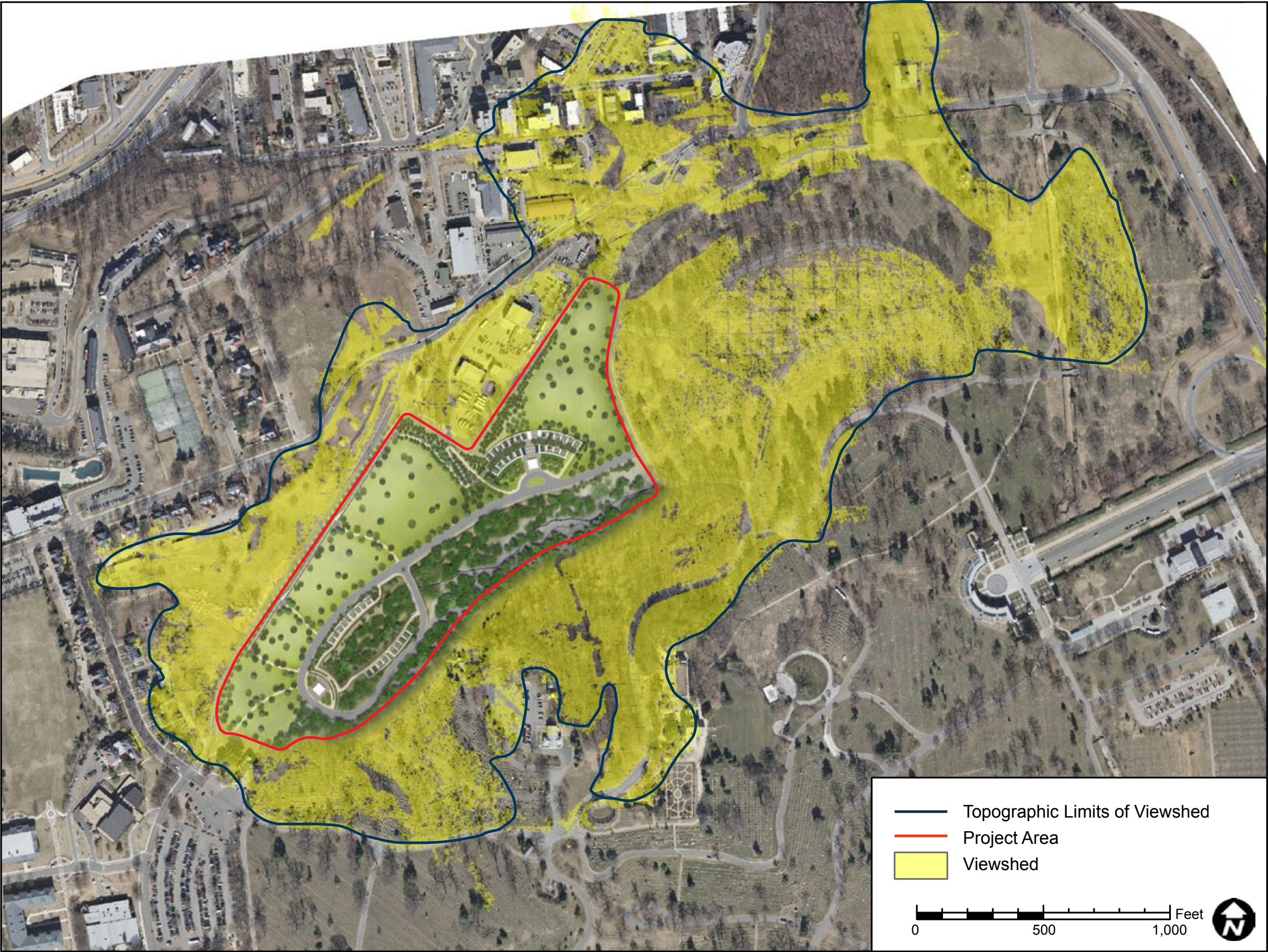


Figure 3.2 - Map of Visual APE

Viewsheds Overview

Views 1-17 are organized sequentially, starting with View 1 located at the Old Post Chapel, and proceeding somewhat clockwise around the Millennium site, and ending with View 17 adjacent to View 1 at the Old Post Chapel. Figure 3.3 shows the 17 views around the Millennium site that are analyzed within this Visual Effects Study.

Views 1-4 are located within JBM-HH with Views 2 and 3 located within the Fort Myer Historic District (NHL). Views 6, 13, and 14 are located within the National Park Service (NPS) Property, while Views 5, 7, 8, 9, 10, 11, 12, 15, and 16 are located within the Arlington National Cemetery. View 17 is located on the southeastern edge of the Fort Myer Historic District (NHL).

Views 6, 7, 8 and 9, were taken from within the Arlington House Contributing Forest. View 6 is the only photo taken from inside the NPS portion of the Arlington House Contributing Forest. Views 13 and 14 are also located with the NPS property, though clustered around the Arlington House. Views 16 and 17 are located to the south within ANC.

Map of Vantage Points

- 1 JBM-HH - Old Post Chapel
 - 2 JBM-HH - Lee Avenue
 - 3 JBM-HH - Jackson Avenue
 - 4 JBM-HH - Marshall Drive
 - 5 ANC - Ord & Weitzel Drive
 - 6 Arlington House Contributing Forest - Old Growth Area
 - 7 Arlington House Contributing Forest - ANC Property East
 - 8 Arlington House Contributing Forest - ANC Property Central
 - 9 Arlington House Contributing Forest - ANC Property West
 - 10 JBM-HH - Marshall Drive
 - 11 ANC - L'Enfant Drive
 - 12 ANC - L'Enfant/Mitchell Drive
 - 13 NPS - Arlington House Kitchen Garden
 - 14 NPS - Arlington House 2nd Floor
 - 15 ANC - Meigs/Humphreys Drive
 - 16 ANC - Meigs Drive
 - 17 JBM-HH - McNair Road
- Selected for Renderings
- Existing Views Only
- Fort Myer Historic District (NHL)
- NPS Property, Contributing to Arlington House
- ANC Property, Arlington House Contributing Forest
- Impact to NRHP Contributing Forest
- Arlington House (National Register of Historic Places)
- Topographic Limits of Visual APE
- Field Observation of Visual APE

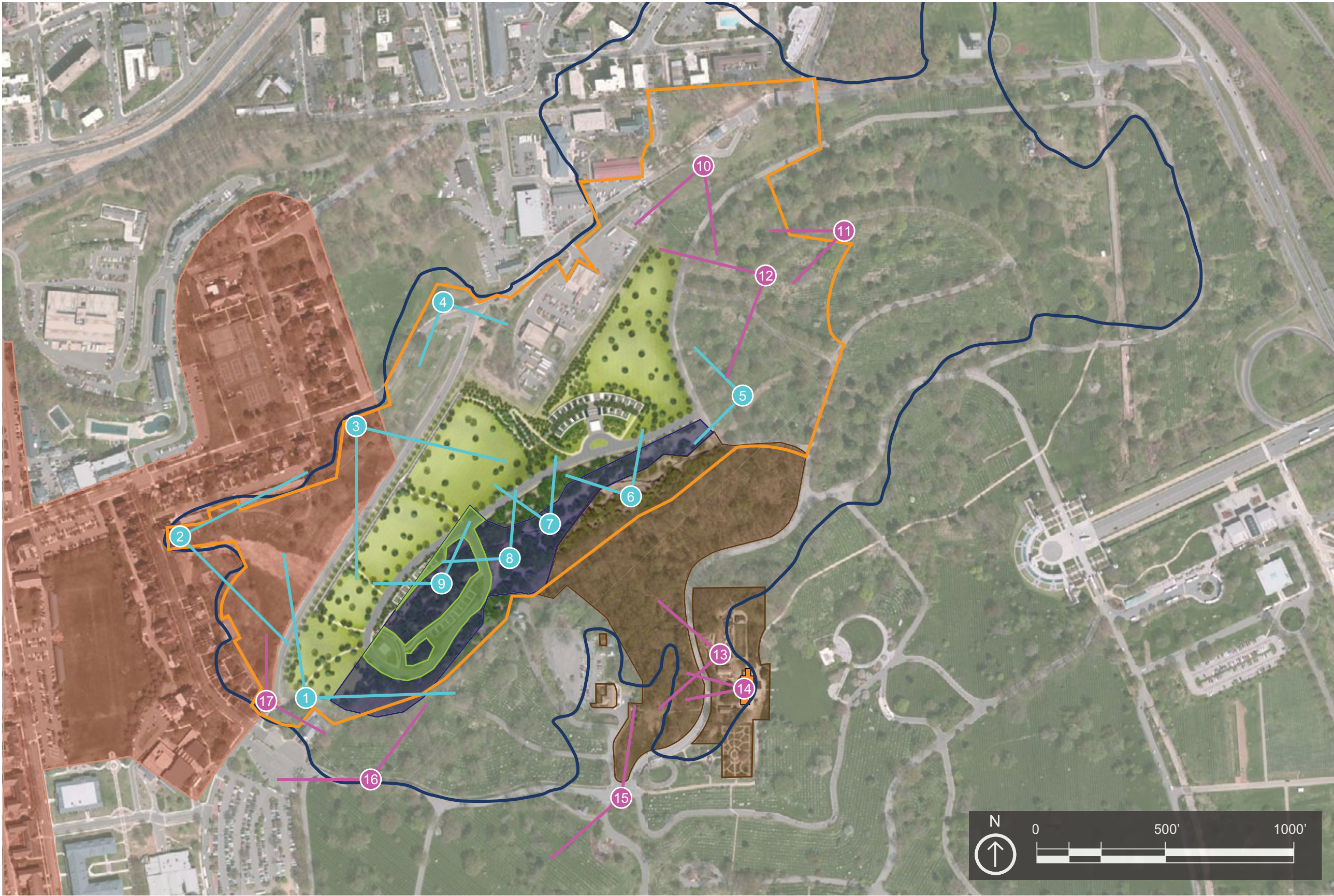


Figure 3.3 - Map of Vantage Points

View 1: JBM-HH - Old Post Chapel

View 1 was taken from the north side of the JBM-HH Old Post Chapel, on the southwestern corner of the Millennium Project site but outside the boundary of the Fort Myer Historic District (NHL). The view is taken from a vantage point that is generally out of the way of public view.

Existing View

The existing viewshed looking northeast is visually defined by dense vegetation, dramatic topographic variation, and the historic red Seneca sandstone wall that serves as the boundary between ANC and JBM-HH. To the east of the Seneca sandstone wall, the iconic rows of ANC white marble grave markers are visually prominent. To the west of the sandstone wall, McNair Road runs in parallel and is the ridge from which the site slopes downward toward the stream. In the middle of the viewshed, there is a wood post and beam picnic shelter located on a relatively flat part of the site surrounded by trees.

Proposed Action

The rendering shows the extent of the re-grading required to achieve the relatively flat slope necessary to accommodate the in-ground burial crypts. The regrading, combined with the removal of a large percentage of vegetation, would constitute a distinctly different visual character from this viewshed. The northwestern edge of the Millennium Site would be visually defined by a stone boundary wall with columbarium and post and beam structures, while the portions of the Seneca sandstone wall have been removed. The remaining portion of the site is now visually defined by rows of white marble grave markers and columbarium that flank the stream bed.

From this vantage point, the full scope of the Millennium Project would be visible from the rear of the Chapel and views toward JBM-HH would be reduced by the introduction of a new perimeter wall along the northwest edge of the Millennium project. Views toward the Old Post Chapel from Meigs Road looking north and east would not be affected since the Millennium Project would not be visible from the front and side vantage points.

To achieve parity with the existing images, the renderings show the proposed vegetation during winter prior to the appearance of any foliage. Therefore, the proposed viewshed during Spring, Summer, and Fall would yield a more obscured view of the Millennium project and provide more visual continuity with the adjacent forested area. Yet even in the proposed winter view, the aesthetic of the proposed project would be consistent with the overall image of Arlington Cemetery and complement the existing visual environment and historic context of the Old Post Chapel.



View 1 - Existing



View 1 - Proposed

View 2: JBM-HH - Lee Avenue

View 2 is located outside the Millennium Project site and within the boundary of the Fort Myer Historic District (NHL), just east of a residential area. It is located east of Lee Avenue atop a steep hill, looking east downward to McNair Road and the Millennium site beyond.

Existing View

The views toward the Millennium Site from this vantage point are affected by the topography which falls steeply downward to the east from the ridge of McNair Road, leaving the visual impression that the boundary of JBM-HH extends well beyond McNair Road. Currently, the only feature of the Millennium Site that is visible from this vantage point is the dense vegetation clustered near the Seneca sandstone ANC boundary wall.

Proposed Action

The rendering shows that the visual perception of JBM-HH extending well beyond McNair Road would be truncated and the new visual character would be defined by the new ANC boundary wall that would flank McNair Road. The uppermost edge of the stream columbarium would be visible over the edge of the new ANC boundary wall. No resources within the Fort Myer Historic District (NHL) would be adversely affected.

From this vantage point, a large portion of northwest wall of the Millennium Project would be visible. The proposed project would represent a noticeable change from the existing conditions, but the effect would be slight in the context of the overall visual environment. The new northwest wall would provide visual definition along McNair Road and its materiality would be consistent with the palette of the historic district within JBM-HH.



View 2 - Existing



View 2 - Proposed

View 3: JBM-HH - Jackson Avenue

View 3 is located outside the Millennium Project site and within the boundary of the Fort Myer Historic District (NHL), just south of a residential area. It is located at the approximate intersection of Jackson Avenue, Grant Avenue, and Marshall Drive on JBM-HHs’ northeast edge. The view shows the vantage point from a ridge line atop a steep hill, looking southeast downward to McNair Road and the Millennium site beyond. The view is taken from a vantage point that is generally out of the way of public view.

Existing View

This panoramic view looking southeast captures the alignment of McNair Road flanking the Millennium Site. The view is currently defined by the rolling topography and dense vegetation along the existing Seneca sandstone ANC boundary wall.

Proposed Action

The rendering shows that the visual perception of rolling topography and vegetation would be replaced with the new ANC boundary wall that would flank McNair Road. Although not shown within the scope of the visualization for view 3, the steeple of the Old Post Chapel would remain visible in the background to the south. Lastly, no resources within the Fort Myer Historic District (NHL) would be affected.

From this vantage point, the entire length of the northwest wall of the Millennium Project would be visible and several of the structures within the boundary of the project, including the columbarium courts and committal service shelters. As with the previous view, the new northwest wall would provide visual definition along McNair Road and its materiality would be consistent with the palette of buildings within the historic district within JBM-HH and the Old Post Chapel to the south.



View 3 - Existing



View 3 - Proposed

View 4: JBM-HH - Marshall Drive

View 4 is located outside the Millennium Project site. This view is located within the boundary of the JBM-HH but outside the National Historic Landmark Historic District. The photograph was taken from Marshall Drive at Jackson Avenue and is looking downhill to the south towards the Millennium site.

Existing View

Similar to view 3, this panoramic view looking southeast captures the alignment of McNair Road flanking the Millennium Site. The view is currently defined by the rolling topography of the Millennium site to the south and the JBM-HH motor pool area to the northeast (left). The panorama is situated against the dense backdrop of the Arlington House Contributing Forest..

Proposed Action

The existing rolling topography of the JBM-HH site to the east would be re-graded and a new ANC boundary wall would be constructed along McNair Road. Portions of the Seneca sandstone boundary wall within this viewshed would be disassembled and reused to face the proposed niche wall facing JBM-HH to accommodate the Millennium project.

From this vantage point, the visual character of the existing open rolling landscape would be replaced with a new ANC boundary wall along McNair Road with a backdrop of grave markers and dense forested area. The visual impact would represent an improvement over the existing conditions as the existing maintenance area and visual appurtenances would be relocated.

As a result of the proposed action, the visual character of the existing open rolling landscape would be replaced with a new ANC boundary wall along McNair Road and a backdrop of grave markers. A portion of the forested area in the distant background would be removed (2.1 acres), but the great majority would be preserved, thus maintaining the broad visual backdrop of dense woodlands.

The visual impact would not be adverse since the aesthetic of the proposed project would be consistent with the overall image of Arlington Cemetery and complement the existing visual environment and the broad visual backdrop of dense forest would be preserved.



View 4 - Existing



View 4 - Proposed

View 5: ANC Ord & Weitzel Drive
View 5 was taken to the north of the Arlington House Contributing Forest within the ANC property. This location is in the northeastern corner of the Millennium Project site.

Existing View
The existing viewshed looking west is defined by rows of white grave markers in the foreground and the entrance to the ANC maintenance area in the background. Although the maintenance area is partially screened, the equipment, vehicles, and storage containers are clearly visible from this vantage point. The old growth dense forested area provides the backdrop to the grave markers to the south and west.

Proposed Action
The rendering shows the new entrance into the Millennium project site and the expansion of the in-ground burial area westward defined by numerous rows of typical grave markers. The Columbarium adjacent to the entrance of the project site is also visible in the background. Views from this vantage point would be noticeably changed, but the visual impact would represent an improvement over the existing conditions as the existing maintenance area and visual appurtenances would be relocated.

Views toward the Arlington House Woods old growth would not be affected and the dense forested area would continue to provide a backdrop to the grave markers to the south and west.

In general, the aesthetic of the proposed project would be consistent with the overall image of Arlington Cemetery and complement the existing visual environment and historic context of the Arlington House Woods.



View 5 - Existing



View 5 - Proposed

View 6: Arlington House Contributing Forest, NPS Old Growth Area

View 6 is located within the dense old growth area of the NPS Property on the southeastern border of the Millennium Project site.

Existing View

This panoramic view shows the dense forest in the foreground through which sporadic and limited glimpses of the ANC maintenance area are visible, including the equipment, storage containers, and vehicles.

Proposed Action

The implementation of the proposed action would not affect the old growth area of the NPS Property. Therefore, the dense forested portion in the foreground of this viewshed would remain unchanged. As with View 5, the views from this vantage point toward the Millennium Project site would be noticeably changed, but the visual impact would represent an improvement over the existing conditions as the existing maintenance area and visual appurtenances would be relocated.

This viewshed location is within a dense forested area and would remain as such following the completion of the Millennium project. It is in a location that is not generally accessible to the public. Therefore, the opportunity to perceive the project from this location would be limited.



View 6 - Existing



View 6 - Proposed

View 7: Arlington House Contributing Forest, ANC Property East

Existing View

View 7 is located within the ANC portion of the Arlington House Contributing Forest, west of the old growth area of the NPS Property toward the middle of the southeastern border of the Millennium Project site. This panoramic view shows the dense forest in the foreground through which limited glimpses of the Millennium Project site are currently visible. These views were taken during the early Spring prior to the appearance of any foliage. In the winter months, with the trees and vegetation at their most sparse, the Millennium project site is minimally visible.

Proposed Action

Through the implementation of the Millennium project, the existing weeds and invasive overgrowth would be removed and the topography would be regarded. All trees within the NPS old growth area would remain untouched.

The image below shows the proposed view as it would appear during winter and early spring, with sparse vegetation. The removal of overgrowth would yield better views toward the Millennium project than the existing conditions, though the views would still be limited and framed by the mature trees. During late Spring, Summer, and Fall, the views would likely be more limited, obscured by thick vegetation. Nevertheless, even with sparse vegetation, the proposed views of the Millennium project would be characterized by the long uniform rows of white grave markers and would appear as an extension of the prominent visual character of the Arlington National Cemetery.

Limited views of the perimeter wall in the distance would also be visible. The Millennium project would introduce new elements to a previously undeveloped portion of the ANC. However, these elements are neither inconsistent nor foreign to the immediate surroundings and would be aesthetically consistent with the overall image of Arlington Cemetery.

This viewshed location is within a dense forested area and would remain as such following the completion of the Millennium project. It is in a location that is not generally accessible to the public. Therefore, the opportunity to perceive the project from this location would be limited.



View 7 - Existing



View 7 - Proposed

View 8: Arlington House Contributing Forest, ANC Property Central

Existing View

View 8 is located within the ANC portion of the Arlington House Contributing Forest, west of the old growth area of the NPS Property toward the middle of the southeastern border of the Millennium Project site. This panoramic view shows the dense forest in the foreground through which a limited glimpse of the Millennium Project site is visible. These views were taken during Spring, amidst new growth and dense foliage.

Proposed Action

The view toward the Millennium project would be limited through the remaining buffer of dense vegetation. The narrow viewshed of the Millennium project would be characterized by the long uniform rows of white grave markers and would appear as an extension of the prominent visual character of the Arlington National Cemetery. The Millennium project would introduce new elements to a previously undeveloped portion of the ANC. However, these elements are neither inconsistent nor foreign to the immediate surroundings and would be aesthetically consistent with the overall image of Arlington Cemetery.

the opportunity to perceive the project from this location would be limited.

This viewshed location is within a dense forested area and would remain as such following the completion of the Millennium project. It is in a location that is not generally accessible to the public. Therefore,



View 8 - Existing



View 8 - Proposed

View 9: Arlington House Contributing Forest, ANC Property West

Existing View
View 9 is located within the ANC portion of the Arlington House Contributing Forest toward the southern portion of the Millennium Project site. This area contains trees that are within the range of 145 years old. The current view is defined by several mature trees on the hillside of a steep slope and a picnic shelter to the west.

Proposed Action
This panoramic view shows the slight change in topography along the alignment of the existing stream bed. The mature trees in the foreground of the photo would remain but the picnic shelter would be removed and replaced by a columbarium and retaining wall. Rows of visually emblematic white grave markers would be visible in the distance to the east.

The picnic shelter is a non-contributing structure and architecturally unremarkable, so its removal would not adversely affect the viewshed. The presence of the new columbarium would represent a noticeable change to this relatively undeveloped area. Its architectural character is consistent with other columbaria in Arlington Cemetery, but not in a location proximate to the immediate surroundings, so whether or not it is complementary to the existing visual environment and the resultant degree of effect is subjective.

However, the columbaria were designed with a low profile so as to be nested into the landscape with an architecturally subdued character to embody the somber and reflective nature of its larger context. In that respect, this viewshed is consistent with the overall visual character of the Millennium project within the larger context of Arlington National Cemetery.



View 9 - Existing



View 9 - Proposed

View 10: JBM-HH - Marshall Drive

This series of views was taken around the northern edge of the Millennium Site within the JBM-HH property. This existing view is visually defined by the presence of the historic Seneca sandstone wall in the foreground with the rolling hills and iconic grave markers of the ANC in the background. The existing Motor Pool building is also present to the far right (west) of the image. The visible portion of

the Seneca sandstone wall and Motor Pool structures shown in this photo would remain intact following the completion of the Millennium Project. As a result of the presence of these structures and the dense coniferous vegetation, no portion of the Millennium Project would be visible.



View 11: ANC - L'Enfant Drive

This series of views was taken around the northwestern edge of the Millennium Site within the ANC property. Due to the topographic ridge present in the background of this image, no portion of the Millennium Project would be visible from this vantage point.



View 12: ANC - L’Enfant/Mitchell Drive

This series of views was taken around the northwestern edge of the Millennium Site within the ANC property. As the vegetation is mainly deciduous, distant views of the far northeast corner of the Millennium Project might be visible during the winter months. During the spring, summer, and fall, no portion of the Millennium Project would be visible due to the density of foliage. When portions of the project are

visible, the limited view of grave markers and columbarium would be consistent with the overall image of ANC and would appear to be an extension of its aesthetic.



View 13: ANC - Arlington House - 2nd Floor

This series of distant views was taken from the second floor of the historic Arlington House within the NPS property. Despite the advantage of a higher elevation, no portion of the Millennium Project would be visible from this vantage point due to the presence of dense vegetation. Even in the winter months, views toward the Millennium

Site are completely obscured. Although a portion of the Arlington House Woods deforested area will be removed to accommodate the Millennium project, the broad visual backdrop of dense forest would be preserved.



View 14: Arlington House - Kitchen Garden

This series of distant views was taken from the garden of the historic Arlington House within the NPS property. Similar to the previous views, no portion of the Millennium Project would be visible from this vantage point due to the presence of dense vegetation. Even in the winter months, views toward the Millennium Site are completely obscured.



View 15: ANC - Meigs/Humphreys Drive

This series of distant views was taken looking toward the southeast corner of the Millennium Site within the ANC property. Due to the distance from the Millennium site, the relatively flat grade of the site, and the ubiquity of grave markers at this location, the Millennium Site is not visible from this vantage point.



View 16: ANC - Meigs Drive

This series of distant views was taken looking toward the southeast corner of the Millennium Site within the ANC property. This vantage point is on a topographic ridge with the project site resting at a significantly lower elevation in the distance. In addition, the myriad of grave markers and presence of the Old Post Chapel completely obscures views toward the Millennium Site from this vantage point.



View 17: JBM-HH

View 17 was taken from a location to the southwest of the JBM-HH Old Post Chapel in southwestern corner of the Millennium Project on the border of the Fort Myer Historic District (NHL). The existing viewshed looking northeast is visually defined by the Old Post Chapel to the east (right), the alignment of McNair Road, and the backdrop of the contributing woods of Arlington House to the far east. The main visual features in the viewshed will not change as a result of the proposed action. Neither the Old Post Chapel nor the alignment of McNair Road will be affected. Although a portion of the Arlington House Woods deforested area will be removed to accommodate the Millennium project, the broad visual backdrop of dense forest would be preserved.



Part 4 - Project Summary and Recommendations

Summary

Distant views from the south and east yielded virtually no visibility of the Millennium Project for a variety of factors, including topography, dense vegetation, and the visual presence of architectural features such as buildings, walls, and grave markers. These factors, when viewed cumulatively from vantage points 10, 11, 12, 13, 14, 15, and 16 completely obscure the visual presence of the Millennium Project. Views toward the site from views 06, 07, and 08 would yield a tenuous view of the Millennium Project in winter months, but the view would be consistent with the overall image of the ANC.

Views 01, 02, 03, 04, 09, and 17 demonstrate that the Millennium Project would be visible from views taken from the south and west looking east. In views 02, 03, 04, 05, and 17 the change from existing to proposed conditions would be noticeable, but the effect would be distant and unimposing. The design and aesthetic of the proposed project would be consistent with and complementary to the overall image and visual environment of Arlington Cemetery. Although a portion of the Arlington House Contributing Forest around the Millennium project would be removed, the broad visual backdrop of dense forest would be preserved.

Views 01 and 09 represent the most noticeable change from existing conditions. The visual character of the existing undeveloped area would be altered and new elements would be introduced. However, the design would be consistent with the overall image of the ANC.

The landscape designers minimized the number of trees to be removed within the Arlington House Contributing Forest and proposed the planting of nearly 800 trees, plus more than 1600 tree seedlings, and 14,000 shrubs. As a result, less than 2.63 acres of the ANC portion of the Arlington House Contributing Forest would be affected by the implementation of the Millennium project. Despite this effect on less than 2.63 acres, the broad visual backdrop of dense forest would be preserved in vantage points from Arlington House and JBM-HH.

Recommendations

Based on the visual analysis presented in this report, the consultant concurs with the findings in the Environmental Assessment that the implementation of the proposed Millennium Project would present direct physical adverse effects to NRHP eligible historic district landscape components resulting from the removal of a portion of the forest contributing to the historic significance of the Arlington House. However, in the opinion of the consultant, the resultant indirect or visual effect would be slight within the context of the overall visual environment due to a variety of factors including: the presence of vegetation and topography; the visual consistency of the proposed actions with the existing visual context of ANC; and the preservation of the broader context of dense forest as the visual backdrop to the Arlington House.

Impacts to views from the Fort Myer Historic District (NHL), including the Old Post Chapel would be minor, as the proposed design is consistent and compatible with the setting and historic associations of this historic property. Moreover, the design of the proposed project would compliment and be consistent with existing areas of ANC which border all properties near it and are an integral part of their histories. Views from Arlington House would not be affected.

References

- NPS 2001 National Park Service. Arlington House, The Robert E. Lee Memorial Cultural Landscape Report, History, Volume I. United States Department of the Interior, National Park Service, National Capital Region Cultural Landscape Program, 2001. Prepared by Jennifer Hanna, Historic Landscape Architect.
- NPS 2013 National Park Service. Arlington House, The Robert E. Lee Memorial website. Available at: <http://www.nps.gov/arho/>. Accessed on April 4, 2013.
- ANC 2013 Arlington National Cemetery. Arlington National Cemetery Millennium Project Environmental Assessment. U.S. Army Corps of Engineers, 2013.
- USACE 1998 U.S. Army Corps of Engineers. Fort Myer, Virginia: Historic Landscape Inventory. U.S. Army Corps of Engineers, 1998.
- USACE 2012 U.S. Army Corps of Engineers. Historic Resources Inventory for Arlington National Cemetery, Arlington, Virginia. U.S. Army Corps of Engineers, 2012.
- USACE 2012 U.S. Army Corps of Engineers. Arlington National Cemetery (Including Soldiers' and Airmen's Home National Cemetery). Integrated Cultural Resources Management Plan 2013 to 2018. U.S. Army Corps of Engineers, 2013.

Appendix



Hany Hassan, FAIA, Partner

BArch, Cairo University, 1974

Registered Architect: MD, DC, VA, NY, NJ, NC, DE, WV, PA, SC, TN, NCARB

As Director of Beyer Blinder Belle's (BBB's) Washington, DC office, Mr. Hassan's career spans more than 35 years. His design and technical knowledge extends to planning, urban design, and architectural design for new construction, renovation and additions for various clients. Mr. Hassan's projects have been awarded numerous honors national and internationally. For the Historic DC Courthouse, we have won: the Historic Resource Merit Award, AIA DC Chapter; GSA Design Award, US General Services Administration; Excellence in Historic Preservation Award, District of Columbia Historic Preservation Office, District of Columbia; and American Architecture Award, Chicago Athenaeum and The European Center for Architecture, to name a few. In the practice of preservation, Mr. Hassan is both a responsible steward of historic buildings and a leader in transforming buildings and sites for new use.

Mr. Hassan has extensive experience in Section 106 reviews required under the National Historic Preservation Act and has have worked with review authorities on the state, regional, and federal level where he has successfully obtained agency approvals and is therefore, skilled at balancing the concerns of historic preservation officials, while advancing designs for complex renovation, new construction, and master planning projects. From the breadth of his experience in working with stewards of nationally significant historic properties including the General Services Administration, the Architect of the Capitol, the National Park Service, and the Smithsonian Institution, he has gained a wealth of experience interpreting the Secretary of the Interior's Standards for the Treatment of Historic Properties and following the historic preservation approach for for stewards of historic properties.

Mr. Hassan is a member of the Association for Preservation Technology, the National Trust for Historic Preservation and the DC Preservation League. He also served as AIA Design Jury Program Member, National Association of Industrial and Office Properties (NAIOP) Design Jury Member for Northern Virginia and International AIA Honorary Fellowship Award Program Member. He currently serves as GSA National Peer for the Design Excellence and the Arts.

SELECTED PROJECT EXPERIENCE

Arlington National Cemetery Millennium Project

Partner in Charge for the Design Team leading the effort to expand the existing 624 acres at Arlington National Cemetery by 27 acres to north-west. This national icon is visited by more than 4 million people annually, 7 days a week, 365 days a year. Up to 30 funerals a day are performed every day resulting in over 7,000 burials per year. However, space is limited and the cemetery ANC is projected to reach full capacity by 2025. Therefore, the Millennium Project will increase burial space by expanding by 27 acres. The Cemetery is under the jurisdiction of the Department of the Army and BBB is working on behalf of the U.S. Army Corps of Engineers, Norfolk District within a project team led by Jacobs/Amman & Whitney Joint Venture as prime and lead engineer and Sasaki Associates, Lead Landscape Architect. Concept Approval was awarded by the U.S. Commission of Fine Arts in October 2012.

Washington Monument Washington, DC

Partner in Charge responsible for developing a range of alternatives to be evaluated in the environmental and historic preservation compliance processes and advancing the preferred alternative into Schematic Design. The scope of work also includes a viewshed analysis for ten views and vistas that are either character defining or contributing features of the cultural landscape as well as a value analysis workshop. Mr. Hassan will present the design for preliminary concept approval with the Commission of Fine Arts in April 2013.

Smithsonian Institution, National Museum of African American History and Culture, Washington, DC

Partner-in-Charge for the Viewshed Analysis and Preliminary Architecture and Urban Design Analysis for the Tier I Environmental Impact Statement (EIS) and National Historic Preservation Act (NHPA) with the Smithsonian Institution. As part of a larger consultant team, Mr. Hassan developed massing studies for a full range of Build Alternatives and a comprehensive Viewshed Analysis for numerous viewsheds from historic views in and around the Monumental Core, including locations from the Washington Monument, Arlington National Cemetery, the Old Post Office, and the National Mall. Mr. Hassan also prepared the assessment for effect for the Visual Resources section of the Tier I EIS.

Historic DC Courthouse Washington, DC

Design Partner for the Modernization of an existing historic building and the design of a new addition as part of the General Services Administration's Design Excellence Program. The concept phase included an assessment of the existing historic interior and exterior that identified historic components to be featured in the restoration. The buildings are being used for administrative offices and court space for the Court of Appeals and include a new ceremonial courtroom, restored courtrooms, and exhibit space on DC court history. A new steel and glass entry pavilion reorients the building to Judiciary Square. The Historic DC Courthouse renovation is the first step in implementing a revised masterplan for Washington's Judiciary Square.

Hany Hassan, FAIA, Partner (continued)

U.S. Diplomacy Center, Washington, DC

Partner-in-Charge and Lead Designer for a new entry lobby/exhibition pavilion and interior renovation of several interior spaces to create a Diplomacy Center and Museum at the State Department Headquarters. The redesign will include new gallery, exhibit and museum support spaces and will feature interactive and other advanced technologies that will support real-time connections with embassies and exhibits throughout the world. The scope for this project also includes the design of a theater, classrooms, gift shops, security screening and climate control for the collections. Much of the historic interior of the Marshall Building will be restored as part of the museum design. The museum space is approximately 20,000 SF and the security lobby is approximately 15,400 SF.

The National Museum of American History, South Wing Washington, DC

Design Partner for the expansion of the National Museum of American History, one of the Smithsonian's most visited museums. This 30,000 sf project included the infill and conversion of garage space to accommodate offices; Health Unit; administrative functions, and The Lemelson Center for the Study of Invention and Innovation. The project required coordination and consultation with the National Capital Planning Commission, U.S. Commission of Fine Arts, and the District of Columbia State Historic Preservation Office.

Maryland State House Re-Creation of the Old House of Delegates Annapolis, MD

Partner-in-Charge to prepare a historic furnishings plan for the recreation of the Old House of Delegates Chamber in the Maryland State House. The plan interpreted the room as it appeared circa 1876 as recorded in photographic and documentary evidence provided by the Maryland State Archives. Following the research and preparation of the historic Furnishings Plan, BBB provided construction documents for the complete re-creation of the historic space. As a re-created historic space, the room functions as a flexible space that can be utilized for smaller meetings or larger events while also maintaining the character of a period room that contains interpretive exhibits about 19th-century Maryland legislative history.

Smithsonian Institution, Mall-wide Security Washington, DC

Partner-in-Charge for the planning and design of the National Mall Security Plan for the Smithsonian Institution. This major undertaking provides the highest standards of security to protect visitors, staff, collections and facilities while maintaining the historic integrity of the site and the openness of the mall. The new security installations, streetscape, landscape, and site design complement the surrounding urban fabric and the museum site. The facilities impacted by this security plan include the National Museum of American History; National Museum of Natural History; National Air and Space Museum; Smithsonian Institution Building; Arts & Industries Building; Hirschhorn Museum and Sculpture Garden; Smithsonian and the Freer Gallery of Art.

National Trust for Historic Preservation, Headquarters Building Washington, DC

Partner-in-Charge for an existing conditions and facilities assessment report for the headquarters building of the National Trust for Historic Preservation. Created a ten-year work plan for facility improvements with a focus on preserving the exterior envelope, improving building systems, correcting non-compliant circulation/accessibility and repair issues, and making recommendations for renovations.

Summerhouse Restoration, Architect of the Capitol, Washington, DC

Partner-in-Charge for the restoration of the Summerhouse which is located on the northwest section of the U.S. Capitol Grounds. Designed by Thomas Wisedell under the direction of the landscape architect Frederick Law Olmsted, the Summerhouse was constructed from 1879 to 1880. The open air structure is constructed of red brick in the form of an open hexagon with a fountain located in the middle. Panels of elaborately hand-carved brick and bluestone decorate the interior elevations. The restoration will include: full restoration of the plantings and landscape that date to Olmsted's original design, restoration of the terra cotta roof, recreation of a historic paving pattern, upgrades to the fountain system, cleaning and re-pointing of historic brick, upgrades that address accessibility.

Taft Memorial Renewal, Architect of the Capitol, Washington, DC

Partner-in-Charge for the Taft Memorial and Carillon which is located north and west of the Capitol in Square 633 of the US Capitol Grounds. Designed by architect Douglas W. Orr and constructed in 1958 to honor Senator Robert A. Taft, the son to the President Taft. The Memorial consists of a 100 foot tower clad in Tennessee pink marble capped with a carillon of 17 bells. The Tower sits on a plaza which is surrounded by a water filled moat. Beyer Blinder Belle has been contracted by the AOC to plan for the Memorials restoration that will include: repairs and restoration to the marble, upgrade to electrical and mechanical systems, restoration of the fountain operation, OSHA and accessibility compliance upgrades and new lighting.

Jill S. Cavanaugh, Assoc. AIA

MS Architecture and Urban Design, Columbia University 2002

BArch, University of Kansas, 1999

Jill Cavanaugh is an architectural designer, planner, and project manager with diverse interdisciplinary experience on complex projects across a variety of scales. She has a depth of experience with the integration of historic preservation and environmental compliance on national monuments, memorials, and landmarks. She has managed numerous projects that require extensive public engagement with broad groups of constituents and stakeholders and translated disparate goals and objectives into cohesive design visions for incremental and long range growth. She has successfully completed numerous land use planning projects on both the city-wide and neighborhood scale including feasibility studies, master plans, revitalization and streetscape projects, and urban design framework plans.

Ms. Cavanaugh is also proficient in CAD and parametric 3d software including Building Information Modeling and has produced simulated environments for several projects from modeling to post-production on behalf of clients for use in Viewshed Analyses, Urban Design Charrettes, and Visual Impact assessments within NEPA and NHPA compliance. She has completed the U.S. Department of the Interior National Park Service Training in Director's Order 12 and Section 106 of the National Historic Preservation Act for the Secretary of the Interior's Standards for the Treatment of Historic Properties.

SELECTED PROJECT EXPERIENCE

Arlington National Cemetery Millennium Project

Project Manager for the Design Team leading the effort to expand the existing 624 acres at Arlington National Cemetery by 27 acres to north-west. Ms. Cavanaugh worked with Mr. Hassan and Sasaki Associates on the architectural design of all above ground elements including burial columbarium walls, committal service shelters, water features, and other landscape features. Ms. Cavanaugh produced the concept submission materials resulting in Concept Approval awarded by the U.S. Commission of Fine Arts in October 2012.

Washington Monument Washington, DC

Project Manager for the new Visitor Security Screening project that will improve the security and visitor flow at the Washington Monument in a manner that preserves the character and visitor experience of the Washington Monument and Grounds. The existing visitor screening station, constructed at the Monument's base in 2001, was intended to be temporary and requires replacement in order to meet the long term security and cultural resource management requirements at the Monument. Ms. Cavanaugh is managing the schematic design for a broad range of options and preliminary concept approval with the Commission of Fine Arts, National Capital Planning Commission, and coordination with the DC Historic Preservation Officer and the Advisory Council on Historic Preservation. She was the lead for the Viewshed Analysis for five Build Alternatives from 10 viewsheds and provided an assessment of visual effect for the Section 106 consulting parties to determine adverse effect and primary technical author of the visual impact section of the Environmental Assessment.

Smithsonian Institution, National Museum of African American History and Culture Washington, DC

Project Manager for the Tier I Environmental Impact Statement and Section 106 Process for the new National Museum of African American History & Culture (NMAAHC), to be constructed on the Washington Monument Grounds on the last buildable parcel on the National Mall at Constitution Avenue NW and 14th Street. Responsible for coordination and technical writing and production of the environmental and historic preservation compliance for the National Capital Planning Commission and the Smithsonian Institution. The project scope included public outreach with a broad and diverse group of constituents and stakeholders including the DC Office of Historic Preservation, DC Office of Planning, District Department of Transportation, US Commission of Fine Arts, and Advisory Council on Historic Preservation. The plan was completed in partnership between BBB and the Louis Berger Group (LBG).

Potomac Park Levee

Ms. Cavanaugh was the Project Manager for the EA and Section 106 process for the design and construction of an improved flood control project at 23rd Street and 17th Street within the National Mall and Constitution Gardens. Coordinated the landscape design (undertaken by a subconsultant), Section 106 process, and consultation with a larger group of stakeholders including NCPC, CFA, WMATA, DC HPO, DDOT, and GSA. The client group included USACE (the federal agencies that certified levees), NPS (federal landowner), and DC Government (responsible for coordinating with FEMA). She was the primary technical author for the Environmental Assessment and facilitated the coordination between multiple stakeholders. Ms. Cavanaugh worked with the Olin Studio Landscape Architects to produce a Viewshed Analysis and was the primary technical author for the assessment of visual impact for the Section 106 consulting parties and the EA Visual Impact Section. Completed in 2008-2009 with the Louis Berger Group.

Jill S. Cavanaugh, Assoc. AIA (continued)

NPS Lincoln Memorial Reflecting Pool Rehabilitation

Project manager for the environmental and historic preservation compliance and full design for the largest Recovery Act Project in the NPS (\$31m) that addresses multiple improvements to enhance and rehabilitate the infrastructure, circulation, accessibility, security, and circulation at various locations around the Lincoln Memorial Reflecting Pool located on the National Mall in Washington, DC. Ms. Cavanaugh was the primary technical writer for the Environmental Assessment and Section 106 Process, including the Finding of No Significant Impact. She transitioned into the project manager role for the design and was responsible for overseeing a team of nine subconsultants for the design development and construction document submissions. She was the lead for the permitting with the Environmental Protection Agency PA, DC Water, and the DC Government pursuant to the Clean Water Act, NCPC and CFA Final Design Submissions, security coordination with U.S. Park Police. The project was completed on time under an aggressive timeline (DD and CD phases were completed in five months). Ms. Cavanaugh worked with Sasaki Associates Landscape Architects to produce a Viewshed Analysis and was the primary technical author for the assessment of visual impact for the Section 106 consulting parties and the EA Visual Impact Section. Completed in 2009-2010 with the Louis Berger Group.

Historic DC Courthouse Washington, DC

Ms. Cavanaugh assisted in the conceptual design and design development of the renovation and new construction of an addition for the Historic Old DC Courthouse in downtown Washington DC. She developed 3d computer models of the existing five block radius for the landscape design of the north plaza as well as a more detailed model of the new addition to articulate both interior and exterior design detailing and the suitability of the proposed addition against the existing historic fabric of the building. Both computer models were instrumental in the successful design review and approval of the National Capital Planning Commission and the Commission of Fine Arts. 2003-2004.

NPS Statue of Liberty, Life Safety Upgrades

Ms. Cavanaugh was the Project Manager for the EA and Assessment of Effect to evaluate a range of alternatives to improve the public safety and accessibility of the Statue of Liberty National Monument in a manner that maintains visitor experience while preserving its historic character. Due to over a century of intensive use, the NPS has undertaken several restorations to maintain optimal visitor experience and public safety. The most recent phase of public safety improvements at the Monument and Statue was completed for the re-opening of the crown on July 4, 2009 and included the addition of handrails on the spiral staircases leading to the crown and the rehabilitation of several doors to provide for visitor access consistent with building codes. The second phase of improvements is currently proposed to address various infrastructure, fire protection, lighting, mechanical, and structural upgrades that are required to continue for safe visitor access at the Statue. Ms. Cavanaugh prepared the Visual Impact Assessment and was the primary technical author for the EA and National Historic Preservation Act Assessment of Effect. Completed in 2010 with the Louis Berger Group.

NPS, Petersen House (House Where Lincoln Died) Accessibility Study

Ms. Cavanaugh was the Task manager for an accessibility study to achieve ADA compliance and the Visual Impact Analysis for upgrades to the Petersen House, located within the Ford's Theater National Historic Park. Produced multiple options for modifications to the historic fabric of the house that avoided a determination of adverse effect with the DC Historic Preservation Office. All options were coordinated with the Center for Education and Learning, a new museum for Lincoln located in the adjacent property that will connect to the Petersen House. Completed in 2009-2010 with the Louis Berger Group.

Allegheny Power, TheTrans-Allegheny Interstate Line (Ap Trail 500 kV) Project

Ms. Cavanaugh was the visual resource lead responsible for producing numerous 3d photo simulations to delineate the new alignment of power lines in landscapes along multiple states in the Mid-Atlantic and east coast. The renderings were used in public meetings to justify the route selection. As such, the level of accuracy needed to be legally defensible to support possible litigation. Completed in 2006-2007 with the Louis Berger Group.

USACE EIS and EA Support for Civil, Military and Federal Programs

Environmental Compliance technical writer responsible for the visual impact assessments for several EAs and EISs including Fort Dix, NJ, Fort Detrick, MD, Fort Benning, Georgia, and Fort Meade, Maryland. Performed visual impact analyses and environmental impact analyses for numerous proposed redevelopment and reuse plans for various military installations under the Base Realignment and Closure (BRAC) program, an initiative to close excess military installations and realign the total asset inventory to reduce expenditures on operations and maintenance, aimed at achieving increased efficiency in line with Congressional and DoD objectives. The majority of installations were historically significant and some resources were listed in the National Register. As such, the project scope of work involved consultation pursuant to Section 106 of the National Historic Preservation Act and State Historic Preservation Officers. Completed in 2005-2007 with the Louis Berger Group.

ALAN L. WARD, FASLA

Harvard University, Graduate School of Design, Master in Landscape Architecture
Advanced Photographic Studies at Massachusetts Institute of Technology
University of Cincinnati, College of Design, Architecture and Art, Bachelor of Architecture

PROFESSIONAL AFFILIATIONS

American Society of Landscape Architects, Fellow
Institute for Urban Design, Fellow
Urban Land Institute
Cultural Landscape Foundation, Member

Alan is an urban designer and landscape architect with over 30 years experience at Sasaki, including landmark projects such as Reston Town Center, the Dallas Arts District, Cleveland Gateway, and the Euclid Corridor, which have received multiple national awards. He was principal landscape architect for the competition-winning 2008 Beijing Olympic Green. Alan has led the design for significant civic landscapes in Washington, D.C. including the East Grounds of the U.S. Capitol related to the Visitor Center and the update to the landscape at the Lincoln Memorial and Reflecting Pool.

Trained as both an architect and landscape architect, Alan takes a balanced and comprehensive view of the built environment. He has taught in both architecture (Ball State University) and landscape architecture (Harvard Design School), and is the author and photographer of the book *American Designed Landscapes: A Photographic Interpretation*. He is also the editor and author of the principal essay in the book *Reston Town Center: A Downtown for the 21st Century*. Mr. Ward has served on national awards juries for Progressive Architecture and the American Society of Landscape Architects, as well as a peer reviewer for the U.S. General Services Administration (GSA). He was a Visiting Artist in Landscape Architecture at the American Academy in Rome in 2002 and 2006.

TOWN PLANNING AND URBAN DESIGN EXPERIENCE

- Babelsberg Media City; Potsdam, Germany Brambleton Town Center; Loudoun County, Virginia Buffalo Downtown Master Plan; Buffalo, New York
- Cleveland Gateway Sports District Master Plan; Cleveland, Ohio
- Columbia Town Center; Columbia, Maryland
- Dallas Arts District; Dallas, Texas
- Dhahran Master Plan; Dhahran, Saudi Arabia
- Downtown Master Plan; Kansas City, Missouri
- Fort Lauderdale Central Beach Master Plan; Fort Lauderdale, Florida
- Fort Lauderdale Feasibility Study; Fort Lauderdale, Florida
- Fort Lauderdale Riverwalk Master Plan; Fort Lauderdale, Florida
- Fort Monroe Master Plan and Implementation Strategy; Hampton, Virginia
- Kierland Master Plan; Scottsdale, Arizona
- Landmark Mall Redevelopment; Alexandria, Virginia Lowry Air Force Base Redevelopment; Denver, Colorado Megaproyecto Puebla City Plus; Puebla, Mexico Nationwide Arena District; Columbus, Ohio
- North Coast Harbor Master Plan; Cleveland, Ohio
- Oerlikon District; Zurich, Switzerland
- El Paseo Del Canal San Antonio; San Juan, Puerto Rico Piedmont Triad Research Park; Winston-Salem, North Carolina Puerto Rico Trade & Convention Center District; Puerto Rico Reedy River Corridor; Greenville, South Carolina
- Reston Town Center Master Plan; Reston, Virginia
- Riverbend Site Development Plan; Buffalo, New York

- Scranton Road Peninsula Redevelopment Master Plan; Cleveland, Ohio
- Southwood Master Plan; Tallahassee, Florida Springfield Old State Capitol; Springfield, Illinois Taipei Terminal Master Plan; Taipei, Taiwan
- The Presidio Trust Management Plan; San Francisco, California The Woodlands Town Center Master Plan; The Woodlands, Texas The Woodruff Arts Center Expansion; Atlanta, Georgia
- Truman Waterfront & Navy Property Master Development Plan; Key West, Florida
- Tysons Galleria Redevelopment Master Plan; Fairfax, Virginia
- U.S. Embassy Site Design; Beirut, Lebanon
- U.S. Embassy Landscape Design; Ndjamena, Chad U.S. Embassy Site Design; The Hague, Netherlands U.S. Embassy Site Design; Helsinki, Finland

PARK, PLAZA, AND LANDSCAPE DESIGN EXPERIENCE

- 2008 Beijing Olympics Landscape Design Competition; Beijing, China
- 2200 Pennsylvania Avenue Master Plan and Site Design (Square 54); Washington, DC Addison Circle Park; Addison, Texas
- Akron Lock 2 Canal Park; Akron, Ohio
- Baton Rouge Downtown Wayfinding; Baton Rouge, Louisiana
- Bayfront Park; Corpus Christi, Texas Benjamin Franklin Circle; Washington, DC Brickell Financial Center Plaza; Miami, Florida Charlotte LRT; Charlotte, North Carolina
- Civic Plaza Redevelopment, San Jose, California
- Cleveland Gateway Sports District Streets and Plazas; Cleveland, Ohio

Attachment A: Resumes Of Principal Investigators

- Cleveland RTA Waterfront Transit Line; Cleveland, Ohio
- Colgate-Palmolive Master Plan and Site Design; Jersey City, New Jersey
- Dallas Area Rapid Transit Mall; Dallas, Texas Euclid Avenue BRT; Cleveland, Ohio Jacksonville Shipyards; Jacksonville, Florida
- Lincoln Memorial Reflecting Pool and Grounds; Washington, DC Metzenbaum Courthouse Security Design; Cleveland, Ohio Miami World Center Streets and Plazas; Miami, Florida President's Park (Ellipse); Washington, DC
- Renaissance Plaza, White Plains, New York
- Reston Town Center Streets, Plaza, and Park; Reston, Virginia
- RiverRow Park; The Woodlands, Texas Waterway Square; The Woodlands, Texas U.S. Capitol Visitor Center; Washington, DC

AWARDS

- Engineering News-Record, Best of the Best, Best Retail/Mixed-Use Developments for 2200
- Pennsylvania Avenue, 2011.
- ULI Award of Excellence for Euclid Avenue Bus Rapid Transit Corridor, 2011. AIA Award of Excellence for U.S. Capitol Visitor Center, 2010.
- IDA Merit Award for Euclid Avenue Bus Rapid Transit Corridor, 2010.
- American Council of Engineering Companies of Ohio, Outstanding Achievement Award for
- Euclid Avenue Bus Rapid Transit Corridor, 2009.
- The Texas Recreation and Park Society, Park Design Excellence Award for The Fountain at
- Waterway Square, 2009.
- AIA Merit Award in Architecture for The Potomac School, Upper School, 2008.
- IDA Outstanding Achievement Award for Downtown Baton Rouge Wayfinding Signage
- Program, 2008.
- BSLA Honor Award for 2008 Beijing Olympics Olympic Green, 2006.
- ULI Award of Excellence for The Presidio Trust Management Plan; San Francisco, California,
- 2006.
- BSLA Honor Award for Addison Circle Park, 2005.
- APA Outstanding Planning Award for Implementation for The Presidio Trust Management
- Plan, 2004.
- BSLA Merit Award for Southwood Master Plan, 2004.
- APA California Chapter First Place Award in Planning Implementation for Large Jurisdiction for The Presidio Trust Management Plan, 2003.
- Association of Environmental Planners Outstanding Planning Document Award, 2003.
- ASLA Merit Award for Planning and Analysis for The Presidio Trust Management Plan, 2003. ASLA Merit Award for Dallas Area Rapid Transit Mall, 2000.
- ASLA Merit Award for Southwood Master Plan, 2000.
- ASLA Honor Award in Communication for American Designed Landscapes, 1998. AIA Honor Award in Urban Design for Cleveland Gateway, 1996.
- AIA Honor Award in Urban Design for Reston Town Center, 1992.
- Progressive Architecture Citation in Urban Design for Cleveland Gateway, 1992. ASLA Honor Award in Urban Design, Cleveland Gateway, Cleveland, Ohio, 1991. ASLA Merit Award in Urban Design, Taipei Terminal, Taipei, Taiwan, 1991. Progressive Architecture Citation in Urban Design for Brambleton, 1990. Bradford Williams Medal for best article in Landscape Architecture, 1986.
- ASLA Merit Award in Communication, Built Landscapes Exhibition, 1985.

**MEMORANDUM OF AGREEMENT
AMONG ARLINGTON NATIONAL CEMETERY, THE NATIONAL PARK
SERVICE—GEORGE WASHINGTON MEMORIAL PARKWAY, AND THE VIRGINIA
STATE HISTORIC PRESERVATION OFFICER
REGARDING
THE MILLENNIUM PROJECT
ARLINGTON NATIONAL CEMETERY
ARLINGTON COUNTY, VIRGINIA**

WHEREAS, Arlington National Cemetery (hereafter ANC), is proposing to develop a 27-acre parcel of land referred as the Millennium Site to provide approximately an additional 10,912 in-ground burial spaces and 16,330 columbarium niches, illustrated in Attachment A, to prolong ANC's longevity and construct measures to restore the drainage in that area known as the Millennium Project (hereafter Project); and

WHEREAS, ANC has determined that the proposed Project is an "undertaking" as defined in 36 C.F.R. § 800.16(y); and

WHEREAS, the George Washington Memorial Parkway administers the Arlington House which is a unit of the National Park System, (hereafter NPS-GWMP), due to its authorization and permitting of storm drain and stream stabilization work on its property, has determined that the permit issuance for the proposed Project is an "undertaking" as defined in 36 C.F.R. § 800.16(y) that requires review in accordance with 36 C.F.R. § 800; and

WHEREAS, in accordance with 36 C.F.R. § 800.2(a)(2), NPS-GWMP has designated ANC as the lead federal agency to fulfill federal responsibilities under Section 106 of the National Historic Preservation Act (hereafter NHPA), 16 U.S.C. 470f (email from NPS dated 24 April 2013); and

WHEREAS, pursuant to Section 10 of the Rivers and Harbors Appropriations Act of 1899 (33 U.S.C. 401 and 403) and Section 404 of the Clean Water Act of 1973 (33 U.S.C. 1344), a Department of the Army permit will likely be required from the United States Army Corps of Engineers (hereafter USACE); and

WHEREAS, the USACE, due to its authorization under a State Programmatic General Permit has determined that the proposed Project is an "undertaking" as defined in 36 C.F.R. § 800.16(y) that requires review in accordance with 36 C.F.R. § 800; and

WHEREAS, in accordance with 36 C.F.R. § 800.2(a)(2), ANC and USACE have agreed that ANC is the lead Federal agency for the purposes of Section 106 review (email from USACE dated 25 April 2013); and

WHEREAS, ANC has consulted with the Virginia State Historic Preservation Officer, (hereafter SHPO) to define the area of potential effects (hereafter APE) for the Projects in

accordance with 36 C.F.R. § 800.16(d) and identified the Project's direct, or physical APE as areas of ground disturbance, including areas of grading, cutting, and/or filling; areas where existing building and infrastructure removal will take place; and the indirect, or visual APE as the viewshed of all of the proposed construction associated with the Millennium Project as indicated in Attachment A to this Agreement; and

WHEREAS, ANC, in consultation with the SHPO, NPS-GWMP, and the other Consulting Parties, has conducted efforts to identify historic properties located within the APE for the Project, as documented in the report *Summary of Information and Consultations for National Historic Preservation Act Section 106 Compliance, ANC Millennium Project* (2013); and

WHEREAS, ANC, in consultation with the SHPO has determined that the approximately 5653 foot long circa 1879 Seneca sandstone boundary wall (DHR Inventory No. 000-0042-0017; hereafter Boundary Wall) located both within ANC, and between ANC and Joint Base Myer-Henderson Hall (hereafter JBM-HH) is eligible for the National Register of Historic Places (hereafter NRHP) under Criteria A and C, for its association with the early development of ANC; and

WHEREAS, ANC administers 8.6 acres of a 20.7 acre forested area that contributes to the NRHP-listed Arlington House, the Robert E. Lee Memorial (DHR Inventory No. 000-0001; hereafter Arlington House) under Criterion A for association with military themes and Criterion C for its architectural merit; and

WHEREAS, ANC, in consultation with the SHPO, NPS-GWMP, and the other Consulting Parties has determined that the Project will have direct adverse effects upon an estimated 1235 foot portion of the Boundary Wall by demolishing it and will have an adverse effect upon less than 2.6 acres of the ANC administered forested area contributing to Arlington House; and

WHEREAS, ANC, in consultation with the SHPO, NPS-GWMP, and the other Consulting Parties has determined that the Project will have no adverse visual effects on historic properties; and

WHEREAS, ANC, in consultation with the SHPO, NPS-GWMP, and the other Consulting Parties has sought to minimize adverse effects to historic properties in design iterations reviewed by these parties in 2002, 2006, 2009, 2011, 2012, and 2013 for the Project which has resulted in designs reducing adverse effects to historic landscapes, through stream restoration, low visual profile, tree preservation, and avoidance of impacts to historic properties on NPS administered lands; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(1), ANC has notified the Advisory Council on Historic Preservation (hereafter ACHP) of its adverse effect determination providing the specified documentation, and the ACHP has chosen not to participate in the consultation pursuant to 36 C.F.R. § 800.6(a)(1)(iii) in a letter dated 24 July 2009; and

WHEREAS, ANC, in accordance with 36 C.F.R. § 800.2(c)(2), has invited the following federally recognized Indian tribes, for which ANC may have religious and cultural significance, to participate in consultation on this Project: the Absentee-Shawnee Tribe of Indians of Oklahoma, Cayuga Nation, Delaware Tribe of Indians, Eastern Shawnee Tribe of Oklahoma, Oneida Indian Nation, Oneida Tribe of Indians of Wisconsin, Onondaga Indian Nation, Saint Regis Mohawk Tribe, Seneca-Cayuga Tribe of Oklahoma, Seneca Nation of New York, Shawnee Tribe, Tonawanda Band of Seneca Indians of New York, Tuscarora Nation, Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians, and the Catawba Indian Tribe; and

WHEREAS, no federally recognized Indian tribes have indicated that they want to participate in consultation on this Project; and

WHEREAS, ANC, in accordance with 36 C.F.R. § 800.2(c)(3), has identified and invited Arlington County to participate in consultation on this Project as the local government and to sign this Agreement as a concurring party in accordance with 36 C.F.R. § 800.6(c)(3) and Arlington County has agreed; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(c)(1)(i), ANC, NPS-GWMP and SHPO are each a Signatory to this Agreement (hereafter referenced by name, as Signatory or collectively as Signatories); and

WHEREAS, ANC, in accordance with 36 C.F.R. § 800.2(c)(5) has identified and invited the following organizations to participate in consultation on this Project: the U.S. Commission of Fine Arts, the National Capital Planning Commission, Washington Headquarters Service, JBM-HH, the National Trust for Historic Preservation, Preservation Virginia (formerly the Association for the Preservation of Virginia Antiquities), the Virginia Council on Indians (hereafter VCI), the Arlington Historical Society, Inc., and the Historical Society of Washington DC; and

WHEREAS, Washington Headquarters Service, Preservation Virginia, the VCI, the Arlington Historical Society, Inc., and the Historical Society of Washington DC have not indicated that they want to participate in consultation on this Project; and

WHEREAS, VCI was dissolved by an act of the General Assembly effective 1 July 2012, and ANC shall consult directly, as necessary, with Virginia and Maryland state-recognized Indian tribes for which ANC may have religious or cultural significance; and

WHEREAS, the U.S. Commission of Fine Arts, the National Capital Planning Commission, JBM-HH, and the National Trust for Historic Preservation did participate in the development of the Agreement as Consulting Parties (referenced herein by name, as Consulting Party or collectively as Consulting Parties); and

WHEREAS, ANC has most recently responded to the interests of Consulting Parties through a series of meetings (13 September 2011, 22 May 2012, 28 August 12, 18 October 2012, 10 December 2012, 15 and 22 January 2013, 4 February 2013, 4 and 18 April 2013, 11 March 13, and 5 and 17 April 2013), and site visits (10 December 2012, and 16 March 2013), and has provided studies of the potential effects of the Project to historic properties to the SHPO and the other Consulting Parties, and

WHEREAS, ANC has sought and considered the views of the public on this undertaking as evidenced by a public notice and publication of a draft Environmental Assessment (EA) released 6 December 2012 as well as a revised EA released 12 March 2013, prepared and issued as part of ANC's compliance with the National Environmental Policy Act, that describes potential effects to historic properties and requests the public's comments, and ANC received these comments over a 30 day period, and replied to them as documented in the Environmental Assessment;

NOW, THEREFORE, ANC, NPS-GWMP, and SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.

STIPULATIONS

ANC shall ensure that the following stipulations are implemented:

I. Minimization of Adverse Effects Through Final Design Implementation

The Project developed over a period of more than ten (10) years producing no fewer than nine (9) design iterations. Over this period of time the successive designs have lessened the impacts to natural and cultural resources. The initial plan for the Project would have cleared all trees from ANC property (8.6 acres), created a nearly level ground surface distinct from surrounding areas, and channeled the stream into an underground culvert. The result of the initial design would have maximized burial and columbaria spaces, with the design adding more than 40,000 to ANC. The Final Design planned for implementation as of April 2013 includes just over 27,000 burial and columbaria spaces, but has lessened impact to all of these resources:

1. Reduces impacts to the forested landscape contributing to the Arlington House NRHP listing (hereafter Landscape) from 8.6 to less than 2.6 acres.
2. Creates a landscape that more closely fits the existing topography.
3. Preserves the open stream and restores the stream bed to a more natural channel, reversing the deep scouring which has resulted from heavy runoff from developed areas on ANC and JBM-HH.

4. Includes new plantings equaling or exceeding the number of trees felled for the Project.

II. Mitigation of Adverse Effects to the Forest Contributing to Arlington House

A. ANC shall allow and facilitate habitat surveys in cooperation with non-governmental organizations such as the Virginia Native Plant Society, and governmental organizations such as the Arlington County Department of Parks and Recreation to document the flora and fauna of the forest contributing to Arlington House, limited to ANC property. This effort shall be scheduled during the Spring and Summer of 2013.

B. ANC shall allow and facilitate relocation of plants or animals which might be threatened by environmental change resulting from the construction of the Project in cooperation with non-governmental organizations such as the Virginia Native Plant Society, and governmental organizations such as the Arlington County Department of Parks and Recreation. ANC shall ensure that all applicable permits have been obtained by the responsible party prior to allowing any handling or relocation of regulated species. This effort shall be scheduled during the Spring and Summer of 2013.

C. As a part of the Project ANC shall remove existing invasive species from all forested ANC property contiguous with the Project area, as well as affected stormwater work area on NPS property, per the specifications in Attachment B (hereafter the Plan). This treatment shall be implemented over not less than three and a half (3 ½) years and shall include no less than six (6) treatments.

D. Implementation of the Plan on NPS administered property shall not include ground disturbance (e.g., digging or pulling for root removal).

E. Within three (3) months of the execution of this Agreement, ANC shall provide printed copies of the Plan to SHPO and the other Consulting Parties for review and comment pursuant to the process outlined in Stipulation VIII.B. Within three (3) months after all comments from the SHPO and other Consulting Parties are received and incorporated, as appropriate, into the Plan, ANC shall provide one (1) copy each to the SHPO and other Consulting Parties of the finalized Plan in a format of the recipient's choice. ANC shall also make the Plan available to any interested groups or individuals upon request.

F. ANC shall include provisions in the construction contract for cross-sections of trunks of four trees specified below to be cut for use by Arlington County. ANC shall also, through written correspondence, offer four tree cross-sections of the trees listed below to the Virginia Department of Forestry. The specified tree cuts shall be labeled and set aside in a secure area on site for retrieval by Arlington County and the Department of Forestry at a mutually agreed upon date. The cross-sections shall be expressly and only for public education. The specified trees are as follows:

1. Tree 1024: 28" pignut hickory
2. Tree 1063: 32" chestnut oak
3. Tree 1258: 36" northern red oak
4. Tree 2027: 38" white oak

G. Within twelve (12) months of the execution of this Agreement ANC shall provide to the SHPO, NPS-GWMP, and the other Consulting Parties a draft design, proposed location, and text for an interpretive display for review and comment pursuant to the process outlined in Stipulation VIII.B., below. The interpretive display shall include appropriate signage bearing text and graphics interpreting the natural and cultural history of the Project area. Prior to completion of the Project, ANC shall, at its own expense, fabricate and install on its property within the Project area the interpretive display. ANC shall submit the draft design for the display to SHPO, NPS-GWMP, and the other Consulting Parties for their review and comment for a thirty (30)-day period, taking into consideration any comments. If the SHPO, NPS-GWMP, Arlington County, or any Consulting Party does not respond within the thirty (30)-day review period ANC may assume that the non-responsive party has no comment.

I. ANC shall avoid adverse effects to the remaining portions of the forest contributing to Arlington House outside the project footprint, leaving it in its natural state; however, invasive plant species and trees presenting hazards to persons or property may be removed within areas under ANC jurisdiction.

III. Documentation of the Boundary Wall (DHR Inventory No. 000-0042-0017) and Landscape

A. Within six (6) months of the execution of this Agreement, and before any demolition is to occur for the Project, ANC shall document the estimated 1235-foot portion of the Boundary Wall that will be demolished as a result of the Project. The documentation shall include, at a minimum, the following:

1. 3 ½" X 5" black and white photographic prints, and tagged image format files on archival quality disks. The number of photographs and drawings/graphics shall be appropriate to the scope and nature of the subject, but a minimum of ten (10) photographs and two plan view and cross-section drawings shall be produced. Photographs should be made of representative sections of the wall and the wall in context of landscape in the affected area.
2. Scale drawings from two representative locations of the wall in the affected area should include a plan view and cross-section.
3. A narrative history specific to the wall, with reference made to more extensive work on the general histories of ANC, Fort Myer/JBM-HH, and Arlington House referenced in *Summary of Information and Consultations for National Historic Preservation Act Section 106 Compliance, ANC Millennium Project* (2013).

4. Maps of historic configurations of the ANC boundary walls, copies of any available historical photographs, images or plans, the present configuration, and identification of the original portions of the Boundary Wall which remain.

B. Within six (6) months of execution of this Agreement, and before any construction is to occur for the project, ANC shall document the approximately 27-acre project area's Landscape. The documentation shall include, at a minimum, the following:

1. 3 ½" X 5" black and white photographic prints, and tagged image format files on archival quality disks. Photographs shall include, at a minimum, general contextual views of the approximately 27-acre Project area from various locations; any existing landscape features (e.g. Boundary Wall, streambed, etc.), and representative examples of tree and other vegetative growth. Photographs shall also be taken of any trees or vegetation that demonstrates an unusual species, size, and/or age. Two 8" X 10" black and white photographic prints of the overall 27-acre Project area, from two different locations, shall also be included.
2. An historical report discussing and describing the physical and contextual history of the 27-acre Project area, its current and past landscape character and use, its overall condition, and any landscape features, including structures and headstone use, and their condition(s). The historical report shall be written and organized in a format utilizing the National Park Service's guidance found in "Historic American Landscape Survey Guidelines for Historical Reports" (Robinson, Vernon, Laviorie; Revised July 2005).
3. A genus, species, and plant cultivars list and count (where appropriate) of vegetation located in the Project area.
4. Topographical site plan of the existing conditions on the 27-acre Project area that illustrates the locations of landscape features and is also tied to the vegetative genus/species list in item No. 3 above.
5. Copies of readily available historic photographs, historic aerial photographs, site plans, topographical maps, and other images, mapping, and visual documentation of the landscape and features of the 27-acre Project area.

C. ANC shall provide SHPO with the draft documentation on the Boundary Wall and Landscape for review and approval, and NPS-GWMP, and the other Consulting Parties for review and comment. The SHPO, NPS-GWMP, and the other Consulting Parties shall have thirty (30) days to comment on the documentation. ANC shall consider all comments received on the documentation. If the SHPO, Arlington County or any Consulting Party does not respond within the thirty (30)-day review period ANC may assume that the non-responsive party has no comment. Demolition of the Boundary Wall

shall not proceed until the documentation has been approved by SHPO, unless thirty (30) days have passed without comment from SHPO.

D. Once the final documentation for the Boundary Wall and Landscape has been approved by the SHPO, ANC shall provide the SHPO with two (2) bound archival hardcopies and one (1) electronic copy on disc of the documentation, and one (1) copy of the documentation to NPS-GWMP, and the other Consulting Parties in a format of the receiver's choice. ANC shall also provide one (1) hardcopy to the main Arlington County library for dissemination to the public. Within three (3) months of approval of the documentation by the SHPO, ANC shall also post electronic copies of the documentation on the ANC website. ANC shall provide the SHPO, NPS-GWMP, and the other Consulting Parties' confirmations in writing that the terms of this stipulation have been completed.

IV. Repair of the Boundary Wall (DHR Inventory No. 000-0042-0017) and Reuse of Salvaged Stone in the New Wall.

A. During the demolition of the Boundary Wall, ANC shall carefully salvage and store the Seneca sandstone and bluestone flag capping of the Boundary Wall for reuse in the new boundary wall constructed as a part of the Project. The salvaged material shall be used as cladding for the outside of the niche wall facing McNair Road, and for freestanding walls on portions facing the Old Post Chapel, as specified in Attachment C. Specifications for the storage and reuse of the materials from the deconstructed Boundary Wall are given in Attachment C, Section 02 42 91 "Removal and Salvage of Historic Building Materials", 1.1.2.

B. ANC shall conduct repairs or reconstruction, as necessary, of the remaining Boundary Wall within the Project using methods and measures specified in Attachment C, Section 04 01 00.91 "Restoration and Cleaning of Masonry in Historic Structures."

C. ANC shall notify and afford the SHPO, NPS-GWMP, and the other Consulting Parties to inspect the mock-up of constructed new boundary wall and repaired Boundary Wall specified in Attachment C, Section 04 01 00.91 "Restoration and Cleaning of Masonry in Historic Structures", 1.6.6. ANC shall transmit digital photos to the SHPO, NPS-GWMP, and the other Consulting Parties as well as allowing onsite inspection if desired. The inspection period shall be for a period of fifteen (15) days.

D. ANC shall construct the new boundary wall in a manner consistent with the plans included in Attachment C, sheets LS-301 and LS-302 dated 5 April 2013.

E. After construction of the Project is complete and the Millennium area becomes an active part of the cemetery ANC shall update the NRHP nomination form for the ANC Historic District and submit the update to the agency Federal

Preservation Officer with ANC's endorsement that the nomination should be forwarded to the National Park Service, National Register of Historic Places, for listing.

V. Post Review Discoveries

ANC shall ensure that the provisions in this Stipulation shall be included as a stipulation of all Project operations and contracts involving ground disturbance. Basic procedures and contact information shall be provided to project managers and supervisory contractors for on-site reference.

A. If previously unidentified, or unanticipated effects, to historic properties are discovered during excavation, construction, or utility installation, the supervisor shall immediately halt the excavation in the immediate area of the finding and notify the ANC Chief Engineer and CRM of the discovery and implement interim measures (e.g., surveillance, concealment) to protect the discovery from looting and vandalism. Discarded headstones and other items resulting from the routine operation of ANC which may be found shall not be regarded as "historic properties" for the purposes of this Agreement.

B. Immediately upon receipt of the notification required in Stipulation V.A., above, the CRM shall:

1. Inspect the work site to determine the extent of the discovery and ensure that the project manager and contractor supervisors know that construction activities with the potential to affect the historic property in question must be halted as a legal and contractual requirement;
2. Clearly mark the area of discovery and establish a 50 foot buffer between the discovery and ground disturbing activities;
3. Implement additional measures, e.g., surveillance or concealment as appropriate, to protect the discovery from looting and vandalism;
4. Have a professional archaeologist inspect the construction site to determine the extent of the discovery and provide recommendations regarding its NRHP eligibility and treatment; and
5. Within 48 hours of the discovery ANC shall notify the SHPO, NPS-GWMP, and other Consulting Parties, as appropriate, of the discovery and describe the measures that will be implemented within five working days.

C. Upon receipt of the information required above, ANC shall provide the SHPO, NPS-GWMP, and other Consulting Parties with its assessment of the NRHP eligibility of the discovery and the measures proposed to resolve adverse effects. In making its evaluation,

ANC in consultation with the SHPO may assume the discovery to be NRHP eligible for the purposes of Section 106. The SHPO, NPS-GWMP, and other Consulting Parties shall respond to the ANC assessment within 48 hours of receipt.

D. ANC will take into account the SHPO's, NPS-GWMP's, and other Consulting Parties' recommendations on eligibility and treatment of the discovery and carry out any appropriate required actions. ANC will provide the SHPO, NPS-GWMP, and other Consulting Parties with a report on the actions within two weeks of implementation.

E. Construction activities may resume in the area of the discovery once the Chief Engineer has determined that implementation of the actions undertaken to address the discovery pursuant to this Stipulation are complete.

F. Any disputes over the evaluation or treatment of previously unidentified historic properties will be resolved in accordance with Stipulation X ("Dispute Resolution") of this Agreement.

VI. Unidentified Human Remains Dating Prior to the Establishment of Arlington National Cemetery

A. ANC shall make all reasonable efforts to avoid disturbing non-ANC gravesites. ANC shall treat these in a manner consistent with the ACHP "Policy Statement Regarding Treatment of Burial Sites, Human Remains and Funerary Objects" (February 23, 2007; <http://www.achp.gov/docs/hrpolicy0207.pdf>) or ACHP policy in effect at the time remains and funerary artifacts are handled.

B. If the remains are determined to be of Native American origin, ANC shall comply with the provisions of the Native American Graves Protection and Repatriation Act (hereafter NAGPRA) (25 U.S.C. Sec 3001 et seq.).

C. If the unidentified non-ANC remains are determined not to be of Native American origin, ANC shall consult with the SHPO, NPS-GWMP, and other appropriate Consulting Parties. Prior to the archaeological excavation of any remains, the following information shall be submitted to the SHPO, NPS-GWMP, and other appropriate parties for consultation:

1. The name of the property or archaeological site and the specific location from which the recovery is proposed. If the recovery is from a known historic property, a state-issued site number must be included.
2. Indication of whether a waiver of public notice is requested and why. If a waiver is not requested, a copy of the public notice (to be published in a newspaper having general circulation in the area for a minimum of four weeks prior to recovery) must be submitted.

3. A copy of the curriculum vita of the skeletal biologist who will perform the analysis of the remains.
4. A statement that the treatment of human skeletal remains and associated artifacts will be respectful.
5. An expected timetable for excavation, osteological analysis, preparation of final report, and final disposition of remains.
6. A statement of the goals and objectives of the removal (to include both excavation and osteological analysis).
7. If a disposition other than reburial is proposed, a statement of justification.

D. ANC shall use reasonable efforts to ensure that the general public is excluded from viewing any Native American or other human remains or associated funerary artifacts. The parties to this Agreement shall release no photographs of any human remains or associated funerary artifacts to the press or general public subject to the requirements of the federal Freedom of Information Act, 16 U.S.C. 470w-3 of the National Historic Preservation Act, and other laws as applicable. ANC shall notify the appropriate federally-recognized Tribe(s) and/or state recognized tribes when burials, human skeletal remains, or funerary artifacts are encountered on the project, prior to any analysis or recovery. ANC shall deliver any Native American Indian human skeletal remains and associated funerary artifacts recovered pursuant to this Agreement to the appropriate tribe requesting their repatriation. The disposition of any other human skeletal remains and associated funerary artifacts shall be determined in consultation with the SHPO, NPS-GWMP, and other appropriate Consulting Parties.

VII. Professional Qualifications

All historical, archaeological, and architectural studies or treatment actions carried out pursuant to this Agreement shall be conducted by or under the direct supervision of an individual or individuals who meet, at a minimum, the Secretary of the Interior's *Historic Preservation Professional Qualifications Standards* (62 FR 33708-33722) in the appropriate discipline.

VIII. Preparation and Review of Documents

A. All archaeological studies, technical reports, and treatment plans prepared pursuant to the Agreement shall be consistent with the federal standards entitled *Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (48 FR 44716-44742, September 29, 1983), the SHPO's *Guidelines for Conducting Historic Resources Survey in Virginia* (October 2011), and the ACHP's *Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites* (1999) or subsequent revisions or replacements to these documents.

B. The SHPO, NPS-GWMP, and the other Consulting Parties agree to provide comments to ANC on all technical materials, findings, and other documentation arising from this Agreement within thirty (30) calendar days of receipt unless otherwise specified. If no comments are received from the SHPO, NPS-GWMP or any Consulting Party within the thirty (30)-calendar-days review period or period otherwise specified, ANC may assume that the non-responsive party has no comment. ANC shall take into consideration all comments received in writing from the SHPO, NPS-GWMP, and any Consulting Party to this Agreement within the thirty (30)-calendar-day review period.

C. ANC shall provide the SHPO three copies (two hard copies and one in Adobe Acrobat format (PDF) on compact disk) of all final reports prepared pursuant to this Agreement. ANC shall also provide NPS-GWMP three (3) printed copies and one (1) PDF on compact disk, and the other Consulting Parties a copy of any final report (in hard copy or Adobe Acrobat format, as requested) if so requested by that party. Such requests must be received by ANC in writing prior to the completion of construction of the Project.

IX. Curation Standards

ANC shall ensure that all original archaeological records (research notes, field records, maps, drawings, and photographic records) and all archaeological collections recovered from ANC property produced as a result of implementing the Stipulations of this Agreement are maintained in accordance with 36 C.F.R. § 79, *Curation of Federally Owned and Administered Archaeological Collections*.

X. Dispute Resolution

A. Objections by a Signatory or Consulting Party

1. Should any Signatory or Consulting Party to this Agreement object in writing to ANC regarding any plans provided for review pursuant to this Agreement, or should Signatory or Consulting Party to this Agreement object in writing to ANC regarding the manner in which measures stipulated in this Agreement are being implemented, ANC shall first consult with the objecting party to resolve the objection. If ANC determines that the objection cannot be resolved through such consultation, ANC shall then consult with the Signatories and Consulting Parties to resolve the objection. If ANC then determines that the objection cannot be resolved through consultation, ANC shall forward all documentation relevant to the objection to the ACHP, including ANC's proposed response to the objection. Within forty-five (45) calendar days after receipt of all pertinent documentation, the ACHP shall exercise one of the following options:

- a. Advise ANC that the ACHP concurs with the ANC's proposed response to the objection, whereupon ANC will respond to the objection accordingly; or

- b. Provide ANC with recommendations, which ANC shall take into account in reaching a final decision regarding its response to the objection; or
 - c. Notify ANC that the objection will be referred for comment pursuant to 36 C.F.R. § 800.7(a)(4), and proceed to refer the objection and comment. ANC shall take the resulting comment into account in accordance with 36 C.F.R. § 800.7(c)(4).
- 2. Should the ACHP not exercise one of the above options within forty-five (45) calendar days after receipt of all pertinent documentation, ANC may assume the ACHP's concurrence in its proposed response to the objection.
 - 3. The ANC shall take into account any ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; ANC's responsibility to carry out all actions under this Agreement that are not the subjects of the objection shall remain unchanged.

B. At any time during the implementation of the measures stipulated in this Agreement, should a member of the public object to ANC regarding the manner in which the measures stipulated in this Agreement are being implemented, ANC shall notify the Signatories and consult with the objector, taking their comments into consideration. The Signatories may request that the ANC notify the Consulting Parties to this Agreement about the objection as well.

XI. Efficient Communications

In accordance with Executive Order 13563 "Improving Regulation and Regulatory Review," and Executive Order 13589 "Promoting Efficient Spending," communications between signatories and concurring parties of this Agreement, and Consulting Parties discussed herein shall be in electronic form whenever practicable, permitted by law, and consistent with applicable records retention requirements. Unless the Consulting Party specifically requests the materials in another form (i.e., mail/hard copy).

XII. Review of Implementation

If the stipulations have not been implemented within three (3) years after execution of this Agreement, the Signatories and Consulting Parties shall review the Agreement to determine whether revisions are needed. If revisions are needed, the Signatories and Consulting Parties shall consult in accordance with 36 C.F.R. § 800 to make such revisions. Review of the implementation of the stipulations of this Agreement will take place at a minimum of every two (2) years until all stipulations have been implemented or the Agreement has been terminated.

XIII. Amendments and Termination

A. In accordance with 36 CFR §§ 800.6(c)(1) and (7), any Signatory may propose to ANC that the Agreement be amended, whereupon ANC shall consult with the other signatories to consider such an amendment. 36 C.F.R. § 800.6(c)(7) shall govern the execution of any such amendment. Any Signatory may terminate it in accordance with the provisions of 36 C.F.R. §§ 800.6(c)(1) and (8).

B. If ANC decides it will not proceed with the Project, it may so notify the Signatories and Consulting Parties and then this Agreement shall become null and void.

C. In the event that this Agreement is terminated or rendered null and void, ANC shall submit to the SHPO a technical report on the results of any archaeological investigations conducted prior to and including the date of termination, and shall ensure that any associated collections and records recovered are curated in accordance with Stipulation IX of this Agreement.

D. In the event of termination, ANC shall either execute a memorandum of agreement with the Signatories under 36 C.F.R. § 800.6(c)(1) or request the comments of the ACHP under 36 C.F.R. § 800.7(a).

XIV. Anti-Deficiency Act

ANC's future efforts to execute requirements arising from the stipulations of this Agreement are subject to the provisions of the Anti-Deficiency Act. If compliance with the Anti-Deficiency Act alters or impairs the ANC's ability to implement the stipulations of this Agreement, ANC shall consult in accordance with the amendment and termination procedures found at Stipulation XIII of this Agreement. No provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, Title 31 U.S.C. § 1341.

XV. Duration

This Agreement shall continue in full force and effect until five (5) years after the date of the last signature of a Signatory. At any time in the six (6)-month period prior to such date, ANC may request that the Signatories consider an extension of this Agreement. No extension or modification shall be effective unless all Signatories have agreed with it in writing.

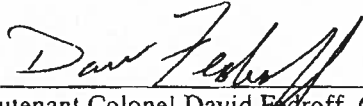
XVI. Signatures

This Agreement may be executed in counterparts, with a separate page for each signatory. Separate pages may also be provided for each concurring party. ANC shall ensure that each Signatory, Invited Signatory, and Consulting Party is provided with a copy of the fully executed Agreement.


Execution of this Agreement by the ANC, NPS-GWMP, and the SHPO, and its submission to the ACHP in accordance with 36 C.F.R. § 800.6(b)(1)(iv) shall, pursuant to 36 C.F.R. § 800.6(c), be considered to be an agreement with the ACHP for the purposes of Section 1 of the National Historic Preservation Act (16 U.S.C. § 470). Execution and submission of this Agreement and implementation of its terms, evidence that ANC and NPS-GWMP have afforded the ACHP an opportunity to comment on the proposed undertaking and its potential effects on historic properties, and that ANC and NPS-GWMP have taken into account the potential effects of the undertaking on historic properties.

SIGNATORIES:

ARLINGTON NATIONAL CEMETERY

By:  Date: 14 MAY 2013
Lieutenant Colonel David Fedoroff, Chief Engineer

NATIONAL PARK SERVICE – GEORGE WASHINGTON MEMORIAL PARKWAY

By:  Date: 6-3-13
Alexey Romero, Acting Superintendent

VIRGINIA STATE HISTORIC PRESERVATION OFFICE

By:  Date: 5/14/13
Ms. Kathleen S. Kilpatrick, Director

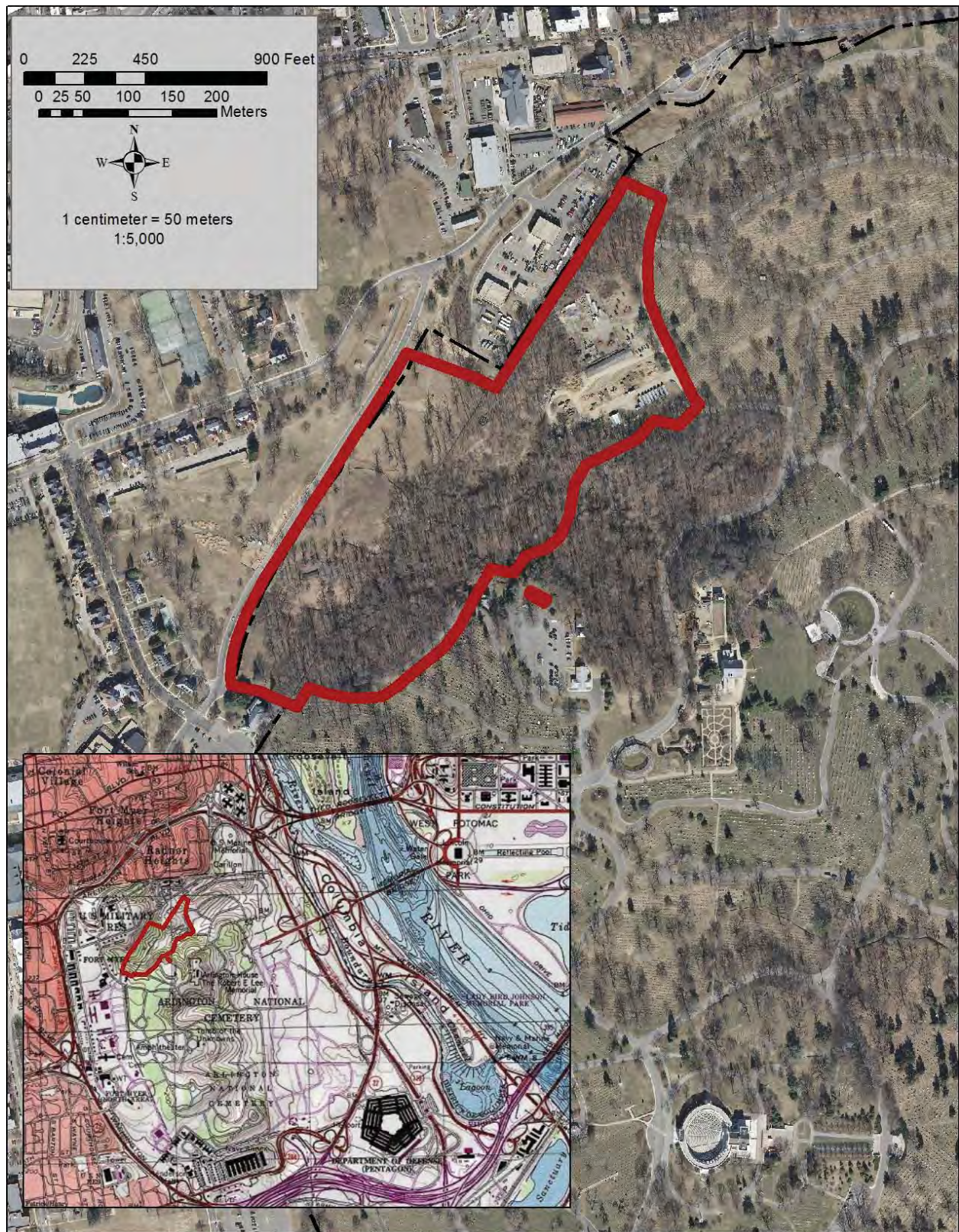
CONCURRING:

ARLINGTON COUNTY, VIRGINIA

By: _____ Date: _____
Barbara Donnellan, *County Manager*

ATTACHMENT A

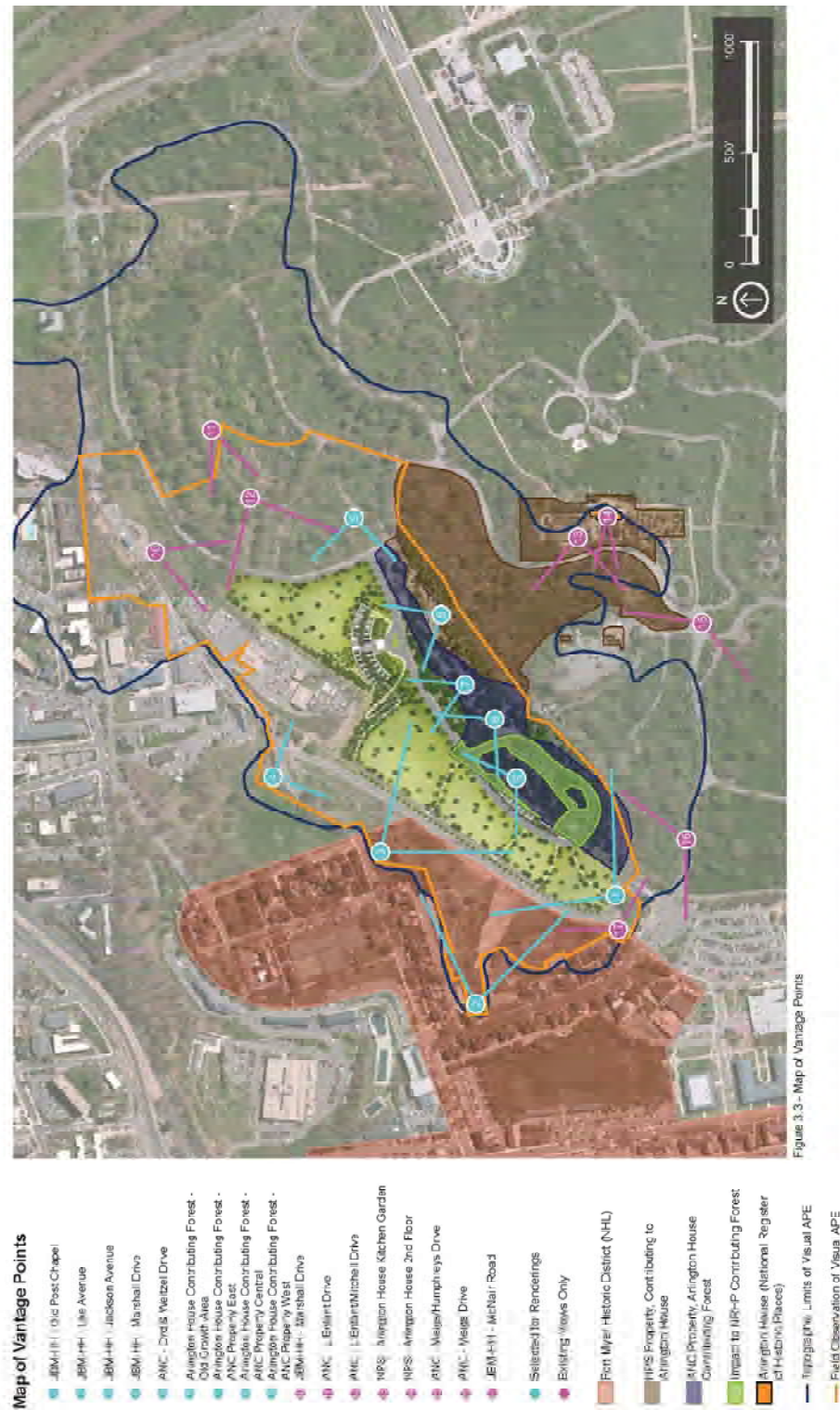
**ARLINGTON NATIONAL CEMETERY MILLENNIUM
PROJECT AREA of POTENTIAL EFFECTS and
ARCHITECTURAL DESCRIPTION**



Millennium Project Area and Location



Millennium Project – Direct (physical) Area of Potential Effects





U.S. Army Corps of Engineers
Norfolk District

Project Definition

Objectives of the Millennium Project include the following:

1. Provide additional interment capacity to Arlington National Cemetery
2. Create an environment in which the built environment conveys the respect and honor to those who served in the Armed Forces, and
3. Provide a place of peace and reflection for their families, loved ones, and visitors.

The Millennium project is located on a 27-acre site consisting of Section 29 of the existing ANC and the old picnic grounds of Joint Base Fort Myer / Henderson Hall (JBM-HH). As proposed, the project will provide approximately 27,200 new burial spaces, including:

Components	Burial Spaces (First Interment)
In ground full casket traditional spaces	1,276
In-ground full casket crypt spaces	6,271
In ground custom or oversize spaces	146
In ground site for cremation remains	3,189
Columbarium Niches	16,400
Total	27,282

In-ground full casket traditional spaces are provided in one section of undisturbed soil in a 5' x 10' grid. In addition, in-ground full casket burial spaces will be provided by pre-placed concrete crypts in two sections in a 3' x 8' grid, each with room for two full-size caskets placed in a double-depth fashion. In-ground custom or oversize spaces are included and vary by location, ranging from 5' to 8' in width to accommodate unusual burial requirements. In-ground spaces for cremation remains consist of undisturbed soil in a 5' x 5' grid. Following interment, the in-ground burial spaces shall be provided with the standard ANC white marble headstone, each 24" wide by 42" high and 4" - 6" thick by the cemetery.

Columbarium spaces are provided by pre-cast concrete niches with marble covers, each 12" wide by 15" high by 20" deep. Two columbarium types are proposed: Inward-Facing Columbarium Courts and the Perimeter Columbarium Wall.

Other Features and Amenities:

- Two (2) Committal Shelters
- Roadway and Maintenance Drive
- JBM-HH Perimeter Wall / Gate and Jogging Path / Streetlight Relocation
- Pedestrian Sidewalks
- Water Features at Columbarium A
- Site Furniture, including benches, waste receptacles, etc.
- Stream Restoration and Reforestation
- Utility Relocations and Extensions
- One (1) Unisex Restroom
- Storage Area / Informational Kiosk / Electric Vehicle Storage Area



U.S. Army Corps of Engineers
Norfolk District

Overall Design Approach

Design baseline is the Preferred Concept E from the *Second Charrette Report Arlington National Cemetery Millennium Site* final submittal dated July 2012.



Design Adjustments:

- Retain dense existing woodland buffer at east edge
- Utilize natural change in grade to design perimeter columbarium wall into the boundary of JBM-HH
- Greater saving of mature trees and larger areas for in-ground crypts
- Softened angle of road and path to conform more closely with natural topography
- Lower elevation of Inward-Facing Columbarium Courts to maintain more existing vegetation at the restored stream bed



**U.S. Army Corps of Engineers
Norfolk District**



Access and Site Improvements

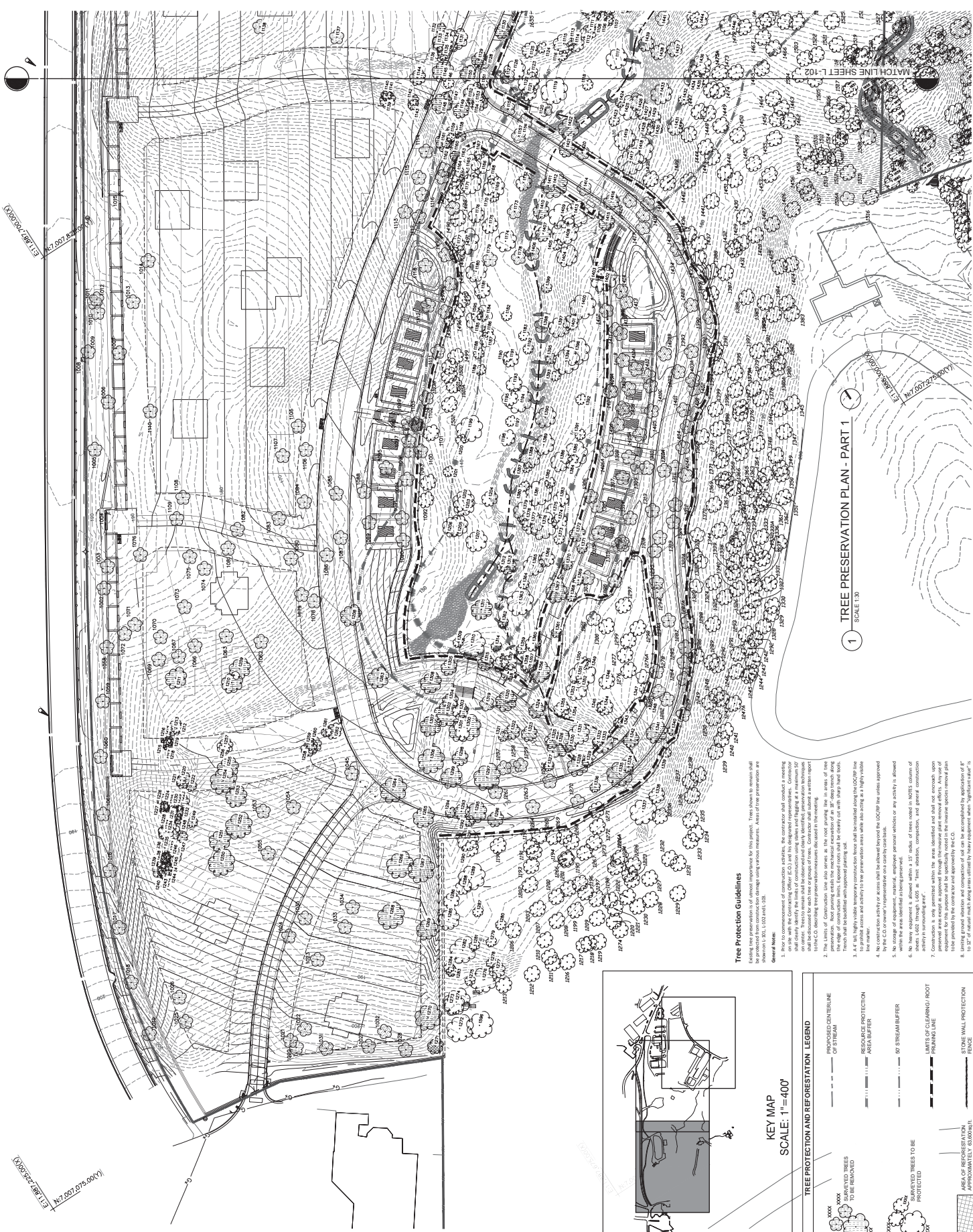
Access to the site will be provided from the northeast only, connecting to Ord & Weitzel Road and the existing ANC ceremonial funeral route. Access for individuals with disabilities will be provided from the main access roadway to the columbaria - turf areas are not fully accessible. In addition, three (3) existing maintenance buildings (10,797 Total SF) will be demolished.

As part of this project, the eroded channel that receives runoff from the National Park Service Headquarters parking lot, as well as some additional runoff from adjacent watershed areas, will be repaired. Through discussions between NPS staff and USACE, the basic elements of the repair will include:

- Underground stormwater detention in the grassed area located between the parking lot and the top of the slope.
- Repair of the eroded stream channel, from the existing pipe outfall down to the point where the markers are to be removed (by others), using Regenerative Step Pool Storm Conveyance (SPSC) techniques.

ATTACHMENT B

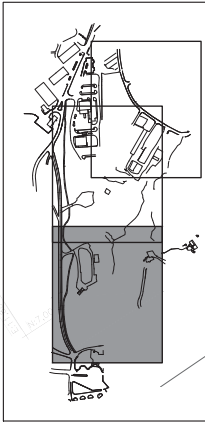
**TREE PRESERVATION PLAN and INVASIVE SPECIES
MANAGEMENT PLAN for the MILLENNIUM AREA of
ARLINGTON NATIONAL CEMETERY**



1 TREE PRESERVATION PLAN - PART 1
SCALE 1:30

Tree Protection Guidelines

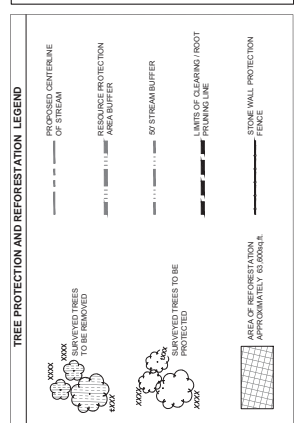
- [illegible]



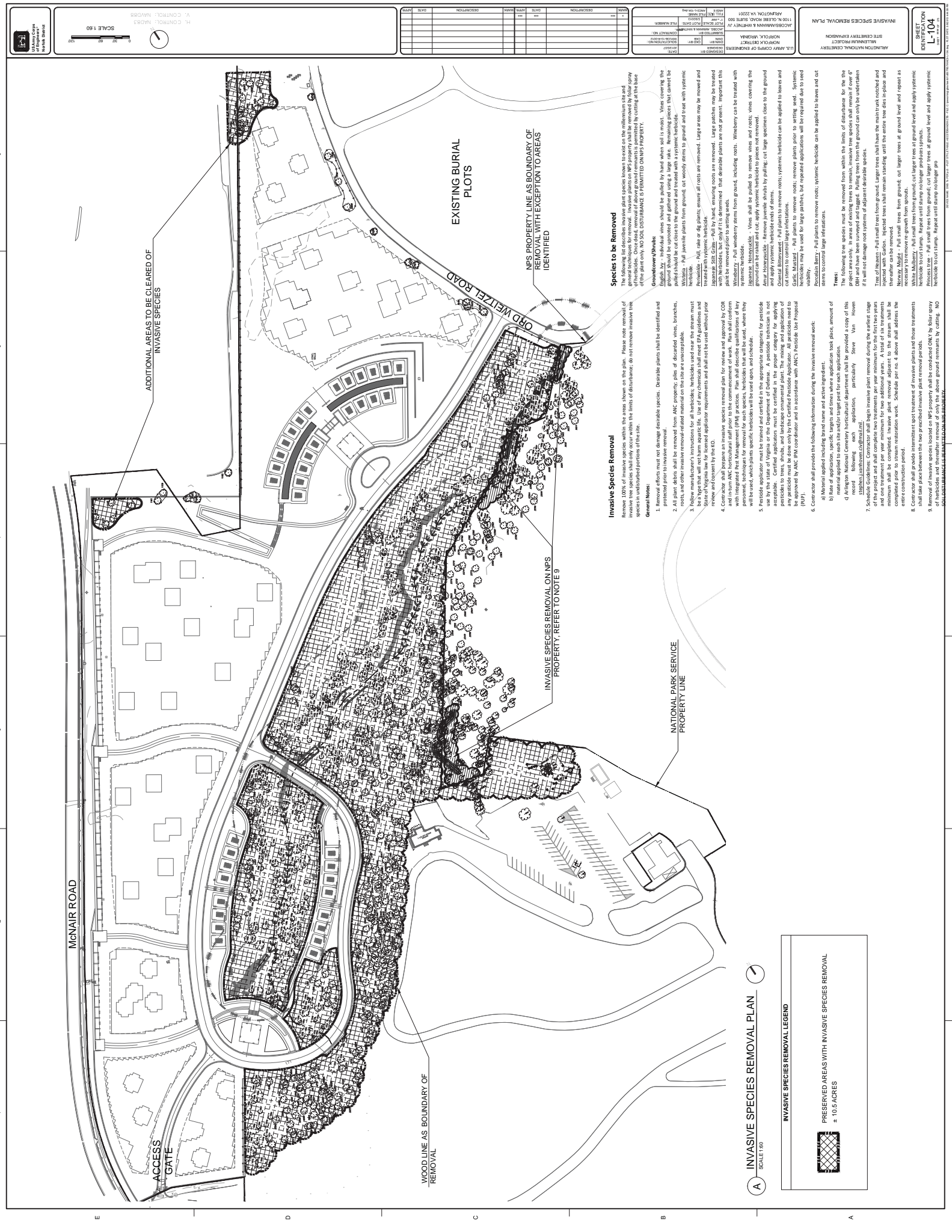
KEY MAP
SCALE: 1"=400'

TREE PROTECTION AND REFORESTATION LEGEND

-
- Diagram illustrating a stream restoration project layout. The diagram includes the following labeled components:
- PROPOSED CENTERLINE OF STREAM**: Indicated by a dashed line.
 - EXISTING CENTERLINE OF STREAM**: Indicated by a solid line.
 - RESISTANCE PROTECTION AREA BUFFER**: Indicated by a thick black line.
 - 50' STREAM BUFFER**: Indicated by a thick black line.
 - LIMITS OF CLEARING ROOT PRUNING LINE**: Indicated by a thick black line.
 - STONE WALL PROTECTION FENCE**: Indicated by a thick black line.
 - SURVIVED TREES TO BE REMOVED**: Represented by cloud shapes with 'X' marks.
 - SURVIVED TREES TO BE PROTECTED**: Represented by cloud shapes with 'X' marks.
 - AREA OF RECREATION APPROXIMATELY 6.80 ACRES**: Indicated by a hatched rectangular area.

[illegible]

KEY MAP
SCALE: 1"=400'

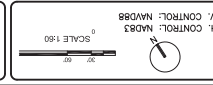


ATTACHMENT C

**SPECIFICATIONS for the DECONSTRUCTION of SECTIONS of
the BOUNDARY WALL and REUSE of MATERIALS in NEW
CONSTRUCTION**



GENERAL NOTES:
1) REFER TO STRUCTURAL DRAWINGS FOR WALL TYPE DELINEATION PLAN IN REGARD TO NON-FREESTANDING STONE WALLS.
2) APPLY SALVAGED SANDSTONE AND CAPSTONE AS VENEER TO MAINWALL SIDE OF COLUMBARIUM WALL.



	NOTED

DATE	NAME

NAME	DATE
ADDRESS	
CITY	
STATE	
ZIP	

D	CORPS OF ENGINEERS
B	
B	COLK DISTRICT
D	COLK, VIRGINIA
F	
52	SAWANN & WHITNEY JV
64	FREE ROAD, SUITE 500
F	STON, VA 22201

NATIONAL CEMETERY
ENNUIUM PROJECT
METEREY EXPANSION
S.S. GUARDRAIL AND
ING STONE WALL DE

SHEET
IDENTIFICATION
LS-302
SHEET NUMBER OF 273



INSTRUCTION ESTIMATES:
ALL LINEAR FEET OF WALL TO REMAIN: 1,035'
ALL LINEAR FEET OF WALL TO BE REMOVED: 125'
USE SEE SHEET GS-301 FOR LOCATIONS

FOLLOWING ESTIMATES ARE FOR BIDDING PURPOSES AND SHALL BE CONFIRMED BY THE CONTRACTOR:

1111 D CON | APSEN WALL | 80"

[illegible]

WIND PARTIALLY FALLEN OR DAMAGED SECTIONS: 125'

REPAIR WILL INCLUDE INSERTION OF STONE OR STONES INTO HOLES IN THE WALL, RE-POINTING OF SECTIONS, OR REBUILDING OF
PARTIALLY COLLAPSED SECTIONS

PARTIALLY COLOURED SECTIONS.

FACE MISSING COPING SECTIONS: 50"

GENERAL PRESERVATION NOTES:

1. PRIOR TO COMMENCEMENT OF CONSTRUCTION ACTIVITIES, INSTALL CHAIN LINK TREE PROTECTION FENCE AS SHOWN ON THE PLANS TO

PROTECT THE SECTIONS OF WALLS THAT WILL BE PRESERVED.

2. CAREFULLY DECONSTRUCT THE WALLS TO BE REMOVED. USE ONLY HAND TOOLS FOR THIS WORK. NO MACHINERY IS TO BE USED FOR

DECONSTRUCTION.

PLACED STONE SHALL BE CAREFULLY PLACED ON PALETTES AND STORED FOR USE IN CONSTRUCTION OF NEW WALLS AND REPAIR OF WALLS TO

AIN. CONTRACTOR SHALL COORDINATE STORAGE OF PALLETIZED STONE WITH COR.

CONTRACTOR SHALL SECURE THE SERVICES OF A HISTORIC MASONRY CONSULTANT WITH A MINIMUM OF TEN YEARS EXPERIENCE WITH

WORK RELATED TO THE WORK DESCRIBED.

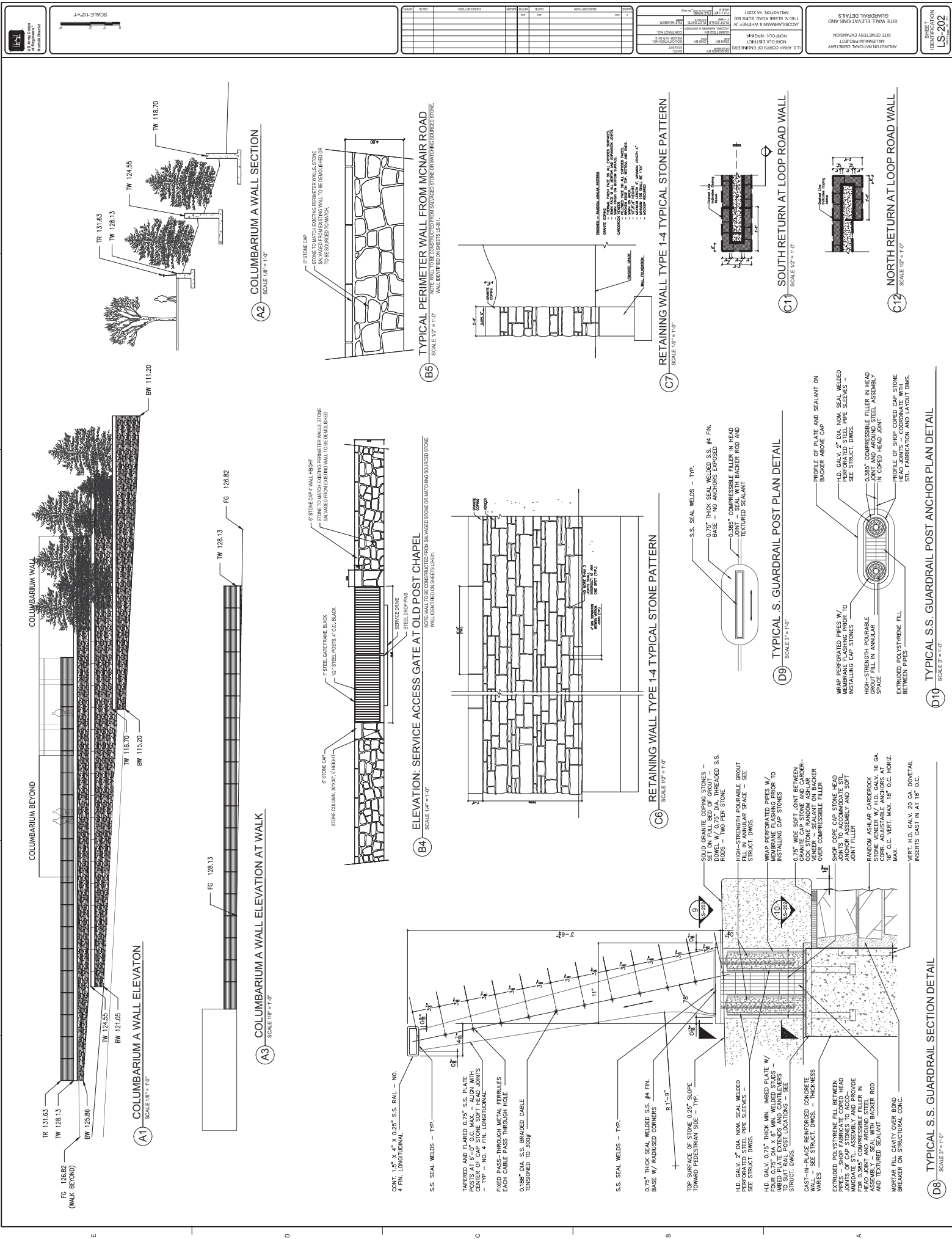
FOR REPAIR OF EXISTING SECTIONS OF WALL, INCLUDING COLLAPSED SECTIONS, CONTRACTOR SHALL USE MORTAR WITH PROPERTIES

CLOSELY MATCHING THE PHYSICAL PROPERTIES OF EXISTING MORTAR.

KIPAR V. CONJUNCTIONS OF THREE CLUSTERS WITH DIAGONAL APPLICATIONS OF THE FUSION RULE 1

1. NEWLY CONSTRUCTED SECTIONS OF WALL SHALL MATCH THE PHYSICAL APPEARANCE OF THE EXISTING WALL.

1. APPLY SALVAGED SANDSTONE AND CAPSTONE AS VENEER TO MCNAIR ROAD SIDE OF COLUMBARIUM WALL.



SECTION 02 42 91

REMOVAL AND SALVAGE OF HISTORIC BUILDING MATERIALS
05/10

PART 1 GENERAL

1.1 PROJECT DESCRIPTION

The work includes removal and salvage of identified historic items and materials, and removal of resulting rubbish and debris. General demolition of non-historic materials and removal of resulting rubbish and debris shall comply with the requirements of Section 02 41 00 DEMOLITION AND DECONSTRUCTION. Materials to be salvaged or recycled shall be stored daily in areas and manner specified by the Contracting Officer. In the interest of conservation, salvage and recycling shall be pursued to the maximum extent possible. Submit a Work Plan including procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged or recycled, dust control, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

1.1.1 Dust Control

The amount of dust resulting from removal, salvage and demolition operations shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water to control dust will not be permitted when it will result in, or create, damage to existing materials and hazardous or objectionable conditions such as ice, flooding, staining and pollution.

1.1.2 Protection

1.1.2.1 Protection of Existing Historic Property

Before beginning any removal, salvage or demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Take necessary precautions to avoid damage to existing historic items that are to remain in place, to be reused, or to remain the property of the Government. Repair or restore items damaged by the Contractor to original condition, or replaced, as approved by the Contracting Officer. Coordinate the work of this section with all other work and shall construct and maintain shoring, bracing and supports, as required. Ensure that structural elements are not overloaded and provide additional supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.1.2.2 Protection From the Weather

Salvaged historic materials shall be stored out of contact with the ground.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan; G.

1.3 QUALIFICATIONS

Provide qualified workers trained and experienced in removal and salvage of historic materials. Submit documentation of five consecutive years of work of this type with a list of similar projects identifying when, where, and for whom the work was done. A current point-of-contact for identified references shall be provided.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 SALVAGED ITEMS

Salvage items to the maximum extent possible. Prior to any demolition work, historic items to be salvaged shall be removed from the structure. Removal of salvageable items shall be accomplished by hand labor. Care shall be taken to not damage historic portions of the structure to remain or items identified for salvage. Furnishings, equipment, and materials not scheduled for salvage or recycling shall be removed prior to any salvaging procedures. Keep a complete recording of all salvaged materials including the condition of such materials before, and after, salvage operations.

3.1.1 Site Work

The following site items shall be removed intact and salvaged: Seneca Stone Rubble and Bluestone Cap Stones (Copings).

3.2 DISPOSITION OF MATERIALS

Title to materials to be demolished, except Government and using service salvage and historical items, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

3.2.1 Items Salvaged for the Government

Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage, crated and isolated in layers with compressible polyethylene sheets to protect the items from damage, or as directed by the Contracting Officer. Items damaged during removal or storage shall be repaired or replaced to match existing items. Crates shall be properly identified as to contents. The following items reserved as property of the Government shall be delivered to the areas designated: Seneca Stone Rubble and Bluestone Cap Stones (Copings).

3.3 CLEAN-UP

Upon completion of the work, portions of structure to remain and adjacent areas and structures shall be cleaned of dust, dirt, and debris caused by salvage and demolition operations. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

-- End of Section --

SECTION 04 01 00.91

RESTORATION AND CLEANING OF MASONRY IN HISTORIC STRUCTURES
05/12

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

It is the intent of this specification to protect historic structures to the greatest extent possible. Use the gentlest means to perform the work and take the greatest of care to ensure that the historic materials are not damaged in the process of the work. In addition to requirements in this section, comply with NPS Hist Prop.

Masonry is stone masonry for most or all work on this project. Exposed bond patterns range from random ashlar to rubble patterns. Reinstalled or reconstructed exposed masonry shall be built as approved to match or blend in to the aesthetic of the existing masonry to remain as determined by the Government.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100 (2001; Supplements 2002-2008)
Documentation of the Threshold Limit
Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM C1324 (2010) Standard Test Method for
Examination and Analysis of Hardened
Masonry Mortar

ASTM C144 (2011) Standard Specification for
Aggregate for Masonry Mortar

ASTM C1489 (2001; E 2008; R 2008) Standard
Specification for Lime Putty for
Structural Purposes

ASTM C170/C170M (2009) Standard Test Method for
Compressive Strength of Dimension Stone

ASTM C207 (2006; R 2011) Standard Specification for
Hydrated Lime for Masonry Purposes

ASTM C881/C881M (2010) Standard Specification for
Epoxy-Resin-Base Bonding Systems for
Concrete

ASTM E11 (2009; E 2010) Wire Cloth and Sieves for

Testing Purposes

ASTM E2659

(2009; E 2010) Standard Practice for
Certificate Programs

ASTM E96/E96M

(2010) Standard Test Methods for Water
Vapor Transmission of Materials

NATIONAL PARK SERVICE (NPS)

NPS Hist Prop

(1995) National Standards for the
Treatment of Historic Properties with
Guidelines for Preserving, Rehabilitating,
Restoring, and Reconstructing Historic
Buildings

NPS TPS Brief 1

(2000) Assessing Cleaning and
Water-Repellent Treatments for Historic
Masonry Buildings

NPS TPS Brief 2

(1998) Repointing Mortar Joints in
Historic Masonry Buildings

1.3 DEFINITIONS

Terms are defined below as applicable to this project.

1.3.1 Aggregates

The sand component of mortar.

1.3.2 Biocides

A chemical treatment meant to eliminate organic growth on the masonry units
and mortar and prohibit re-growth.

1.3.3 Binder

The component of mortar that binds together the aggregate particles into a
cohesive material.

1.3.4 Dispersed Lime Crack Injection

A repair method in which dispersed lime material is injected into small
hairline cracks by use of needle or syringe.

1.3.5 Dutchman

A repair method in which deteriorated stone is removed in part and replaced
with salvaged, harvested or new stone to make a seamless patch.

1.3.6 Insitu

A term referencing a repair procedure in which the masonry units and mortar
remain in place and are repaired without removal from the wall system

1.3.7 Joint Sealant

A flexible, chemical product that is used to create a weather-tight seal at

the boundary of masonry units with other units or dissimilar materials.

1.3.8 Lime Wash

A protective surface treatment comprised of calcium hydroxide particles in suspension in water, along with small amounts of calcium carbonate, silica particles and other minerals.

1.3.9 Mockup

Specific area on the building approved by Contracting Officer to demonstrate the contractor's ability to apply, match and install specified materials.

1.3.10 Mortar

A mixture of binders, aggregates, and pigments used for reconstruction, repointing or stucco applications.

1.3.11 New Elements

New, non-historic materials added to masonry structures to aid in their ability to resist loads (typically seismic) or to resist water infiltration.

1.3.12 Patch

The use of substitute repair materials to treat damaged or deteriorated masonry units insitu.

1.3.13 Remediate

The practice of restoring a historic masonry structure and its component materials with the intent to maintain the original fabric to the greatest extent possible.

1.3.14 Remove

Specifically for historic masonry materials, the term means to detach an item from existing construction to the limits indicated.

1.3.15 Replace

To reinstall an item in its original position (or where indicated) after remedial treatment, or to duplicate and reinstall an entire item with new material; with the original item serving as the pattern for creating the duplicate.

1.3.16 Repoint

To remove existing mortar joints to the specified depth and replace with a mortar that matches in color, texture, and performance with maximum breathability, bond, and flexibility to accommodate movement.

1.3.17 Retool

A repair method in which a chisel is used to re-create the surrounding stone texture finish by removing loose pieces of stone.

1.3.18 Test Panel

Specific area on the building approved by the Contracting Officer to demonstrate individual applicator competency in workmanship proficiency.

1.3.19 Tuckpointing

Often called skim-coating, an American practice of surface repairing mortar joints without the required removal of existing deteriorated mortar beneath. This practice is not recommended for mortar joint repair work on historic masonry. There is also an acceptable British form of tuckpointing practice that involves careful thin penciling of smaller joints within larger ones to give the wall the appearance of an ashlar finish.

1.3.20 Wall System

A term used to address the fact that masonry structures are comprised of different materials but function holistically, requiring that all restoration and cleaning process take into account the implications of the treatment to the adjacent materials and the site as a whole.

1.3.21 Masonry Treatment Requirement (MTR)

Defined treatments that are required by the specification (contract) documents for project specific repairs to masonry.

1.3.22 Saturated Surface Dry (SSD)

Defined as a condition of the wall surface after water has been applied and allowed to dry to a point with no standing water visible.

1.4 PRE-CONSTRUCTION CONFERENCE

Prior to beginning the work of this Section, convene a meeting with the Contracting Officer's Representative(s) to review the requirements of the Quality Control Plan, Project Training Program, installation procedures, location of required mockup areas, and all job conditions and processes. All subcontracting firms involved with this work shall participate in this meeting.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Plan; G

SD-02 Shop Drawings; G

Documentation

SD-03 Product Data

Repair Materials; G

Structural Upgrades; G

Cleaning and Restoration Methods; G
Cleaning Materials; G
Qualifications; G

SD-04 Samples

Mock-ups; G

SD-07 Certificates

Repair Materials; G

1.6 QUALITY CONTROL

Submit resumes for all historic masonry workers, demonstrating the minimum experience required. Product manufacturers, vendors, distributors, or suppliers of materials will not be permitted to offer on-site project training certificates or historic masonry consultation services.

1.6.1 Quality Control Plan

Prior to beginning restoration and cleaning work, submit a written Quality Control Plan. Include a separate section in the overall project Quality Control Plan specifically addressing this restoration and cleaning work. Do not proceed without written approval of the plan. At a minimum, include the items in the Quality Control Plan

- a. Describe methods of dust containment during the work specific to the restoration and cleaning work.
- b. Describe the methods of protecting surrounding construction, memorial and cemetery markers, columbariums, surrounding landscape, and adjacent bases and properties. Provide drawings of protection.
- c. Describe the work procedures, materials, and tools the contractor proposes to use for each MTR specified.
- d. Describe the sequence of each MTR.
- e. Describe how the sequence of MTR and the construction schedule changes as it relates to climate changes and protection of completed work.
- f. Describe the methods for surveying original layout and collecting datum points and plumb lines for rebuilding masonry.
- g. Describe the methods for shoring and providing a safe working environment.
- h. Describe the methods for select deconstruction of individual masonry units and tools for cleaning the masonry for reuse.
- i. Describe the method and approach to mortar joint removal.
- j. Describe the method and approach to cleaning mortar coating smears and old patching materials from the masonry surfaces.
- k. Describe, in detail, the procedures relating to techniques and tools proposed for masonry matching.

- l. Describe the complete masonry removal and matching procedures; include equipment, approach, length of time the masonry will be out of the wall, documentation on mapping the location, and where (on-site or in shop) the masonry units will be repaired.
- m. Describe the procedure for matching of different colors at different locations.
- n. Describe the procedure for mixing and matching of substitute repair materials.
- o. Describe the methods and system by which the use of reclaimed (salvaged) masonry units can be utilized.
- p. Describe the methods for setting masonry back into its original position and maintaining the original bond patterns and joint widths and profiles.
- q. Describe the methods of transition points where replacement /preservation work will meet the original historic work.

1.6.2 Qualifications

1.6.2.1 Historic Masonry Consultant

Secure the services of a historic masonry consultant with a minimum of 10 years experience applying NPS Hist Prop as they relate to the work in this section. Submit five relevant projects within that period that include how NPS Hist Prop was applied to the work of similar scope and scale and what jurisdiction or agency was involved in approving the work. The consultant's services include; investigating the condition of the masonry materials and mortar, arranging for material analysis in the laboratory, recommending appropriate cleaning methods and materials, recommending restoration options, providing project specific specifications, providing a training program and providing quality control services during construction.

1.6.2.2 Masonry Firm

The firm performing the masonry work shall have a minimum of five years experience on similar projects. The firm shall have completed work similar in material, design, and extent to that indicated for this Project and shall demonstrate a record of successful in-service performance. Proven implementation of NPS Hist Prop and related Preservation Briefs are required.

1.6.2.3 Field Supervision

Retain an experienced full-time supervisor on the project site at all times when masonry restoration is in progress. A single individual shall be responsible for supervising the historic masonry restoration work throughout the duration of the project.

1.6.2.4 Masonry Applicator

Employ craftspeople who are experienced with and specialize in restoration work of the types they will be performing. All masonry restoration treatments must be performed by a craftsperson that is familiar with historic masonry construction and has worked on historic masonry projects for at least five years. Only skilled journeyman masons who are familiar

and experienced with the materials and methods specified may be used.

1.6.3 Project Training Definition and Use

In addition to five years demonstrable experience on masonry restoration projects, offer workers project training certificate(s) within the framework of ASTM E2659. Project training certificates are earned by individual workers and issued with the understanding that they are for limited time use, enforceable only to this specific project and for a specific MTR. It is not necessary, nor a requirement of this specification, that all restoration workers obtain all project training certificates offered. Rather it is desirable that workers be trained for each project specific task they will perform to ensure the highest quality results from the cleaning and restoration program.

1.6.4 Documentation

Submit digital photographic documentation of the all phases of masonry restoration, including prior to the start of restoration work. Provide thorough photo documentation of the project and project details and targeted areas.

1.6.5 Cleaning and Restoration Mock-ups

1.6.5.1 Cleaning and Restoration Methods

Submit the cleaning and restoration methods, and materials selected for a specific structure for approval before work starts. Take into account the total construction system of the structure to be worked upon, including different masonry and mortar materials, as well as non-masonry elements which may be affected by the work. Utilize mockups to identify the appropriate cleaning and restoration treatment and materials and set the standard for each project task. Demonstrate the correct execution of the approved cleaning and restoration methods and materials during the workmanship training program within the framework of ASTM E2659.

1.6.5.2 Cleaning Products and Procedures

Establish cleaning products and procedures during the mockup process; proposing the least aggressive method used to achieve the desired level of clean. Where chemical products are proposed for cleaning, use them in accordance with the manufacturer's instructions and the environmental restrictions for the project.

1.6.6 Masonry Mock-ups

Submit mock-ups of each treatment proposed for use in the work. No masonry or mortar shall be used in the work until the mock-ups and the represented material and workmanship have been approved by the Contracting Officer. Materials shall be submitted and approved prior to the creation of mock-ups. The location for placement, size, and location of mock-ups will be as directed.

Mock-ups shall demonstrate the methods and quality of workmanship to be performed in each masonry treatment requirement (MTR). Provide a mockup for each MTR indicated and included in related specification Sections.

- a. Prepare mock-ups on existing walls under the same weather conditions expected during the remainder of the work.

- b. Throughout restoration, retain approved mock-up panels in undisturbed condition, suitably marked, as a standard for judging completed work.
- c. Review manufacturer's product data sheets to determine suitability of each product for each surface.
- d. Apply products using manufacturer-approved application methods, determining actual requirements for application.
- e. Obtain approval as to the preservation treatment approach, design, and workmanship to include, but not limited to the verification of all material applications and finishes as specified to the requirements of color, texture, profiles, and finishes before proceeding with work.
- f. Mock-ups: May be performed on inconspicuous sections of actual construction
 - (1) Location and number as directed.
 - (2) Size: 2 feet by 3 feet or as appropriate for the repair specified
 - (3) Repair unacceptable work.

1.6.6.1 Repointing

Repoint mortar joints, minimum acceptable mock up dimensions: twelve feet in length - 2/3 horizontal joints and 1/3 vertical joints. Demonstrate method for cutting out mortar joints, preparing wall for repointing, mixing mortar, installing mortar and curing the mortar. Prepare and place repointing mortar in accordance with NPS TPS Brief 2 and in compliance with NPS Hist Prop.

1.6.6.2 Retooling Stone Masonry Insitu

Demonstrate treatment technique and methods to retool three deteriorated stone faces insitu in all known historic profile textures identified. Finishes include, but are not limited to honed, rough dressed, and rock faces finishes.

1.6.6.3 Masonry Removal and Replacement

Fully remove masonry and replace to specified dimensions and texture. Select size of masonry units representing typical conditions. Return one masonry unit to same location, set to surrounding profile joint width and bond pattern. Set masonry unit using specified mortar. Confirm with Contracting Officer's Representative that the replacement masonry units meet specification requirements for matching and that sufficient quantity required for the work have been identified. Leave one stone dry-set into opening set on wood shims for evaluation and approval of preparation conditions.

1.6.6.4 Substitute Repair Materials

- a. Patching - Apply substitute repair material on at least two masonry units for repair. Include one masonry unit on which to demonstrate proficiency in removing previous patching material and repairing with new substitute repair material.

- b. Dutchman - Undertake dutchman repairs in two locations, including one that is only cut and prepared for application. Demonstrate the quality of the stone insert, as well as the workmanship and techniques to be performed in the dutchman repairs. Do not proceed with other dutchman repairs until the technique has been approved.

1.6.6.5 Crack Repair

Repair one crack, 2 feet in length, using mortar. Repair one crack, 2 feet in length, using dispersed hydrated lime injection technique with appropriate substitute repair material.

1.6.6.6 New Masonry Elements

Install new accessories in a manner demonstrating their final installation on the structure.

1.7 DELIVERY, STORAGE, AND HANDLING

Furnish cement in suitable bags used for packaging cements. Labeling of packages shall clearly define contents, manufacturer, and batch identification. Detergents, masonry cleaners, paint removers, solvents, epoxies and other chemicals used for masonry cleaning shall be in sealed containers that legibly show the designated name, formula or specification number, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Store materials in weathertight structures which will exclude moisture and contaminants. Accessories shall be stored avoiding contamination and deterioration. Admixtures which have been in storage onsite for six months or longer, or which have been subjected to freezing, shall not be used unless retested and proven to meet the specified requirements.

1.8 FIELD CONDITIONS

1.8.1 General Ambient Conditions

Masonry, mortar, and epoxy adhesives shall not be placed when weather conditions detrimentally affect the quality of the finished product. No masonry or mortar shall be placed when the air temperature is below 40 degrees F in the shade. When air temperature is likely to exceed 90 degrees F masonry and mortar shall have a temperature not exceeding 90 degrees F when deposited. Materials to be used in the work shall be neither produced nor placed during periods of rain or other precipitation. Stop material placements, and protect all in-place material from exposure, during periods of rain or other precipitation. Masonry surfaces shall be cleaned only when air temperatures are above 40 degrees F and will remain so until masonry has dried out, but for not less than 7 days after completion of the work.

1.8.2 Masonry Installation Conditions

Do not perform any masonry repointing unless air temperatures are between 40 degrees F and 95 degrees F and will remain so for at least 48 hours after completion of work. Phase repointing during hot weather by completing process on the shady side of the building or schedule installation of materials during cooler evening hours to prevent premature evaporation of the water from the mortar. Do not use frozen materials or materials mixed or coated with ice or frost. Do not lower the freezing

point of mortar by the use of admixtures or anti-freeze agents. Do not add chlorides to the mortar. Prevent repointing mortar from staining the face of the masonry or other exposed surfaces. Immediately remove all repointing mortar that comes in contact with such surfaces. Cover partially completed work when work is not in progress. Protect ledges and projections from mortar droppings. If the Contractor fails to protect against damage as a result of work of this Section, such damage shall be the Contractor's responsibility. The Contractor shall restore damaged areas to the complete satisfaction of the Owner at no expense to the Owner. Do not apply products under conditions outside manufacturer's requirements, which include:

- a. Surfaces that are frozen; allow complete thawing prior to installation.
- b. Surface and air temperatures below 40 degrees F.
- c. Surface and air temperatures above 95 degrees F.
- d. When surface or air temperature is not expected to remain above 40 degrees F for at least 48 hours after application.
- e. Wind conditions that may blow materials onto surfaces not intended to be treated.

1.9 WARRANTIES

1.9.1 Cleaning Warranty

Warrant cleaning procedures for a period of two years against harm to substrate (masonry and mortar) or to adjacent materials including, but not limited to, discoloration of substrate from improper procedures or usage, chemical damage from inadequate rinse procedures, and abrasive damage from improper procedures.

1.9.2 Repair Warranty

Warrant repair procedures, including repointing, for a period of two years against: discoloration or mismatch of new mortar to adjacent original historic mortar, discoloration or damage to masonry from improper mortar clean-up, loss of bond between masonry and mortar, fracturing of masonry edges from improper mortar joint preparation procedures or improper mortar formulation, and occurrence of efflorescence.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

Selection of appropriate cleaning products requires a clear understanding of the masonry materials to be cleaned, a rationale for the cleaning, and an understanding of the anticipated level of cleanliness expected from the cleaning program. Caution against over-cleaning of surfaces which may be detrimental, and which may remove desirable historic surface details or patinas. For example, if cleaning reveals unexpected conditions; suspend the cleaning action, protect the exposed area and notify the Contracting Officer. Research has determined that overly aggressive cleaning methods and materials can cause subtle, long-term damage to masonry units. Use products that have a minimum 5 year performance record on similar projects. Selection of the products shall be predicated on long-term negative effects to the masonry rather than current level of cleanliness of

the comparable structure.

2.1.1 Paint Removers

- a. Provide chemical paint removers which are manufacturer's water soluble, low toxicity products, effective for removal of paint on masonry without altering, damaging, or discoloring the masonry surface.
- b. Provide commercially available poulticing materials designed to adhere to and peel off paint without damaging the underlying masonry or project specific mixtures that include absorbent materials and cleaning solutions which can be demonstrated to do no harm to the masonry.

2.1.2 Biocides

Use biocides that are chemical treatments designed to remove organic growth from masonry. The manufacturer's literature for all biocides shall contain information on the product as well as the expected service life of the material and any detrimental effects it may have on the masonry or mortar.

2.1.3 Liquid Strippable Masking Agent

Liquid strippable masking agent shall be manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from the damaging effect of approved masonry cleaners.

2.1.4 Cleaning Implements

Furnish brushes that contain natural or nylon fiber bristles only. Do not use wire brushes. Scrapers and application paddles shall be made of wood with rounded edges. Metallic tools are not permitted.

2.1.5 Water

Obtain potable water from a local source. Filter to remove minerals resulting in a neutral pH, prior to application.

2.2 REPAIR MATERIALS

Use materials, physical and chemical properties, and composition of masonry and mortar in renovation work that match the original existing masonry and mortar to be repaired, unless samples and testing determine that existing mixtures and materials are faulty or non-performing. Masonry materials used for repair and renovation shall match the original existing historic materials as closely as possible in composition, color, texture, strength, size, finishing and porosity. Substitute repair materials for each condition shall be of one type and from one source, when used in repair treatments exposed to view.

2.2.1 Mortar

The replacement mortar shall coexist with the old in a sympathetic, supportive and, if necessary, sacrificial capacity. The replacement mortar shall have greater vapor permeability and be softer (measured in compressive strength) than the masonry units. The replacement mortar shall be as vapor permeable, and as soft, or softer, (measured in compressive strength) than the existing historic mortar. Measure water vapor transmission in accordance with ASTM E96/E96M.

2.2.1.1 Matching

Take test specimens of existing mortar from a sound and intact representative portion of the structure, at locations indicated by the Contracting Officer's Representative. The replacement mortar shall match the original existing material in color, texture and tooling. The sand shall match the sand in the original existing mortar by color, shape and particle size distribution as defined using ASTM C144; ASTM E11 sieves. Use of admixtures is subject to approval.

2.2.1.2 Binder Content of Historic Mortar

Historic mortars can represent four different binder types, or combination of them, depending on the time period of construction. A building constructed in the early 1800s is likely built with a straight lime putty binder type because the discovery of natural cement binder types had not occurred until the early 1820s. A building constructed in 1940 might be built with portland cement (1871) and hydrated lime (1930s). The historic binder types include: non-hydraulic lime (fat lime, lime putty or hydrated lime); hydraulic lime (feebly, NHL 2, moderately, NHL 3.5, and imminently, NHL 5.0); natural cement; and portland cement. The binder types are all derived from limestone. Each successive type is fired at higher temperatures in a kiln to the point of vitrification or liquid phase (2200-2800F) when Portland cement is developed. Lime can be slaked into a hydrate powder or putty form by adding water due to the lower firing temperatures (1650-2000F), while cement products must be crushed mechanically into a powder form before use. Each binder type has its own unique performance properties in relation to historic masonry units and the building wall design. A mortar formula made from lime putty (low compressive strength) will accommodate building movement in load-bearing masonry much more effectively than a portland cement formula of much higher compressive strength. Identify performance characteristics of the replacement mortar carefully based upon evaluation of the existing historic mortar. Each binder type or mixture of mortar shall have a cement, lime, or combination thereof consistent with the original existing mortar content in order to provide uniform durability, weathering characteristics, and the same, or better, life-cycle performance expectations.

2.2.1.3 Crack Injection

Comply with the dispersed hydrated lime manufacturer's written instructions. Inject cracks that are no greater than 1/8 inch in width and masonry is soundly bonded but cracked. Unless specifically instructed inject the full length of the cracks.

2.2.2 Replacement Masonry Materials

2.2.2.1 Replacement Stone

Replacement stone shall match in type, color, shape, size, texture and finish-profile the appearance of the existing historic stone units. Test replacement stone in comparison to the existing historic stone using ASTM C170/C170M. Where possible, stone salvaged from this site shall be used for repair of existing masonry walls.

2.2.3 Masonry Elements

2.2.3.1 Epoxy Anchor Adhesives

Use an epoxy-resin grout to bond stainless steel anchors to masonry. The grout shall be a 100 percent solids, moisture insensitive, low creep, structural adhesive. The epoxy shall conform to ASTM C881/C881M, Type IV; Grade and Class selected to conform to the manufacturer's recommendations for the application.

2.2.3.2 Metal attachments

Anchors for spall repairs shall be threaded or helical stainless steel, size as indicated.

2.3 EQUIPMENT

2.3.1 Cleaning Equipment

Cleaning equipment shall not cause staining, erosion, marring, or other damage or changes in the appearance of the surfaces to be cleaned.

2.3.1.1 Sandblasting

Sandblasting equipment is not allowed for cleaning masonry surfaces.

2.3.1.2 Water Blasting

Provide water blasting equipment including a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water re-supply equipment. Do not operate the equipment at a pressure which will cause etching or other damage to the masonry surface or mortar joints. Operate the equipment at a discharge capacity of 55 to 400 psi and 2.5 to 3 gpm for general surface cleaning operations. The water tank and auxiliary re-supply equipment shall be of sufficient capacity to permit continuous operations. Provide protective covers and barriers as required to prevent over-spray onto adjacent surfaces.

2.3.2 Spray Equipment

Spray equipment for chemical cleaners shall be low-pressure tanks or chemical pumps suitable for chemical cleaner indicated, and shall be equipped with stainless steel, cone-shaped spray-tip. Spray equipment for water shall disperse water through a fan-shaped spray tip at an angle of not less than 15 degrees. Spray equipment shall deliver water at a pressure not greater than 400 psi and at a volume between 2.5 and 3 gpm. Spray equipment for heated water shall be capable of maintaining temperature, at flow rates indicated, between 140 and 180 degrees F. Keep the spray-tip at a 10-inch minimum distance from the wall surface during operations.

2.3.3 Alternative Blasting Methods

Alternative blasting methods require equipment designed to discharge sponges, walnut shells, ice, soda and other friable materials. These are specially designed systems that must be operated in accordance with manufacturer's recommendations and maintained in good working order. Do not operate the equipment at a pressure which will cause etching or other damage to the masonry surface or mortar joints. Determine the discharge

capacity on a case by case basis during the mockup test panel demonstration and approval process. Provide protective covers and barriers as required to prevent over-spray onto adjacent surfaces.

2.3.4 Drilling Equipment

Use standard handheld masonry drills, commonly used for drilling small holes in concrete and masonry to drill holes in masonry for patch anchors and other applications. The drill shall be a small, powered, handheld type, using rotary drilling mode only. Impact and rotary impact type drills will not be allowed.

2.3.5 Compressed Air Supplies

Compressed air equipment shall deliver clean, oil and moisture free compressed air at the surface to be cleaned. The compressed air line shall have at least two in-line air filters to remove oil and moisture from the air supply. Test the compressed air supply during each shift for the presence of oil and moisture.

PART 3 EXECUTION

3.1 EVALUATION AND ANALYSIS

Undertake masonry renovation only after complete evaluation and analysis of the areas to be repaired are completed, including sampling and testing of the existing mortar to determine its composition and qualities. No repair work shall be undertaken until conditions that have caused masonry deterioration have been identified. Correct such conditions, if possible, prior to start of the work.

3.1.1 Mortar Analysis

Analyze existing original historic mortar before repointing in order to provide a match with the new repointing mortar. Historic mortars are usually softer than newer mortars, often using lime as a binder rather than cement. Lime for repointing mortar shall conform to ASTM C207, Type S, or ASTM C1489 unless otherwise specified. Full laboratory analysis of the existing mortar shall conform to ASTM C1324, and include methods for precise determination of the binder constituents. Field analysis of the existing mortar shall be as specified below.

3.1.2 Field (Insitu) Mortar Analysis

- a. Analyze the mortar composition and detect cracks, degradation and de-bonding from the surrounding masonry. Also determine previous surface coating treatments that may be contributing to the current conditions.
- b. Compare the bedding mortar with the pointing mortar and determine the cross-sectional characteristics of the wall.
- c. Determine the level of moisture movement in the insitu mortar, and if the mortar or masonry units are handling the brunt of the water movement through the wall.
- d. Assess the physical characteristics of the mortar and determine indirect compressive strength. Gather data on insitu mortar joint shear strength.

3.1.3 Taking and Preparation of Samples

Take and analyze samples of unweathered original historic mortar and different type of mortar in the structure in order to match the new mortar to be used for repointing. Remove three or four samples of each type of mortar to be matched with a hand chisel from several locations on the building. Set aside the largest sample for comparison with the repointing mortar. Place the remaining samples in labeled, sealed sample bags for transport to the laboratory.

3.1.3.1 Laboratory Mortar Analysis Equipment

Equipment for evaluating historic mortar in the lab includes physical preparation and analysis equipment such as scales, ovens, compression machines, sieves, sieve shakers and the like. All lab equipment should be calibrated and in good working condition. To accurately determine the binder constituents and proportions requires additional equipment such as high magnification microscopes to perform petrography, specialized ovens to perform Differential Thermal Analysis and specialized equipment to perform X-Ray diffraction analysis. This specialized equipment should be operated and the results analyzed only by trained, experienced personnel.

3.1.3.2 Laboratory Masonry Unit Evaluation Equipment

Equipment for evaluating masonry units in the lab includes physical preparation and analysis equipment such as scales, ovens, compression machines, freeze-thaw equipment, soaking chambers and the like. All lab equipment should be calibrated and in good working condition.

3.1.4 Binder Analysis

Subject a part of the historic mortar sample to Differential Thermal Analysis or X-ray Diffraction to determine the binder components.

3.1.5 Aggregate Analysis

Separate aggregate of the mortar sample from the binder by taking the crushed mortar sample and either gently blowing away the fine binder material, placing the crushed sample in a centrifuge, or chemically separating the aggregate from the binder. The separated aggregate shall be rinsed clean with water and dried. Examine the aggregate with a magnifying glass, and record the component materials as to range of materials, sizes, colors, as well as the presence of other materials. Perform sand analysis using a sieve analysis of the aggregate as part of the ASTM C1324 process.

3.2 PREPARATION

3.2.1 Material Handling and Associated Equipment

3.2.1.1 Mixing, Transporting, and Placing Job Materials

Provide equipment used for mixing, transporting, placing, and confining masonry and mortar placements capable of satisfactorily mixing material and supporting uninterrupted placement operations. Equipment used for mixing, conveying, and placing of materials shall be clean, free of old materials and contaminants, and shall conform to the material manufacturer's recommendations.

3.2.1.2 Associated Equipment

Provide associated equipment, such as mixer timing equipment, valves, pressure gauges, pressure hoses, other hardware, and tools, as required to ensure a continuous supply of material and operation control.

3.2.2 Protection

Protect persons, motor vehicles, adjacent surfaces, surrounding site features or buildings, equipment, and landscape materials from chemicals used and runoff from cleaning and paint removal operations. Erect temporary protection covers, which will remain in operation during the course of the work, over pedestrian walkways and at personnel and vehicular points of entrance and exit.

3.2.2.1 Worker Exposures

Exposure of workers to chemical substances shall not exceed the limits established by ACGIH 0100, or those required by a more stringent applicable regulation.

3.3 EQUIPMENT AND TECHNIQUES DEMONSTRATION

Demonstrate equipment and techniques of operation in an approved location. Dependable and sufficient equipment, appropriate and adequate to accomplish the work specified, shall be assembled at the work site in sufficient lead time before the start of the work to permit inspection, calibration of weighing and measuring devices, adjustment of parts, and the making of any repairs that may be required. Maintain the equipment in good working condition throughout the project.

3.4 MASONRY CLEANING

Historic materials shall not be damaged or marred in the process of cleaning. Cleaning shall conform to NPS TPS Brief 1. Protect open joints to prevent water and cleaner intrusion into the interior of the structure from pressure spraying. Protect non-masonry materials and severely deteriorated masonry by approved methods prior to initiation of cleaning operations. Masonry cleaning shall remove all organic and inorganic contaminants from the surface and pores of the substrate, without causing any short or long-term negative consequences. Surfaces shall be evenly cleaned with no evidence of streaking or bleaching. The cleaning process shall not affect the density, porosity, or color of the masonry or mortar. Cleaned masonry shall have a neutral pH. Use the gentlest methods possible for cleaning historic masonry to achieve the desired results. Make test patches to determine a satisfactory cleaning result. Cleaning shall proceed in an orderly manner, working from top to bottom of each scaffold width and from one end of each elevation to the other. Perform cleaning in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry. The cleaning materials, equipment, and methods shall not result in staining, erosion, marring, or other damage to the surfaces of the structure. Following an initial inspection and evaluation of the structure and surfaces, give the structure a surface cleaning which shall be completed prior to start of repair work, and sampling and testing of mortars. The work shall provide for the complete cleaning of all exposed masonry surfaces of the structures, removing all traces of moss, dirt, and other contaminants to allow determination of the masonry's color and shades, finish and texture, and other properties.

Following completion of the surface cleaning of the structure (or side of structure) the masonry shall be dried prior to the start of any repair work. The following sequence of methods shall be used to determine the least aggressive, effective cleaning method:

1. Water with brushes
2. Water with mild soap
3. Water with stronger soap
4. Water with stronger soap plus ammonia
5. Water with stronger soap plus vinegar (but not on calcareous masonry)

3.4.1 Test Patches

Demonstrate the materials, equipment, and methods to be used in cleaning in a test section approximately 3 feet by 3 feet. The location of the test section, and the completed test section is subject to approval. Adjust the cleaning process as required and the test section rerun until an acceptable process is obtained. Locate test patches in inconspicuous areas of the structures. The areas tested shall exhibit soiling characteristics representative of those larger areas to be cleaned. Also conduct tests on areas to be stripped of paint. Allow tested areas to dry before a determination is made on the effectiveness of a particular treatment.

3.4.2 Water Cleaning

3.4.2.1 Pressure Spraying

Spray apply water to masonry surfaces to comply with requirements indicated by test patches for location, purpose, water temperature, pressure, volume, and equipment. Unless otherwise indicated, the surface washing shall be done with clean, low pressure water (pressure of less than 55 psi and 2.5 to 3 gpm discharge) and the spray nozzle shall not be held less than 12 inches from surface of masonry. Water shall be applied side to side in overlapping bands to produce uniform coverage.

3.4.2.2 Hand Scrubbing

Scrub surfaces to be cleaned to remove surface contaminants. Pre-wet surfaces and use hand-held natural bristle or nylon brushes. Do not use wire brushes.

3.4.2.3 Rinsing

Rinse scrubbed surfaces clean of all contaminants and cleaning solutions with water in a low-to-moderate pressure spray, working upwards from bottom to top of each treated area. The rinsing cycle shall remove all traces of contaminants and cleaning solutions.

3.4.3 Chemical Cleaning

Chemical cleaning of historic masonry shall use the gentlest means possible to achieve the desired result as determined by test patches. Chemical cleaning is the use of any product in addition to water, including detergents, ammonia, and vinegar. Proceed in an orderly manner, working from top to bottom of each scaffold width and from one end of each elevation to the other. Cleaning shall result in uniform coverage of all surfaces, including corners, moldings, interstices and produce an even effect without streaking or damage to masonry. Do not apply chemical cleaners to the same masonry surfaces more than twice.

3.4.3.1 Surface Prewetting

Wet masonry surfaces to be cleaned with chemical cleaners with water using a low pressure spray before application of any cleaner.

3.4.3.2 pH Testing

Determine the pH of masonry surfaces which have been chemically cleaned using pH monitoring pencils or papers. Rinse chemically cleaned masonry of all chemical residues until a neutral pH (7) reading is obtained from the masonry surface.

3.5 MASONRY REPAIR

Match repaired surfaces with adjacent existing surfaces in all respects. Proceed with masonry repair only after the cause of deterioration has been identified and corrected. Demonstrate the materials, methods and equipment proposed for use in the repair work in test panels. The location, number, size and completed test panels is subject to approval. Use products in accordance with the manufacturer's instructions.

3.5.1 Deterioration Investigation

Perform a field investigation, conducted by the historic masonry consultant, to determine the causes and extent of degradation. To facilitate the investigation utilize the following techniques.

- a. Employ a field microscope to closely assess the conditions at the surface of the mortar and masonry units. Determine the mortar composition, detect cracks and assess for degradation and debonding from the surrounding masonry. Detect previous surface coating treatments on the mortar and masonry that may be contributing to the current conditions. Employ a boroscope to examine mortar deeper in the joint. Compare the bedding mortar with the pointing mortar and ascertain the cross-sectional characteristics of the wall.
- b. Employ moisture meters to determine the level of moisture in the mortar and masonry, and if the mortar or masonry units are handling the brunt of the water movement through the wall. Infrared thermography, employed by a trained investigator, can provide additional information on the moisture conditions. Employ rilem tubes to determine the rate of water uptake into the masonry. To access the physical characteristics of hard mortar, use a spring loaded impact device to determine indirect compressive strength. For evaluating softer mortars, mortar integrity deeper in the wall, and the condition of the masonry units, a drill resistance tool shall be employed by an experienced consultant.

3.5.2 Repointing Masonry

Repoint masonry in accordance with NPS TPS Brief 2.

3.5.2.1 Wall Preparation

Remove old caulking, grout, or non-original mortar from previously repaired joints to a minimum depth of 2.5 times the width of the joint. Cut all joints (unless otherwise noted) back to sound, solid, back up material. Leave a clean, square face at the back of the joint to provide for maximum

contact of repointing mortar.

- a. Shallow or feather edging is not permitted. Remove loose particles from joints. Clean joints, followed by blowing with filtered, dry, compressed air or vacuum.
- b. Existing joints shall not be cut out using power tools. All joints must be removed by hand using a hammer and chisel.
- d. Remove existing mortar using only small-headed chisels that are no wider than half the width of the existing masonry joints.
- e. Do not widen the existing masonry joints. The surrounding masonry edges shall not be spalled or chipped in the process of mortar removal. Damage to surrounding masonry units is not permitted. Replace all masonry units damaged during mortar removal with replacement units that match the original.
- f. Do not permit applicators to be trained at the project site in this masonry treatment requirement.

3.5.2.2 Mixing and Installation

Repointing mortar shall be pre-blended in single containers in a factory-controlled environment; Type L, Type O and Type K. Ensure appropriate material proportions as regards to the affect of moisture content on the individual components (cement, sand and lime. Batch materials using volumetric measurement devices (not shovels) and consistently consolidate the material in these devices to ensure the uniformity of the mortar.

a. Batching

- (1) Utilize a calibrated measuring device for batching portland cement.
- (2) Utilize a calibrated measuring device for batching hydrated lime or lime putty.
- (3) Utilize a calibrated measuring devices for batching the sand.

b. Cement and Lime Proportions: Fill the measuring device with portland cement, hydrated lime or lime putty.

- (1) Briskly strike the bottom of the measuring device against the ground a minimum of ten times and then strike the top flush.
- (2) For dry hydrate lime, fill the measuring device using a minimum of 3 lifts, strike the bottom of the measuring device against the ground a minimum of ten times and then strike the top flush. Dry hydrate lime experiences a significant volumetric loss when converted to a wet paste during mixing; therefore, add additional 25 percent dry hydrate lime to the formulation.
- (3) For lime putty briskly strike the bottom of the measuring device against the ground a minimum of ten times and then strike the top flush. No additional lime is required when measuring from putty.

c. Sand Proportions

- (1) Proportion sand when the sand is in saturated surface dry (SSD), loose damp condition.
- (2) Proportion the sand by filling a measuring device using a minimum of 3 lifts, striking the sides a minimum of ten times, and then striking the top flush.

3.5.3 Presoaking Masonry / Mortar Consistency / Lifts

Use the same mortar as the repointing mortar for setting the replacement masonry. Soak exposed surfaces of historic masonry adjacent to joint with water prior to repointing. Allow time for excess water to run off and evaporate prior to repointing. Joint surfaces shall be damp but free from standing water. Maintain a water sprayer on site at all times during the repointing process. The mortar material shall resemble the consistency of brown sugar during installation. This drier consistency enables the material to be tightly packed into the joint, allows for cleaner work, and prevents shrinkage cracks as the mortar cures. Point joints in layers or "lifts" where the joints are deeper than 1-1/4 inch. Apply in layers not less than 1/2 the depth but not more than 1-1/4 inch or until a uniform depth is formed.

3.5.4 Compression / Joint Finish / Curing

- a. Compress each layer thoroughly and allow it to become thumbprint hard before applying the next layer.
- b. When mortar is thumbprint hard at the surface of the wall, finish the joints to match the original historic joint profile. Allow water evaporation from the freshly repointed walls in order to initiate the carbonation process in high lime content mortars. The carbonation of lime mortar initially requires wet-and-dry cycles, which can be created by water misting the joints after the mortar application when dry weather conditions prevail. Finish the joint profile before these cycles are started. Depending on the environmental conditions (temperature and humidity), carry out water misting until a full nine alternating wet-and-dry cycles are completed.
- c. Adjust curing methods to ensure that the repointing mortar is damp without eroding the surface of the mortar.

3.5.5 Protection

Keep the mortar from drying out too quickly or from becoming too wet. Protect it from direct sun and high winds for the first 72 hours after installation or from driving rain for the first 24 hours, using plastic sheeting if necessary. Be careful not to create a greenhouse effect by sealing off air movement in an attempt to protect the wall with plastic. Allow for air circulation to facilitate the carbonation process.

3.5.6 Retooling Stone Masonry Insitu

Scale off all loose pieces of original stone from masonry intended to remain in place, including surface material in powder or granular form and detachments of planer elements, spalls and chips. Sound all stone on building by using the "ring test method" in order to distinguish fully intact stone from those in which delamination may be hidden or pieces of unstable material may not be immediately visible. Any stone that is designated for retooling insitu can become a candidate for removal if,

after chiseling is completed, the solid stone substrate is no longer in plane or plumb with the surrounding stone masonry surfaces.

3.5.7 Masonry Removal and Replacement

Before removing any deteriorated masonry units, establish bonding patterns, levels and coursings. Remove masonry that has deteriorated or is damaged beyond repair, as determined through investigation and evaluation. Carefully demolish or remove entire units from joint to joint, without damaging surrounding units in a manner that permits replacement with full-size units. Support and protect remaining masonry work that surrounds removal area. Maintain adjoining construction in an undamaged condition. Notify Contracting Officer of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items. Remove as many whole masonry units as possible without damage.

- a. Remove mortar, loose particles, and soil from masonry by cleaning with hand chisels, brushes, and water.
- b. Remove sealants by cutting close to masonry units with utility knife and cleaning with solvents. Clean surrounding masonry areas by removing mortar, dust, and loose particles in preparation for replacement.
- c. Replace removed masonry with harvested masonry units, where possible, or with new masonry units matching the existing units. Butter vertical joints for full width before setting and set units in full bed of mortar, unless otherwise indicated. Remove mortar used for laying/setting masonry units before mortar sets to the repointing depth of the surrounding area. Repoint new mortar joints in repaired area to comply with requirements for repointing existing masonry units.
- d. If a few isolated masonry units are to be replaced, remove each without disturbing the surrounding masonry. Remove deteriorated masonry units and mortar requiring replacement by hand chiseling. Do not damage adjoining masonry units during the removal of deteriorated units and mortar.
- e. Test the new element for fitting into its space without mortar. If wedges are used to support and align the new unit, cover them with at least 1-1/2 inches of mortar when pointing is complete.
- f. Cover the four sides and back of the space with sufficient mortar to ensure that there will be no air spaces when the new unit is set. Line up and set the new unit by tapping it into place with a wooden or rubber mallet. Align the face of new unit with that of existing masonry.
- g. Repoint joints to match the rest of the wall after new units have been properly installed and adjusted.
- h. Clean replacement areas with a non-metallic brush and water to remove excess mortar.

3.5.8 Substitute Material Repair

Repair or replace original historic masonry materials only if surfaces are extensively deteriorated (surface missing to a depth of 4 inches or more)

or are threatening the safety of the structure or individuals. Deteriorated surfaces shall be removed and repaired or replaced only upon approval. Repairs and replacements shall match the materials, colors, and finish of the existing historic masonry as closely as possible. Use material salvaged from the site when and where possible.

3.5.8.1 Areas To Be Removed

Remove unsound, weak, or damaged masonry and mortar in areas as indicated. Loose particles, laitance, spalling, cracked, or debonded masonry and mortar and foreign materials shall be removed with hand tools unless otherwise noted. Surfaces prepared for repair shall be cleaned free of dust, dirt, masonry chips, oil or other contaminants, rinsed with water, and dried before repair work is begun. Protect surfaces of the structure, and surfaces adjacent to the work area from damage which may result from removal, cleaning, and repair operations.

3.5.8.2 Application of Substitute Repair Materials

Place substitute repair materials to rebuild spalled or damaged areas to match the original surface finish, level, texture, bonding patterns, color and porosity. Match the finished appearance of the substitute repair material patch with the adjacent existing surface. Apply samples to the masonry units insitu.

- a. Substitute repair material shall not be installed in thicknesses exceeding 2 inches. Masonry repairs in excess of 2 inches thick shall utilize a Dutchman repair approach or replacement unit.
- b. Remove all loose mortar and masonry prior to installation of the substitute repair material. "Sound" the masonry with a hammer to verify its integrity. If necessary, cut away an additional 1/2 inch of the masonry substrate to ensure the surface to be repaired is solid and stable.
- c. Remove any sealant residue. Cut out used anchors, threaded rod anchors and/or dowels within the damaged masonry area. Any anchors that are free of rust, solidly embedded, and do not project beyond the solid masonry surface may remain.
- d. Using clean water and a scrub brush, clean all dust from surface and pores of the substrate.
- e. Pre-wet the substrate with water prior to the application of the repair material to prevent the substrate from drawing out the moisture too quickly. Re-wet the surface with water again immediately before applying the repair material. Use approved methods to deliver the substitute repair work as demonstrated.
- f. Follow manufacturers' instructions pertaining to the placement of materials. If the manufacturer requires that installers of a specified product be trained, provide this documentation to the Contracting Officer. Training certificates previously issued by product companies for the application of specified products cannot be substituted for the Project Training "Substitute Repair Material Certificate" on this project.

3.5.8.3 Masonry and Substitute Material Repair Finishes and Color

Match the exposed surfaces of masonry and substitute material repair finish, color, texture, and surface detail with the original surface. Mechanical finishing and texturing may be required to produce the required finish and appearance. The finishing and texturing shall conceal bond lines between the repaired area and adjacent surfaces. The texturing shall provide replication of all surface details, including tooling and machine marks. Use low-impact energy type equipment in finishing and texturing, which will not weaken the patch or damage the patch bond and the adjacent masonry.

3.5.8.4 Patch Anchors

Provide patch anchors to ensure that the patch is tied to the existing masonry structure at a frequency of at least one patch anchor per 4 square inches of patch plan surface area; specific locations for patch anchors shall be as indicated. Use small handheld, low-speed rotary masonry drills to produce holes in the existing masonry, within the limits for the patch anchor installation.

3.5.8.5 Holes

Drill holes into the existing substrate material of the masonry using rotary (non-hammer) drills. Holes shall have a diameter of 1/8 inch larger than the anchor diameter. The holes shall be drilled to a depth of 4 inches, except as otherwise indicated or directed. Drill holes shall not penetrate completely through the masonry, and shall provide at least 1 inch of cover around the drill hole. Holes shall be cleaned by water blasting to remove drill dust and other debris and then blown dry with filtered, dry, compressed air. Drill holes shall be conditioned in accordance with the epoxy adhesive manufacturer's recommendations.

3.5.8.6 Anchor Installation

Clean anchors to remove all contaminants which may hinder epoxy bond. Epoxy adhesive shall be pressure injected into the back of the drilled holes. The epoxy shall fill the holes without spilling excess epoxy when the anchors are inserted. Insert anchors immediately into the holes. The anchors shall be set back from the exterior face at least 1 inch. Install anchors without breaking or chipping the exposed masonry surface. Where voids exist in the masonry units or between the wythes, use socks to contain the epoxy.

3.5.8.7 Cleanup

Remove excess epoxy and spills from the surface of the masonry. Leave the surface of the masonry in a clean and uncontaminated condition. Remove spills on adjacent surfaces and repair surfaces as required.

3.5.8.8 Dutchman Repairs

Select stone for Dutchman repairs from the following three sources listed in order of priority: 1) stone harvested from the same elevation and stone type; 2) approved salvaged stone; 3) new stone made from a similar stone type. Fit the new piece into place with tolerances of no more than plus or minus 1/16-inch. Provide supporting rods of stainless steel as necessary for the extent of the repair and the location. Closely blend repairs in with the surrounding original materials.

3.5.9 Crack Injection

3.5.9.1 Application of Dispersed Hydrated Lime (DHL)

Notify the Contracting Officer as to when and where the installation will occur at least 48 hours prior to start. Provide samples to the Government representative from the dispenser during the course of the injection. Apply in accordance with the manufacturer's instructions.

- a. Drill 1/8-inch diameter, downward-sloping injection holes. For transverse cracks less than 3/8 inch wide, drill holes through center of crack at 1 to 1.5 inches on center.
- b. Clean out drill holes and cracks with compressed air and distilled water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.
- c. Inject Dispersed Hydrated Lime through holes sequentially, beginning at one end of area and working to opposite end. Where possible begin at lower end of injection area and work upward. Inject Dispersed Hydrated Lime until it extrudes from adjacent holes. After Dispersed Hydrated Lime has set, remove excess material and patch injection holes and surface of cracks with appropriate surface treatment.

3.5.9.2 Tools and Equipment

Do not use tools and equipment in the work that have not been cleaned of set dispersed hydrated lime.

3.6 NEW ELEMENTS

Evaluate new materials and components for both functional and aesthetic impacts on historic structures.

3.6.1 Structural Upgrades

Mechanical anchors used to reinforce masonry structures shall be designed by a registered professional structural engineer. It is critical that such strengthening measures take into account the current loads and stresses in the structure and the nature in which the structure has historically managed thermal and other environmental changes or cycles. Submit manufacturers literature, design analysis and detail drawings for the proposed additional materials.

3.7 FINAL CLEANING

No sooner than 72 hours after completion of the repair work and after joints are sealed, faces and other exposed surfaces of masonry shall be washed down with water applied with a soft bristle brush, then rinsed with clean water. Discolorations which cannot be removed by these procedures, shall be considered defective work. Perform cleaning work when temperature and humidity conditions allow the surfaces to dry rapidly. Protect adjacent surfaces from damage during cleaning operations.

3.8 PROTECTION OF WORK

Protect work against damage from subsequent operations.

3.9 DEFECTIVE WORK

Defective work shall be repaired or replaced, as directed, using approved procedures.

3.10 FINAL INSPECTION

Following completion of the work, inspect the structure for damage, staining, and other distresses. The patches shall be inspected for cracking, crazing, delamination, unsoundness, staining and other defects. The finish, texture, color and shade, and surface tolerances of the patches shall be inspected to verify that all requirements have been met. Repair surfaces exhibiting defects as directed.

-- End of Section --

