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# 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

# EXECUTIVE SUMMARY

This Environmental Assessment (EA) has been prepared to assess the potential impacts of the expansion of Arlington National Cemetery (ANC), known as the Millennium Project. The Millennium Site will be developed to increase burial space at ANC. Building and site element construction shall be suitable for the environment and complementary to the architectural theme and historical considerations of ANC. ANC is the lead agency for this National Environmental Policy Act (NEPA) document and the U.S. National Park Service (NPS) is a cooperating agency. US Army Corps of Engineers (USACE) Norfolk District prepared this Environmental Assessment.

The proposed action includes construction of casket burial sections, in-ground sites for ashes, and both columbarium niche courts and niche walls. The site would include two assembly areas for service participants including Committal Service Shelters. Supporting facilities would include restrooms, storage areas, water features, waterlines, sanitary sewer, storm drainage, underground electrical and communications/information systems, landscaping, retaining walls, perimeter fencing, vehicle and pedestrian access roads and walks, and security systems. Stream restoration will occur within the existing stream channel to restore the stream to its original floodplain. In addition, stormwater management improvements to include underground stormwater storage and a modified stormwater conveyance system, primarily on NPS property, would be implemented at the Chaffee Place parking lot (adjacent to the NPS Administration Building). NPS is a cooperating agency for this NEPA document due to portions of the stormwater management and stream restoration measures occurring on NPS-administered property. This led to a high level of coordination with NPS, especially on those actions occurring on or near NPS lands.

Benefits of the project, in addition to the primary goal of extending the longevity of ANC, include:

- Restoration of a currently severely degraded stream
- Conversion of the maintenance yard, which is currently extremely disturbed with open dirt roads and no vegetation to vegetated green space and primarily forested area

- Stormwater management improvements to the area coming off of the Chaffee Place parking lot to ensure improved conditions within the channel flowing into the NPS-administered Arlington Woods
- Preservation of the entire project site as a "green space", serving as one of the few areas in Arlington County that will remain indefinitely vegetated with a mix of natural areas and open green areas
- A multi-year invasive species control plan on the entire portion of the Millennium site owned by ANC, improving the existing conditions of the highly infested (up to 95% invasive cover in some areas) property

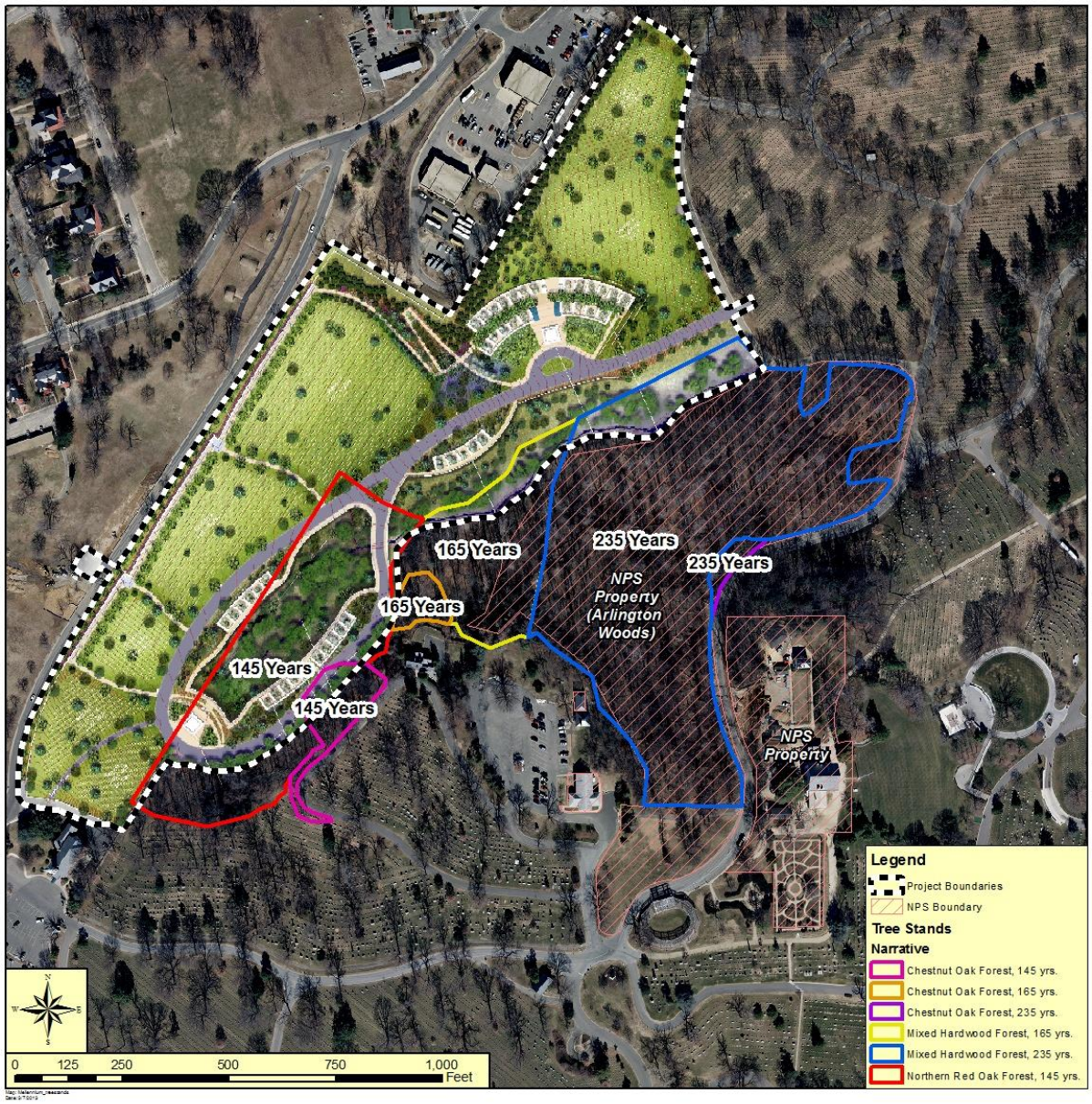
Short-term impacts associated with the proposed action include land use, topography, drainage and surface water impacts, disturbance of soil and removal of vegetation, air and noise emissions, increased construction traffic, temporary closures or interruptions in the jogging path on Joint Base Myer-Henderson Hall near the construction site, and altered aesthetics from the presence of a construction site. Short-term impacts to utilities such as water and electric service may also be encountered during construction. Short-term impacts would cease with the completion of construction. Long-term impacts to land use, soils, topography and drainage, surface water, vegetation, wildlife, cultural resources and aesthetics would be expected as a result of the Proposed Action. The project would result in both positive and negative impacts; however the negative impacts have been avoided and minimized to the maximum extent practicable. No significant impacts are anticipated.

This EA was prepared in compliance with NEPA (40 CFR 1500-1508) and all applicable implementing regulations. A Proposed Alternative and a No-Action Alternative were fully evaluated in this EA. Five additional Action Alternatives were eliminated from detailed evaluation, as they did not meet the operational intent of the Cemetery and/or resulted in unacceptable levels of impact based on regulatory requirements. The direct and indirect impacts of the Proposed Action Alternative and No-Action Alternative were evaluated for temporary, permanent, and cumulative impacts. As discussed in Section 5, no significant impacts would occur as a result of this project.

An initial draft EA was prepared and released for public and agency review on 6 December 2012. The 45-day public comment period ended on 21 January 2013. Approximately 30 individuals and organizations submitted comments on that EA. The primary concern raised was the impacts to the forested area on the Millennium Site. Approximately 20.7 acres of forest are included in the historic property boundary on the National Register of Historic Places (NRHP) nomination for Arlington House. This entire forested area was historically considered "Arlington Woods." Of this, approximately 12.1 acres are currently under NPS jurisdiction, and 8.6 acres are under ANC jurisdiction. As shown in the figure below, the NPS administered property, described in this document as "Arlington Woods" and the oldest part of the NRHP contributing forest, is adjacent to the Millennium Project Footprint. NPS-administered Arlington Woods contains trees estimated to be 235 years old; however, those trees will not be removed as a result of this project. Only one non-native invasive tree will be removed from NPS property. The trees that would be removed on ANC property are all in areas that were clear cut during the Civil War. The impacted trees are a maximum of 145 years old, but the majority are less than 105 years old and do not contribute to the Arlington House NRHP listing (and are not in the NRHP boundary). About half of the acreage of the five acre 145 year old tree stand, which is NRHP contributing, would be impacted. None of the NRHP contributing 165 year old tree stand on ANC property would be impacted. Figure A below displays the ages of the contiguous tree stands. There are other trees on the site that are more highly disturbed and are described in Section 4.6.

A revised EA was released on 12 March 2013 for a 30-day public review. That public comment period ended on 12 April 2013 and resulted in approximately 19 letters from organizations, 98 "form letter" (duplicate) comments and 79 unique comments from private citizens. All comments were considered and are found in Appendix J of this Final EA.

**Figure A - Millennium Project with Tree Ages and NPS Property**




As is discussed in Section 4.6, additional surveys were executed to verify the tree ages, develop a complete survey of all trees within the project footprint, and also identify the smaller vegetation (understory) in the project area. Trees that will be removed are all in areas that were clear-cut during the Civil War. These trees are a maximum of 145 years old. As a result of comments received, the team has implemented additional measures to minimize the number of trees that

would be impacted by the project. Analysis of the current project design (as of April 2013) indicates that of the 1804 trees (6" diameter and greater) on site, approximately 905 trees would be removed to facilitate construction of the cemetery expansion. Of those 905 trees, 57 are dead, 77 are invasive species and 771 are healthy native trees. Approximately 491 trees would be removed from the northern portion of the project site which includes trees as old as 105 years. Approximately 211 trees would be removed from the portion of the woodland that includes trees as old as 145 years. Approximately 203 trees would be removed from the former Ft. Myer picnic area which is currently a park-like area with a range of tree ages to include most trees in the 50-100 year old range and a maximum of 145 years old. The number of trees being replanted has increased to nearly 800 trees (1 1/2" to 5" caliper), plus more than 1600 tree seedlings, and 14,000 shrubs. ANC is committed to further minimize removal of trees. As a result of comments received, the team will continue to consider additional measures to save as many trees as possible. For example, several adjustments to the road alignment have been incorporated which preserve healthy older groves of trees. Efforts to minimize the number of trees impacted will continue to be a priority for the project as it moves forward.

The planning and design of this project have been coordinated with multiple organizations including but not limited to the NPS, National Capital Planning Commission (NCPC), U.S. Commission of Fine Arts (CFA), Joint Base Myer-Henderson Hall (JBM-HH), Virginia Department of Historic Resources (VDHR), Virginia Department of Environmental Quality (VDEQ), Virginia Department of Conservation and Recreation (VDCR), and Arlington County.

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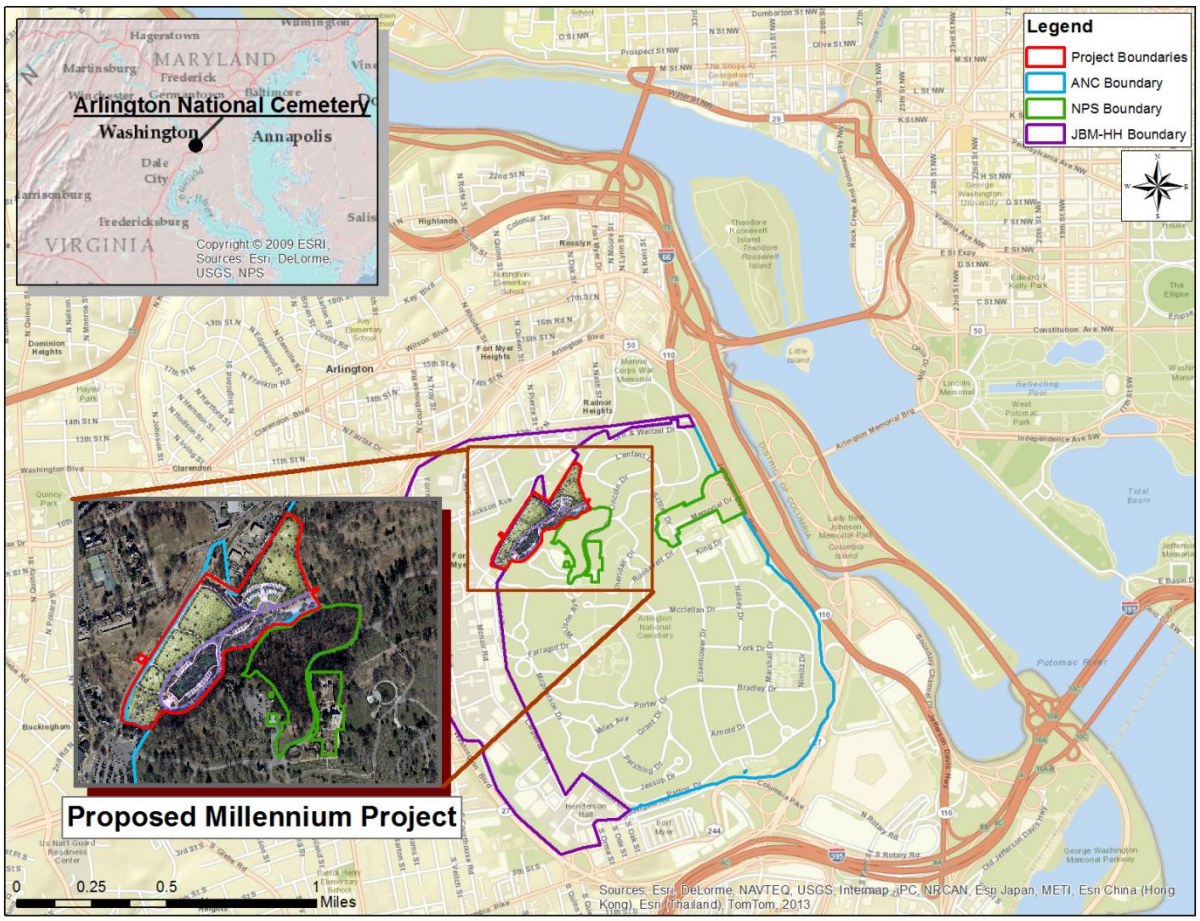
# 1 INTRODUCTION AND PROJECT LOCATION

Arlington National Cemetery (ANC) is located in Arlington County, Virginia, at the western terminus of Memorial Drive, directly across the Potomac River from the Lincoln Memorial. ANC is approximately 624 acres in size. ANC functions as an active historical military shrine, a contemporary military cemetery honoring those who serve in the Armed Forces, and as a popular visitor attraction. ANC has become one of the most important shrines that the United States maintains. In 1861 the United States seized the estate from its owner, Mary Custis Lee, and by 1864 it had begun using the grounds as a cemetery. ANC was designated officially as a military cemetery by Secretary of War Edwin M. Stanton on 15 June 1864. Following an 1882 Supreme Court decision which overturned the government foreclosure of the property, the government officially purchased the estate from Lee's heir. The dead of every war since the American Revolution and distinguished statesmen, including John F. Kennedy, rest in the cemetery. ANC also hosts major memorial events and ceremonies, and has become a significant attraction for visitors of the Washington D.C. area. In addition to in-ground burial, ANC has one of the larger columbaria for cremated remains in the country. Eight courts and a niche wall are currently in use, with 53,661 niches for cremated remains. In 2013 another 20,292 niches will be available for use, raising the total available niche capacity to approximately 73,953 niches.

The Millennium Project is an expansion of ANC, designed to provide future interment space in the northwest portion of ANC. The Arlington National Cemetery Millennium Project is located on a 27-acre site consisting of the former Section 29 of the existing northwest portion of ANC and the former picnic grounds of Joint Base Myer-Henderson Hall (JBM-HH). It is bounded to the west by McNair Road and extends roughly to Humphrey's Drive on the East, Ord & Weitzel Drive on the North, and Ft. Myer Chapel on the South. The proposed project area is on ANC-administered property with a very small portion of restoration activity on U.S. National Park Service (NPS)-administered property. The project location is identified in Figure 1. Building and site element construction have been designed in order to minimize impacts to the environment and complement the architectural theme and considerations of ANC, and support the cemeteries operational requirements associated with burial of service members.

ANC is the lead federal agency for this action and this Environmental Assessment (EA). The NPS is a cooperating agency on this EA and as such has provided support during the formulation of alternatives and plan selection, primarily for the portions of the stormwater management and stream restoration which are located on NPS-administered lands. The U.S. Army Corps of Engineers (USACE), Norfolk District, provides project support to Arlington National Cemetery and prepared this EA.

**Figure 1 - Millennium Site Location**



## 1.1 MILLENNIUM LAND TRANSFERS

In the 1990s, Congress recognized that ANC was nearing capacity. As expansion areas were limited, the Millennium site was identified. In 1995, Public Law 104-201 directed the Secretary of the Interior to transfer to the Secretary of the Army jurisdiction over the Millennium Project Site. Public Law 107-107 dated Dec 28 2001 directs the Secretary of the Army to develop the area for in-ground burial sites and columbarium. The land, approximately 12.1 acres, was transferred from NPS to ANC in January 2002. In 2004, the portion of the property owned by Ft. Myer was transferred to ANC. Public Law 107-107, Section 2863(h) states:

> *Use of transferred land.--The Secretary of the Army shall use the transferred property for the development of in-ground burial sites and columbarium that are designed to meet the contours of Section 29.*

## 1.2 PURPOSE AND NEED

More than four million people visit ANC annually, many coming to pay final respects at graveside services. ANC performs 27 to 30 funeral services each weekday and 5 to 8 Saturday services. Cemetery space is limited and ANC is projected to reach full capacity in 2025. A space study conducted by the Center for Army Analysis indicated the average burial frequency at 27 per day, resulting in a total of approximately 7,000 burials per year. It is difficult to provide an exact determination of the additional years of internments that would be provided by the Millennium project considering the many variables involved with burials at the Cemetery. However, seven to twelve years appears to be a conservative estimate for first internments based on current trends and information available. Considering that the site will still be used for second and/or third internments it is likely that the Millennium site will remain an active area of the Cemetery for several decades. Current trends show a distribution of approximately 40% for columbaria burials, 37% for casket in-ground burials, and 23% for cremated in-ground burials. The ANC Millennium Project would provide additional 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."*

### 1.2.1 Purpose of ANC Expansion

The purpose of the Millennium Project is to extend the longevity of ANC. The design is intended to be a combination of columbaria burials, casket in-ground burials, and cremated in-ground burials. In addition, the project was planned in consideration of the natural, cultural and historic resources of the site.

### 1.2.2 Purpose - Stream Restoration

The purpose of the stream restoration is to improve the condition of the stream and protect the main stem of the stream as a natural and aesthetic resource. Most portions of the stream located on the Millennium Project site are deeply incised (preventing storm flows from accessing the floodplain) and have raw, actively eroding banks. In addition, in their current state, they are transporting and providing sediments to downstream receiving waters.

### 1.2.3 Purpose - Stormwater Management Improvements

The purpose of the stormwater management improvements is to attenuate flows leaving the Chaffee Place parking lot (adjacent to the NPS Administration Building) and stabilize the scoured channel that runs from the parking lot into the NPS-administered Arlington Woods. This channel feeds into the restored stream described above, so the project seeks to reduce the sediment load into that area. This action was requested by NPS and coordinated closely with NPS staff in their capacity as a cooperating agency.

## 1.3 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

Under the requirements of Section 102 of National Environmental Policy Act (NEPA), this proposed project constitutes a major federal action, and an EA is therefore required. This EA has been prepared pursuant to NEPA and its implementing regulations.

The purpose of this EA is to evaluate the direct and indirect impacts associated with the proposed expansion of ANC's interment space on the Millennium Site. This document identifies and

evaluates the potential environmental, cultural resources, and socioeconomic effects associated with the Proposed Action as accomplished by implementing the Preferred Alternative that is detailed in Section 2.0. Section 3.0 of this EA describes all alternatives considered. Section 4.0 describes the existing environmental, cultural, and socioeconomic conditions that fall within the scope of this EA. Section 5.0 describes the environmental, cultural, and socioeconomic consequences expected as a result of implementing the feasible alternatives.

The EA focuses on impacts likely to occur within (and near to) the proposed area of development. The document analyzes direct effects (those resulting from the alternatives and occurring at the same time and place) and indirect effects (those distant or occurring at a future date). The potential for cumulative impacts as defined by 40 Code of Federal Regulations (CFR) 1508.7 is also addressed in Section 5.16.

## 1.4 PUBLIC AND AGENCY INVOLVEMENT

Early agency coordination was accomplished in accordance with 40 CFR 1501.6, by way of coordination letters to federal, state, and local organizations in 2005 and 2009. Documentation of this coordination is included in Appendix A. The early coordination served to inform the conceptual designs of this project. Official coordination comments included a desire to protect the forested areas and the stream as well as the need to maintain the architectural theme and historical considerations of ANC. Given that the planning for this area has spanned over a decade, the current planning team felt it appropriate to reassess the situation and determine whether past decisions are still relevant. In 2011 and 2012, a series of meetings and charrettes were held with internal planning team members as well as external stakeholders to help define the alternatives and determine the best path forward.

In August of 2012, a scoping update meeting was held at ANC and federal, state, and local organizations were again notified. This meeting served to update all organizations on the Millennium Project planning and allow organizations an opportunity to comment on the project as well as discuss any potential environmental impacts of concern. Some of the concerns mentioned at that meeting include:

- Access to the site and security issues for JBM-HH

- Consideration of historic site conditions
- Consideration of the new perimeter/retaining wall adjacent to JBM-HH; specifically on height and line of sight over the wall, and maintaining a consistent appearance to the wall on the exterior (non-ANC) side
- Impacts to jogging path
- Old Post Chapel, gate and security measures addressed at the gate
- Utilities
- Preserve historic nature of the woods behind Arlington House
- Retain as many old-growth trees as possible
- Recommendation for guide maps, kiosks, information areas
- Security at top of boundary wall and understanding that JBM-HH security requirements change over time
- Adjacent existing JBM-HH Motor Pool and loud noise which may come from that area
- Staging and access routes – to include access to the NPS parking lot stormwater management

In addition to the meeting, information regarding the project was sent to all interested parties via email in September 2012. Comments on this scoping material were received from Arlington County and are included in Appendix A. Arlington County concerns (which are addressed in this EA) included:

- Proper adherence to the NEPA process
- Assurance that all cultural resource issues are identified, documented and coordinated
- Information on a full range of alternatives
- Boundary wall and viewshed considerations
- Consideration for signage
- Stormwater runoff and stream restoration strategy
- Water quality impact assessment

ANC has an on-going coordination effort with the Virginia Department of Historic Resources (VDHR), the National Capital Planning Commission (NCPC), and the U.S. Commission of Fine

Arts (CFA) for the development of the Millennium Site. NCPC and CFA have been invited to charrettes and been briefed in order to solicit their comments early and often. In addition, ANC is coordinating with the Virginia Department of Conservation and Recreation (VDCR) and Virginia Department of Environmental Quality (VDEQ) regarding the stream restoration. This effort is described in detail in Sections 4.0 and 5.0.

Consultation regarding cultural resources within the area of the Millennium Project was initiated with VDHR in 2005 and 2009. Additional surveys and analysis undertaken in 2012 have resulted in determinations of no adverse effect to archaeological properties; however adverse effects to historic landscapes were identified. A Section 106 consultation letter, summary of identification and consultations for the Millennium Project, and related reports were submitted to VDHR on 13 November 2012 (with copies provided to NPS, JBM-HH, CFA, NCPC, National Trust for Historic Preservation (NTHP), and Arlington County). Avoiding or minimizing adverse effects to historic properties has been an objective of the design process with input from stakeholders, notably the CFA and NPS, influencing results. The adverse effects currently identified are demolition of the historic Boundary Wall in the project area and impacts to forested areas considered to be contributing to Arlington House (see Section 5.8). Mitigation of adverse effects has been integrated into the preferred design by reconstructing the boundary wall re-using historic stone to build the facade of the new niche wall and by preserving most of the historic forested area.

Responses were received from VDHR (Letters Marc Holma [VDHR] to Daniel Delahaye [ANC] 19 December 2012; and 1 February 2013), Arlington County (Memorandum from Michael Leventhal, Rebeccah Ballo [Arlington County] to John Haynes, Susan Conner [USACE] 21 December 2012). Issues identified were the need for a visual effects study to assess effects on the Fort Myer National Historic Landmark Historic District and Arlington House, as well as natural and cultural landscape effects. USACE and ANC findings of no adverse effects to archaeological resources were either explicitly concurred with or not commented on by VDHR. Section 106 consultation was completed among ANC, VDHR, USACE, Arlington County, CFA, NCPC, JBM-HH, NTHP and NPS. A memorandum of agreement was signed for the

implementation of measures to mitigate the determined adverse effects, as defined in Section 106.

A draft version of this EA was released for a 45-day public review in December 2012. The public comment period ended on 21 January 2013. Comments were accepted after the formal closure of the comment period. The comments received on the draft EA are included in Appendix F – Draft EA Comments. Upon review of the comments, it was determined that the EA would be revised to address those comments and re-released for public review. A matrix summarizing the comments and responses is also included in Appendix F. The EA was revised and released on 12 March 2013 for a 30-day public review. A public open house and site visit to discuss the project was held at ANC on Saturday 16 March 2013. The public comment period ended on 12 April 2013 and resulted in approximately 19 letters from organizations, 98 form letter comment and 79 unique comments from private citizens. All comments were considered and are found in Appendix J of this Final EA. A project "open house" to discuss the Millennium Project and the EA occurred on 16 March 2013.

The final EA will be available electronically (or via hardcopy upon request) on the ANC (http://www.arlingtoncemetery.mil/) and U.S. Army Corps of Engineers Norfolk District (http://www.nao.usace.army.mil/) websites.

# 2 PROPOSED ACTION

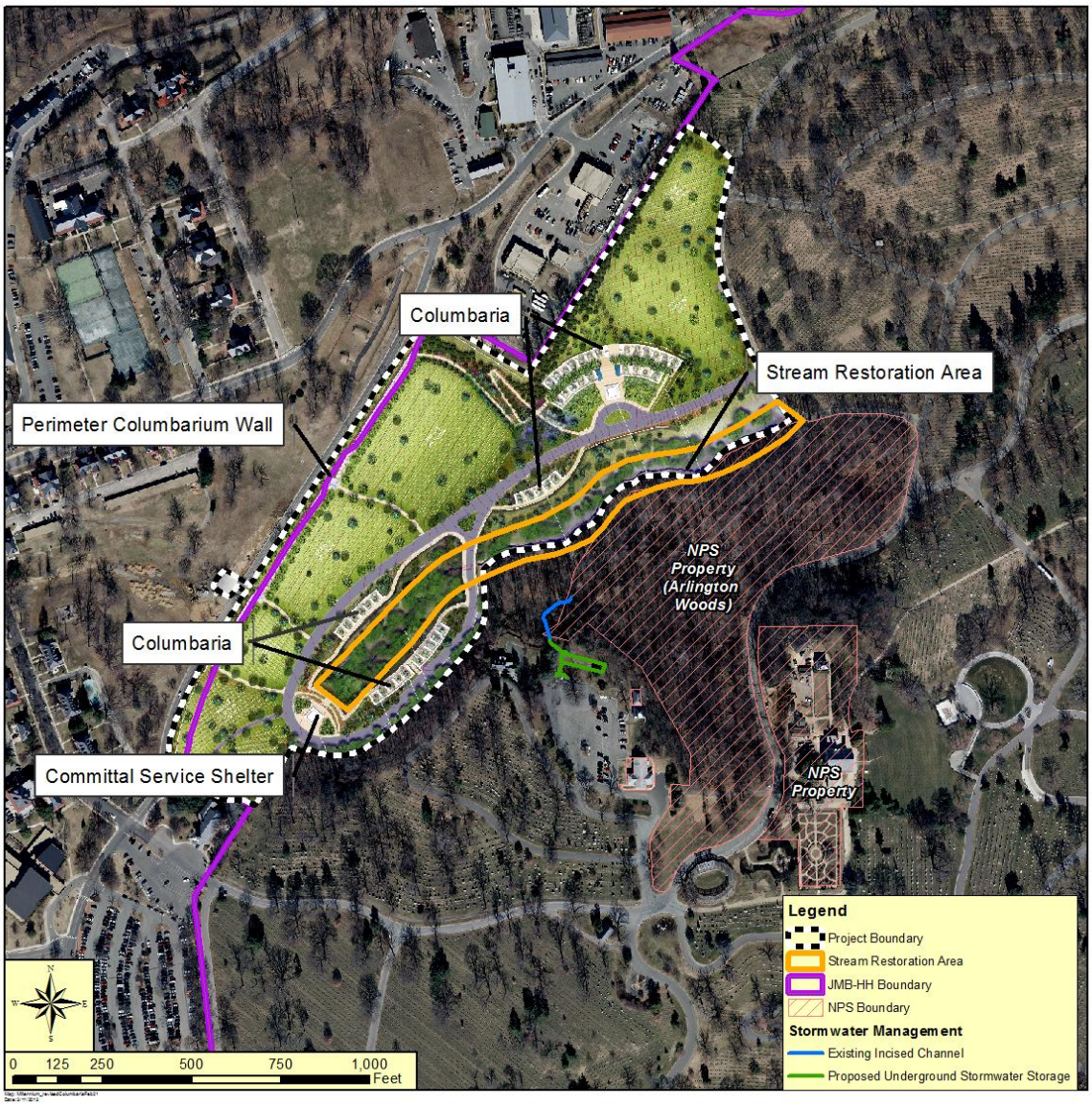
The Proposed Action is the expansion of ANC by developing the Millennium Project Site to increase interment space at ANC. Construction would include casket burial sections, in-ground sites for ashes, and both columbarium niche courts and niche walls. The site would include two assembly areas for service participants, including Committal Service Shelters. Building and site element construction shall be suitable for the environment and compliment the architectural theme and historical considerations of the National Cemetery at Arlington. Additionally, supporting facilities would include restrooms, storage areas, water features, waterlines, sanitary sewer, storm drainage, underground electrical and communications/information systems, landscaping, retaining walls, perimeter fencing, vehicle and pedestrian access roads and walks, and security systems. Stream restoration will occur within the existing stream channel to restore the stream to its original floodplain. The existing site is visually characterized by a dense existing woodland buffer along its southeastern edge, a topographical drop along its western edge, and a stream that runs down its center from west to east. The proposed design includes landscape modifications and architectural features that accommodate in-ground pre-placed crypts for casketed and cremated remains and above grade columbaria and niche walls for cremated remains.

The planning considerations for the project (in no specific order) included:

- Extend the longevity of ANC
- Current rate of burials and national trends for burials (cremation versus casket)
- Respect the aesthetic integrity of ANC
- Avoid and then minimize impacts to environmental and cultural/historic resources
- Ensure that design decisions are based on data and facts
- Decisions are to be supported by facts regarding ANC current conditions and future need
- Consider cost-effectiveness of the options
- Use land wisely
- Incorporate sustainable practices where appropriate
- Involve stakeholders early and often in the process

The main features of the Millennium Project are shown in Figure 2 and described below. NOTE: This graphic and the others throughout this EA reflect a March 2013 design graphic. The design has continued to evolve, with any design changes resulting in similar or lower levels of environmental impact.

**Figure 2 - Main Features of Millennium Project**



## 2.1 LANDSCAPE DESIGN

The landscape design consists of modifications to the existing stream bed, topographical changes to accommodate new subsurface burial crypts, the introduction of a new vehicular road and a series of meandering paths, and the planting of additional trees at selected locations throughout the site. The design intent is to minimize the amount of proposed 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.

**Figure 3 - Sketches of the landscape design**


## 2.2 PERIMETER COLUMBARIUM WALL

At the western edge of the Millennium site, along the boundary of Ft. Myer, a perimeter columbarium wall is proposed. This wall would serve two purposes: it would accommodate niches for cremains (cremated remains) and also act as a retaining wall while providing a security separation for Ft. Myer. To mitigate the length of the wall and provide visual relief, three perimeter walls are proposed and tied together with a post and beam structure that enframes the space immediately surrounding it. The three walls break at the intersection points of the meandering paths from the east.

At these junctures, a larger space is created that is approximately double the width of a single structural bay. In these locations, a feature wall is proposed. At regular intervals along the walls, benches and trees are proposed for visitor comfort.

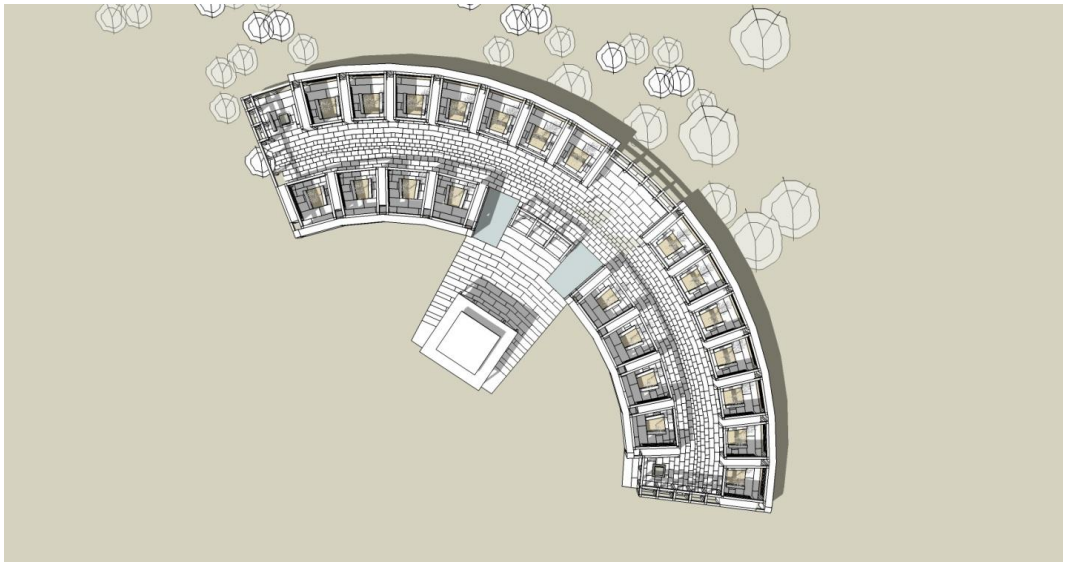
**Figure 4 - Sketch of the perimeter columbarium wall**

## 2.3 COLUMBARIA

A columbarium is a series of compartmentalized niches for cremains. Throughout the Millennium site, the height of the columbarium is limited to five niches, while the configuration and repetition of niches in width varies. There are a series of curved columbarium rooms proposed along the stream and a semicircular columbarium court to the north end of the site. The stream columbaria curve slightly to conform to the existing topography and avoid the 100' stream setback (Chesapeake Bay Preservation Act Resource Protection Area Buffer, see section 5.3 *Hydrology* for more information) to the maximum extent practicable. The stream columbaria also serve as retaining walls for the surrounding topography. Each columbarium would be unified visually by the post and beam system, similar to the perimeter wall. Within each room, a small tree or vegetative planting and two benches is proposed for visitor comfort. At the north columbarium, a series of rooms are configured in a semicircular pattern around a curved roadway. At the entry point of the columbarium, as well as in between and at the terminus of

several rooms, quiet and contemplative areas are proposed for visitor comfort, to be furnished with benches, water features, vegetative plantings, and trees.

**Figure 5 - Sketch plan view of columbarium**



## 2.4 COMMITTAL SERVICE SHELTER

A Committal Service Shelter serves as a venue for an interment ceremony that is not conducted adjacent to an actual gravesite. There are two committal service shelters proposed at the Millennium Site, one at the southern end and one at the northern end. The size of the shelter is approximately 40’ in width by 40’ in length. Adjacent to each shelter space is provided for the military honor guard. The design of the committal service shelters is based on the post and beam system present in the other architectural features.

**Figure 6 - Sketch view of committal shelter**

## 2.5 STREAM RESTORATION

The main stream channel (shown in Figure 2 above) would be restored and integrated into the overall project as a natural landscape amenity. Natural Channel Design (NCD) techniques would be utilized to restore the existing degraded stream channels. Unlike conventional engineering practice, the goal of NCD is not simply the abatement of stream bank erosion or the maximization of channel conveyance (typically done with riprap and concrete), but is to restore the balance of flow and sediment in the stream system and to reestablish natural hydraulic and ecologic functions.

## 2.6 STORMWATER MANAGEMENT

An additional element of the Millennium Project includes stormwater management improvements in an area near the NPS Administration Building. This effort would include underground storage and channel stabilization for the flows coming off of the Chaffee Place parking lot. The parking lot on ANC property is used daily by the NPS and several times per year for various events. The project team considered means for storing water (to alleviate peak flows and volumes) and options for stabilizing the steep eroding slope near the parking lot. Although this is not a section of the main stream that would be restored as a part of the Millennium Project, this stormwater channel does feed into the main stream. The improvements

consisting of an underground storage area as well as improvements to the steep bank would reduce flashy flows into the restored stream. Figure 7 below shows the main features of the stormwater management. As seen on Figure 2 above, the stormwater management features are near the Chaffee Place parking lot and located on both ANC and NPS-administered property.

**Figure 7 Main Features of Stormwater Management**


The current stormwater outfall at the Arlington National Cemetery-owned parking lot for the National Park Service building has caused severe erosion of the steep slope where the pipe surfaces as well as downstream within the existing channel. The channel downstream of the eroded slope includes cross-vane rock structures, biodegradable soil erosion control matting

(installed from a recent project), and native vegetation. The channel is vulnerable to the highly variable flow from the parking area's single outfall pipe; therefore, means to mitigate the amount of flow and improve the outfall condition were explored. Design goals include:

- Decrease the volume of runoff generated by the parking area
- Stabilize the steep slope and mitigate erosion
- Capture and slowly release flows from large storm events into the channel
- Create habitat through the use of the modified stormwater conveyance
- Limit disturbance to existing trees as much as possible – preserve existing white oak tree within parking area
- Maintain the area available for parking and off-loading
- Avoid impacts to historical resources

The sub-alternatives identified in Section 3.3 to address the stormwater management issue were developed, discussed, and reviewed as a collaborative process with the NPS, USACE, and ANC. Any of the sub-alternatives considered could be matched with the primary selected alternative for the Millennium Project.

# 3 ALTERNATIVES TO THE PROPOSED ACTION

Under NEPA, an EA must evaluate reasonable alternatives for a project, including the No-Action Alternative. Seven primary alternatives have been identified for this project. With the exception of the No-Action Alternative, all of the plans include construction at the Millennium Site. In 2011, four primary alternatives, known as A, B, C, and D, were evaluated in a charrette with individuals from ANC, Norfolk District USACE, and NPS. The plans were reviewed on the following criteria: increased longevity of ANC, relative cost, impact on operations, impact on environment, compatibility with ANC traditional aesthetics, and implementation timeframe. Alternatives A and B were determined to be least preferred and Alternatives C and D were identified as more preferred; however, none of the alternatives met the necessary criteria of operational intent and regulatory acceptability (see below in Section 3.9). Instead, Alternatives C and D were used as the basis for the development of two new alternatives, E and F. Alternative E was carried forward as the Proposed Action.

In addition to the primary alternatives, there was also a group of sub-alternatives that were considered in order to address the stormwater drainage issue from the Chaffee parking lot as well as the steep slope that is eroding adjacent to the parking lot. These alternatives were reviewed as sub-alternatives to the proposed action. Any sub-alternative could be matched with any primary alternative.

NOTE: Alternative E has evolved in both the number of burial spaces (which has been reduced due to design refinements and in response to comments received) and the number of trees anticipated to be removed (which has gone through a similar process). It is important to note, however, that neither trees nor burial spaces were the primary criteria considered for alternative elimination. If the other Alternatives had gone through additional design development, it is likely that all alternatives would have less burial spaces and fewer trees removed than originally estimated. In addition, because the design has continued to evolve, the final project graphics as well as exact number of burials and trees removed will likely differ slightly from those reflected in this document. The design as of April 2013 includes the deletion of the middle columbarium. This change will not alter the environmental analyses and conclusion that no significant impacts

are anticipated. The area where the columbarium was previously located will now be reforested adding additional green space to the overall project. This change would result in beneficial impacts to vegetation and soils and no additional significant adverse impacts.

## 3.1 ALTERNATE LOCATIONS

As discussed in Section 1.1, the land for the Millennium Project was Congressionally directed to be transferred to ANC. The land transfers of the property took place in 2002 and 2004. There are limited options for expanding ANC. ANC occupies 624 acres in northeast Arlington County, Virginia. It is bounded on the west and northwest by Fort Myer-Henderson Hall; on the north by the U.S. Marine Corps Memorial, on the east by Jefferson Davis Highway (Route 110); on the southeast by the Pentagon, and on the southwest by Fort Myer-Henderson Hall and the Navy Annex (Figure 2). The Arlington Memorial Bridge over the Potomac River and Memorial Drive connect ANC with downtown Washington D.C. to the east. ANC is bounded on all sides by urban development as well as previously developed public lands, with minimal additional expansion options available.

ANC is currently considering additional options for extending the longevity of the Cemetery, to include the former Navy Annex site, within its Master Plan. At this time, the Millennium Site is the only other parcel of undeveloped land owned by ANC that is suitable for the construction of additional gravesites and columbaria.

## 3.2 EARLY CONCEPTUAL ALTERNATIVES

The Millennium Project has been in the planning stages for over ten years. Many alternatives and concepts were considered during this time. However, the final array of alternatives only considers those alternatives that were feasible from an engineering perspective while meeting the project goals. In the early and mid-2000s, the conceptual alternatives for the Millennium Project included plans that removed most of the trees on the site and filled in large portions of the stream. These alternatives were not carried forward into the final array of alternatives due to the extremely large level of impact on the natural and historic resources. See Figure 8 below for an alternative from 2002 which filled the stream entirely and removed approximately 1244 trees.

### 3.2.1 Alternate Configurations for Loop Road

Having the loop road turn toward Ft. Myer would have greatly limited the total number of available spaces. Not only would the in-ground burial spaces in those areas be lost, but the columbarium proposed near the loop road would either be lost or stand in place of the in-ground burials. The Millennium Project was specifically planned to make the best use of existing topography. Cremated remains and interment spaces were planned for the more consistent gentle slope while the columbaria were planned for steeper terrain. Adjusting the alignment of the loop road to the West, looping closer to McNair Road would necessarily include the relocation of the columbaria. Columbarium courts must be located near an access road and committal shelter for appropriate ceremonial access. The movement of these features would reduce the terrain suitable for cremated remains and internment space, reducing the number of burial spaces considerably.

Another concept suggested was to have the "new" redesigned loop road connect Humphreys Rd (skirting around the edge of the woodlands and behind the Old Post Chapel) to the planned Millennium Road which already connects to Ord and Weitzel. Due to its higher elevation, a connection to Humphreys Rd would be excessively steep, impacting the ability of the ceremonial caisson to safely use the road. In addition, the re-alignment of such a road would eliminate convenient access to any columbaria placed on the east side of the stream. Lastly, this type of road construction would require much more significant amounts of cut and fill with the associated environmental impacts and tree loss.

**Figure 8 - Early Conceptual Alternative for Millennium Project**


## 3.3 THE NO-ACTION ALTERNATIVE

NEPA regulations refer to the No-Action Alternative as the continuation of existing conditions of the affected environment without implementation of, or in the absence of, the Proposed Action. Inclusion of the No-Action Alternative is prescribed by the Council on Environmental Quality (CEQ) regulations as the benchmark against which federal actions are evaluated. Under this alternative, the Proposed Action by ANC to create burial and columbarium space would not occur on the Millennium Site, and ANC would reach full capacity in 2025.

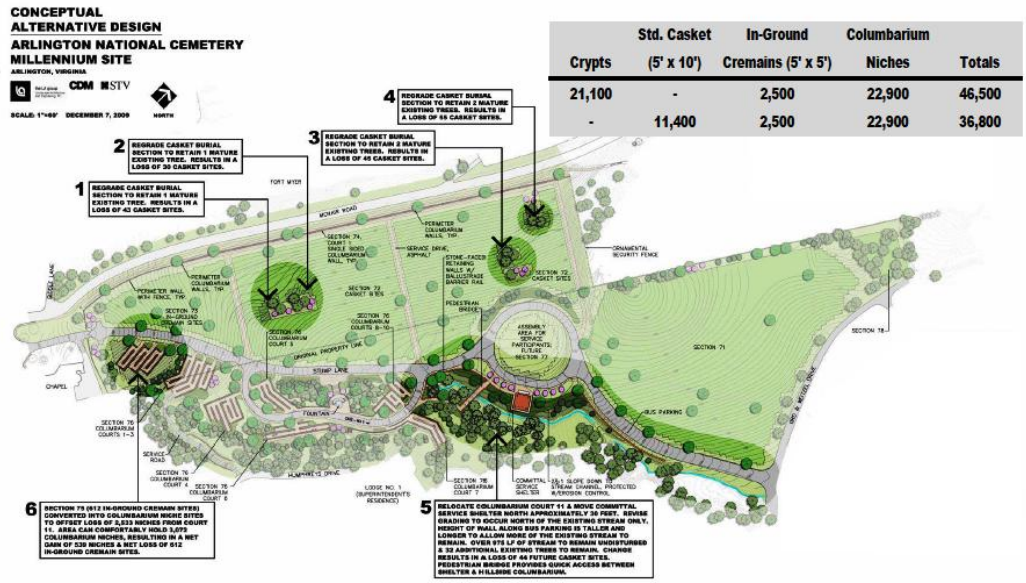
## 3.4 PRIMARY ALTERNATIVES CONSIDERED

### 3.4.1 Alternative A

Alternative A is based on a recommended plan from earlier project planning studies. The project had a plan in 2002 that evolved into a similar plan in 2009. Alternative A presents the 2009 plan with the only change being that the standard burial plots are replaced with pre-placed crypts in order to determine the potential increase in yield. This plan would provide 42,150 total new burial sites: 14,250 3-foot x 8-foot crypts for casket burials, 4,900 3-foot x 8-foot crypts for

inurnment burials, and 21,000 niches for remains. While this alternative provides the highest number of total burial sites, this plan was ranked as the least environmentally sensitive. This Alternative served as the starting point for the more recent planning efforts.

**Figure 9 – Alternative A**



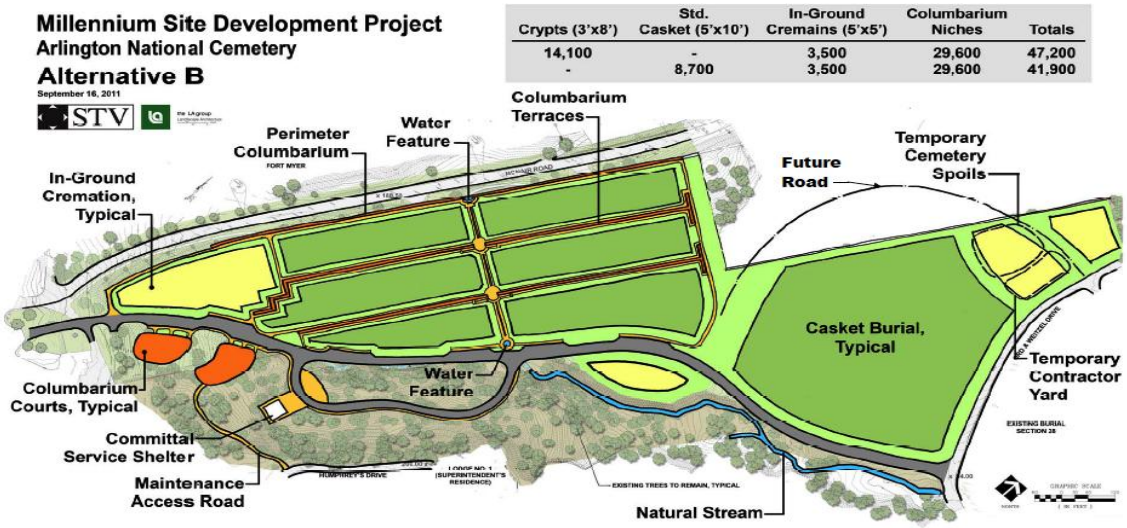

### 3.4.2 Alternative B

Alternative B would provide 38,700 total new burial sites: 15,600 3-foot x 8-foot crypts for casket burials, 2,500 3-foot x 8-foot crypts for inurnment burials, and 20,600 niches for remains. This plan would provide the second highest number of total burial sites; however, stakeholders expressed concerns that the linear columbarium walls in Alternative B may not match the traditional character of ANC and that the design did not provide a location suitable to view the entire vista. The following design considerations were included:

- A series of terraced columbarium walls were located to best mitigate the grade. These walls run parallel to the wall along McNair Road. One of the primary considerations is that people can see over the wall. It was determined that a wall two niches high facing the higher elevation and five niches high facing the lower elevation would maximize yield while maintaining views throughout the site.

- A water feature was proposed to cascade down the terraces and appear to connect into the natural stream.
- Spaces most suitable for burial were identified. Considerations included suitable slopes and frontage to the road.
- Given the quantity of columbaria accommodated within the northern portion of the site, the courts proposed within the southern section of the site could be kept to a minimum.

**Figure 10 - Alternative B**



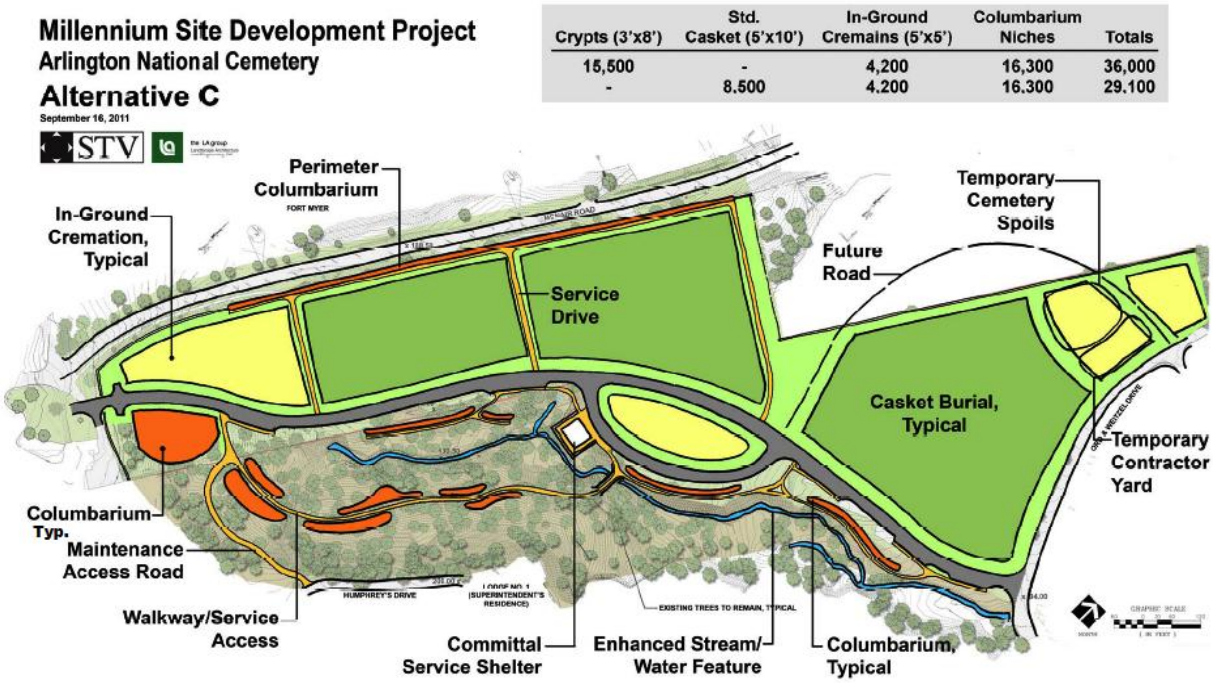

### 3.4.3 Alternative C

Alternative C would provide 35,620 total new burial sites: 13,700 3-foot x 8-foot crypts for casket burials, 2,550 3-foot x 8-foot crypts for inurnment burials, and 19,370 niches for remains. Although Alternative C is the best alternative when compared against A, B, and D, stakeholders were concerned about the placement of the committal shelter and columbarium. In addition, this plan provides the fewest total burial sites. The following design considerations were included in Alternative C:

- In this alternative, the roadway is designed so as not to cross the stream. This allows for greater preservation of the southern slope with its stands of trees, and respects the existing stream.
- Since the stream is preserved, it can be enhanced to serve as a water feature, which is a requirement for columbarium courts.

- Linear columbaria are proposed running parallel to the stream, below the road level.
- The committal service shelter is centrally located among the courts and is positioned to overlook the stream.

**Figure 11 - Alternative C**



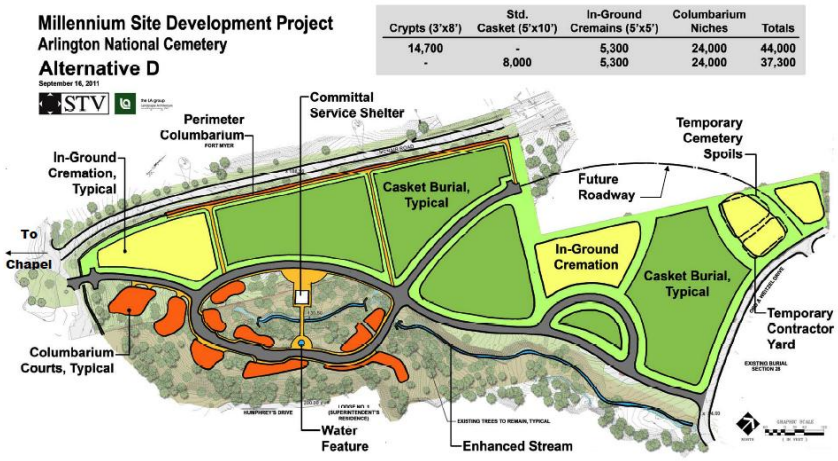

### 3.4.4 Alternative D

Alternative D would provide 37,280 total new burial sites: 12,150 3-foot x 8-foot crypts for casket burials, 4,850 3-foot x 8-foot crypts for inurnment burials, and 20,280 niches for remains. This plan was ranked in the middle for the total burial sites, percentage of trees retained, and length of stream retained criteria. Alternative D would result in heavier site impacts than the other alternatives because it requires more roadway and the longest retaining wall of all the plans. In addition, stakeholders expressed a desire for a circle to be added at the end of the road near JBM-HH. The following design considerations were included in Alternative D:

- Access points were determined in order to allow for the most efficient flow of traffic.
- A loop road was proposed in lieu of a circle to accommodate vehicular traffic while maximizing contiguous space outside the loop.

- Early development of this alternative showed no physical connection to the chapel. Upon further refinement the plan showed no significant gain in yield or improvement to the overall concept by not having the connection. So a connection to the chapel was included.
- Pedestrian access through the site was developed with consideration of meeting National Cemetery Administration (NCA) guidelines. Spaces most suitable for burial were identified. Considerations included suitable slopes and frontage to the road.
- The steep slope along the southern portion of site was identified for columbarium courts.
- The committal service shelter is centrally located among the courts.

**Figure 12 - Alternative D**




### 3.4.5 Alternative E

This alternative would minimize impacts to the project area while accomplishing the project purpose of expanding ANC by providing 29,922 total new burial sites: 6,565 crypts for casket burials, 3,822 in-ground sites for cremated remains, 1,590 in-ground traditional burials, 115 in-ground custom spaces, and 17,830 niches for remains. Supporting facilities would include restrooms, storage areas, 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.

**Figure 13 - Alternative E**

### 3.4.6 Alternative F

Alternative F was developed with the goal of maintaining the environmental sensitivity of Alternative C while improving the operational circulation. Alternative F includes a circular loop road on the western side of the site. Alternative F would provide 32, 350 total new burial sites: 13,700 3-foot x 8-foot crypts for casket burials, 2,550 3-foot x 8-foot crypts for inurnment burials, and 16,100 niches for remains. The committal service shelter was relocated to provide a visual terminus at this location. The "room-like" columbarium spaces would be oriented inward and span the length of the stream corridor. Alternative F would also allow for a through-road to a motor pool area, should it become available for use.

**Figure 14 - Alternative F**


## 3.5 SUB-ALTERNATIVES: STORMWATER MANAGEMENT

### 3.5.1 Impervious Area Reduction

One method for reducing the rate of runoff to the outfall is to reduce the impervious area within the drainage shed. A modest section of pavement would be removed from around the existing parking lot trees in order to provide an improved habitat. Ideally this would occur from the base of the trees to the drip line; however, site vehicle circulation will need to be maintained for ANC operations. Pervious paving can also reduce the impervious area; pervious paving allows water to drain into the base material that consists of open graded aggregate providing 40% void space. This system releases the stormwater at a much slower rate. Pervious paving comes in three basic forms:

- Pervious Asphalt
- Pervious Concrete
- Pervious Pavers

### 3.5.2 Underground Stormwater Storage

In addition to decreasing the impervious area, another technique to reduce the rate of runoff is to store it and release it at a lower rate. Site constraints effect the placement of underground

storage, which needs to be at the low end of the parking lot or beyond in the lawn area. Constraints include:

- Archeological findings under the paved area, which limit the amount of excavation to 12" pending further detailed study
- Existing utilities, which include a 14" water main, a fire hydrant and two electrical lines of unknown configuration
- The steep slope: a system that uses infiltration must be located 50' from a steep slope to avoid excessive surcharge which could lead to collapse of the slope

Several systems are available to store water underground, including:

- Concrete vaults
- Aggregate drywells
- Aggregate enhanced with high density polyethylene (HDPE) pipe

### 3.5.3 Bio-filtration

A bio-filtration facility is an effective option for the lower end of the parking lot to provide additional reduction of harmful pollutants associated with runoff from a paved surface, and to further attenuate stormwater flow to the outfall. Bio-filtration removes larger particulates that migrate across the paved area, provides greater uptake of nutrients through biological functions of the plants, and removes a much greater percentage of petroleum based pollutants through interaction with the mulch layer should a planting area be utilized. The potential use of bio-filtration is somewhat limited due to the presence of existing utilities, the proximity of a steep slope, and by archeological constraints. The topographic challenge is the proximity of the steep slope; a 50' separation of bio-filtration to the top of a steep slope is recommended, which pushes the facility very close to the parking lot. A portion of asphalt would need to be removed to provide the required filter strip into the facility. Archaeological investigations have recently been conducted in the area of the proposed facility and found evidence of potential historic importance under a portion of the parking lot, but found no evidence in the lawn area. Therefore, because of the need for the parking lot to maintain capacity and its potential archaeological sensitivity, bio-filtration would need to be located almost entirely within the lawn area.

### 3.5.4 Slope Management

Due to years of inadequate stormwater control and outfall protection, parking lot runoff has caused severe damage to the steep slope where the 18" pipe surfaces. Damage includes a severely incised channel with vertical drop-offs, exposed rocks, root masses and other debris, creating an unstable condition. Runoff from the parking lot is gravitationally directed to a filtering drainage point that directs flow to the underground storage, from which flow goes to the outfall system. Two methods for conveying the runoff down the slope were considered:

1. **Piping**: This method consists of a pipe placed within the existing channel and anchored to prepared bedding that would be covered with soil stabilized by vegetation. High performance polypropylene pipe would be used due to its high strength and solid joint connection. Two options for the base of the pipe is a manhole structure to provide an anchor for the pipe, help decrease flow energy, provide maintenance access at a potential clogging point, and to become less visible within the forest setting. The alternative to a manhole would be a manufactured bend. A bend provides similar benefits to the manhole; except that it would need to have a separate anchoring system and it would not provide access to the pipe, posing a possible long-term maintenance issue. At the point where the pipe daylights, two options exist: a headwall or an end section. The headwall is cast in place concrete, with a footing and reinforcement steel generally based on state department of transportation standards. The advantage of the headwall is it allows adequate fill to be placed directly up to the end of the pipe and protects the outfall from erosion. While the structure can be covered in an attractive stone veneer, it is a visible structure within the forest. The end section is a flattened, truncated cone that slips onto the end of the outfall pipe and spreads to about twice its width. It can be made from the same material as the pipe and is less costly than the headwall. It does not provide a means to bury the pipe near the end and is usually recessed back into the slope, which makes it less intrusive than the headwall. The limits of disturbance (LOD) for the pipe option is estimated as a 10-20 foot wide path within and straddling the streambed. Access by machine to the steep portion of the slope may or may not be necessary since the pipe is moveable by hand. It is possible that debris may be winched out of the channel, with minimal grading and placement of aggregate performed manually.

A smaller machine (i.e. skid steer) could possibly reach from below from within the channel or through the woods from the Millennium development.

2. **Modified Stormwater Conveyance**: This relatively new approach creates a more natural stormwater conveyance system consisting mainly of a series of pools connected by short, relatively steep and armored channels. Generally the channel would be built-up from existing grade approximately 18" or greater depending on level of channel incision; vegetation would be planted within the channel and on the side slopes for stabilization and to help filter the water. Large stones are used to help define the pools and to provide a very stable medium to convey the water between pools. Trucks would dump a mixture of sand, aggregate and organic matter into the incised channel until it becomes navigable by a tracked machine. The filling operation continues until it resembles a haul road; this access is compacted and used by machines to get to the downstream end of the project. Construction starts at that point and material is removed in some instances as the channel is built back up the slope. Access would not be expected to extend beyond the tops of both side of the channel, therefore the footprint of the construction will be held to the minimum dictated by the stream width. The pools are formed by light excavation of the fill material and more so by the placement of boulders and smaller stone that will form weirs designed to pass the design storm. Boulders are placed upon large sheets of geotextile fabric, so that if pockets of settlement occur, the mass of boulders and cobbles settle together which mitigates the extent of the effect on the design.

## 3.6 PREFERRED ALTERNATIVE – ALTERNATIVE E

The preferred alternative is Alternative E. This plan best meets the criteria and needs identified for the project. The dense existing woodland at the east edge of the site would be retained to allow an appropriate boundary/buffer to the NPS property and retain the natural aesthetic character of this portion of the ANC. A small portion of the stream restoration occurs on NPS property. At the west perimeter, the natural change in grade and design of the perimeter columbarium wall closely conforms to the area's topography and the boundary of Ft. Myer to reduce the amount of topographical cut and fill inward toward the stream. This design results in

a greater preservation of mature trees and larger areas for in-ground crypts. Alternative E would eliminate approximately 50% of the trees on-site (as would the other alternatives). The angle of the road and path system also conform to the natural topography, allowing for the introduction of groves of trees within the in-ground burial area, meandering paths, and a more contemplative environment within the Millennium Site.

This alternative would minimize impacts to the project area while accomplishing the project purpose of expanding ANC by providing 29,922 total new burial sites: 6,565 crypts for casket burials, 3,822 in-ground sites for cremated remains, 1,590 in-ground traditional burials, 115 in-ground custom spaces, and 17,830 niches for remains. The number of total burial sites has evolved during the project planning process. Based on preliminary analysis by the Center for Army Analysis (CAA), this project would extend the longevity of the cemetery by 7-12 years.

Access to the site would be provided from the northeast only, connecting to Ord & Weitzel Road and the existing ANC ceremonial route from the Old Post Chapel. A 30-foot wide roadway (narrowed on the southern portion to 22 feet to reduce impacts to trees) with mountable curbs would cross the site along the edge of the woodland area and loops around the restored stream area. A bus loop/drop-off area is provided close to Ord & Weitzel Road to accommodate large vehicles and minimize their impact. Pedestrian access from the roadway would be provided by 10-foot-wide tree-lined curved paths. Solitary trees would be provided in the large in-ground areas to recall the iconic image of ANC. The staging and storage area for the project would primarily be in the adjacent existing JBM-HH Motor Pool, roadway, and adjacent burial area.

### 3.6.1 Stormwater Management

The preferred alternative for the stormwater management effort is underground stormwater storage which would slowly release into a modified stormwater conveyance system on the slope. The attenuated peak flows discharging from the underground storage device are incorporated into the modified stormwater conveyance design to avoid failures (please see Section 5.3.2.6 for additional information). In addition to the stormwater management features, the pavement around all four trees in the Chaffee Place parking lot would also be removed to the drip lines (as

appropriate) to allow for better long-term habitat for the trees. This is also the preferred alternative of the NPS.

## 3.7 AVOID, MINIMIZE AND MITIGATE

The NEPA process seeks to avoid, minimize and then mitigate for adverse environmental impacts. Although this process is described throughout this document, some of the specific measures proposed are outlined below. Section 106 Consultation was concluded and resulted in additional mitigations specific to that process.

### 3.7.1 Measures to Avoid Impacts

- Stream restoration using NCD techniques
- Detailed design seeks to specifically avoid larger trees where feasible, including realignment of the loop road to avoid desirable tree stands
- Oldest stands of trees completely avoided, with no impacts to stands of trees greater than 145 years-old (see Figure 20)

### 3.7.2 Measures to Minimize Impacts

- Enhancing aesthetics
- Salamander protections on all NPS property
- Modified stormwater conveyance construction methods with access limited to the channel
- Invasive species removal and control plan incorporated into design
- Native species used for all re-plantings in natural areas; formal areas may include a few non-native species (but no invasives)

### 3.7.3 Measures to Mitigate and Offset Impacts

- The number of trees being replanted has increased to nearly 800 trees (1 1/2" to 5" caliper), plus more than 1600 tree seedlings, and 14,000 shrubs. ANC is committed to further minimize removal of trees.
- Interpretive/educational signage to enhance the visitor experience

- Materials from historic boundary wall incorporated as part of facade on new boundary wall (Section 106 Mitigation)
- Vegetation re-location and inventory by local environmental organizations
- Historic American Buildings Survey of the Boundary Wall (Section 106 Mitigation)
- Documentation of the historic landscape following the Historic American Landscape (HALS) Level II standards.

## 3.8 UPDATED INFORMATION BASED ON COMMENTS

Based on comments received on the Draft EA, all alternative evaluations were reviewed. Based on this review, some of the impact quantifications have been adjusted slightly. This re-assessment was made to ensure that all plans were compared using the same method of quantification (i.e. comparison at same level of design detail). Additional information in this EA includes expanded resource inventories and updated tree survey. Also, the total number of burial spaces has evolved during the project planning process.

In addition, some design refinements have been made to the Recommended Plan (Alt. E) which reflects incorporation of comments. These refinements will be highlighted in Section 5.0, Environmental Effects. Please note that these design refinements are not included in the figures in this EA. The refinements include:

1. Eastern portion of Loop road reduced from 30 feet to 22 feet wide to reduce tree removal.
2. Adjustments to road alignment in at least two locations to save higher quality trees and reduce impacts to the stream.
3. Adjustment of Columbaria locations so that the overall effect is more balanced and less Columbarium are located south of the stream.
4. Based on a geologic inventory provided by Arlington County, a spring was identified within the impact area. This spring is at the head of an intermittent stream. The use of an arched bottomless span structure over the spring-fed intermittent stream will ensure that the spring will not be permanently or significantly impacted. In addition, the intermittent stream will now flow free, instead of being piped as was previously planned.

## 3.9 ALTERNATIVES ELIMINATED FROM DETAILED EVALUATION

Per 32 CFR Part 651.34:

> *In the discussion of alternatives, any criteria for screening alternatives from full consideration should be presented, and the final disposition of any alternatives that were initially identified should be discussed.*

Based on this guidance, the following criteria were developed to meet the minimum goal of expanding the cemetery to the greatest extent practicable while meeting the other criteria.

**The criteria for screening alternatives from full consideration include:**

1. Alternative must maintain operational intent of the cemetery to include vehicular circulation, ceremonial procession requirements, parking along the roads, pedestrian traffic, ADA accessibility, emergency access and maintenance access
2. Alternative must be able to meet all minimum regulatory requirements, to include (but not limited to) Coastal Zone Management Act (CZMA) enforceable policies, Chesapeake Bay Preservation Act, National Historic Preservation Act and Clean Water Act.

Below is a discussion of those alternatives that were eliminated and the criteria used to eliminate each alternative. A main driver of the concept and design efforts was to minimize impacts to the existing stream, as well as the trees, while retaining as many burial spaces as possible. All alternatives would eliminate approximately 50% of the trees, so this was considered but was not a major factor in differentiating the alternatives.

**Table 1 - Alternatives Eliminated from Detailed Evaluation**

| Alternative | Criteria for Elimination |
|---|---|
| **Alternative A** | **Criteria 2** – Would not meet Chesapeake Bay Preservation Act Standards |
| **Alternative B** | **Criteria 2** – Would not meet Chesapeake Bay Preservation Act Standards |
| **Alternative C** | **Criteria 1** – Would not meet minimum operational intent for vehicular traffic flow, ceremonial procession requirements, and parking along the road (needed for internment ceremonies) |
| **Alternative D** | **Criteria 1** – Would not meet minimum operational intent for vehicular traffic flow, ceremonial procession requirements, and parking along the road (needed for internment ceremonies)<br>**Criteria 2** – Would not meet Chesapeake Bay Preservation Act Standards |
| **Alternative F** | **Criteria 1** – Would not meet minimum operational intent for vehicular traffic flow, ceremonial procession requirements, and parking along the road (needed for internment ceremonies) |

### 3.9.1 Alternative A

Alternative A was eliminated from further evaluation based on Criteria 2. Specifically, it would not have been able to meet the standards of the Chesapeake Bay Preservation Act due to its impacts on the stream. This alternative would have had 370 feet of permanent impact to the intermittent streams as well as 748 feet of permanent impact to the perennial stream (i.e. where the stream is eliminated or its habitat is significantly and permanently reduced in function and value). Because of these impacts, it would likely have required an Individual Permit from VDEQ, and would not have been able to meet the requirements of the Chesapeake Bay Preservation Act. Approximately 1088 trees would be removed under Alternative A.

Additional discussion on elimination of Alternative A:

- ***Ceremonial Access and Traffic Circulation (Criteria 1)*** – Burial services at Arlington often involve a horse-drawn caisson that moves in a ceremonial fashion through the cemetery along an established route. Funeral processions will proceed from the Old Post Chapel through the central area of the cemetery, and will enter the Millennium site via Ord & Weitzel Drive. Alternative A envisions a roadway connecting Arlington National Cemetery (ANC) to the area near the Old Post Chapel on Joint Base Myer-Henderson Hall (JBM-HH). After review with JBM-HH and the CFA, it was agreed that such an access point near the Old Post Chapel should be provided only for emergency and service vehicles and controlled with a locked gate for security purposes. Access to the Millennium site should be limited to Ord & Weitzel Drive only, with a loop road or other method to turn around vehicles on site. Alternative A does provide for such vehicular circulation, with two loop rood areas, but creates a "dead end" at the Old Post Chapel gate.
- ***Security concerns with access via Old Post Chapel (Criteria 1)*** – JBM-HH is required to maintain a secure boundary between its property and ANC. A service/emergency vehicle access point with a locked gate is acceptable as part of this secure boundary; however, the use of this access point as a main circulation route, as shown in this alternative, is not acceptable to JBM-HH.
- ***Impacts to the environment (Criteria 2)*** – As mentioned above, Alternative A has a significant impact on the existing stream. In addition, a large number of existing trees are removed by this alternative. In December 2012, a tree survey was conducted to identify all trees larger than 6 inches in diameter on the Millennium project site. Based on this survey, Alternative A would require the removal of 1,088 existing trees. Approximately 725 of these trees are located west of the boundary wall or near the Motor Pool, and will be replaced by new landscaping included in the project. However, approximately 360 trees are part of the mature forests located along the eastern boundary of the site. Protecting and preserving more of these trees is recognized as a compelling goal for the further development of the Millennium project.

### 3.9.2 Alternative B

Alternative B was eliminated from further evaluation based on Criteria 2. Specifically, it would not have been able to meet the standards of the Chesapeake Bay Preservation Act due to its impacts on the stream. Compared to the others, Alternative B is the least traditional in terms of aesthetics. The design of the terraces presents a unique visual by having the columbarium walls integrated within the rows of headstones. This terracing effect was deemed aesthetically inappropriate by both CFA and NCPC. In addition, this alternative would have resulted in permanent unacceptable impacts to the stream similar to those identified for Alternative A. Approximately 1002 trees would be removed under Alternative B.

Additional discussion on elimination of Alternative B:

- ***Ceremonial Access and Traffic Circulation (Criteria 1)*** – Much like Alternative A, Alternative B envisions a roadway connecting Arlington National Cemetery (ANC) to the area near the Old Post Chapel on JBM-HH. After review with JBM-HH and the US Commission of Fine Arts, it was agreed that such an access point near the Old Post Chapel should be provided only for emergency and service vehicles and controlled with a locked gate for security purposes. Access to the Millennium site should be limited to Ord & Weitzel Drive only, with a loop road or other method to turn around vehicles on site. Alternative B does provide for such vehicular circulation, with one loop road area, but creates a "dead end" at the Old Post Chapel gate.
- ***Security concerns with access via Old Post Chapel (Criteria 1)*** – JBM-HH is required to maintain a secure boundary between its property and ANC. A service/emergency vehicle access point with a locked gate is acceptable as part of this secure boundary; however, the use of this access point as a main circulation route, as shown in this alternative, is not acceptable to JBM-HH.
- ***Impacts to the environment (Criteria 2)*** – As mentioned above, Alternative B also has a significant impact on the existing stream. In addition, a large number of existing trees are removed by this alternative. However, a "tree save" area has been incorporated into the plan in the center of the loop road area. In December 2012, a tree survey was conducted to identify all trees larger than 6 inches in diameter on the Millennium project site. Based

on this survey, Alternative B would require the removal of 1,002 existing trees. Approximately 725 of these trees are located west of the boundary wall or near the Motor Pool, and will be replaced by new landscaping included in the project. However, approximately 275 trees are part of the mature forests located along the eastern boundary of the site. Compared to Alternative A, Alternative B protects and preserves an additional 86 trees in the mature forest areas, primarily by the "tree save" area at the loop road area.

### 3.9.3 Alternative C

Alternative C was eliminated from further evaluation based on Criteria 1. Specifically, the vehicular circulation, parking along the road, and ceremonial procession requirements would not be acceptable. Approximately 912 trees would be removed under Alternative C. Permanent impacts to the stream include 291 linear feet of permanent impact to the intermittent streams and 363 linear feet of permanent impact to the perennial stream.

Additional discussion on elimination of Alternative C:

- ***Ceremonial Access and Traffic Circulation (Criteria 1)*** – Much like Alternative A, Alternative C envisions a roadway connecting Arlington National Cemetery (ANC) to the area near the Old Post Chapel on JBM-HH. After review with JBM-HH and the US Commission of Fine Arts, it was agreed that such an access point near the Old Post Chapel should be provided only for emergency and service vehicles and controlled with a locked gate for security purposes. Access to the Millennium site should be limited to Ord & Weitzel Drive only, with a loop road or other method to turn around vehicles on site. Alternative C does provide for such vehicular circulation, with one loop road area, but creates a "dead end" at the Old Post Chapel gate.
- ***Parking and vehicle stacking space (Criteria 1)*** – The funeral cortege is often accompanied by a large group of private automobiles that transport family and friends to the burial site. Sometimes there are simultaneous funerals within close proximity of others. This creates a significant demand for parking space in close proximity to the burial sites. These vehicles follow the cortege and park on either side of the road, leaving

the center lane available for through traffic. Alternative C, with only one smaller loop road, has only limited parking space available for funeral participants.

- ***Visitor/family access (Criteria 1)*** – In this alternative, many of the columbarium locations can only be reached from a pedestrian path, which is relatively far from the committal service shelters and the vehicle parking areas. These lengthy walking paths could pose difficulties for visitors to the cemetery, especially the elderly and disabled.
- ***Maintenance access (Criteria 1)*** – In this alternative, maintenance access to many of the columbarium areas is also limited to the walking paths. This could present problems for visitors, if they are confronted with maintenance vehicles on these limited path areas. In addition, the vehicles themselves may damage the walking areas due to heavy use for daily maintenance access (trash pick-up, landscape upkeep, etc.).
- ***Security concerns with access via Old Post Chapel (Criteria 1)*** – JBM-HH is required to maintain a secure boundary between its property and ANC. A service/emergency vehicle access point with a locked gate is acceptable as part of this secure boundary; however, the use of this access point as a main circulation route, as shown in this alternative, is not acceptable to JBM-HH.
- ***Impacts to the environment (Criteria 2)*** – As mentioned above, Alternative C has a significant impact on the existing stream. In addition, a large number of existing trees are removed by this alternative. In December 2012, a tree survey was conducted to identify all trees larger than 6 inches in diameter on the Millennium project site. Based on this survey, Alternative A would require the removal of 1,088 existing trees. Approximately 725 of these trees are located west of the boundary wall or near the Motor Pool, and will be replaced by new landscaping included in the project. However, approximately 275 trees are part of the mature forests located along the eastern boundary of the site. Compared to Alternative A, Alternative C protects and preserves an additional 176 trees in the mature forest areas, primarily by the "tree save" area east of the roadway and by not providing a vehicular access roadway around the columbarium areas served by the pedestrian path.

### 3.9.4 Alternative D

Alternative D was eliminated from further evaluation due to Criteria 2. Alternative D would likely have significant concerns under the Chesapeake Bay Preservation Act, given its greater encroachment into the RPA as well as its greater direct impacts to linear feet of perennial stream. Approximately 976 trees would be removed under Alternative D. Impacts to streams were similar to Alternative C. Over 4000 linear foot of road were included in Alternative D, resulting in a concern over the large increase in impervious area as well as the aesthetic impacts of the roadway. In addition, this alternative had a very large amount of fill, estimated at approximately 250,000 cubic yards. Concepts from both Alternatives C and D were used to create Alternatives E and F.

Additional discussion on elimination of Alternative D:

- ***Visitor/family access (Criteria 1)*** – In this alternative, many of the columbarium locations can only be reached from a pedestrian path, which is relatively far from the committal service shelters and the vehicle parking areas. These lengthy walking paths could pose difficulties for visitors to the cemetery, especially the elderly and disabled.
- ***Maintenance access (Criteria 1)*** – In this alternative, maintenance access to many of the columbarium areas is also limited to the walking paths. This could present problems for visitors, if they are confronted with maintenance vehicles on these limited path areas. In addition, the vehicles themselves may damage the walking areas due to heavy use for daily maintenance access (trash pick-up, landscape upkeep, etc.).
- ***Security concerns with access via Old Post Chapel (Criteria 1)*** –JBM-HH is required to maintain a secure boundary between its property and ANC. A service/emergency vehicle access point with a locked gate is acceptable as part of this secure boundary; however, the use of this access point as a main circulation route, as shown in this alternative, is not acceptable to JBM-HH.

### 3.9.5 Alternative F

Alternative F was eliminated from further evaluation based on Criteria 1. From an operational perspective (Criteria 1), there were several issues. Stakeholders were concerned about the columbarium locations being too far away from the committal service shelter. There was not

vehicular access to many of the columbaria. There were also concerns that the walking path could pose an operational challenge for both maintenance work and visitors to the cemetery. Approximately 987 trees would be removed under Alternative F.

Additional discussion on elimination of Alternative F:

- ***Parking and vehicle stacking space (Criteria 1)*** – The funeral cortege is often accompanied by a large group of private automobiles that transport family and friends to the burial site. Sometimes there are simultaneous funerals within close proximity of others. This creates a significant demand for parking space in close proximity to the burial sites. These vehicles follow the cortege and park on either side of the road, leaving the center lane available for through traffic. Alternative F, with one loop road area and one cul-de-sac, has only limited parking space available for funeral participants.
- ***Impacts to the environment (Criteria 2)*** – As mentioned above, Alternative F has less of an impact on the existing stream than the previous studies, due to the "tree save" area that allows for the restoration of the existing stream. In addition, a large number of existing trees are removed by this alternative. In December 2012, a tree survey was conducted to identify all trees larger than 6 inches in diameter on the Millennium project site. Based on this survey, Alternative A would require the removal of 1,088 existing trees. Approximately 725 of these trees are located west of the boundary wall or near the Motor Pool, and will be replaced by new landscaping included in the project. However, approximately 275 trees are part of the mature forests located along the eastern boundary of the site. Compared to Alternative A, Alternative F protects and preserves an additional 101 trees in the mature forest areas, primarily by the "tree save" area east of the roadway and by not providing a vehicular access roadway around the columbarium areas served by the pedestrian path.

### 3.9.6 Sub-alternatives for Stormwater Management

As the stormwater management had a different purpose and need than the primary alternatives, a separate set of criteria was established to screen alternatives from full consideration. Those criteria were:

1. Alternative must be able to meet all regulatory minimum requirements, to include (but not limited to) CZMA enforceable policies, Chesapeake Bay Preservation Act, National Historic Preservation Act and Clean Water Act.
2. Alternative for slope restoration must be able to be constructed with a minimal Limit of Disturbance as this was a minimum requirement from NPS.
3. Alternatives must have little to no maintenance requirements.

**Table 2 - Sub-Alternatives Eliminated from Detailed Evaluation**

| Sub-Alternatives | Criteria for Elimination |
|---|---|
| **Impervious Area Reduction** | • Criteria 1 – Potential NHPA issues<br>• Criteria 3 – Pervious pavers have a long-term maintenance requirement |
| **Bio-filtration** | • Criteria 3 – Would have a long-term maintenance requirement |
| **Pipe on slope** | • Criteria 2 – Would have a 10-20 foot LOD in order to construct and anchor the pipe |

The sub-alternatives that were eliminated from detailed evaluation within this document include:

1. **Impervious Area Reduction (Criteria 1, Criteria 3)** – This option (except for around the parking lot trees, which would be implemented) was eliminated due to potentially significant items of historical value found in the NPS parking lot area under consideration for impervious pavement (Criteria 1). The project team determined that it was not willing to risk potentially impacting these culturally significant items. In addition, pervious pavers would pose a long-term maintenance requirement (Criteria 3).
2. **Bio-filtration (Criteria 3)** –Bio-filtration was eliminated because there would be a long-term maintenance requirement. In addition, it was determined the bio-filtration

was not consistent with other landscape features at ANC and would occupy an area that is currently used for staging of new trees and shrubs. Additionally, the modified stormwater conveyance system would be providing water quality benefits; therefore, the treatment feature of the bio-filtration was redundant.

3. **Pipe on slope (Criteria 2) –** It was determined that the access needed for installing the pipe would cause an unacceptable level of disturbance. In addition, the aesthetics of the pipe were not acceptable to the NPS. The NPS did not want a manhole structure on the property, and were concerned with the durability of the bend at the end of the pipe. In addition, no treatment would occur in a piped system, compared to extensive treatment through the modified stormwater conveyance system.

# 4 AFFECTED ENVIRONMENT

This section describes the affected environment and the existing conditions for the resource categories that may be impacted by the Millennium Project. Each resource category was reviewed for its potential to be impacted. Through this analysis, resource categories clearly not applicable to the alternatives were screened from further evaluation (and are briefly described in Section 4.18). Only those affected resources applicable to the Proposed Action are discussed in Section 5.0, Environmental Consequences.

The Millennium Project is located on a 27-acre site consisting partly of Section 29 of the existing northwest boundary of Arlington National Cemetery and partly of the old picnic grounds of JBM-HH. The proposed project area is primarily on ANC-administered property. The NPS also administers several properties within ANC, including Arlington House and portions of the forested area adjacent to the Millennium site. The project site is bounded to the west by McNair Road and extends roughly to Humphrey's Drive on the East, Ord & Weitzel Drive on the North, and Ft. Myer Chapel on the South. Surrounding the study area are the JBM-HH to the west, maintained cemetery to the northeast beyond Ord & Weitzel Drive and the south beyond Ft. Myer Chapel, and deciduous forest to the east. One perennial stream and two intermittent streams convey flow generally north through the study area. The impacts from this project would primarily be found within the project boundaries.

A geologic features inventory of the site prepared by Tony Fleming in 1996 provides a good overview of the site and is located in Appendix G. It is important to keep in mind, however, that the inventory includes all of Section 29, which includes the NPS-administered property known as the "Arlington Woods" as well as the ANC-administered portion of the forest contributing to the Arlington House NRHP listing which is proposed for the Millennium Project.

## 4.1 SOILS

The predominant soil unit found within the vicinity of the study area is the Arlington National Cemetery (5) soil unit, according to the *Soil Survey of Arlington County, Virginia* (United States Department of Agriculture-Natural Resources Conservation Service [USDA-NRCS], 2007) and the more recently available digital NRCS Soil Survey Geographic Database (SSURGO) soils data for the county (NRCS Web Soil Survey, 2010). This soil unit is described as having deep, well drained soils on level to moderate slopes within the Upper Coastal Plain landform. Soils within the study area are not classified as sensitive or as "Prime or Unique Farmland" soils.

Mapped soil units are classified as primary or secondary hydric soils based upon their listing on the *National Hydric Soils List by State* (USDA-NRCS, 2010). Primary hydric soils are defined as those soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. The ANC soil unit is not classified as a primary hydric soil according to the *National Hydric Soils List by State*. Secondary hydric soils are those soils that potentially contain small inclusions of primary hydric soils, typically in drainage ways or depressional areas. The ANC soil unit is not classified as a secondary hydric soil within the Commonwealth of Virginia.

The NRCS Soil Survey Geographic Database (SSURGO) classifies two soil types for the Millennium Project site, the Arlington National Cemetery (5) in the eastern half of the site, and Urban land-Udorthents complex (12) in the western half of the site (the land that was formally part of Joint Base Myer-Henderson Hall). Neither soil group has a hydrologic soil group associated with it in SSURGO; however, other sources associate Leonardtown silt loam with Urban land-Udorthents complex (12).

The most recent soil survey of the project area that provides more detailed information is the Soil Survey of Fairfax and Alexandria Counties, Virginia, 1915. Hydrologic soil groups were not in existence in 1915. The hydrologic soil group referenced for these soil types was determined by comparing the 1915 soil survey soil description to the general descriptions of the hydrologic soil groups and selecting the appropriate one. Per the 1915 soil survey the soil types and symbol, and associated hydrologic soils groups are as follows:

- Leonardtown silt loam (L) - D
- Susquehanna loam (So) - C
- Sassafras gravelly loam (Sf) – B

The soils from the Soil Survey of Fairfax and Alexandria Counties, Virginia, 1915 were used in the development of the hydrologic models for the stream and channel restoration portions of this project. Soil conditions vary throughout the site. In some areas the soils are relatively intact and undisturbed. In other areas, including the incised streambeds and especially the steep slope near the Chaffee Place parking lot, soils are actively eroding resulting in sedimentation in downstream portions of the watershed.

## 4.2 TOPOGRAPHY AND FLOODPLAINS

ANC is located within the Northern Coastal Plain Physiographic Province. The general topography at ANC is gently rolling hills dominated by landscaped grass areas used for burial sites. The northeast portion of the Millennium Site was formerly developed as a warehouse and maintenance complex. Its southeast facing slopes vary between 5 and 20 percent, with plateaus for buildings, parking, and outdoor storage. Approximately 60% of the site has steep slopes (defined as slopes >15%).

The undeveloped portion of the Millennium Site is characterized by steep slopes, wooded hilltops, and ravines. In the southwestern portion of the site, natural ravines carry surface runoff from the higher elevations of the site into a collector stream which runs southwest to northeast through the center of the site. Drainage in the northeastern portion of the site runs into a collector stream, which runs northeasterly under Ord & Weitzel Drive to an underground storm drainage system.

The project area is located high above the Potomac River and is located in Zone D (Areas with possible but undetermined flood hazards) per the Federal Emergency Management Agency (FEMA) Map panel 515520 0010B.

The wooded area near the Chaffee Place parking lot is characterized by varying slopes which lead into several tributaries of the main stream. Due to years of inadequate outfall protection, parking lot runoff has caused severe damage to the steep slope from the parking lot where the 18" pipe surfaces on the slope. Damage includes a severely incised channel with vertical drop-offs, exposed rocks, root masses and other debris, creating an unstable condition. The overall length of the system is approximately 170' from the outfall of the existing 18" pipe.. Existing slopes vary from approximately 70% near the outfall to about 18% nearer the bottom.

## 4.3 HYDROLOGY AND WATER QUALITY

Arlington National Cemetery is located within the Middle Potomac-Anacostia-Occoquan watershed (Code 02070010), and is within the larger Middle Potomac Sub-Basin which covers approximately 603,520 acres (943 square miles). ANC is located approximately 1.5 miles west of the Potomac River. An unnamed channel to Long Branch runs along the southwestern boundary of Ft. Myer and ANC. Long Branch, in turn, drains to Four Mile Run, which meets the Potomac just south of Ronald Reagan National Airport. Refer to Figure 15 for the jurisdictional streams and wetlands.

**Figure 15 - Wetlands and Streams On and Near the Millennium Project**


A wetland delineation performed by KCI, Inc. on December 2, 2010, identified both perennial and intermittent streams that convey flow generally north through the study area. A site visit to confirm the findings was also conducted by USACE Norfolk District Regulatory staff in November 2011 and as a result of this visit an amendment to the wetland delineation was added. The wetland delineation report is included in Appendix H. Please note that the project boundary (for reference) on the jurisdictional determination is slightly different than the current proposed

project boundary. Figure 15 depicts the streams and wetlands on the project site and reflects the current boundary.

In the Geologic Inventory by Fleming (found in Appendix G), several seeps and springs are identified. Two seeps are identified (labeled AH8 and AH10 on Inventory). These seeps are currently adjacent to the main branch of the stream and are very close to the ANC/NPS boundary. However, both seeps are on the southern side of the stream, outside of the LOD of the construction. Four springs are identified on the Inventory (labeled AH10, AH 15, AH18, and AH24). Of these springs, only AH15 is within the boundaries of the Millennium Project and is identified on Figure 15. The other three springs are entirely on NPS property.

Two site visits were performed by USACE Regulatory staff in late 2012 and early 2013 to investigate potential site features. In December 2012 an inquiry was made regarding a "vernal pool" identified in an earlier project site document. Upon further investigation during a site visit, no vernal pool was found (see memo included in Appendix H). In February 2013 a site visit was performed by the Corps to investigate a spring (AH15) within the project footprint. The Corps concluded that the feature is a natural spring. The spring is a water of the United States and is feeding the intermittent stream already identified as part of the JD (see memo included in Appendix H).

Some portions of the stream located on the Millennium Project Site are deeply incised (preventing storm flows from accessing the floodplain) and have raw, actively eroding banks. In their current state, they are effectively serving as conduits - transporting and providing pollutants (i.e. total nitrogen, total phosphorus, and total suspended solids) to downstream receiving waters. Except for a 200 linear foot section of stream located just upstream of Ord and Weitzel Drive, an area proposed for spot improvements only, the entire reach of stream through the Millennium project is in need of restoration. A representative photo of the degradation can be found in Figure 16 below (additional photos in Appendix G). The existing stream channel at this point is approximately 20 feet wide and 6 feet deep and the stream banks are vertical. The drainage area to the stream at this point is approximately 8 acres. Per Maryland Piedmont Regional Curves, adjusted for watershed impervious area, a stream with a contributing drainage area of this size

should have a bankfull width of approximately 6.5 feet and a depth of 0.7 feet. During site inspections, representatives from USACE regulatory, VDEQ, and Arlington County all concurred that the streams flowing through the Millennium project site were in need of restoration.

**Figure 16 - Stream Degradation**


The main stream, titled the North Branch, is a second order perennial stream that conveys flow northeast through the study area to a culvert beneath Ord & Weitzel Drive and continues beyond the limits of the study area. Approximately 1,879 linear feet of this stream is within the study area. In addition, two small sections of intermittent stream are also identified as tributaries to this stream. Based on the field investigation, the Cowardin Classification for this system is riverine, upper perennial, streambed, cobble-gravel/sand (R3SB3/4).

The southern-most portion of the North Branch contains the most degraded reaches of existing stream and would require the most intensive restoration effort. Currently, the streams in this section are deeply incised (up to 8 feet, preventing storm flows from accessing the floodplain) and have raw, actively eroding banks. The northern sections of the stream are fairly stable with few areas of stream bank erosion. Currently on the northernmost portion of the stream, a headcut

is developing as the stream flows into the existing culvert (from a combination of steeper gradient and the culvert's flow concentration) and there is evidence of erosion around the sides and bottom of the culvert. If left unattended, the headcut would progress upstream and threaten the stability of other portions of the stream.

WSSI conducted a physical assessment of the stream (see Appendix G) that will be restored as part of the Millennium Project. Cross-section survey, bank erosion hazard index (BEHI), pebble counts, benthic macro invertebrate assessments, and a chemical analysis were performed. The cross section analysis shows that the stream is deeply incised and disconnected from the floodplain, with the exception of a 200-foot reach at the downstream end of the stream. The BEHI analysis concluded that the stream banks are unstable and actively eroding, with the exception of a 200-foot reach at the downstream end of the stream. The benthic macro invertebrate community is degraded and dominated by pollution tolerant organisms. This degradation is a direct consequence of the stream bed and bank instability and the resulting loss of habitat. The chemical analysis indicates that the pH, dissolved oxygen content, and temperature levels are within normal and accepted parameters for such streams.

The main water quality concern in the project area is sediment and associated Total Phosphorous (TP) bound to the silt and clays which is currently eroding from the incised banks as well as the steep slope near the NPS Administrative Building parking lot. However, high velocities of water during storm events are cutting a large gully into the above-mentioned slope, resulting in Total Suspended Solids (TSS) and TP loadings and thus sedimentation in downstream reaches of the watershed.

## 4.4 GROUNDWATER

According to the Ground Water Atlas of the United States, Delaware, Maryland, New Jersey, North Carolina, Pennsylvania, Virginia, West Virginia, HA 730-L (Trapp and Horn, 1997), the Arlington, VA region is underlain by the Potomac aquifer, which is part of the Northern Atlantic Coastal Plain aquifer system**.** The Potomac aquifer in Virginia consists of the middle and lower Potomac aquifers, which are similar to the Patapsco and the Patuxent aquifers of Maryland and Delaware.

The sediments that comprise the Potomac aquifer are predominately of fluvial and deltaic origin. The maximum thickness of the Potomac aquifer in Virginia is about 4,600 feet, and the average thickness is about 800 feet. General groundwater flow in the area is toward the southeast and groundwater recharge occurs from precipitation or from downward movement through confining beds. Groundwater is not used as a drinking water supply in the Arlington area. See Section 4.3 for a discussion of seeps and springs.

Groundwater readings taken during a subsurface investigation in 2007 (USACE, 2007) reflected a significant variation that generally corresponded to the changes in topography across the Millennium Site. It was observed that the groundwater table typically lies approximately 10 feet to 15 feet below the surface at the lower end of the drainage channel. The groundwater elevation rises but is at a greater depth below the ground surface as the topography rises away from the drainage channel.

## 4.5 WETLANDS

Refer back to Figure 15 for the jurisdictional wetlands located adjacent to the project site. Wetlands are identified based on characteristics of vegetation, hydrology, and soils. Prior to conducting field activities, readily available primary source materials including U.S. Geological Survey (USGS) maps, National Wetland Inventory (NWI) maps, FEMA floodplain data, and the Arlington soil survey were reviewed to determine the presence or absence of wetlands and streams within the study area.

A field reconnaissance for the entire study area was performed on 2 December 2010, to determine the presence or absence of wetland areas. A site visit to confirm the findings was also conducted by USACE Norfolk District Regulatory staff in November 2011. As a result of this site visit an amendment to the wetland delineation was added which noted some adjustments to the original delineation. Figure 15 reflects the updated wetland delineation. One small wetland area has a total area of 7,140 square feet and an additional wetland area, approximately 1,267 square feet, is found in the wooded area on NPS property between the Millennium Project and

Arlington House. Neither of these wetland areas is within the construction footprint of the Millennium Project. The wetland delineation for the project area can be found in Appendix H.

NOTE: NPS has specific agency requirements for NEPA and wetlands identification. Per Director's Order 12 Handbook, which deals with NPS implementation of NEPA, and NPS Procedural Manual 77-1, which deals with wetlands protection and NPS responsibilities under Executive Order 11990, NPS would use "Classification of Wetlands and Deepwater Habitats of the United States" (FWS/OBS-79/31; Cowardin et al., 1979) as the standard for defining, classifying, and inventorying wetlands and considers the creek in its entirety a riverine wetland. As a small portion (approximately 199 linear feet, or 0.044 acre) of the stream restoration is located on NPS-administered property, NPS considers that portion of the stream a wetland per their implementing regulations. However, it is not a jurisdictional wetland.

## 4.6 VEGETATION

Vegetation at the Millennium Site varies with location. The eastern portion of the site, formerly a warehouse and maintenance complex is predominantly vegetated with grass and other typical lawn species, while the remainder of the site is forested or grassy area. The forested areas on the Millennium Site vary from disturbed forested areas near the old warehouse area to roughly 105-year-old white oak and chestnut oak forests to approximately 145-year-old northern red oak and chestnut oak forests to roughly 165-year-old mixed hardwood forest.

The Arlington National Cemetery Millennium Project site and adjacent areas have been characterized in the past by others, including the Virginia Native Plant Society and by the NPS, as described in an EA prepared by the NPS in 1999. The Virginia Native Plant Society has listed the Arlington House Woods (which for the purposes of this EA is defined as the NPS administered property adjacent to the Millennium project, and referred to as “Arlington Woods” within this EA) as a Virginia Native Plant Society Registry Site which, although this is not a legal designation, recognizes a site for one or more reasons, including: “…an exemplary occurrence of a habitat, a plant community, or a plant species. Sites may include an unusual, persisting variation of a plant species, or an assemblage of species. Or the site may exhibit some quality with the unique potential to inspire community awareness.” The Virginia Native Plant

Society Registry characterizes the Arlington House Woods as "…one of northern Virginia's surviving examples of Old-age Terrace Gravel Forest. The ravine forest canopy consists mainly of oaks, hickories, tulip tree and beech with an understory of fringetree, witch-hazel, pinxter azalea, black haw and maple-leaved viburnum, and a carpet of spring wildflowers."

The 1999 Environmental Assessment prepared by the NPS includes an "Appendix E, Plant Inventory" which includes the Arlington House Woods and the majority of the Arlington National Cemetery Millennium Project site, and was conducted in 1996. This Plant Inventory is included in Appendix G of this EA. As noted in the results of the 1996 report, over 180 different species were found during the inventory, and none of the species were determined to be rare or uncommon in Virginia.

In February of 2012, Wetland Studies and Solutions, Inc. (WSSI) conducted a vegetation survey on the project site. The report of this survey (including the map of community boundaries and photo locations) is located in Appendix G. Four general vegetative communities are present on the site (map of communities is found in report), as described below, including mature hardwood forest, medium-aged disturbed forest, disturbed field/old field, and maintained parkland. A high prevalence of invasive species is present throughout the site, attesting to the level of disturbance, adjacent development, and other anthropogenic pressures that influence these communities as a result of this site's generally urban location.

### 4.6.1 Mature Hardwood Forest

The mature hardwood forest is present primarily in the southern and eastern portion of the site and is dominated by tulip tree (*Liriodendron tulipifera*), chestnut oak (*Quercus prinus*), white oak (*Q. alba*), American beech (*Fagus grandifolia*), and various cherries (*Prunus spp*.) in the tree layer, American holly (*Ilex opaca*), bush honeysuckle (*Lonicera maackii*), Chinese wisteria (*Wisteria sinensis*), and spicebush (*Lindera benzoin*) in the sapling/shrub layer, and English ivy (*Hedera helix*), poison ivy (*Toxiocodendron radicans*), Japanese honeysuckle (*Lonicera japonica*), and serrate-leaf blackberry (*Rubus argutus*) in the herb/vine layer. In addition, WSSI noted a number of standing dead snags and trees with partially dead crowns. It appears that the forest community has undergone a significant shift since the 1996 inventory was conducted, with

the majority of the understory now dominated by invasive and noxious species, leaving little space for native species. However, given the time of year that this survey was conducted, other plants would be expected to be visible in the spring and summer months. The mature hardwood forest area generally includes the 145 year-old stand and the 165 year-old stand of trees.

**Figure 17 - Mature Hardwood Forest**


### 4.6.2 Medium-Aged Disturbed Forest

The medium-aged, disturbed forest is present primarily in the northeastern portion of the site and is dominated by white oak, black cherry (*P. serotina*), black locust (*Robinia pseudoacacia*), and various hickories (*Carya spp*.) in the tree layer, bush honeysuckle, American holly, black-haw (*Viburnum prunifolium*), and white mulberry (*Morus alba*) in the shrub layer, and English ivy, Japanese honeysuckle and poison ivy in the herb/vine layer. These disturbed areas are exhibiting a community type shift (i.e., an apparent increase in the amount/density of invasive species) most likely as a result of disturbance from ongoing activities at the adjacent maintenance yard. The disturbance has also allowed for the introduction of the *Hypoxylon canker* in oaks, affecting the

overall health of this forest community. The medium-aged disturbed forest generally includes the 105 (or less) year old forested stands.

**Figure 18 - Medium-Aged Disturbed Forest**


### 4.6.3 Disturbed Field/Old Field Area

The disturbed field/old field area is present in the central portion of the site and is dominated by black locust, wineberry (*Rubus phoenicolasius*), Bradford pear (*Pyrus calleryana*), and bush honeysuckle in the sapling/shrub layer, and garlic mustard (*Alliaria petiolata*), mugwort (*Artemisia vulgaris*), grape vines (*Vitis sp.*), English ivy, chickweed (*Stellaria media*), and goldenrod (*Solidago sp.*) in the herb/vine layer. No tree layer is present. This area is typical of a disturbed area undergoing regeneration, with a moderate amount of invasive species in the herbaceous layer.

**Figure 19 - Disturbed Field/Old Field Area**


### 4.6.4 Maintained Parkland Area

The maintained parkland area is located primarily in the western portion of the site, north of a stone wall dividing the cemetery property from the previous Fort Myer property. A picnic area is present in the southern portion of this area. The area is dominated by white oak, chestnut oak, and northern red oak (*Q. rubra*) in the tree layer and crabgrass (*Digitaria sp*.) and an unknown bluegrass (*Poa sp*.) dominating the lawn area. This area is best characterized as a man-altered and maintained area.

**Figure 20 - Maintained Parkland Area**


### 4.6.5 Age of Forested Areas

Ages of the forested areas which are cited in this document are based on a forestry study completed in 1998 by Garrow and Associates (Appendix G, please note that ages in study have been increased to 2013 ages). The ages of different stands are shown in Figure 21. Please note that this graphic represents all tree ages, those in the area contributing to the Arlington House NRHP listing as well as those not, including the disturbed areas in the northeast corner of the site which are not in the contiguous forested area adjacent to the NPS-administered Arlington Woods. The figure in the Executive Summary only identifies ages of stands within the contiguous forested area. Some of the area reforested after being cut during the Civil War is within the impacted area, but designs avoid all of the older part (165year old) of this stand, and over half of the younger portion which dates about 145 years old. The forest west of Arlington House, the Robert E. Lee Memorial, was preserved even during the Civil War when most of the forests in what is now Arlington County were cut down to provide fields of fire for the ring of forts around Washington, as well as fuel and building material. The NPS-administered Arlington Woods (235 year old) is adjacent to the Millennium Project but is not located within the main

project footprint. The 145, 165, and 235 year old stands constitute the historic forested landscape contributing to the Arlington House NRHP listing. Table 3 reflects the approximate acreages for each age of contiguous tree stands within the project footprint. Please note that there are other trees, predominantly on the former Ft. Myer property and identified above as maintained parkland area, that are not captured in the below acreages.

**Table 3 - Approximate Acreage of Each Contiguous Tree Age Group**

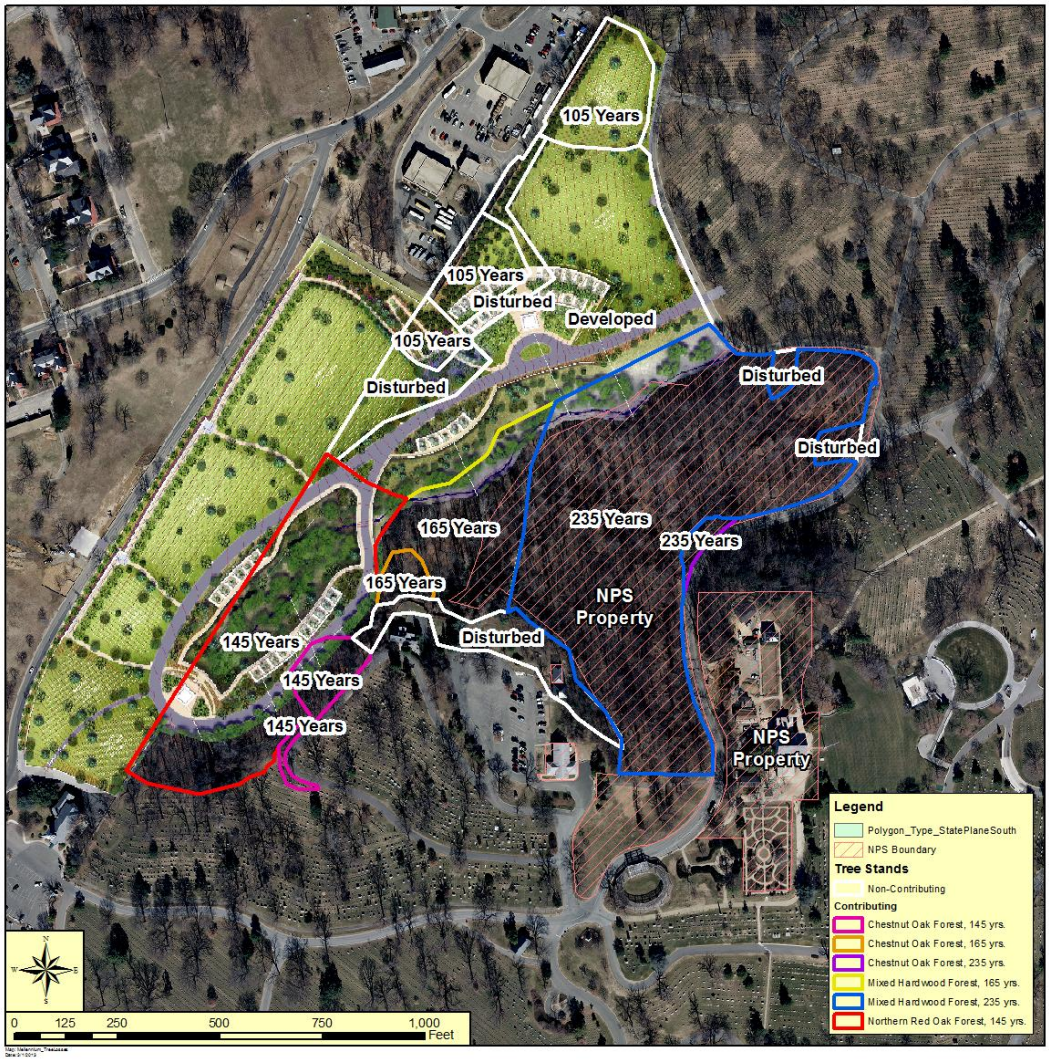
| Age | Acreage |
|---|---|
| Disturbed Forest – 105 years old | 5.58 acres |
| 145 years old | 5.84 acres |
| 165 years old | 2.74 acres |

Based on comments received on the Draft EA concerning the ages of the forested areas, in February 2013 a site visit was made to verify identified ages of forested areas. This site visit included a Department of Army forester as well as the ANC Master Arborist.

A large red oak 52 inches in diameter that fell on Feb 1, 2013 was analyzed. It is located to the south west of the Millennium site, within the stand identified as 145 year old by the Garrow report. A ring count concluded the tree to have been approximately 140-145 years old. A second fallen white oak in the same stand was core sampled and determined to be approximately the same age, around 140 years old. This tree fell during Hurricane Sandy in 2012. The estimated ages of these trees are consistent with the historical documentation. This stand was cleared during the Civil War and has since regenerated.

A white oak that had fallen in the Ft. Myer picnic area was also cored. Although an accurate core was not obtainable as the tree was too large to hit the center, the team approximated it at just over 100 years. The stand of mixed oak/hardwood in the Northeast part of the site was also visited. This stand exhibits more canopy layers and more diverse ages of trees. This stand was identified in the Garrow report as 105 years old (90 years old at the time of the report). This area was also cleared during the Civil War and the forest has since regenerated.

**Figure 21 - Millennium Project Area - All Tree Ages**




## 4.6.6 Tree Survey

A survey locating trees 6" diameter and greater was conducted for the Millennium site, with 1804 trees of this size identified. Oak is the dominant species, with beech, hickory, ash, yellow poplar, and elm comprising the majority of subspecies on hillsides, and maple and black gum scattered along lower-lying areas. Very few evergreens exist. Invasive species include tree of heaven, Norway maple and Princess trees. Tree sizes range from 6" to a 64" Northern Red Oak; therefore tree ages vary greatly. A full list of trees found on the Millennium Project Site is

located in Appendix I, Tree Inventory and Analysis. NPS noted that there are two native plant species (*Lonicera sempervirens* and *Prunus virginiana*) found in the the NPS-administered Arlington Woods that occur nowhere else in George Washington Memorial Parkway.

## 4.7 WILDLIFE RESOURCES INCLUDING RARE, THREATENED AND ENDANGERED SPECIES

No federally listed or proposed threatened or endangered species are known to exist on the project site, based on data from the USFWS Information, Planning and Conservation System. This was confirmed via online project review certification letter from the USFWS dated 16 January 2013 and found in Appendix A. The State Threatened Bald Eagle and other migratory birds may pass through and use areas included within the project site; however, no nesting sites are present and no negative impacts are anticipated. Virginia Department of Game and Inland Fisheries (VDGIF) has reviewed the project and their comments are included in Appendix F.

WSSI conducted a Wildlife Habitat Survey of the project site in February 2013. In summary, a number of wildlife habitat features were found, including stick nests, squirrel nests, tree cavities, ground dens, and snags within the study area. Wildlife species observed during the survey were those that would be commonly found in an urban park like setting. Observations included red fox den, raccoon tracks, and sightings of eastern gray squirrel, eastern cottontail and white-tailed deer. The full report including the location of all identified wildlife habitat features is found in Appendix G.

**Figure 22 - White Tailed Deer on Millennium Site**


The 1999 NPS EA included a survey of the bird population which identified 62 species. This survey included the entire area of Section 29, which at that time was all NPS property but is now made up of both the "Arlington Woods" on NPS property as well as the ANC-administered portion of the forest contributing to the Arlington House NRHP listing that is proposed for the Millennium Project. That survey can be found in Appendix G. Four species were confirmed to be breeding (nesting) at the site and 26 other species were possibly breeding (seen or heard during peak breeding season) in Section 29. The 1999 NPS EA also states: "Other wildlife species found in Section 29 and Arlington National Cemetery include red foxes, grey squirrels, rabbits, raccoons, probably opossums, whitefooted mice, chipmunks, bats, deer, box turtles, garter snakes, black rat snakes, and various frogs and salamanders common to the area."

According to the Animal Welfare League of Arlington (AWLA, 2010), wildlife found in this area is typical for an urban environment. Species generally include squirrel, rabbit, raccoon, opossum, fox, and deer. Songbirds and bats inhabit the area as well as various small reptiles and amphibians. Wildlife is not abundant in the area as it is surrounded by an urban environment. Salamanders and other amphibians are cryptic animals and seek shelter beneath wet stones and woody debris in and along stream corridors. They will likely be encountered during the proposed

project. They are non-venomous, and in the fall/winter/spring season, will be very slow-moving and easy to catch and relocate. The Northern Two-lined Salamander is identified by its reddish brown color, two dark lines along its sides from eye to tail and dark spots along the dorsum (top surface).

## 4.8 CULTURAL RESOURCES

Cultural resources include archaeological sites, structures, cultural landscapes, museum collections, and ethnographic resources. For the purposes of Section 106 of the National Historic Preservation Act, significant cultural resources are identified as historic properties, if they are either considered to be eligible for or listed in the National Register of Historic Places (NRHP). Section 106 of the National Historic Preservation Act mandates that federal agencies consider the impact of their undertakings on historic properties within the project's Area of Potential Effect (APE). If adverse effects on historic, archaeological, or cultural properties are identified, then agencies must attempt to avoid, minimize, or mitigate these impacts to resources considered important in our nation's history.

### 4.8.1 Archaeological Resources

The earliest archaeological survey of the Millennium Project APE was in 1991 when a Phase I survey was conducted in the northern half of the Picnic Area of Ft. Myer for BRAC planning (Custer 1991). This survey identified a prehistoric site (44AR0043), and further work (Phase II) was recommended for it. Phase II investigations at 44AR0043 resulted in recommendations that the site is not NRHP eligible (Katz 2010) with which the Virginia Department of Historic Resources (VDHR) concurred (Letter Marc Holma to John C. Metzler, 1 April 2010, DHR file #2008-1022)

A multi-disciplinary cultural resources field investigation (Garrow & Associates, 1998) of NPS property to be returned to ANC consisting of a section of the forest associated with Arlington House, the Robert E. Lee Memorial and within its NRHP boundary (formerly Section 29 of ANC) identified one large archaeological site consisting of small prehistoric lithic resource extraction activity areas coupled with historic activity areas associated with Arlington House. Listed as the Arlington Ravine Site (44AR0032), the site is located on the east slopes of the

ravine west of Arlington House. Originally, site 44AR0032 was identified as consisting of six archaeological loci within a site boundary of over 21.33 acres. Miscellaneous archeological materials found outside of these loci were termed "non-site finds" implying that the area was not conceived of as a single site.

The loci include three areas of relatively sparse prehistoric lithic (stone) artifacts, with no diagnostic artifacts (Loci 1, 2, and 3), an area with both historic and prehistoric deposits including historic features related to Arlington House (Locus 4/5 which have the same boundary), and a focused area of prehistoric lithic artifact production containing a hearth feature, Locus 6. Loci 1, 2, and 3 are on lands ceded back to ANC from NPS, while Loci 4, 5, and 6 remain on NPS property. Spatially discontinuous loci 1, 2, and 3 have been re-designated as separate archaeological sites, 44AR0047, 44AR0048, and 44AR0049 respectively, in the Virginia Department of Historic Resources (VDHR) data base (Data Sharing System). Contiguous Loci 4, 5, and 6 remain as 44AR0032. The 'non-site' areas between these four sites are no longer on record as being within the boundaries of an archaeological site. While the remaining area of 44AR0032 contains historic period components determined NRHP eligible it lies outside of the Millennium Project APE. In addition, there would be no ground disturbance at 44AR0032, including no grubbing, planting or invasive species control. The 'main stem' of the stream (historically known as Wampakam Branch) separates the Millennium APE from site 44AR0032. The remaining sites, re-designated 44AR0047, 48, and 49, are within the Millennium Project APE, but have been recommended as not eligible for the NRHP (Haynes 2012b). All three are prehistoric sites of unidentified culture periods referred to as 'lithic scatters' by regional archaeologists. In consultation the VDHR concurred that these sites were not NRHP eligible or contributing (Letter Marc Holma [VDHR] to Daniel Delahaye [ANC] 1 February 2013 [VDHR file # 2008-1022]).

Review of existing materials in early 2012 indicated the need for further survey. No Phase I archaeological survey had been conducted on the south half of the Ft. Myer Picnic Area portion of the Millennium APE. Fieldwork in March 2012 identified a historic period site (44AR0046) which was recommended for further work (Haynes 2012b). Phase II at 44AR0046 found these remains to be associated with a 20th century temporary building, probably dating no earlier than

the World War I era. The site was recommended as not eligible for the NRHP (Carmody and Blondino 2012), and the report sent to VDHR 13 November 2012, which has made no comment on it. Per 36 C.F.R. § 800.3(c)(4) ANC and USACE have determined 44AR0046 to be not eligible for the NRHP.

VDHR concurred with the Garrow & Associates, 1999, report conclusions and recommendations regarding the cultural resource significance of the forested landscape of the south branch area and need for preservation of that portion of former Section 29 lands in a letter dated 30 September 1999 (letter Cara Metz to Audrey Calhoun 30 September 1999 VDHR file #95-1353-F). The report was submitted for review along with an Environmental Assessment (EA) for the proposed division of the former Section 29 lands between the NPS and ANC. The VDHR acknowledged the historic component of Site 44AR0032 as NRHP eligible, as related to the significance of Arlington House; however, they cited a lack of evidence presented to support eligibility for the prehistoric component at Locus 1 (ibid.). The letter does not mention Loci 2 or 3.

Archaeological survey in the APE of an associated project, drainage improvements at NPS Administration Building Place Parking Lot, well outside of the main APE of the Millennium project identified a brick pavement and scattered building materials. This site was recorded as 44AR0050, and recommended as potentially NRHP eligible (i.e., further work needed to determine eligibility). Project planners developed a plan to avoid this site, and install the facility in an area where no significant archaeological remains were identified.

A consultation letter and summary of survey work and previous consultations with VDHR for the Millennium Project, along with access to copies of a total of all previous archaeological survey was transmitted to VDHR 13 November 2012 (letter John Haynes to Marc Holma, DHR file #2008-1022). This recommends that there are no NRHP eligible archaeological resources within the Millennium APE. No ground disturbance is indicated in project plans east of the "main stem" or "south branch" of Wampakam Branch which represent the revised boundaries of 44AR0032. All ground disturbing actions associated with the Millennium Project, including

stream restoration measures, plantings, and invasive species control which may cause ground disturbance, would avoid site 44AR0032.

### 4.8.2 Buildings and Structures

The only building within the physical APE of the Millennium Project is an old warehouse in the maintenance yard area of Section 29. This was determined not NRHP eligible by previous survey (letter, Marc Holma to John C. Metzler 29 July 2009, DHR file #2008-1022). A picnic shelter stands in the Ft. Myer Picnic Area portion of the Millennium Project; it is however less than 50 years old and not deemed to have potential NRHP eligibility.

Buildings contributing to or eligible as contributing to the Fort Myer NRHP listed historic district would be within the visual APE of the Millennium Project. The Old Post Chapel is adjacent to the Millennium Project boundary, and was recommended as eligible as a contributing property to the Ft. Myer historic district (Versar 2011) under Criterion A for its association with military funerals. It is presently bordered on one side by ANC. Other contributing properties of the Ft. Myer historic district in the Millennium Project visual APE are residences along Lee Avenue and Jackson Avenue; however these face away from the Millennium Project area. Arlington House is not within the visual APE. No part of the Millennium project can be seen from Arlington House or any of its associated buildings (as verified during a visual effects study, Jacobs 2013), and vice versa due to topography and vegetation which will remain intact in all alternatives developed thus far. This is discussed in more detail in the summary of Section 106 surveys.

### 4.8.3 Cultural Landscape

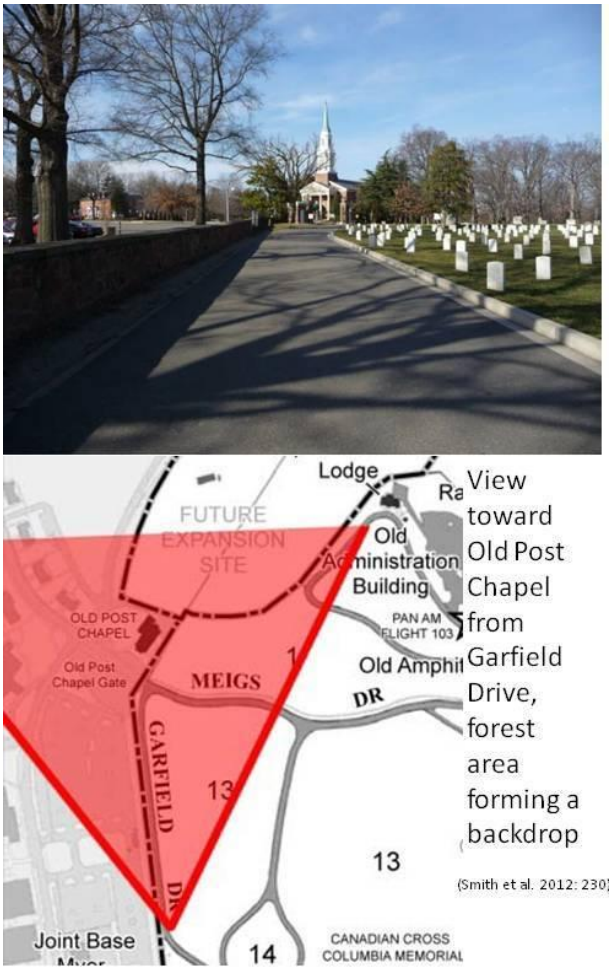
A historic landscape inventory (Garrow & Associates, 1997) identified old growth forest east of the stream in Section 29 (North Branch) as contributing to the historic landscape of Arlington House. Structural features within this area were, however evaluated in that study as not contributing to the historic landscape of Arlington House. The structural features include the footbridges, culvert, and rip-rap employing grave headstones as material. A more recent survey of the NRHP eligible ANC Historic District evaluated the contribution of these features to the historic landscape of ANC (Haynes 2012[a]; Smith, Tooker, and Enscore, 2012). The

footbridges and culvert were associated with a path connecting the area of the Old Administration Building and Superintendant's Lodge (Lodge #1) with the former site of the ANC stables (later warehouses and now a maintenance staging yard). Although these landscape features were developed during the period of significance for the historic landscape design of ANC (1864-1966), due to the ruinous condition of the culvert and footbridges, and the disappearance of the footpath, the features do not contribute to the historic landscape due to a lack of integrity. VDHR concurred with the finding that the undertaking, which would demolish the footbridges and culvert, would result in no adverse effects to historic properties (letter Marc Holma to Col. Victoria Bruzese 12 June 2012, DHR file #2012-0390). The 1998 survey (Garrow & Associates, 1998) indicated that these landscape features of Section 29 did not contribute to Arlington House. The headstone removal is a separate already completed project, independent of the Millennium Project.

The forest west of Arlington House the Robert E. Lee Memorial was identified as contributing to Arlington House (Garrow and Associates, 1998). Historic writings, drawings, and photographs, as well as the forest composition in the ravine along what is identified as the South Branch in this publication indicated that this was existing forest at the time Arlington House was built, and was intentionally preserved during the Custis-Lee occupation of Arlington House. Moreover, it was preserved even during the Civil War when most of the forests in what is now Arlington County were cut down to provide fields of fire for the ring of forts around Washington, as well as fuel and building material. This area of old growth, dating back 235 years or more corresponds to the portion of Section 29 retained by NPS. Other portions of Section 29 deforested during the Civil War were also recommended to contribute to Arlington House, the argument being that the forest had regenerated to its appearance during the Custis-Lee period. The NPS completed a Cultural Landscape Report (CLR) in 2001. The significance of the forest contributing to the Arlington House NRHP listing as part of the cultural landscape is emphasized in the CLR (NPS 2001: 60) by indicating that "… more than an economic rationale lay behind the preservation of the forests at Arlington. Early on in the history of the estate, the forests were considered integral to the success of the home's design. 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…" None of the old growth area (ca. 235 year old) is within the

Millennium APE. Some of the area reforested after being cut during the Civil War was also recommended as contributing to Arlington House (Garrow & Associates 1998) and is within the Millennium Project APE. However, designs avoid all of the older part (165 year old) of this stand, and over half of the younger portion which dates about 145 years old. Some portions of the forest in Section 29 that border Section 1 also contribute to the ANC historic landscape as a backdrop (Smith et al. 2012). This viewscape is shown in Figure 23.

**Figure 23 - Viewscape of ANC historic landscape including Section 29 forest**




The Seneca sandstone boundary wall bisects the Millennium APE running south west to northeast. Part of the original landscape design it dates to the first decade of the cemetery, built during the 1870's and contributes to the NRHP eligible historic landscape (Smith et al. 2012).

Also within the project area, the Ft. Myer Picnic Area was recommended as a contributing landscape to the Ft. Myer Historic District by a historic landscape survey, although this was apparently never reviewed (Batzli 1998). Chaffee Place parking lot (adjacent to the NPS Administration Building) was identified as contributing as a landscape element to the ANC historic district (Smith et al. 2012)

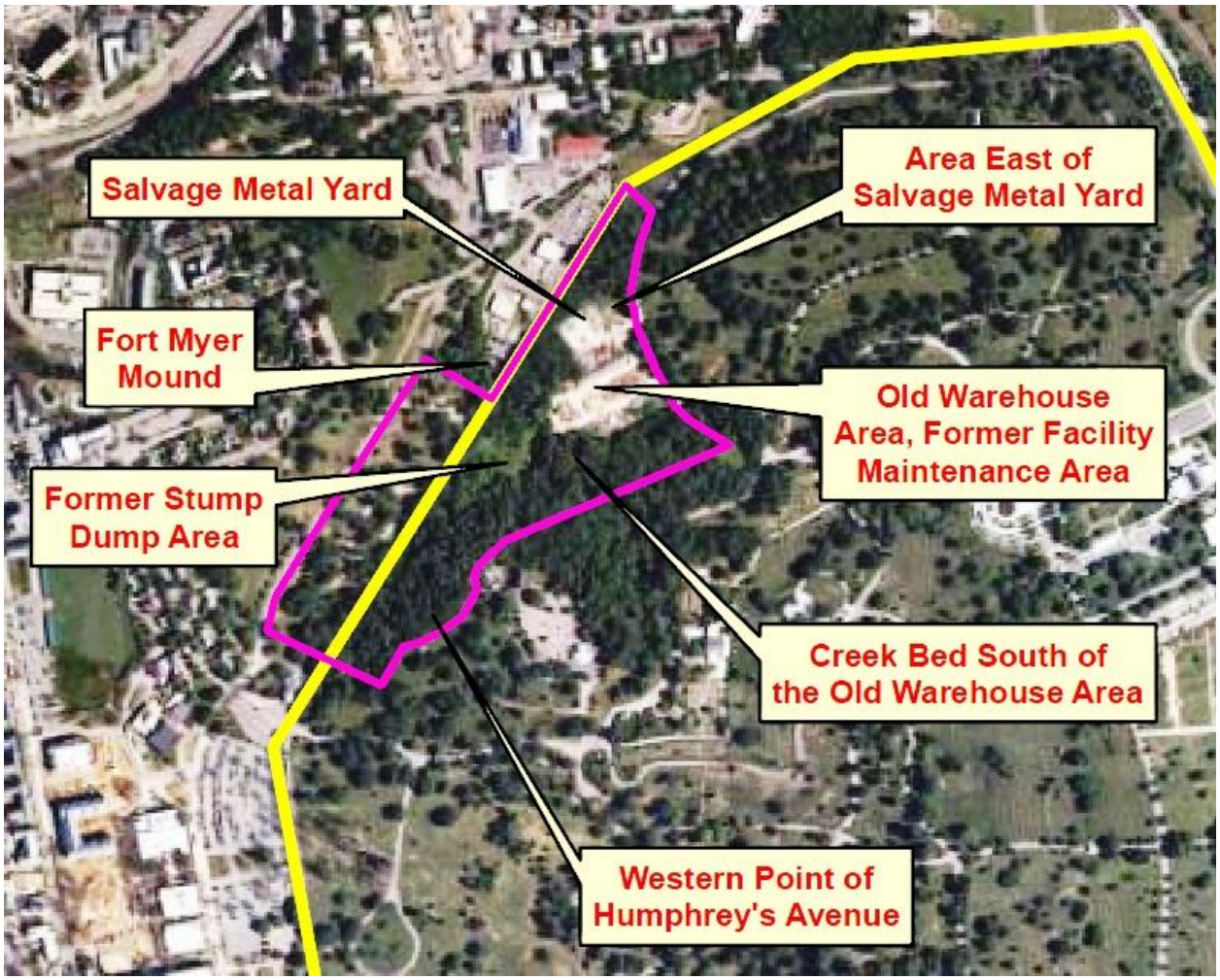
### 4.8.4 Additional Cultural Resource Considerations

For the purposes of compliance under NHPA Section 110, ANC is currently in the process of drafting a nomination to the NRHP (Smith, Tooker, and Enscore 2012). Coordination efforts with regard to cultural resources at ANC are ongoing among USACE, VDHR, NCPC, CFA, and NPS.

## 4.9 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

Six areas of concern (AOCs) were identified within the limits of the Millennium Project. The AOCs included the Salvage Metal Yard (SMY), Old Warehouse Area (OWA), Fort Myer Mound (FMM), Western Point of Humphreys Road (WPH), Area East of the SMY (ESMY), and Creek Bed south of the former Stump Dump and OWA. AOC locations are shown in Figure 24. Activities and conditions of concern conducted at these areas include storage and mixing of chemicals, storage of petroleum products, stockpiling of soil and debris, storage of equipment and scrap metal, maintenance of equipment, storage of drums and tanks, organic odors, and runoff.

**Figure 24 - Area of concern (HTRW) locations within the Millennium Site**




In 2009, USACE contracted Shaw Environmental, Inc. to review historical data and collect soil, soil gas, sediment, and surface water samples for field and laboratory analysis from the six AOCs. Sampling was limited mainly to the surface. Constituents of potential concern (COPCs) identified at the AOCs included total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), semi-VOCs (SVOCs), metals, pesticides, and polychlorinated biphenyls (PCBs).

Based on the findings of the investigation, Shaw did not require additional action at the FMM, WPH, and the creek bed south of the former Stump Dump; however, further assessment of soil and groundwater conditions at the FMM, SMY, OWA, and ESMY was recommended.

### 4.9.1 Investigation Findings

Soil, groundwater, and gas soil gas quality were assessed through the collection of samples for visual inspection, field screening, and laboratory analysis. The soil analytical results were compared to the most-current VDEQ T3SC-Rs. The groundwater analytical results were compared to the most-current VDEQ T3SL-Rs and T3GC-CW-GNs. The soil gas results were compared to the most-current VDEQ Tier III Commercial deep soil gas Screening Level for inhalation of indoor air (T3C-DSG) and Tier III construction worker soil gas Screening Level for inhalation of air in a trench (T3SG-CWT).

### 4.9.2 Soil Quality

The 2009 surface soil and A-ZONE soil analytical data was compared to VDEQ screening levels for a commercial use property (VDEQ-T3SCRs) and EPA, Region III screening levels for a commercial use property (EPA-RSL-IS). The metals were also compared to concentrations of metals detected in background surface soil samples collected during the 2009 sampling event and background concentrations for eastern Virginia (USGS 1984). Impacted areas in the SMY, ESMY, OWA, and FRM are shown in Figure 25.

**Figure 25 - Area of concern (HTRW) locations within the Millennium Site**


Location 1 is attributed to the historical storage of scrap metal near this location. Location 3 and 7 are attributed to the operations and storage of material at and near the storage building. Location 9 is attributed to a historical underground storage tank spill and location 8 is attributed to the historical use of the area as a dump. Location 2, 4, 5, and 6 cannot be specifically connected to a known use, and are considered as incidental spills during the historical operation of the site. Based on the proposed Millennium Expansion development, seven locations will be

disturbed during construction and need to be remediated as part of the Construction Project. Two of the locations, denoted as No. 6 and 9, will be partially disturbed during utility installation therefore only the disturbed areas require remediation. Areas 6 and 9 are expected to receive several feet of fill to reach proposed grades. The locations of the impacted areas are shown on Figure 25 and described below:

1. Area 1 is impacted by TPH-DRO and SVOCs to a depth ranging between 2 feet and 6 feet below the existing ground surface. The estimated volume is between 150 and 200 cubic yards (225 to 300 tons).

2. Area 2 is impacted by SVOCs (benzo(a)pyrene) to a depth of 3 feet below the existing ground surface. The estimated volume is between 40 and 60 cubic yards (60 to 90 tons).

3. Area 3 is impacted by SVOCs (benzo(a)pyrene) to a depth of 3 feet below the existing ground surface. The estimated volume is between 160 and 320 cubic yards (240 to 480 tons).

4. Area 4 is impacted by TPH-DRO and SVOCs to a depth ranging between 4 feet and 5 feet below the existing ground surface. The estimated volume is between 70 and 90 cubic yards (105 to 135 tons).

5. Area 5 is impacted by SVOCs (benzo(a)pyrene) to a depth of 2 feet below the existing ground surface. The estimated volume is between 18 and 36 cubic yards (27 to 55 tons).

6. Area 6 is impacted by SVOCs (benzo(a)pyrene) to a depth of 2 feet below the existing ground surface. The estimated volume for complete removal is between 18 and 36 cubic yards (27 to 55 tons).

7. Area 7 is impacted by SVOCs (benzo(a)pyrene & Dibenzo(a,h)anthracene) to a depth between 2 and 4 feet below the existing ground surface and TPH-GRO and TPH-DRO at

the surface and subsurface. The estimated volume is between 236 and 470 cubic yards (355 to 705 tons).

8. Area 8 is impacted by SVOCs (benzo(a)pyrene) to a depth between 4 and 17 feet below the existing ground surface and TPH-GRO and TPH-DRO at the subsurface, In addition, historical documents suggest other debris of concern (e.g., wagon wheels, drums, tanks, concrete, asphalt, etc) may have been buried within the fill comprising the mound. The estimated volume is between 1000 and 1500 cubic yards (1500 to 2250 tons).

9. Area 9 is impacted by TPH-DRO and TPH-GRO to a depth ranging between 4 feet and 6 feet below the existing ground surface. The estimated volume for complete removal is between 1325 and 1590 cubic yards (1980 to 2380 tons).

## 4.10 TRANSPORTATION

ANC is located in the easternmost portion of urban Arlington County, Virginia. It is adjacent to several highways and the Potomac River to the east, highways and residential areas to the north, JBM-HH to the west, several highways, and commercial businesses to the south. The Arlington National Cemetery Metro stop is regularly served by subway trains. The cemetery is also serviced by several tour bus companies.

The proposed Millennium Site is located within ANC. As such, transportation to and from the site is limited to surface transportation on restricted-access roadways. Parking is available to visitors, accessible from Memorial Drive and the public may access the site, during public hours, by walking. Persons visiting a specific grave may obtain a vehicle pass to drive to their destination. Access permits may be obtained from ANC depending upon the type and duration of business activities.

## 4.11 STORMWATER SYSTEMS

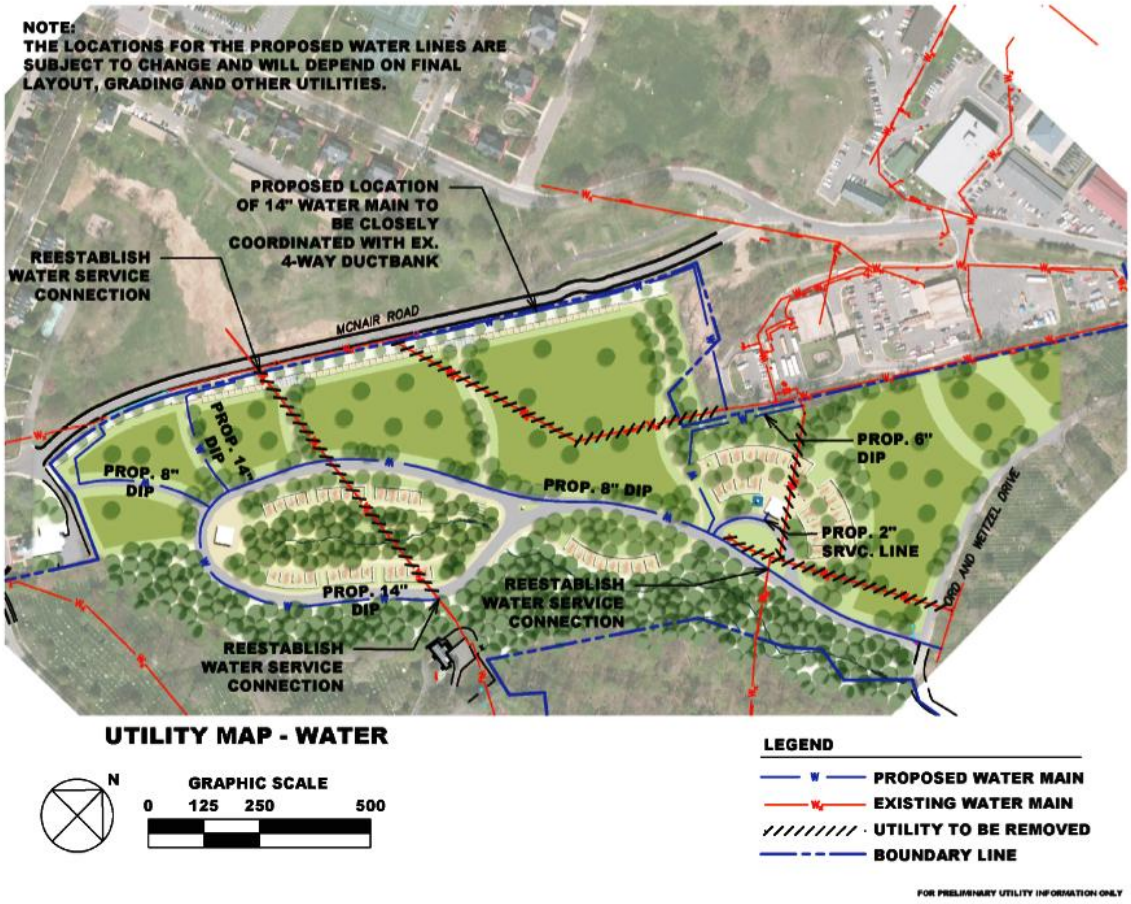
Stormwater management at ANC is achieved through a system of open channels and underground pipes. A stormwater diversion project, built several years ago to assist with stormwater management in anticipation of the Millennium Project, diverts water from JBM-HH

away from the project area. Water is diverted to a large underground holding tank on JBM-HH, and then flows into the existing channels in the Millennium Site to Ord & Weitzel Drive, where it enters the Arlington municipal stormwater system, which eventually discharges to the Potomac River.

## 4.12 UTILITIES (WATER, SEWER, ELECTRIC, GAS)

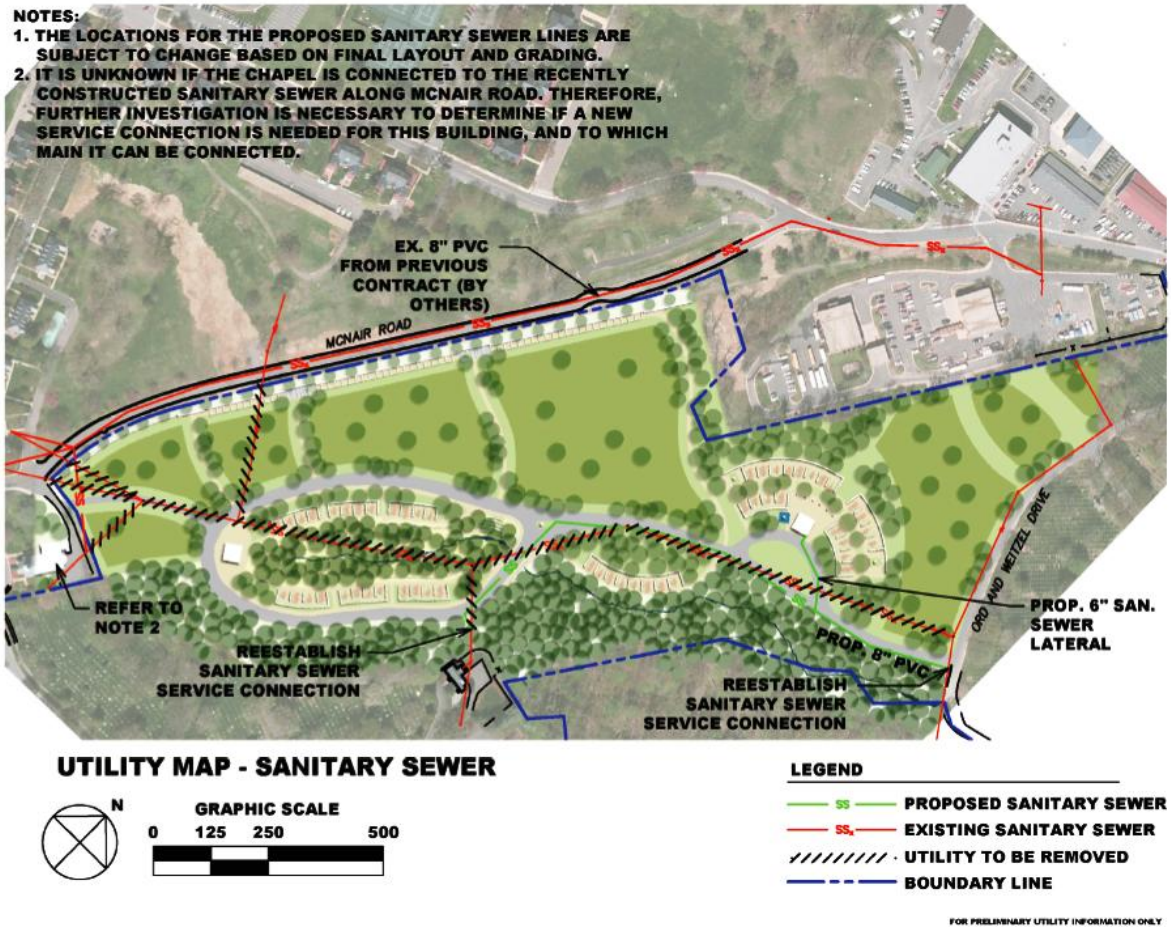
Potable water is supplied to ANC by the USACE Washington Aqueduct Division, which is the municipal source of drinking water for Washington, D.C. and suburban northern Virginia. There are several water lines crossing the proposed project area, including a 14-inch ductile iron pipe which crosses from the Whipple Field area, reduces to a 6-inch line as it crosses the valley at the site, and rises up at the other side to provide fire protection to the Arlington House.

**Figure 26 - Utility Map - Water**



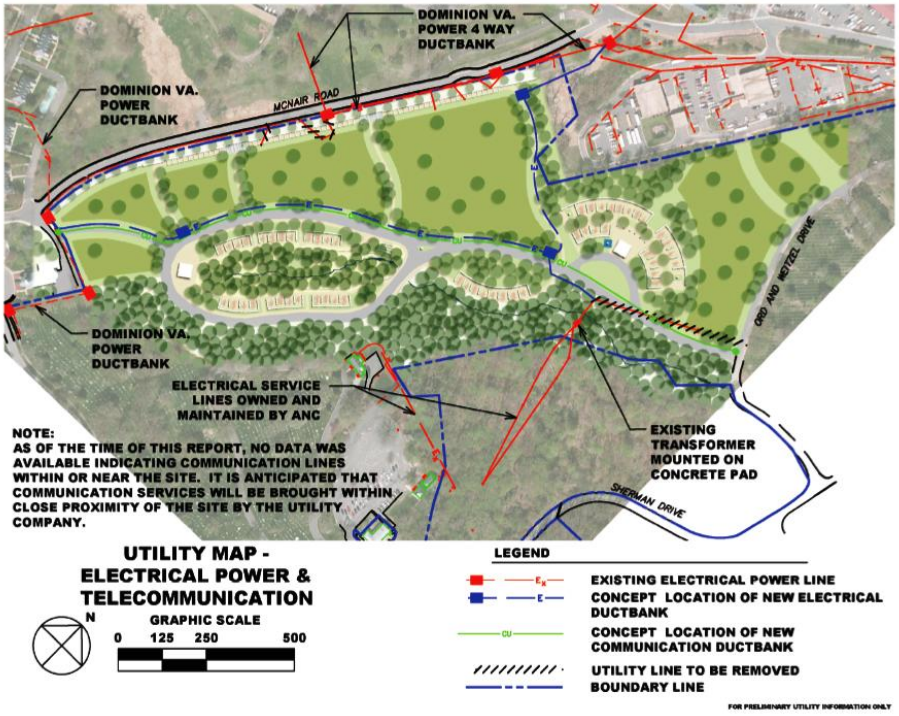
Arlington County provides municipal sewage service to ANC. Several sanitary sewer pipes cross the proposed Millennium Site, ultimately carrying effluent to the Arlington County Water Pollution Control Plant, located approximately two miles south of the Pentagon.

**Figure 27 - Utility Map - Sanitary Sewer**



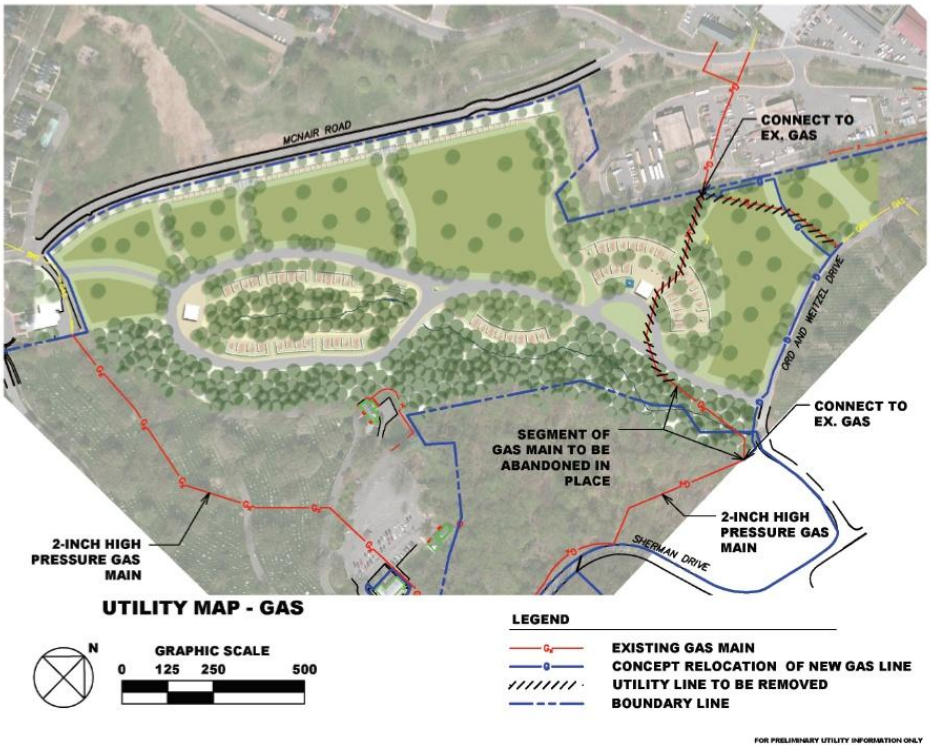

Dominion Power supplies electrical service to ANC from the Ft. Myer substation. An underground cable crosses the southern end of the proposed Millennium Site to the north of the Post Chapel. Additional underground cables carry electricity from Arlington House to the old warehouse area. Along the east side of McNair Road, there are white, fluted street lights, and additional light poles along the jogging path in the picnic area.

**Figure 28 - Utility Map - Electrical Power and Telecommunications**




There are several identified existing gas lines within the project area.

**Figure 29 - Utility Map - Gas**



## 4.13 NOISE

The main source of noise at ANC and the surrounding area is vehicular traffic, as well as commercial airplanes and ceremonial flyovers. Other sources of noise come from maintenance operations such as lawn mowers and maintenance shops, and from funeral services such as gun salutes, bugles, and military bands.

## 4.14 AIR QUALITY

The 1963 Clean Air Act, as amended, (42 U.S.C. 7401 et seq.) requires federal land managers to protect park air quality. Arlington National Cemetery is located in the Washington Metropolitan Area marginal non-attainment zone for ozone and non-attainment for fine particulate matter (PM 2.5). Particles less than 2.5 micrometers in diameter are called "fine" particles. These particles are so small they can be detected only with an electron microscope. Sources of fine particles include all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes.

## 4.15 AESTHETICS

The proposed Millennium Site has varied visual and aesthetic features. At the north end, the old warehouse is neither aesthetically prominent nor architecturally distinguished. There is a former picnic area on the western side of the site that sits atop a deep ravine and is surrounded by a park-like, woodland setting. The eastern half of the site on the ANC property is heavily forested with dense mature tree growth.

## 4.16 VISITOR USE AND EXPERIENCE

Although the Millennium Project site is adjacent to areas easily accessible to the public, the site is currently not commonly viewed by visitors. A jogging path running along the edge of JBM-HH is near the Millennium Site. Some portions of the site have been used as picnic areas as well as military training in the past. The portion of the Millennium Project site that is currently located within the JBM-HH boundary wall is not accessible by the general public currently.

## 4.17 UNIQUE ECOSYSTEMS, BIOSPHERE RESERVES, WORLD HERITAGE SITES

The site is not a unique ecosystem, biosphere reserve or World Heritage Site. The adjacent property, NPS-administered Arlington Woods, is listed on the Virginia Native Plant Society Registry and may be considered a unique habitat at a local scale. Tony Fleming in a 2006 geologic features inventory notes:

> *This property is significant in being one of only two public natural areas in the county (Barcroft Park is the other) to completely span a Coastal Plain slope from the bedrock, through the Potomac Group, to the terrace gravel. The relationship of both natural communities and spring hydrology to geologic setting is illustrated exceptionally clearly here.*

## 4.18 IMPACT TOPICS ELIMINATED FROM FURTHER ANALYSIS AND CONSIDERATION

The following impact topics were eliminated from further analysis in this EA and a brief rationale for dismissal is provided for each topic. Potential impacts to these resources would be negligible, localized, and most likely difficult to measure.

### 4.18.1 Wild and Scenic Rivers

The proposed project is within the Potomac River watershed. This river is not designated as a National Wild and Scenic river (nor are its tributaries); therefore, this impact topic was dismissed from further analysis in this EA.

### 4.18.2 Geohazards

Based on studies and assessments it is highly unlikely there are known geohazards within the project area; therefore, this impact topic was dismissed from further analysis in this EA.

### 4.18.3 Prime Farmland

Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. The soil qualities, growing season, and moisture supply are those needed for a well-

managed soil to produce a sustained high yield of crops in an economic manner. The land can be cropland, pasture, rangeland, or other land, but not urban built-up land or water. Prime farmland is protected under the Farmland Protection Policy Act of 1981 to minimize the extent to which federal programs contribute to the unnecessary or irreversible conversion of farmland to nonagricultural uses. ANC is not considered prime farmland; therefore, this impact topic was dismissed as an impact topic in this EA.

### 4.18.4 Marine or Estuarine Resources

There are no marine or estuarine resources within ANC, nor would this project impact any marine or estuarine resources; therefore, this impact topic was dismissed from further analysis in this EA.

### 4.18.5 Land Use

The project area is on federal property with federal adjacent uses and would not impact occupancy, property values, ownership, or any type of land use; therefore, this impact topic was dismissed from further analysis in this EA. The property will be converted from an open park-like setting to an area used for burials.

### 4.18.6 Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of Interior agencies is explicitly addressed in environmental documents. The Federal Indian Trust responsibility is a legally enforceable fiduciary obligation on the part of the U. S. Government to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian tribes and Alaska Native entities. There are no federally-recognized Indian Tribes in Virginia. The project area is not held in Trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, this impact topic was dismissed from further analysis in this EA.

### 4.18.7 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations". This order directs agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement from any adverse effects by federal policies and actions on these populations. Local residents near the Millennium Project may include low-income populations; however, these populations would not be particularly or disproportionately affected by activities associated with the project. Therefore, this impact topic was dismissed from further analysis in this EA.

### 4.18.8 Socioeconomic Resources

NEPA requires an analysis of impacts to the human environment, which includes economic, social, and demographic elements in the affected area. The current conditions in the project area, as represented by the No-Action Alternative, would not have any impacts to the socioeconomic resources of the surrounding area. The Proposed Action would neither change local and regional land use, nor appreciably impact local businesses or other agencies. Implementation of the Proposed Action could provide a negligible beneficial impact to the nearby surrounding economies from short-term minimal increases in employment opportunities for the construction workforce and revenues for local businesses and government generated from construction activities. Since the impacts to the socioeconomic resources associated with the project would be negligible, this impact topic was dismissed as an impact topic in this EA.

### 4.18.9 Human Health and Safety

No human health and safety risk factors currently exist on the project site, and none would be introduced as a result of this project. Since the impacts to human health and safety associated with the project would be negligible, this impact topic was dismissed as an impact topic in this EA.

# 5 ENVIRONMENTAL CONSEQUENCES

This section of the EA identifies and evaluates the anticipated environmental consequences or impacts associated with the Proposed Action Alternative and the No-Action Alternative. The terms "impact" and "effect" are used interchangeably in this section. Impacts may be discussed as positive or negative, significant or minor, as appropriate to the resource area. Positive impacts occur when an action results in a beneficial change to the resource, whereas negative impacts occur when an action results in a detrimental change to the resource. Significant impacts occur when an action substantially changes or affects the resource. A minor impact occurs when an action causes impact, but the resource is not substantially changed. Impacts are also discussed as temporary as well as short-and long-term impacts, and are associated with relative time frames as the direct result of the action. In this case, temporary refers to an impact only during the period of construction. Short-term describes the impact for 1-3 years post construction, whereas long-term describes the permanent impacts that would be expected to remain for many years.

For those resource areas where impacts would occur, a "threshold of significance" has been established, per 32 CFR 651.39 which states that: *Significance of impacts is determined by examining both the context and intensity of the proposed action (40 CFR 1508.27). The analysis should establish, by resource category, the threshold at which significance is reached.* NEPA requires considerations of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Intensity refers to the severity of impact.

This section is organized by resource area following the same sequence as in the preceding Section 4.0. This section also includes a discussion on cumulative impacts and a summary of environmental compliance with applicable environmental laws and regulations. Some resources topics were excluded from further evaluation. A brief discussion of those topics can be found in Section 2.7. NOTE: Access to the construction site will be limited to ANC land. NPS land will not be used for access.

## 5.1 SOILS

### 5.1.1 Threshold of Significance

The threshold of significance for soils, for this EA, is defined as substantial soil erosion beyond regulatory limits or construction on unstable soil or geologic units that could result in health and/or safety issues.

### 5.1.2 Proposed Action

Short-term and long-term impacts, typical of construction projects, would be expected from the Proposed Action. The Millennium Project includes extensive earthwork. The total volume of cut and fill has been estimated at approximately 100,000 cubic yards. The significant amount of earthwork is required in response to the necessary removal of unsuitable soil (clay), replacement with proper foundation and topsoil material, and the use of the pre-placed crypt system. The soil would be re-used within the site to the maximum extent practicable per engineering specifications. Although there would be a large quantity of cut and fill, the extensive retaining walls will serve to ensure that the soil movement does not result in exceeding of the threshold of significance. The vast majority of the land disturbance and grading changes are in the former Ft. Myer picnic area. The project would include approximately 3,376 feet of freestanding retaining walls along the following areas: the inner wall of the loop road, outer wall of the loop road, columbarium A terrace walls, and main entrance east side wall. These retaining walls would vary from 2 feet to 30 feet in height. The thirty foot structures would only be found on the approaches to the arched bridge structure. All other retaining walls are 13 feet or less in height. Retaining walls are used to provide the required ADA slopes and a 5% slope for safe operations in the new internment areas. The only retaining walls that exceed 13-feet in height support the areas near the bottomless arch bridge across the perennial stream.

Soils that are not appropriate for re-use would be trucked off-site to appropriate locations for such material. Soils to be removed include both contaminated soils as well as plastic clay soils that not suitable for reuse as backfill behind the retaining walls. The soils in the proposed project area are predominantly previously disturbed soils. No sensitive soils or soils classified as Prime or Unique Farmland soils are present in the proposed project area.

The soil on the slope near the Chaffee Place parking lot would be stabilized through burial under the modified stormwater conveyance system, resulting in less erosion of the soil to downstream areas. A very small portion of the project (restoration activities only) would occur on NPS property (less than .05 acre); work on NPS lands will take measures to avoid impacts to soils (limit excavation and machinery travel) and impacts to trees and other vegetation. In addition, the underground storage near the parking lot will result in some minor temporary impacts to soil as those are constructed.

The Proposed Action would disturb much of the 27-acre site. The area least disturbed would be the 50-100 foot buffer around the stream restoration. The existing topography in the steep ravine and across the streambed will not be greatly altered in most areas. Only those areas directly impacted by the roadway and the new columbarium structure will be altered. This activity would require a General Permit for Discharges of Stormwater from Construction Activities issued by VDCR under its Virginia Stormwater Management Program (VSMP). This permit would include the preparation and approval of a Stormwater Pollution Prevention Plan (SWPPP) which will include an Erosion Control Plan (ECP) component. These permits and approvals would be obtained by the contractor prior to the start of construction. Because all regulatory standards for soil erosion would be met and the project has been designed to ensure no geologic failures would occur that would present a danger to health and safety, these impacts are not considered significant.

### 5.1.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur. The stream channels as well as the steep slope near the Chaffee Place parking lot would continue to cause adverse environmental impacts due to scouring and erosion.

## 5.2 TOPOGRAPHY AND FLOODPLAINS

### 5.2.1 Threshold of Significance

The threshold of significance for topography and floodplains, for this EA, is defined as a change in the topography that is out of character for the surrounding Cemetery and region or a change to

the floodplain which would result in excessive or additional flooding that would impact either the natural resources or the local community.

### 5.2.2 Proposed Action

The Proposed Action would include restoring existing streams and performing earthmoving activities. The result of these actions would be a change in both topography and drainage at the proposed Millennium Site. Short-term and long-term impacts would be expected from the altering of the terrain and drainage.

Short-term minor impacts to the drainage would result from the temporary collection of stormwater to meet approved erosion control practices and the stockpiling of soils during construction. These impacts would cease with the end of construction activities.

Long-term impacts to the topography and drainage at the Millennium Site associated with the large amount of earth movement would result from the Proposed Action. These impacts include the re-grading of the existing steep slope and valley topography of the site through cut and fill operations to achieve an appropriate landscape suitable for public access and burials. The current topography which is largely steep slopes would be converted to more gradual slopes (<15% slope). The vast majority of the land disturbance and grading changes are in the former Ft. Myer picnic area. Please see Figure 30 below for a cross-section which illustrates the largest areas of cut and fill. Existing grade is shown as a line along the edge of the cross-section. In the figure, the area to the left of the stream is the former Ft. Myer property. The area to the right of the stream is the former NPS property. The existing topography in the steep ravine and across the streambed will not be greatly altered in most areas. On the former NPS property, only those areas directly impacted by the roadway and the new columbarium structure will be altered.

The area within Section 29 is designed to meet the existing contours to the greatest extent practical. The areas with more significant grading requirements are located on the former Ft. Myer property. The area within Section 29, which was transferred under Public Law 107-107, includes the minimal earthwork required to allow for construction of the loop road and columbarium. The Millennium Project was specifically planned to integrate into the existing

topography. The cremated remains and interment spaces were planned for the more consistent gently sloping terrain and the columbaria complexes were planned for the steeper areas. In this manner, the topography of Section 29 is preserved, with only limited cuts required to facilitate the road and columbaria. In fact, the current design includes setting these features into the ground so that the topography on both the edges of slope is not impacted.

**Figure 30 – Cross Section of Millennium Project Site**


The topography of the constructed project will be consistent with other areas of Arlington National Cemetery as well as other slopes in the region, and is therefore not considered significant. The restored stream bed area will generally retain its original topography. The stream will in fact, where previously eroded and incised, be raised back up to its original floodplain. This will be a benefit to the natural resources in the project area. The banks of the stream would be anticipated to overflow onto their natural floodplain every few years, and this flooding would not result in any adverse impacts to natural resources, the project, or the community.

The proposed stream channel for the Millennium project was sized to convey the flow from the 1.5-year storm event using the proposed (i.e. ultimate build out) site conditions. Flows larger

than the 1.5-year storm event would overtop the stream banks and spread out across the floodplain. A hydraulic model of the proposed stream conditions for the 100-year storm event was developed to confirm that the overbank velocities are not erosive. Therefore, the proposed stream will be able to accommodate the flows associated with the cemetery expansion. Since the drainage area is significantly less than 1 square mile and the topography is so well defined, the final grading plan would easily confine the 100 year flood events. Thus, the impacts to the floodplain are not considered significant. The existing sheet and channel runoff would be collected and handled within the proposed storm drainage system, providing a long-term beneficial impact by decreasing erosion at the project area. The topography of the steep slope near the Chaffee Place parking lot would be slightly altered by filling of the incised channel with the modified stormwater conveyance system.

### 5.2.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to the topography and drainage. However, streambank erosion and channel incision would continue to occur resulting in negative impacts to the area's topography and drainage.

## 5.3 HYDROLOGY AND WATER QUALITY

### 5.3.1 Threshold of Significance

The threshold of significance for hydrology, for this EA, is defined as a substantial alteration to the course of local surface water resources. The threshold of significance for water quality is violation of any water quality standards.

### 5.3.2 Proposed Action

The Proposed Action would include restoration of the stream and stream bank. Temporary minor impacts would occur due to construction activities but long-term beneficial impacts, as described below, would result from the project.

#### 5.3.2.1 Stream and Buffer Restoration

As part of the project, the existing stream channels, where not impacted, would be restored and integrated into the overall project as a natural landscape amenity. Natural Channel Design techniques would be utilized to restore the existing degraded stream channels. Unlike conventional engineering practice, the goal of NCD is not simply the abatement of stream bank erosion or the maximization of channel conveyance (typically done with riprap and concrete), but to restore the balance of flow and sediment in the stream system and to reestablish natural hydraulic and ecologic functions. This is accomplished by mimicking, as much as possible, the characteristics (channel dimension, planform geometry, slopes) of a stable, "natural" system. Further, a stream's floodplain connection is reestablished, allowing large flow events (those equal to or greater than the ±0.8 to 1.5 year storm event) to access, spread out, and slowdown in the floodplain. The reestablished floodplain connection helps reduce downstream water quality by improving nutrient (nitrogen and phosphorus, etc.) and sediment uptake in the floodplain, increasing evapotranspiration, improving riparian habitat, and raising local ground water tables. By establishing a stable channel geometry and reestablishing a floodplain connection, excessive bank and bed erosion can be arrested, in-stream habitat improved, and the downstream transport of pollutants reduced.

In addition to the stream restoration, a small area (approximately 0.3 acre) of the stream Resource Protection Area (RPA) buffer that is currently a maintenance yard would be restored and reforested, consistent with the planting guidelines presented in Riparian Buffer Modification and Mitigation Guidance Manual prepared by the Virginia Department of Conservation and Recreation Chesapeake Bay Local Assistance, September 2003 – Reprinted 2006.

#### 5.3.2.2 Stream and RPA Impacts

Pursuant to the jurisdictional determination issued by USACE dated November 28, 2011 (#NAO-2011-02220) there are Waters of the U.S. (WOUS) present on the Millennium Site, as well as RPA's along the perennial stream channels. While no wetland impacts are proposed as part of this project, the proposed plan does impact both intermittent and perennial streams and the associated RPA Buffer. Please see Appendix C for additional details on the analysis of the stream restoration. Please note that all analyses in this report are preliminary and subject to

slight adjustments based on detailed design and coordination with the appropriate regulatory agencies. Some of the numbers in the tables below reflect updated calculations based on the recent design adjustments and are not yet updated in the full calculations in the appendix.

Over the past several years as the development of this project has progressed, reductions in the amount of impacts to these natural resources have been achieved with each subsequent design iteration. The result of these design efforts is a plan that represents the Least Environmentally Damaging Practicable Alternative (LEDPA). A summary of these impact reductions (to both streams and RPA buffers) is provided below in Table 4 (please note that these calculations may adjust slightly as the design evolves – all adjustments will be coordinated with appropriate regulating agencies):

**Table 4 - Summary of Stream and RPA Impacts**

| | ***Impact Lengths for Specified Streams (linear feet f of stream and buffer width for RPA)*** | | | | |
|---|---|---|---|---|---|
| ***Resource Type*** | ***Current Condition*** | ***Alternative A*** | ***Alternative C*** | ***Alternative D*** | ***Alternative E – impacts minimized*** |
| Average RPA Buffer | 100 | 16 | 40 | 64 | 81 |
| Intermittent Stream (R4) | 372 | 370 | 291 | 216 | 115 |
| Perennial Stream (R3) | 1,680 | 758 | 363 | 148 | 50 |
| **Total Stream Impact** | **0** | **1,128** | **654** | **364** | **165** |

A more detailed analysis of the evolution of the Millennium Project from the 1 December 2009 plan to the draft layout dated 6 November 2012, as it relates to stream and RPA buffer impacts, is presented in Appendix B. To offset the unavoidable proposed impacts to the existing streams and their RPA buffers, the remaining stream channels and buffer would be restored (1,879 linear feet, existing length; 1,754 linear feet, proposed length; and ±0.3 ac of RPA buffer). Additional information on the details of the restoration approach can be found in Appendix B, and will be updated as necessary based on the final design.

#### 5.3.2.3 Permitting

Through the iterative design process, proposed impacts to WOUS have been reduced to the point where they can be permitted using a State Programmatic General Permit (SPGP), or a

combination of an SPGP and Nationwide Permit #27. Coordination has occurred with the USACE Regulatory Project Manager and the VDEQ VWPP staff on site and in VDEQ's office for a formal Pre-Application meeting. Both agencies have concurred that the necessary criteria are met to approve the proposed project with a combination of an SPGP and NWP #27. No compensatory mitigation would be required given the minimal proposed impacts (<300 linear feet). Thus coincident with the SPGP issuance, DEQ would issue a General Permit WP1 or WP4. This result was achieved through efforts to comply with the Clean Water Act Section 404(b)(1) Guidelines that require the following three step process be followed in order to achieve a permittable plan: 1) avoid impacts to the maximum extent practicable, 2) minimize unavoidable impacts to the maximum extent practicable, and 3) provide compensatory mitigation for those unavoidable impacts that exceed de minimis thresholds under the Clean Water Act and Virginia Water Protection Permit program.

At the pre-application meeting held on 7 November 2012, VDEQ and USACE requested 2-years of post-construction monitoring. It was also requested that the post-construction monitoring include photo monitoring of the in-stream structures (with a survey of the structures only if a problem becomes evident) and stem counts of wood vegetation. A specific monitoring plan that includes these items will be included in the Clean Water Act permit. The 2008 Compensatory Mitigation Rule is not applicable to this project because both USACE and VDEQ have concurred that the permanent impacts from the proposed project alternative are below the threshold that triggers a Compensatory Mitigation requirement.

#### 5.3.2.4 Water Quality

With the exception of Section 2 (described above), the streams located on the Millennium Project Site are deeply incised (preventing storm flows from accessing the floodplain) and have raw, actively eroding banks. In their current state, they are effectively serving as conduits - transporting and providing pollutants (i.e. total nitrogen, total phosphorus, and total suspended solids) to downstream receiving waters. Through the use of NCD techniques, the proposed stream restoration component of this project would restore a stable cross section and planform, resulting in approximately 1,501 linear feet of restored stream channel (this length does not

include the 200 linear foot section of spot improvements) of an unnamed tributary to the Potomac River, reconnect it to its floodplain, and reduce the pollutant load.

Water quality would be improved as a result of the Millennium Project stream restoration. A significant source of these pollutant loads is the existing streambank and bed erosion. Thus, by restoring the stream and effectively eliminating the streambank and bed erosion there would be improvements to the water quality.

The Chesapeake Bay Program's Chesapeake Bay Phase 5.3.2 Community Watershed Model (CBCWM) presents pollutant removal rates (CBP 2003) achieved through stream restoration. Since the publication of CBP 2003, the scientific community has performed additional research showing that these removal rates are significantly (i.e. orders of magnitude) underestimated. In August 2011, the Chesapeake Stormwater Network (CSN) published "CSN Technical Bulletin No. 9 Nutrient Accounting Methods to Document Local Stormwater Load Reductions in the Chesapeake Bay Watershed" (CSN 2011) which proposed interim pollutant removal rates. Per CSN 2011, these rates are to be used until the University of Maryland completes the stream restoration research review, and the Best Management Practices (BMP) Expert Panel has an opportunity to review its findings (ongoing). Table 5 compares the pollutant load reductions resulting from stream restoration as presented in CBP 2003 and CSN 2011:

**Table 5 - Comparison of CBP 2003 and CSN 2011 Stream Restoration Pollutant Load Reduction Rates**

| ***Pollutant*** | ***CBP 2003 Removal Rate*** | | ***CSN 2011 Removal Rate*** | |
|---|---|---|---|---|
| Total Nitrogen | 0.02 | lb/lf-yr | 0.2 | lb/lf-yr |
| Total Phosphorus | 0.0035 | lb/lf-yr | 0.068 | lb/lf-yr |
| Total Suspended Solids | 2.55 | lb/lf-yr | 310 | lb/lf-yr |

Despite the "interim" label, it is justifiable to use the CSN 2011 values in order to determine the pollutant removal benefit of the proposed stream restoration. First, the CSN recommended the use of these rates until a final determination is made by the University of Maryland panel

currently reviewing them. Second, when the CSN 2011 TSS load reductions are converted to a streambed and bank erosion rate, they indicate a yearly erosion rate that, anecdotally, is consistent with stream bank erosion witnessed throughout Fairfax County. The CSN 2011 removal rates estimate a reduction of 2.4 inches per year of stream bed and bank erosion in Snakeden Branch while the CBP 2003 removal rates estimate less than 0.2 inches per year of stream bed and bank erosion.

Table 6 presents a summary of the total pollutant load reduction resulting from the stream restoration.

**Table 6 - Pollutant Removal Rates (Per 2011 CBWM)**

| ***Pollutant*** | ***Removal Rate*** | ***Restored Stream Length*** | ***Total Pollutant Load Reduction*** | ***TSS Load Reduction (by Volume)**** |
|---|---|---|---|---|
| Total Nitrogen | 0.2 lb/lf/yr | 1,554 lf | 311 lb/yr | --- |
| Total Phosphorus | 0.068 lb/lf/yr | 1,554 lf | 106 lb/yr | --- |
| Total Suspended Solids | 310 lb/lf/yr | 1,554 lf | 481,740 lb/yr | 198 (cy/yr) |
| **Based on an assumed soil density of 90 lb/cf* | | | | |

To determine the overall effect of the portion of the proposed project related to streams and RPA buffers on water quality, an analysis of the proposed project's effect on the net total phosphorus (the keystone pollutant in the Chesapeake Bay Preservation Act) loading was performed. By comparing the increases in loading from the proposed land use changes in the RPA (both land use change and buffer encroachment) to the decreases in loading from the stream restoration, the project's overall environmental benefit can be determined. Total phosphorus loading rates from the CBCWM were used. As discussed in the previous section, the total phosphorus removal rates for stream restoration from CSN 2011 were used. The Buffer Equivalency calculation from the Chesapeake Bay Local Assistance Department (CBLAD) Information Bulletin 3, dated March 1991 was used to determine the impact of encroachments into the 100 foot RPA buffer.

Table 7 is a summary of the net phosphorus loading calculation. A detailed calculation is presented in Appendix B. As summarized by Table 7, the proposed project yields a net reduction

in total phosphorus loads which would result in improved water quality in the Millennium Project stream and downstream receiving waters, even with the construction of the proposed cemetery expansion.

**Table 7 - Phosphorus Loading Summary (lb of TP/yr)**

| ***Phosphorus Load Changes*** | | | ***Net Phosphorus Load*** |
|---|---|---|---|
| ***From Change in Land Use*** | ***From Buffer Reduction*** | ***From Stream Restoration*** | |
| 1.98 | 0.29 | (106) | **(103.4)** |

### 5.3.2.5 RPA Buffer Impacts: Approval Process

Pursuant to the Coastal Zone Management Act, in 1986, the National Oceanic and Atmospheric Administration (NOAA) approved Virginia's Coastal Zone Management Program (CZM Program). As a result, any proposed federal activity that is likely to affect any coastal land, water or natural resources of Virginia's designated coastal resources management areas, must be consistent, to the maximum extent practicable, with the enforceable policies of Virginia's CZM Program. In Virginia, the Coastal Lands Management program is an enforceable policy administered by Chesapeake Bay Local Assistance Department (CBLAD) through the Bay Act and the Regulations.

NOAA has determined that the Coastal Zone Management Act does not grant states regulatory authority over activities on federal lands, so there are no formal Chesapeake Bay Preservation Areas (CBPAs) designated on federal lands located in Virginia and projects proposed on federal lands are not directly subject to the Bay Act. However, while CBPAs are not locally designated on federal lands, pursuant to the Coastal Zone Management Act of 1972, as amended, federal activities affecting Virginia's coastal resources must be consistent with the Bay Act and the Regulations as one of the enforceable programs of Virginia's CZM Program. Thus, federal agencies have the responsibility to be consistent with the provisions of the Regulations, § 9 VAC 10-20-10 et seq., including adherence to the performance criteria applicable to lands within locally designated CBPAs. As a result, projects on federal lands that include land disturbing activity must adhere to the general performance criteria, especially with respect to minimizing

land disturbance (including access and staging areas), retaining indigenous vegetation and minimizing impervious cover.

Through the iterative design process that has been followed for the ANC Millennium Project, these performance criteria are being met. A summary of the extent to which impacts to the RPA buffer have been reduced is contained in this document. Detailed computations demonstrate compliance with the Bay Act through the following steps:

- Preparation of an RPA Plan (using the restored stream alignment as a core RPA component)
- Preparation of an RPA Exception Request (that documents the changes made during design development to comply with the Bay Act Regulations)
- Preparation of an associated Water Quality Impact Assessment (WQIA) prepared in accordance with state regulations

In accordance with the CZM Program, the above documents will be submitted for review, comment, and approval by the appropriate ANC Officer based on the final design. As demonstrated in the previous section, the WQIA will clearly demonstrate a net improvement of water quality resulting from the proposed actions in the RPA. In addition, a CZM federal consistency determination was submitted to VDEQ on 8 November 12. Following the public comment period on the Draft EA, which closed on 21 January 2013, VDEQ concurred with the USACE CZM federal consistency determination (Appendix F).

#### 5.3.2.6 General Hydrology Impacts

All appropriate regulatory permits will be obtained. Accordingly, appropriate erosion and sediment control measures would be incorporated. Once the project is complete, there would be no long term impacts to surface water resources.

Given the findings of the cross section survey and the BEHI analysis, restoration of the stream system is needed. The pebble counts indicate that, given the proposed conditions, the in-situ streambed material is not stable, thus a reinforced bed material will be incorporated into the final design of the stream restoration. The benthic macro invertebrate community is degraded and

dominated by pollution tolerant organisms. This degradation is a direct consequence of the stream bed and bank instability and the resulting loss of habitat. Stream restoration is necessary to correct the active erosion, unstable stream bed, and to prevent contaminated soils from washing downstream. Restoration activities are also expected to improve riparian and benthic macro invertebrate habitat, though recovery of the benthic macro invertebrate community should not be expected in the near-term.

Two seeps were identified (labeled AH8 and AH10 on Fleming's Inventory). These seeps are adjacent to the main branch of the stream and are very close to the ANC/NPS boundary. However, both seeps are on the southern side of the stream, outside of the LOD of the construction and would not be impacted. Four springs are identified on the Inventory (labeled AH10, AH 15, AH18, and AH24). Of these springs, only AH15 is within the boundaries of the Millennium Project. The use of an arched bottomless span structure over the spring-fed intermittent stream (Stream 11) will minimize impacts to this spring. The spring and associated stream will incur some minor impacts due to shading that prevents re-vegetation, however the re-design of that portion of the roadway based on the location of the spring will both minimize impacts to the spring and also result in the intermittent stream in this area flowing freely rather than being piped as had been assumed in earlier versions of the plan. The other three springs are entirely on NPS-administered property that is not being impacted.

No water quality monitoring is proposed as it is not required by the regulatory agencies. Based on these analyses, the impacts to both hydrology and water quality are not considered significant. No water quality violations would occur (per regulatory provisions of the permits) and no substantial alterations to the course of local surface waters would occur. Access to the construction site will be limited to ANC land and will be done in a manner that least impacts the ability of the area to rehabilitate quickly.

#### 5.3.2.7 Stormwater Management

The stormwater management features constructed near the Chaffee Place parking lot would result in a positive impact to both the hydrology in the non-jurisdictional drainage channel as well as the water quality in that channel. By storing the water for a longer period during storm

events and slowly releasing the water back into the channel, the velocity and volume (at any one point in time) in the channel would be greatly reduced. In addition, the modified stormwater conveyance portion would provide water quality benefits for both nutrient reduction and temperature moderation. This would in turn provide benefits to the downstream areas.

The drainage shed is 2.38 acres, with 1.53 acres of pavement and 0.85 acres of lawn. The proposed detention system would be approximately 19,000 cubic feet in volume, and would capture and attenuate the 1, 2, 10, and 100-year storm events to a good forested condition using the "Energy Balance" method (explained below). The resulting peak flow rates for the design storms will be 0.5 cfs, 1.1 cfs, 3.3 cfs, and 9.7 cfs respectively. The receiving channel is sized to convey up to the 100-year storm event within its bankfull limits. It will slowly release the captured storm events over an extended period at peak flow rates similar to what would be expected in a forested watershed in good condition. To minimize the risk of progressive failure, each structure will be keyed in with footer rocks. If a structure were to fail, it would be isolated and not cause a system wide failure. In addition, the structure rocks are sized to withstand the storm flow velocities. The rocks sizes being utilized in the design have been selected to withstand the flow velocities and shear stress of the channel given the proposed channel dimensions. Unlike traditional storm water management which simply controls the pre-development peak discharge to the pre-development rate, and does not account for the increase in runoff volume associated with the increase in impervious surfaces (which results in the condition described in the comment), the proposed detention system will reduce the discharges to a forested condition using the "Energy Balance" method.

The "Energy Balance" method accounts for the increase in runoff volume associated with increases in impervious area by proportionately reducing the product of the post-development discharge and post-development runoff volume to equal the predevelopment conditions, as follows:

Qforested * RVforested – Qpost * RVpost

Where,

Qforested = Forested Discharge

RVforested = Forested Runoff Volume

Qpost = Post-Development Discharge

RVpost = Post-Development Runoff Volume

The storage detention system provides a drawdown time (from peak discharge to when flow has effectively stopped) of approximately 12.3, 12.5, 12.9, and 14.2 hours for the 1, 2, 10, and 100-year storm events, respectively. The Energy Balance method has been adapted for use in Virginia and is specifically intended to provide protection of receiving channels.

Long-term maintenance of the modified stormwater conveyance channel is the responsibility of NPS as the channel is primarily located on NPS-administered land. Given the character of the watershed and the design of the detention system and channel restoration, maintenance should be negligible. There is very limited sediment or solids input into the system (with the exception of winter sands and leaves/acorns from the oak trees in the parking lot) from the watershed. Approximately 47% of the contributing drainage area is asphalt parking lot, and the remaining portion is primarily maintained lawn. A hydrodynamic separator, sized to treat up to the 100-year storm event, would be installed at the inflow to the detention system. The hydrodynamic separator will remove acorns, any trash, and sediment from the runoff before it goes into the detention pipes. The channel restoration itself has been designed to assume no infiltration. Therefore, if the system clogged it would not affect the design capacity.

Short-term and long-term beneficial impacts to surface water would occur as a result of the stormwater management improvements to the parking lot of the NPS Administration Building as well as bank erosion control at the parking lot outfall. The improvements would control and slow the velocity of the water, allowing for less scouring of the channel and ultimately decreased total suspended solids during storm events. It is important to note that most of the channel is a drainage channel resulting from parking lot runoff and therefore, it is not regulated.

### 5.3.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to the existing surface water resources. However, streambank erosion and channel incision would continue to occur, which is detrimental to water quality within the area.

## 5.4 GROUNDWATER

### 5.4.1 Threshold of Significance

The threshold of significance for groundwater, for this EA, is defined as a change to regional groundwater patterns or a substantial depletion of groundwater supplies.

### 5.4.2 Proposed Action

Short-term, minor impacts to groundwater may result during earthwork operations at the project site. Over-excavations to remove undesirable foundation material in the stump dump area and along the drainage channel may encounter groundwater. Zones of perched water may also be encountered. These areas would require dewatering during work in these areas. Groundwater impacts would be expected to be limited to within the project footprint. No regional impacts to groundwater are anticipated. In addition, the project would not place any additional demand on regional groundwater resources, as all water for facilities would come from the Washington Aquaduct. No wells will be drilled. Based on this discussion, no significant impact to groundwater would occur.

### 5.4.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to the existing groundwater resources.

## 5.5 WETLANDS

### 5.5.1 Threshold of Significance

The threshold of significance for wetlands, for this EA, is defined as an action that could not be permitted under all applicable regulations. More specifically, this would entail direct impacts to wetlands for which the project does not appropriately minimize and mitigate.

### 5.5.2 Proposed Action

No wetlands are found directly within the construction footprint of the Millennium Project (see Figure 16). One of the wetlands identified in Section 4.5 is found very near the stream that will be restored, but is located south of the stream and outside of the LOD of the project. All construction access will be on the northern side of the stream (from ANC property) and precautions will be taken to avoid impacting the wetlands. Project activities are expected to have only minor, temporary, effects on the wetland areas. In addition, access to the modified stormwater conveyance system construction will be from above and will not impact the wetlands. The function and quality of these wetlands would not be significantly impacted. An Erosion & Sediment Control plan will be required and will ensure that appropriate techniques are implemented to minimize erosion during construction.

In addition, all regulatory permits will be obtained for this project. Through the iterative design process, proposed impacts to WOUS have been reduced to the point where they can be permitted using a State Programmatic General Permit (SPGP), or a combination of an SPGP and Nationwide Permit #27. No compensatory mitigation would be required given the minimal proposed impacts (<300 linear feet). Therefore, all applicable regulations will be addressed and no significant impacts are anticipated.

### 5.5.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to the existing wetland resources.

## 5.6 VEGETATION

### 5.6.1 Threshold of Significance

The threshold of significance for vegetation, for this EA, is defined as the following:

- Non-compliance with Section 7 of the Endangered Species Act
- Considerable degradation or loss of “old-growth forest”. Although an exhaustive definition of old-growth forest is not universally agreed-upon, the following characteristics are generally accepted to pertain to an old-growth forest:

- primary forest status (never been logged)
- a myriad of ages and species of trees to include both old trees (relative to species and environmental conditions) as well as young saplings
- snags and logs at various stages of decomposition
- lack of invasive species invasion
- lack of disturbance

### 5.6.2 Proposed Action

The Proposed Action includes the clearing and filling of some portions of the proposed Millennium Site and calls for a few trees to be left in place at the proposed interment area, and as many trees as possible to be left in place in the proposed columbarium area. No native trees in the oldest track of forested area, the 235-year-old forest on NPS property adjacent to the northeastern portion of the site, would be removed.

The 27-acre Millennium Project site is approximately one-half forested and one-half open field with scattered mature trees. Most of the proposed burial sites are located within the open field portion with a loop road and columbaria located within the wooded portions of the site. The mature hardwood forest would be partially converted to woodland (landscape dominated by trees, at a density that allows an open canopy) enfolding the proposed columbarium area, road, walkways, and interment shelter where trees would be carefully selected for removal to minimize impact. The medium-aged disturbed forest would be converted primarily to open green space for burials, with native grasses and scattered trees. The disturbed field area would be converted to columbaria with appropriate roads and walkways, as well as open green space for burials. The maintained parkland area would primarily be converted to open green space for burials with native grasses and scattered trees.

### 5.6.3 Impacts to Trees

Trees that will be removed are all in areas that were clear-cut during the Civil War. These trees are a maximum of 145 years old. As a result of comments received, the team has implemented additional measures to minimize the number of trees that would be impacted by the project. Analysis of the current project design (as of April 2013) indicates that of the 1804 trees (6”

diameter and greater) on site, approximately 905 trees would be removed to facilitate construction of the cemetery expansion. Of those 905 trees, 57 are dead, 77 are invasive species and 771 are healthy native trees. Approximately 491 trees would be removed from the northern portion of the project site which includes trees as old as 105 years. Approximately 211 trees would be removed from the portion of the woodland that includes trees as old as 145 years. Approximately 203 trees would be removed from the former Ft. Myer picnic area which is currently a park-like area with a range of tree ages to include most trees in the 50-100 year old range and a maximum of 145 years old. The number of trees being replanted has increased to nearly 800 trees (1 1/2" to 5" caliper), plus more than 1600 tree seedlings, and 14,000 shrubs. ANC is committed to further minimize removal of trees.

Based on comments to the December 2012 Draft EA, the team evolved the design through an iterative process whose specific purpose was to maximize the number of trees that would not be impacted by the project. For instance, the road alignment was slightly adjusted and a few of the Columbaria were re-located to less impactful areas. Table 5.5 below shows approximate acreages of each forested age stand to be impacted. As is shown, none of the 165 year old tree stand would be impacted and slightly less than half of the 145 year old tree stand would be impacted. Of the trees to be removed, approximately 77 trees are invasive species (primarily Tree of Heaven, White Mulberry, Norway Maple and Princess Tree) and 57 (included in the inventory) are dead.

**Table 8 - Approximate Acres of Impact Per Tree Age Stand**

| Age | Acreage Existing | Acreage of Impact |
|---|---|---|
| Disturbed Forest – 105 years or less | 5.58 acres | 5.25 acres |
| 145 years or less | 5.84 acres | 2.63 acres |
| 165 years or less | 2.74 acres | 0 acres |

As noted previously, no native trees would be removed from the 235-year old stand of trees on NPS property. This forested area, included on the Virginia Native Plant Society Registry and

commonly known as "Arlington Woods," is adjacent to the Millennium Project. The only activities on NPS property would include a very small area along the stream restoration and a small portion of the modified stormwater conveyance system. The only large vegetation to be removed on NPS property is an invasive 6" dbh (diameter at breast height) Tree of Heaven, *Ailanthus altissima*) tree in the vicinity of the modified stormwater conveyance. It is anticipated that several downed and/or dead trees may also be removed to ensure the integrity of the restored stream channel.

There would be some loss of forested buffer for the NPS property. However, the project would leave in place an unaffected significant buffer around the entire NPS property. In addition, invasive species control will take place during construction on all ANC portions of the Millennium project site. Therefore, the buffer to the NPS property will be improved from an invasive species perspective. To the west of the NPS-administered Arlington Woods, the 165 year old trees (see Figure 22) would remain. Along the entire northern border, the main branch of the stream is near the NPS boundary. As part of the stream restoration and RPA buffer, the trees on both sides of that stream will remain. Therefore, a significant buffer would remain around the entire NPS property.

There were many public comments on the draft EA regarding destruction of "old-growth" forest. As stated earlier, there is no universally accepted, exhaustive definition of old-growth, but some of the characteristics generally accepted as pertaining to old-growth include primary forest status (never been logged), a myriad of ages and species of trees to include both old trees (relative to species and environmental conditions) as well as young saplings, snags and at various stages of decomposition, lack of invasive species invasion, and lack of disturbance.

The trees on the ANC property that will be impacted by this project are situated within areas that possess few, if any, of the characteristics defining old-growth forest. None of the trees impacted are primary forest as they were all clear-cut during the Civil War. Most of the areas do not have a good diversity of age, largely due to a blanketing of invasive species on the forest floor. Even in Chris Fleming's Vegetation Inventory in 1996, the results stated that "Only two areas were free of invasive species: the little woodland along the road at the north end of Section C and the

woods behind the warehouses. Most of the other areas are more or less covered with invasive species, the most extreme being the wisteria and ailanthus dominating Section A." In addition, in the WSSI 2013 vegetation survey, in reference to the Mature Hardwood Forest, the report states: "It appears that the forest community has undergone a significant shift since the 1996 inventory was conducted, with the majority of the understory now dominated by invasive and noxious species, leaving little space for native species." The summary of that vegetative survey states that: "A high prevalence of invasive species is present throughout the site, attesting to the level of disturbance, adjacent development, and other anthropogenic pressures that influence these communities as a result of the sites generally urban location."

Because of this blanketing of invasive species, there are not a large number of saplings in much of the forested area. In addition, the area shows high levels of disturbance. There are various utilities in the wooded area, and many areas which have been disturbed from the placement of those utilities. There are large pieces of concrete and various discarded trash items in the forested area, and near the maintenance yard are discarded maintenance items from years past. Based on the large levels of invasive species and disturbance as well as the lack of primary forest status and the lack of new growth, the forested area that will be impacted as a result of this project is not old-growth. Because the project is not removing old-growth forest, and no threatened and endangered plant species will be impacted, no significant impact is anticipated.

Consistent with this assessment's conclusion of no significant impact, the Virginia Department of Forestry (VDOF) found that the project "…will not have an adverse impact on the forest resources of the Commonwealth for the following reasons" (see 4 Jan 2013 letter from Evans to Ellis included in Appendix F):

1. The site is approximately one-half forested and one-half open field with scattered mature trees.
2. The EA shows that the project site is an urban, partially forested site located away from the main body of the existing urban forest so forest fragmentation is minimized. The eastern half of the site on ANC property is heavily forested with dense mature tree growth and this would be retained.

3. The oldest trees on the site, the 220-year old forest at the northeastern tip of the site, would be avoided entirely.
4. The stated design intent is to minimize the amount of proposed cut and fill and to preserve as many mature trees as possible surrounding the stream bed that runs through the site. Existing stream channels and associated riparian buffers, which are currently severely degraded in some areas, would be restored and integrated into the overall project as a natural landscape amenity thereby improving the ecosystem service functions of the forest and stream channel. The buffer area would be maintained with 100' setbacks to comply with the Chesapeake Bay Preservation Act criteria (*USACE note: this is true to the maximum extent practicable – the buffer will be on average 80'+ depending on the area of the stream. This clarification was provided to VDOF on 1 March 2013* )
5. Based upon preliminary grading studies, approximately 890 trees would be removed for construction, with 248 from open areas of the site and 642 from within forested areas. However, the project will also plant approximately 600 new trees and 500 new shrubs to partially mitigate this loss. (*USACE note: The 890 trees noted as removed in a prior draft of the EA has since increased slightly to 905 trees and the tree replanting have increased significantly so that there is "no net loss" of trees*).
6. Tree protection areas in the vicinity of proposed excavation and proposed stock pile areas are planned to preserve those locations and prevent injury to trees.
7. Preservation of existing trees is a stated priority for the project and tree preservation plans and best practices are detailed in the EA, including a large tree save area.

The mission of the VDOF is to protect and develop healthy, sustainable forest resources for Virginians.

Short and long term impacts to vegetation, including removal or injury, would be expected from the Proposed Action. Clearing and grading would remove some trees, shrubs, and grasses within the project area. This would be mitigated to some degree by the planting of new trees. Tree protection areas in the vicinity of proposed excavation and proposed stock pile areas would be established to preserve those locations and prevent injury. Disturbed areas would be temporarily

seeded following construction, and permanently seeded with native seed when growth is more likely to establish itself. The choice of seed mix would depend on the current site conditions.

Long-term impacts would result from a limited portion of the overall burial area being transformed from existing forest and woodland into a landscape with scattered trees dominated by grasses, throughout most of the site, and woodland (landscape dominated by trees, at a density that allows an open canopy) enfolding the proposed columbarium area, road, walkways, and interment shelter where trees would be carefully selected for removal to minimize impact. These impacts are not considered significant.

Conversion of the current maintenance area into a green space with grasses and trees would result in a beneficial impact. Currently that area is primarily a dirt road and open area for parking, maintenance vehicles, storage, and operations equipment. It would be converted into a vegetated area with many tree plantings as well as some grassy area.

### 5.6.4 Tree Save Plan

Preservation of existing trees is a priority for this project. Tree preservation plans would be prepared with the construction drawings. Retaining walls would be used to quickly transition from proposed to existing grades, thereby shrinking limits of clearing. A large tree save area would be provided in the center of the site associated with setbacks from the small stream. Figures 30 and 31 below shows the trees being removed and those that have been "saved" compared to prior designs for the project. These are similar figures, but figure 30 displays the aerial photo and design features for reference. Figure 31 only displays the trees, for easier visibility of impact areas. Figure 32 displays the tree analysis along with the most recent design changes. The red dots represent trees that will be removed. The green dots represent trees that would have been removed under Alternative A but are now slated to be saved.

**Figure 31 - Tree Impact Analysis with Project Graphic and Tree Ages**

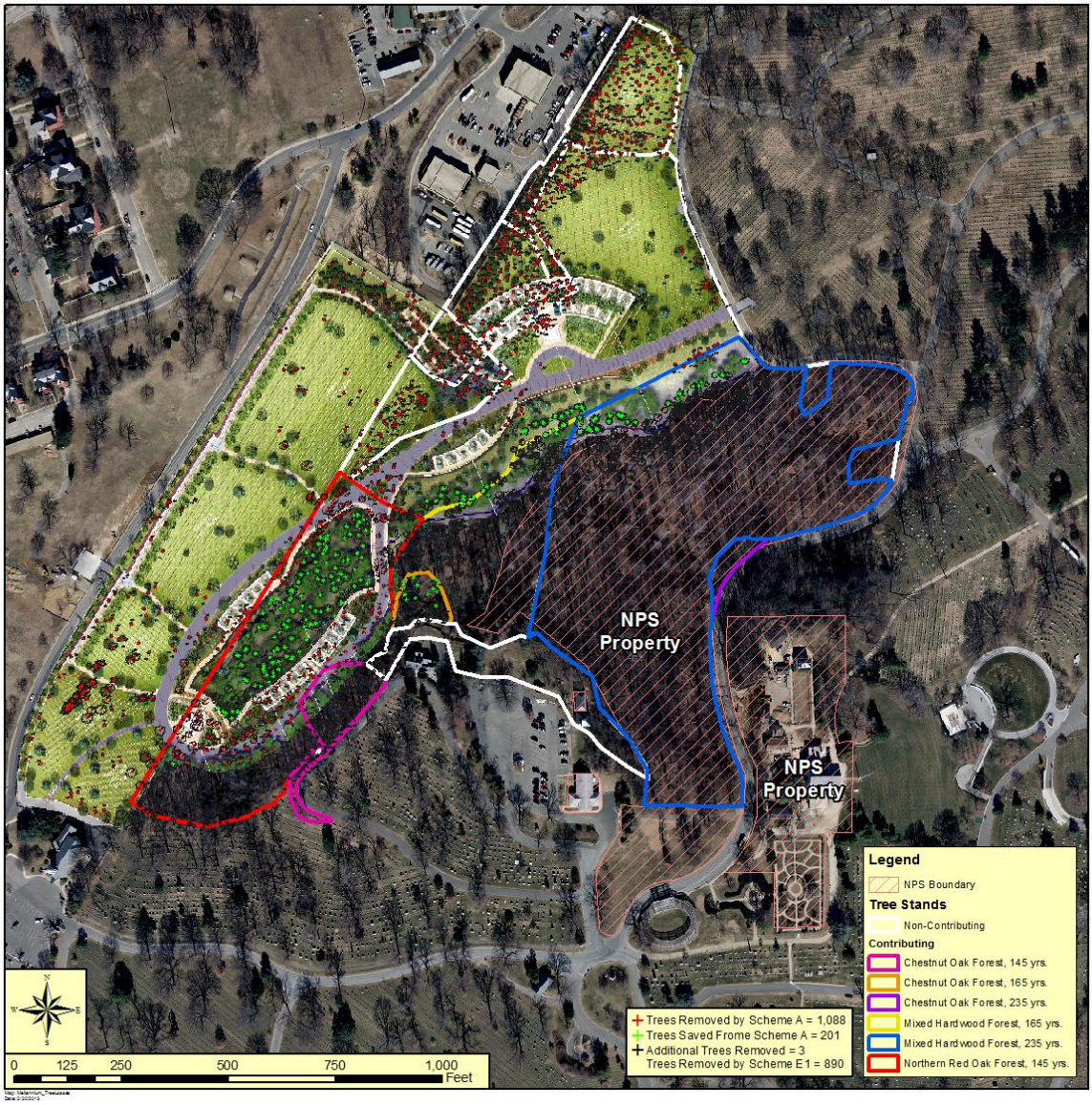


**Figure 32 - Tree Impact Analysis with Tree Ages**

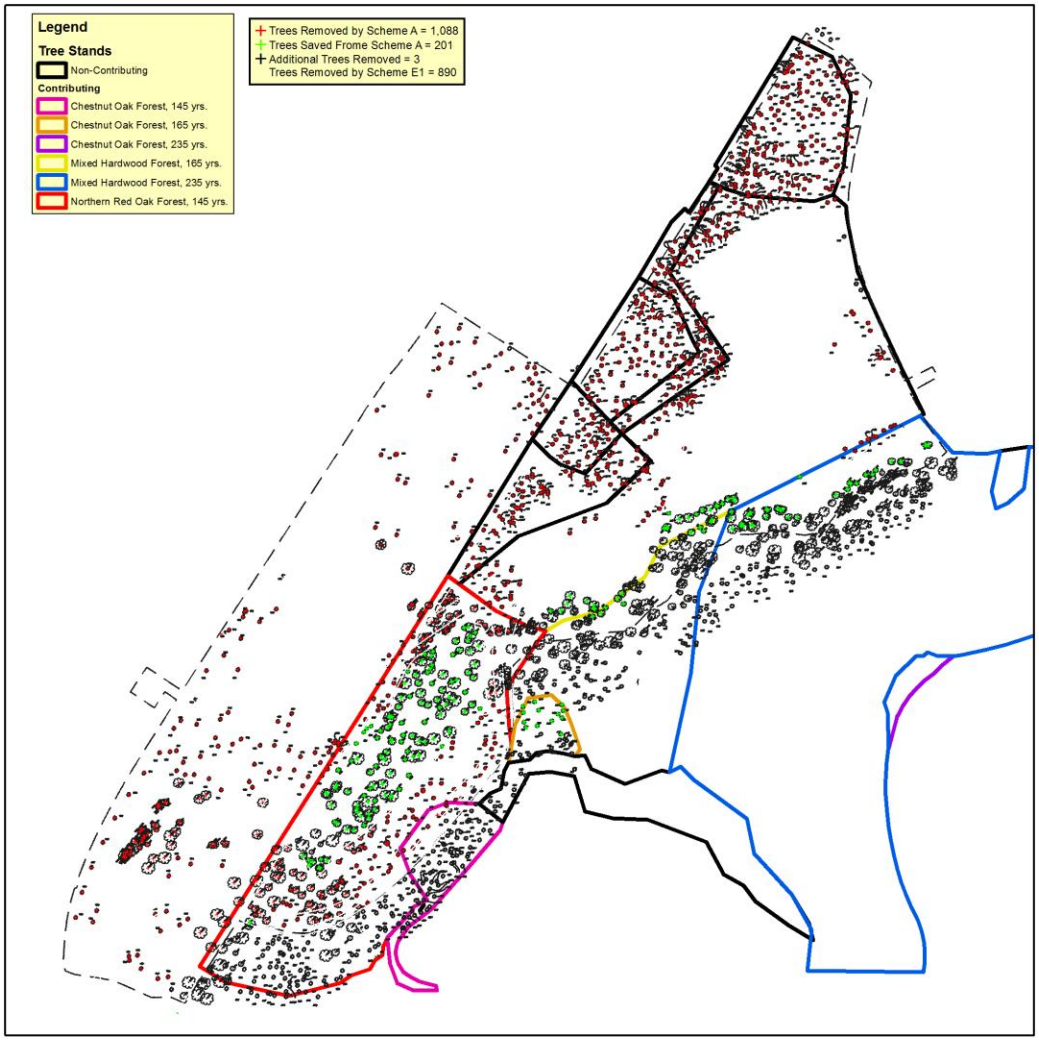
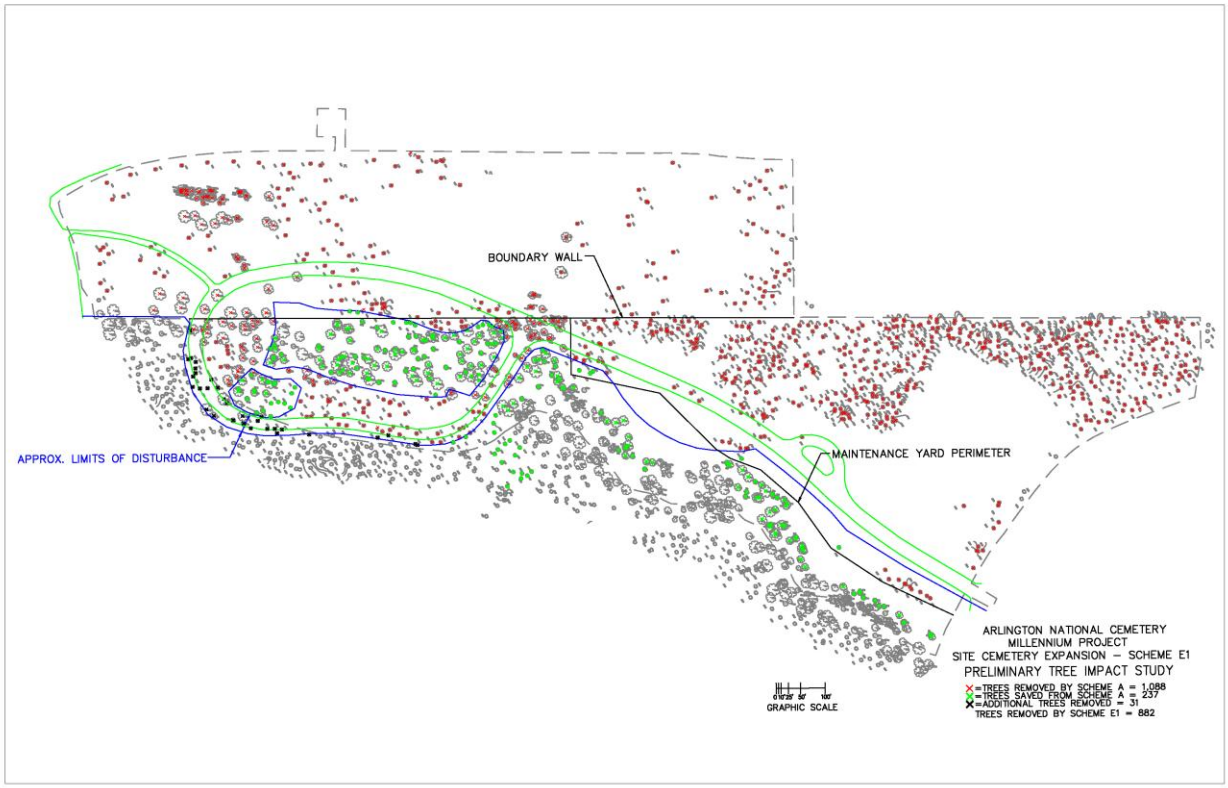


**Figure 33 - Tree Impact Analysis with Design Modifications**




When the layout and grading design is nearing completion, limits of construction would be delineated in the field. A team would assess the trees on each side of the limits and make adjustments to the plans to save as many trees as practicable. The number of trees being replanted has increased to nearly 800 trees (1 1/2" to 5" caliper), plus more than 1600 tree seedlings, and 14,000 shrubs. Of course, the new young trees will not immediately provide the same function and value as the mature trees that would be removed. All new plantings in natural areas will be native species. All new plantings in the formal areas will be non-invasives, and most will be native species.

Although these trees would not totally replace the function and value of the trees that are lost, they will serve to:

- ✓ Provide landscape consistency with the rest of ANC
- ✓ Improve air quality by filtering many airborne pollutants
- ✓ Provide wildlife habitat.

- ✓ Increase evapotranspiration process

### 5.6.5 Invasive Species Control Plan

The project would be in compliance with EO 13112 on Invasive Species. An invasive species control plan would be followed during construction and in-place for multiple years post-construction. This plan would include removal of 100% of invasive species within all ANC-administered areas of the Millennium project site. This includes invasive species removal on the 145 and 165 year old forested areas. A list of invasive plants includes, but is not limited to: English Ivy, Japanese Honeysuckle, Wisteria, Oriental Bittersweet, Porcelain Berry, Tree of Heaven, and Norway Maple.

Invasive plant removal would be accomplished by personnel qualified to identify invasive species. Initial removal would occur prior to restorative planting. Below are the general guidelines for the invasive control plan.

1. Treat entire area of invasive plant removal with a non-selective herbicide following manufacturer's directions. Use only herbicides approved for use near water bodies.
2. Following the herbicide application, remove invasive plants by hand, taking care to remove all plant parts including roots and avoiding damage to desirable, native plants. Root removal and other potentially ground disturbing actions would not be conducted within site 44AR0032.
3. Do not attempt to remove climbing vines from the canopies of trees; cut the vines at the base of the tree and remove the rooted plants. Vines in the tree will die and decay in place.
4. Dispose of removed plants legally offsite.
5. Invasive tree species shall be cut down and removed from the site. Treat the exposed stumps with herbicide.

In addition to the invasive species control plan, it is acknowledged that any new “edge” habitat creates a welcome environment for new invasive species invasion. So although invasives will be removed in the near-term, there is always a risk of future increases in invasive species

establishment given the newly disturbed areas. ANC does have a long-term ongoing invasive species management program which always seeks to minimize invasive species establishment to the extent practical. The overall net impact to invasives on the Millennium site is anticipated to be positive given the extensive nature of the invasive species control plan.

### 5.6.6 Stormwater Management Features

The stormwater management feature adjacent to the Chaffee Place parking lot would have minor short-term impacts to vegetation. Some of the grassy area next to the parking lot would be temporarily impacted for the construction of the underground storage. At the request of the NPS, construction and construction access would be primarily limited to the eroded gulley to minimize impacts to existing vegetation during the construction of the channel restoration. All areas impacted would be re-vegetated with a diverse mix of riparian vegetation native to the Arlington region. It is currently anticipated that only one invasive non-native tree, 6" dbh Tree of Heaven, *Ailanthus altissima*, would need to be removed for the modified stormwater conveyance construction on the slope. No access roads from the bottom or the side are anticipated.

Pavement surrounding the trees in the Chaffee Place parking lot would be removed to the drip line, resulting in a benefit to those trees. To avoid tree root damage, no changes to the soil compaction would be attempted. The existing asphalt would be mechanically stripped and the sub base would be removed with an air spade to prevent damage to the tree roots. Topsoil would be spread, by hand, over the pavement removal area, and the area would be mulched. Traffic control devices would be placed at the edge of the pavement to prevent vehicles from driving on the restored areas.

### 5.6.7 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to existing vegetation. The adverse impact of invasive infestation throughout much of the site, including the contiguous stands of 145 year old and 165 year old trees, would continue.

## 5.7 WILDLIFE RESOURCES INCLUDING RARE, THREATENED AND ENDANGERED SPECIES

### 5.7.1 Threshold of Significance

The threshold of significance for wildlife resources, for this EA, is defined as non-compliance with Section 7 of the Endangered Species Act or the total loss of regional habit for any species.

### 5.7.2 Proposed Action

Wildlife is not abundant in the project area, as it is surrounded by urban areas. The Proposed Action activities would temporarily disturb any wildlife present. Construction activities would lead to increased human presence and noise, which would most likely cause wildlife to temporarily relocate. Construction personnel would be mindful of all wildlife and take practical measures to avoid impacts to any wildlife in the project area. Long-term impacts to wildlife are expected to be minimal from the Proposed Action because disturbed areas would regenerate upon completion of the project and a large portion of the wooded area would remain forested with little human disturbance.

Many species of birds were noted in the 1999 NPS EA survey as well as the February 2013 WSSI survey. These birds would be expected to quickly relocate to the surrounding un-impacted forested area. In addition, there are many trees throughout ANC which could provide nesting habitat for birds impacted. Deer are occasionally sited on the property and were noted in the 2013 wildlife survey. Again, these deer would be expected to remain in the un-impacted forested area. Other wildlife noted on the site includes red fox, raccoon, eastern cottontail and eastern gray squirrel. The habitat for these animals will be altered. However, there will be remaining available habitat both during and after completion of construction. In addition, many of the habitat features (see Exhibit 5 of the WSSI Wildlife Survey in Appendix G) are found along the stream corridor. Although it is likely that this wildlife would be disrupted in the short-term, that corridor will remain post-construction, and the trees will not be removed in that stream corridor, preserving that habitat for the long-term. Because the lower portion of the stream is immediately adjacent to NPS property, the stream corridor will remain as part of a contiguous refuge for wildlife within the very urban metropolitan region. Wildlife may be more susceptible

to vehicular interactions post-construction, but because traffic generally travels very slowly through ANC, high levels of mortality due to road strikes are not anticipated.

No threatened and endangered species are identified on the site, so no impacts to those species would occur. No negative impacts are expected to occur to the State Threatened Bald Eagle and other migratory birds that may pass through and use areas included within the project site. Because of the remaining forested area on both ANC and NPS property, there would be remaining habitat for the wildlife that does use the area. Therefore no significant impact to wildlife would occur as a result of this project.

The modified stormwater conveyance on the steep slope near the parking lot should provide benefits to wildlife by improving the habitat compared to the current deeply incised channel and providing a more consistent base flow for aquatic biota compared to the existing conditions of that channel. NPS has provided special protective measures that will be incorporated to protect the Northern Two-lined Salamanders and any other amphibians that may be encountered in the project area on NPS property.

### 5.7.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to existing wildlife.

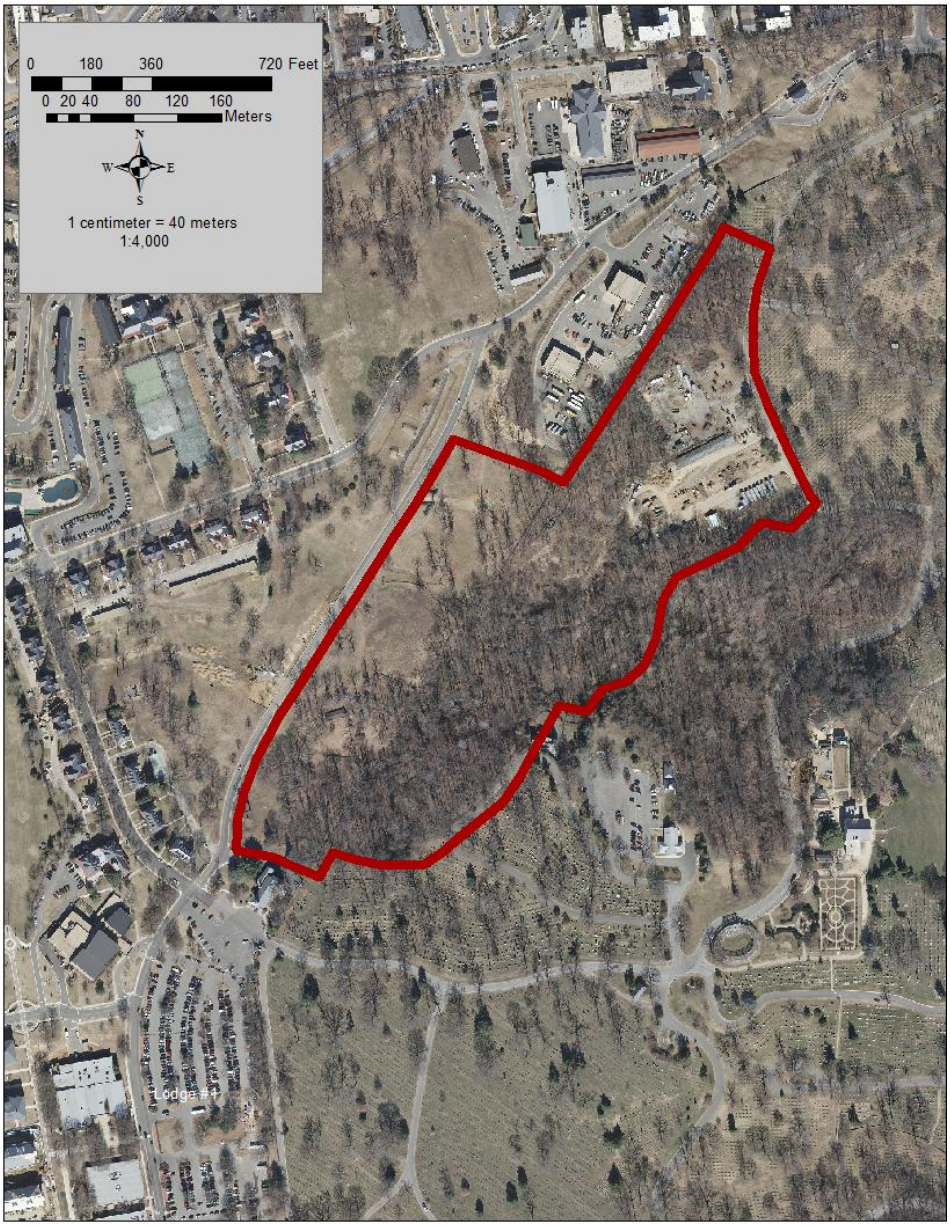
## 5.8 CULTURAL RESOURCES

There are no NRHP eligible or potentially eligible archeological resources located in the proposed project construction APE, which is discussed at length in Section 4.8. NRHP eligible and listed historic district contributing cultural landscape elements are within the physical APE, and contributing buildings and landscapes are within the visual APE, shown in Figures 34 and 35. Additional information on cultural resources can be found in Appendix B.

### 5.8.1 Threshold of Significance

The threshold of significance for cultural resources, for this EA, is defined as unresolved adverse effects to historic properties in accordance with Section 106 of the National Historic Preservation Act.

**Figure 34 - Millennium Project APE**



### 5.8.2 Archeological Resources

#### 5.8.2.1 Proposed Action

Archaeological resources within the physical APE are not NRHP eligible. Site 44AR0043 has been determined not eligible. Sites 44AR0046, 47, 48, and 49 (former designation of the latter three 44AR0032 loci 1, 2, and 3) have been determined not eligible (Haynes 2012b, Carmody and Blondino 2012). Sites 44AR0032 (eligible, loci 4, 5, and 6) and 44AR0050 (potentially eligible) are outside of the project APE. All ground disturbing actions associated with the Millennium Project, including stream restoration measures, plantings, and invasive species control which may cause ground disturbance, would avoid site 44AR0032. The revised boundaries of 44AR0032 are separated from Millennium ground disturbances by a topographical feature; i.e., the main stem water course (Wampakam Branch), and no ground disturbing actions which would affect it are a part of this plan. The proposed action would cause no adverse effects to NRHP eligible archaeological sites.

#### *5.8.2.2* No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to archaeological resources.

### 5.8.3 Architectural Resources

#### *5.8.3.1* Proposed Action

A visual effects study was conducted for the viewshed of the proposed action (visual areas of potential effect shown in Figure 34). Implementation of the proposed Millennium Project would have no effect on the historic setting of NRHP listed Arlington House. Visual effects to the Ft. Myer historic district listed contributing properties would be minimal due to distance and the low profile of the proposed construction (Figure 35 and 36). The listed contributing residences on Jackson and Lee Avenues face away from the Millennium site and are distant. Recommended as contributing to the Ft. Myer historic district, the Old Post Chapel is about 62 feet south of the southern end of the proposed Millennium boundary wall. The project would be visible only from the rear of the Old Post Chapel. "However, the aesthetic of the proposed project would be consistent with the overall image of Arlington Cemetery and complement the existing visual environment" (Jacobs 2013:9). Thus, the visual effects to the Old Post Chapel would not be

adverse. Cemetery development adjacent to the Old Post Chapel is consistent with its historic and landscape context and would not adversely affect its historic character. The proposed Millennium Project area would not be visible from Arlington House, or its immediate grounds, the view shielded by topography and dense forest as verified by a visual effects study in January 2013 (Jacobs 2013). The study used computer modeling of the design, post construction topography, existing topography, and field observation to develop a visual area of potential effects, shown in Figure 35. Similarly, the proposed construction would be shielded from view from ANC, except in the northeast, where the project replaces a maintenance area where trailers and workers cars are parked now and would be a positive effect.

**Figure 35 – Visual Area of Potential Effect**

Figure 3.3 - Map of Vantage Points

**Figure 36- Existing View from Jackson Ave, Ft. Myer Historic District**

**Figure 37 - Rendering of Proposed Construction on Photo of View from Jackson Avenue**

#### *5.8.3.2* No-Action Alternative

Under the No-Action Alternative the Millennium Area Project would not occur; therefore, there would be no direct impacts to existing historic architectural resources.

### 5.8.4 Cultural Landscape Resources

#### *5.8.4.1* Proposed Action

The proposed action would result in direct physical adverse effects to NRHP listed or eligible historic district landscape components. A section (945 feet of out of approximately 5653 feet of

the remaining original boundary wall) of the historic Seneca sandstone boundary wall of ANC would be demolished. A small portion of the forest contributing to the Arlington House NRHP listing would be affected, although the house and associated buildings would not be affected. Of the 20.7 acres of forest determined to contribute to Arlington House, the Millennium Project would impact a 2.63 acre portion of the 145 years old section which has grown back since the Civil War. There would be visual effects to the forest areas contributing to Arlington House, not physically impacted by the proposed action, however the current conditions are inconsistent with the historic character of the perimeter of the forest area, consisting of an industrial area (maintenance yard) and soil dumps (Figure 38). Given this, the indirect, visual impact of the introduction of the new cemetery area would not be adverse. It would also be a consistent extension of the historic context of Arlington House since 1864.

The relatively steep terrain of Arlington Ridge has characterized the setting of Arlington House and the oldest parts of ANC. This terrain has been substantially altered in the 20th century. In Section 29 (the portion of the Millennium area within the Boundary Wall) there has been extensive grading and filling, and the watercourses have become deeply incised in some places, or choked with alluvium in others due to runoff from paved surfaces at ANC and JBM-HH. Across the wall in the former Ft. Myer picnic area portion of the Millennium area soil dumps occupy the center and northern edge of the area. The biggest changes to the terrain by the proposed action would be in this area and modified areas in the north part of Section 29, leaving the southeastern edge of the Millennium area relatively unmodified.

Section 106 mitigation of adverse effects through project design has been a continuing objective of Millennium Project planners. Adverse effects to the Seneca sandstone boundary wall element of the ANC historic landscape would be mitigated through the reuse of the materials, or matching material, in the new boundary wall for the Fort Myer side of the Millennium Area and documentation of the structure. Mitigation of effects to the forested area of Section 29 has been through minimizing the number of trees taken by the preferred design option, as well as replanting of approximately 800 trees (1 1/2” to 5” caliper), plus more than 1600 tree seedlings, and 14,000 shrubs. The proposed stormwater management measures at Chaffee Place parking lot would not affect its historic character or site 44AR0050 identified in that area.

#### *5.8.4.2* No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to existing cultural landscape resources or historic buildings.

### 5.8.5 Additional Cultural Resource Considerations

Section 106 consultation was completed among ANC, VDHR, USACE, Arlington County, CFA, NCPC, JBM-HH, NTHP and NPS. The ANC and VDHR signed a Memorandum of Agreement for the implementation of measures to mitigate the determined adverse effects, as defined in Section 106, in June 2013. The resolution of the Section 106 consultation ensures that, based on the threshold of significance for cultural resources, there will be no significant impacts.

**Figure 38 Existing conditions, impacts, and contributing areas of Arlington House**

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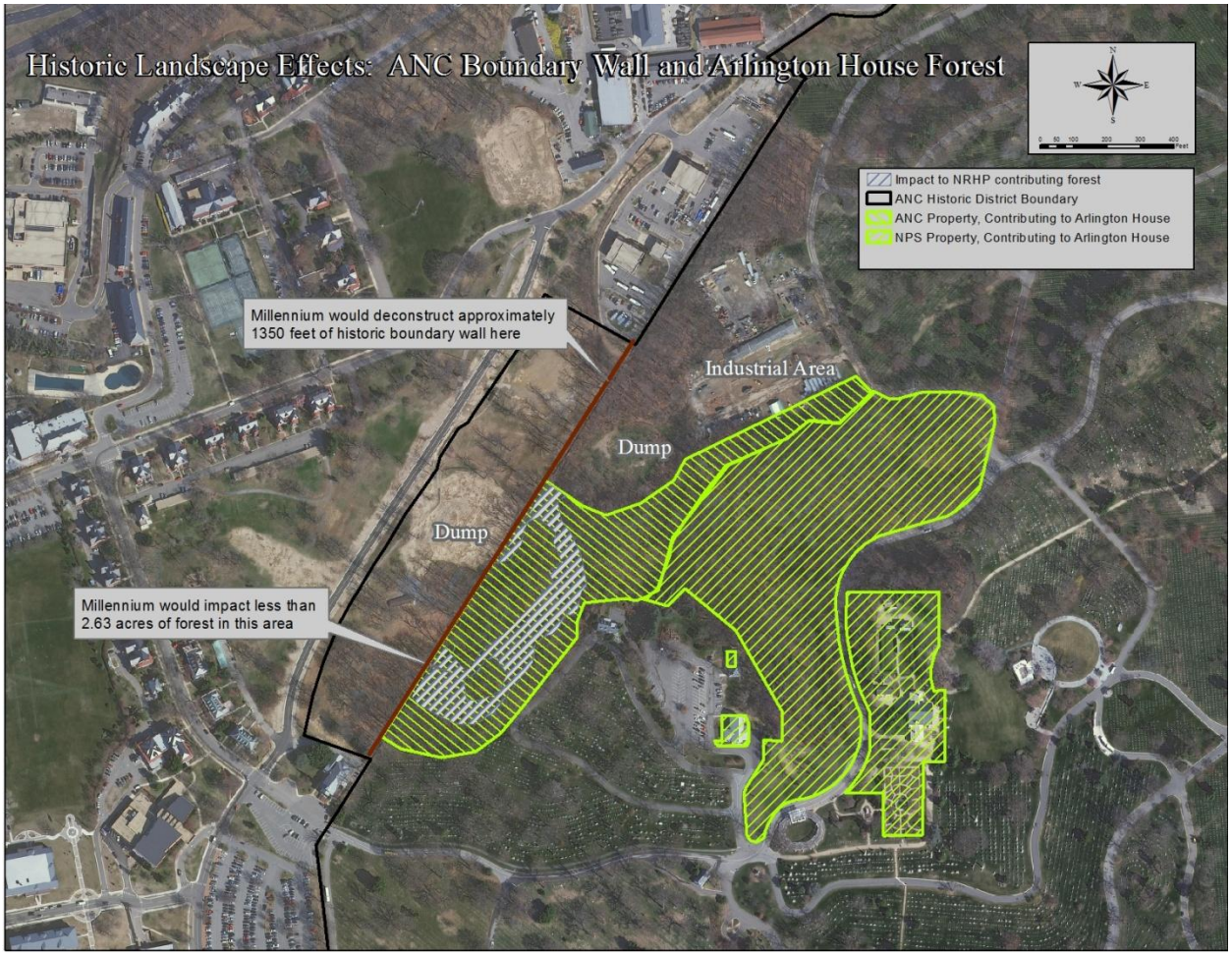


## 5.9 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

### 5.9.1 Threshold of Significance

The threshold of significance for HTRW, for this EA, is defined as non-compliance with any applicable hazardous waste laws and regulations.

### 5.9.2 Proposed Action

The vast majority of soil that will be generated during mass grading and construction within the limits of the Millennium Project is expected to be acceptable for beneficial reuse as fill on site (from an environmental standpoint).

SVOCs were detected in soil samples collected from the ESMY and OWA at concentrations above VDEQ and EPA screening levels for a commercial use property. The metals arsenic and chromium were detected in soil samples collected from the SMY, ESMY, OWA, and FMM at the concentrations above VDEQ and EPA screening levels for a commercial use property; however, the concentrations of these metals were within expected background levels. TPH were detected at elevated concentrations (above 100 mg/kg) in soil samples collected from the SMY and OWA.

Based on the proposed Millennium Expansion development, seven locations that require remediation based on the site studies will be disturbed during construction. Two of the locations, denoted as No. 6 and 9, will be partially disturbed during utility installation therefore only the disturbed areas require remediation. Areas 6 and 9 are expected to receive several feet of fill to reach proposed grades. Based on the type and concentration of COPC detected in the samples, the soil is expected to meet criteria for disposal/treatment as a non-hazardous, petroleum impacted waste for all nine areas.

No new HTRW issues will be generated as a result of this project. Compliance will occur for all applicable HTRW laws and regulations pertaining to this project, therefore no significant impact is anticipated.

### 5.9.3 No-Action Alternative

The No-Action Alternative would not be expected to result in any changes to the existing conditions. The currently identified contaminated soils would continue to be coordinated with the appropriate regulatory agencies.

## 5.10 TRANSPORTATION

### 5.10.1 Threshold of Significance

The threshold of significance for transportation for this EA, is defined as long-term regional transportation disruptions.

### 5.10.2 Proposed Action

The development of the Millennium Site would have minor, short-term adverse impacts to traffic in the area. The large number of construction vehicles and truck traffic removing unsuitable soils and bringing in fill and top soils, gravel, and rock could disrupt normal traffic patterns in the area. ANC will coordinate with JBM-HH regarding disturbance to its roadways due to increased construction vehicle traffic. Possible state Highway Occupancy and local traffic permits may be required and would be coordinated by the contractor prior to the start of construction.

No long-term significant impact on transportation is anticipated as a result of the Proposed Action. The Proposed Action includes the construction of a roadway through the proposed Millennium Site, which would allow vehicular traffic into this area. This would be a local impact only, however, as the short (less than half-mile) portion of road would not connect with any public streets or thoroughfares, and is not anticipated to allow a significant increase in traffic to or from ANC.

### 5.10.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to existing traffic, roadways or transportation systems.

## 5.11 STORMWATER SYSTEMS

### 5.11.1 Threshold of Significance

The threshold of significance for stormwater systems, for this EA, is defined as non-compliance with any laws and regulations related to stormwater management.

### 5.11.2 Proposed Action

The Proposed Action includes restoring the existing stream, and providing a stormwater collection system as part of the development of the Millennium Site. Surface water collection would enter the restored stream channel in various locations along its length. Short-term minor impacts to stormwater management would be expected as this water would be handled through

the ECP during construction. The design of the burial areas provides ample mitigation of any deleterious effects of the construction, acting as a very large filter system. It consists of a free draining, 24" topsoil layer with approximately 8' of gravel surrounding and underneath the burial vaults, providing an efficient means of water quality improvement. In areas where storm water does not drain through a burial area, smaller rain garden type facilities would be located to clean and cool the water prior to it entering the outfall channel. Long-term impacts associated with this action are beneficial.

In addition, beneficial impacts are anticipated from the stormwater management features to be constructed adjacent to the Chaffee Place parking lot. As already discussed, the proposed features would provide both attenuation of flows in the currently eroding channel, water quality benefits from the detention, and stabilization of the steep bank which would decrease erosion.

The proposed burial area composted topsoil modifications, coupled with their underdrains and the very low level of proposed impervious areas, will allow the project to meet the Stormwater control requirements of Section 502 of Executive Order 13508 and Section 438 of the Energy Independence and Security Act. If final design calculations determine that additional retention is needed, other Low Impact Design practices will be implemented such as pervious pavements/pavers, vegetated channels, roof disconnections, bioretention facilities, infiltration facilities, and structural soils to the maximum extent practicable.

Section 502 of EO 13508 implementation measures that would be utilized on the project includes:

- ✓ Tree planting and urban forestry (U-1)
- ✓ Soil amendments and turf management (U-1)
- ✓ Restore Predevelopment hydrology through stream restoration (U-2)

Section 438 of the Energy Independence and Security Act implementation measures include:

- ✓ Reforestation/revegetation using native plants
- ✓ Protection and enhancement of riparian buffers and floodplains
- ✓ Trees

Based on this information, no significant impact to stormwater management is anticipated.

### 5.11.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to existing stormwater drainage and collection systems on the main Millennium site. The stormwater drainage off of the Chaffee Place parking lot would continue to flow in high volumes and velocities during storm events, eroding the steep bank and providing no water quality benefits to the downstream areas.

## 5.12 UTILITIES

### 5.12.1 Threshold of Significance

The threshold of significance for utilities, for this EA, is defined as a long-term or permanent disruption to utilities in the local area.

### 5.12.2 Proposed Action

The Proposed Action would have minor short-term impacts to utilities within the project area as utility relocation and electrical distribution is provided throughout the Millennium Site. These actions could cause temporary disturbances of potable water, sewer, electric and gas services during the work on these utilities, although these impacts will be minimized by careful phases of construction activities. Any impacts would cease once the construction associated with the utilities has been completed. No long-term impacts are anticipated as all active utilities impacted would be avoided or relocated which would likely result in updated and improved utility infrastructure. Therefore, no significant impacts would occur.

### 5.12.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to existing utilities within the project area.

## 5.13 NOISE

### 5.13.1 Threshold of Significance

The threshold of significance for noise, for this EA, is defined as a permanent increase in noise levels that would cause an impact to neighboring properties.

### 5.13.2 Proposed Action

The Proposed Action would result in minor, short-term, local increases in noise production during the construction period. This noise would result from the use of heavy machinery and equipment for demolition of existing structures, clearing vegetation, landforming, and construction of the proposed Millennium Site features. The construction crews would be required to comply with all applicable laws regarding noise, including time of day restrictions and maximum decibel levels. Scheduling work to avoid impacting services at Memorial (Old Post) Chapel has been suggested and will be coordinated as necessary throughout the project duration. Subsequent operation of the proposed Millennium Site is not anticipated to result in the production of any significant amounts of noise; visitors and employees may produce noise including human voices, vehicles, and lawn maintenance equipment. Noise levels generated by activities from the project would be similar in nature, duration, and intensity as what normally occurs at ANC. Long-term noise levels would include those already common to ANC such as gun salutes and bands/bugles. Therefore no significant impact is anticipated.

### 5.13.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no noise impacts beyond those associated with daily activities at the facility.

## 5.14 AIR QUALITY

### 5.14.1 Threshold of Significance

The threshold of significance for air quality, for this EA, is defined is defined as non-compliance with any laws and regulations related to air quality.

### 5.14.2 Proposed Action

With the Proposed Alternative, temporary increases in air pollution could occur during the project implementation; however, the impacts to air quality are anticipated to be localized and negligible, lasting only as long as construction activities occurred. The area's current level of air quality would not be affected by the proposed project; therefore, no significant impact would occur.

### 5.14.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no air quality impacts beyond those associated with daily activities at the facility.

## 5.15 AESTHETICS

### 5.15.1 Threshold of Significance

The threshold of significance for aesthetics, for this EA, is defined as a change to the landscape which would be out of context with the rest of the Cemetery.

### 5.15.2 Proposed Action

The proposed project would alter the visual and aesthetic environment of the Millennium Site. The construction of the Millennium Site is required by ANC to fulfill their mission; therefore alteration to the site's current aesthetics is unavoidable. The goal of the proposed modifications to the site and requisite structures has been to blend harmoniously with the overall visual character of both ANC and JBM-HH and minimize topographical changes to the landscape. Plantings, walkways, and lighting have all been designed to evoke an aesthetic setting similar to the rest of ANC and create an appropriate final resting place of peaceful permanence befitting for all who are laid to rest in service of this country. Please see Section 5.8.3 for further discussions from the historic landscape perspective. Impacts are anticipated to be noticeable and long-term but would not negatively affect the current aesthetics at ANC. Currently large portions of the project site are occupied by unsightly maintenance facilities and equipment. The project would result in a significant visual improvement in those areas. The modified stormwater conveyance proposed near the Chaffee Place parking lot would improve the aesthetics of the wooded area,

although few if any visitors to ANC ever visit that area. No significant impact would occur, as the aesthetic would blend well with other areas in the Cemetery.

### 5.15.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to the existing aesthetics within the project area.

## 5.16 VISITOR USE AND EXPERIENCE

### 5.16.1 Threshold of Significance

The threshold of significance for visitor use and experience, for this EA, is defined as an experience that is different from the current experience of a visit to ANC.

### 5.16.2 Proposed Action

The Millennium Project Site is adjacent to areas commonly viewed by visitors. Visitors near the Millennium Project Site would experience temporarily altered aesthetics due to the presence of a construction site being adjacent to areas that convey a sense of peaceful permanence. Temporary impacts to air and noise may also be experienced due to increased construction traffic and other activities during the project's construction. In addition, the jogging path that lies adjacent to the Millennium Project Site may undergo temporary closures or detours for visitors' safety. Any impacts would cease once the construction activities have been completed; therefore, impacts to visitors' use and experience at ANC are anticipated to be minor and temporary. Long term beneficial impacts to the visitor use and experience are anticipated, as the longevity of the cemetery as an active burial ground would be extended. In addition, visitor information such as interpretive signage and/or kiosks are planned to be incorporated into the project. This would have beneficial impacts on the overall visitor experience at ANC.

Comments were received that discussed the solace and peace that is part of the experience of visiting ANC, particularly in the forested areas. Although there will be minor impacts to this experience, as a result of the loss of some trees, it is felt that the overall visitor experience at the site will be very positive. Although there will be some loss of trees, there will be even more trees replanted, and these trees will generally be very accessible by the general public. The

stream restoration area would provide a natural area for peace and meditation. The entire project area will maintain the current atmosphere of honor and dignity that is apparent throughout Arlington National Cemetery. The Millennium Project has been very carefully designed with input from multiple agencies in order to maximize the visitor use and experience of the site. No significant impact would occur and beneficial effects would be expected.

### 5.16.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur. There would be no immediate impact to visitors' use and experience of ANC. However, over the long-term, burial space would no longer be available. This would greatly impact the visitor use and experience. The cemetery would eventually move from an active and operating cemetery to a national memorial.

## 5.17 UNIQUE ECOSYSTEMS, BIOSPHERE RESERVES, WORLD HERITAGE SITES

### 5.17.1 Threshold of Significance

The threshold of significance for unique ecosystems, biosphere reserves and world heritage sites, for this EA, is defined as destruction of a significant portion of any of these areas.

### 5.17.2 Proposed Action

The Millennium Project would not impact a unique ecosystem, biosphere reserve, or world heritage site. As noted in Section 4.17, the forested area on the Millennium Project site is considered by some a locally unique habitat as there is limited area of contiguous forest left in Arlington County. However, only a small portion of the contiguous forested area will be disturbed, and the entire Millennium Project will remain in perpetuity as "green space" in the midst of a very developed urban area. No significant impact will occur to a unique ecosystem, biosphere reserve or world heritage site.

### 5.17.3 No-Action Alternative

Under the No-Action Alternative the Millennium Project would not occur; therefore, there would be no direct impacts to unique ecosystems, biosphere reserves and world heritage sites. This is no different than the proposed action, which also has no impact on these sites.

## 5.18 CUMULATIVE IMPACTS

A cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). This section also states "such impacts can result from individually minor but collectively significant actions taking place over a period of time."

Evaluations of cumulative impacts include consideration of the Proposed Action with past and present actions, as well as reasonably foreseeable future actions. Compliance with applicable federal, state and local regulations would assist in ensuring that implementation of the Proposed Action would minimize the incremental impacts of past, present, and future actions.

### 5.18.1 Proposed Action

This project would have an overall beneficial cumulative impact to ANC and the surrounding area. The Proposed Action provides for development of the Millennium Project Site to support ANC's expansion for increased interment/inurnment capacity, overall aesthetics, and primary mission to serve as a military cemetery and shrine. However, some short-term and long-term cumulative impacts would occur and are described in Table 5.5 below.

There are additional ANC projects that have already occurred and would occur in the near future. The cumulative impact assessment for each resource area would include the following actions as already occurred or reasonably foreseeable to occur in this area:

- Past – JBM-HH Stormwater Retention System
- Present – Millennium Area Headstone Removal
- Present – ANC Millennium Project
- Future–long–term – Continued usage of ANC as a National Cemetery (Master Plan), expansion project at the Navy Annex Site

As described in Table 9, overall cumulative impacts of these projects are generally beneficial in nature with some minor and temporary negative impacts to some resource areas.

In addition to ANC projects, the county of Arlington has a variety of projects ongoing. Most of these projects can be summarized into facility maintenance or construction, utility maintenance or construction, transportation, neighborhood improvements, and parks and recreation projects. Facility maintenance or construction projects include bridge rehabilitation, structural repair to buildings, and land acquisition for future construction of buildings such as community centers and parking garages. Utility maintenance or construction projects include the overhead and underground installation of utilities in multiple locations, replacement of pipes for sanitary sewer system improvements, as well as improvement studies and renovations to current storm drainage systems and improvements such as the installation or replacement of water mains and pipes in the water distribution system. Transportation projects include installation and modification to traffic signals, construction of new trails and bikeways as well as rehabilitation of older paths, renovations to metro and bus stations, sidewalk improvements for increased access and crossing safety for pedestrian, transit users, and bicycle traffic, and a study for the planning and preliminary engineering for a streetcar line with station stops between Pentagon City Metrorail and the City/County line.

Neighborhood improvement projects include the installation of sidewalks, curbing, and aesthetic features such as trails, signage, and street lights. Traffic calming projects, such as curb extensions, construction of traffic circles, and installation of speed bumps are also ongoing. Parks and recreation projects include park enhancements such as swings, signage, benches, as well as open space site improvements which will include the construction of a boat house, courts and fields for sports, as well as playgrounds. Studies for stream hydraulics and the potential development of an indoor facilities and synthetic turf fields are also ongoing. In addition to Arlington County's projects, regional development is primarily along the same trends as described above, with urban development and appropriate supporting infrastructure being the general characteristic of the region.

**Table 9 - Cumulative Impact Analysis – ANC Projects and Regional Development**

| Impact Topics | JBM-HH Stormwater Retention | Millennium Area Headstone Removal Project | Millennium Project | Regional Development | Cumulative Impacts Summary |
|---|---|---|---|---|---|
| Soils | Beneficial long-term impacts due to reducing cumulative stormwater runoff to project area, lessening soil erosion on the site. | Minor short-term impacts due to removal of soil from streambank due to grading. There would also be long-term beneficial impacts to soils due to decreased sedimentation in stream channel from decreased velocity of water and sediment settling in the cross-vane structures. | Minor local impacts to soils. Soils would be re-used on-site to the maximum extent practicable. Beneficial long-term impacts due to stormwater retention treatments to Chaffee Place parking lot. This would include reductions to cumulative stormwater runoff to project area, lessening soil erosion on the site. | Strong stormwater and erosion regulations ensure that significant cumulative impacts are not occurring to soils in the region due to development. | There are cumulative impacts to soils as a result of these projects. There are some negative as well as some positive benefits. Overall the net cumulative impact is not significant. |
| Topography and Drainage | Beneficial long-term impacts due to improved management of stormwater and decreased overland drainage. | Long-term beneficial impacts due to decreased velocity in stormwater drainage channel. | Topography and drainage impacts to be minimized and mitigated by stream restoration. Drainage directly onto Millennium Area Headstone Removal Project site to be beneficial long-term impacts. | Topography and drainage altered often on a very local scale by development. Regional impacts to topography are not significant. Stormwater regulate drainage so impacts are minimized. | Drainage issues addressed in JBM-HH project as well as Millennium Project would result in long-term beneficial impacts to area. |
| Surface water resources | Beneficial long-term impacts due to decreased overland stormwater drainage. | Long-term beneficial impacts due to decreased sedimentation in the project area. | Stream restoration resulting in overall beneficial impacts to surface water resources. | Strong regulations ensure that impacts to surface waters are minimized. | Beneficial impacts to surface water resources as a result of stream restoration techniques. |

| Impact Topics | JBM-HH Stormwater Retention | Millennium Area Headstone Removal Project | Millennium Project | Regional Development | Cumulative Impacts Summary |
|---|---|---|---|---|---|
| Groundwater | Minor local impacts due to retention of large volumes of stormwater. | Insignificant Impact | Minor local impacts due to stream restoration and earthwork operations. | Drinking water provided regionally by the Washington Aqueduct. ANC does not significantly impact regional groundwater supply. | Insignificant impact |
| Wetlands | Insignificant Impact | Temporary minor impacts due to project activities within <.1 acre of wetland. | No identified wetlands to be significantly impacted during Millennium construction. | Strong regulations ensure that impacts to wetlands are minimized. | No identified wetlands to be impacted during Millennium construction. Temporary minor and indirect impacts to wetlands. |
| Vegetation | Insignificant Impact | Temporary minor impacts within the LOD to be mitigated by seeding with native species in disturbed areas and minimizing construction equipment size and frequency of trips to maximum extent possible. | Impacts to vegetation to be minimized to maximum degree possible with design techniques which minimize loss of large trees. Impacts also mitigated by additional plantings of new trees in final design. Large "green space" reserved indefinitely amidst a very urbanized area. | The Washington D.C. metro area has limited large areas of green space. This space is mostly limited to parks and natural areas. ANC does provide one of the largest "green spaces" in the area, providing a wide variety of trees and natural areas which contribute both environmental and aesthetic value to the community. | Long-term minor impacts to vegetation to be minimized and mitigated with avoidance and additional tree plantings. ANC, including the Millennium Project, provides the local area with a large green space to remain indefinitely amidst a very urbanized area. |
| Wildlife Resources | Insignificant Impact | Temporary minor impacts during construction. | Temporary minor impacts during construction. | Wildlife is limited in this extremely urban area. ANC does provide some level of refuge for urban wildlife. | Minor impacts to wildlife during construction of each project. Green corridor will remain in the forested area. |

| Impact Topics | JBM-HH Stormwater Retention | Millennium Area Headstone Removal Project | Millennium Project | Regional Development | Cumulative Impacts Summary |
|---|---|---|---|---|---|
| Cultural Resources | Negligible impacts to cultural resources. | No adverse effects to historic properties. Cultural resources would not be negatively impacted. | Effects to cultural resources are under evaluation. Section 106 compliance will ensure that any effects are appropriately minimized and mitigated. | The National Historic Preservation Act provides some protection to historic resources in the area. | No adverse impact as cultural resources would be avoided and/or mitigated for as necessary. |
| HTRW | No contamination issues. | No contamination issues. | Minor impacts to be mitigated with appropriate remediation techniques. | Strong regulations ensure that HTRW is appropriately handled. | Insignificant impact as any contaminated sites would be mitigated through appropriate remediation techniques. |
| Transportation | Short term very minor impacts due to construction equipment. | Short-term very minor impacts due to construction equipment. | Short-term impacts would be minimized as possible and would only occur during construction of project. | Transportation projects struggle to keep up with continued urban development. This project will not have a relative significant effect on transportation. | Short-term minor impacts to transportation due to construction projects. |
| Stormwater Systems | Long term beneficial management of stormwater systems. | Long-term beneficial impacts due to decreased water velocity in channel. | Long-term beneficial management of stormwater. | Strong regulations ensure that stormwater is appropriately handled. | Long-term beneficial management of stormwater. |
| Utilities | Insignificant impacts to all utilities except beneficial stormwater management systems. | Insignificant impacts. | Any utilities would be avoided and/or relocated. | Providing appropriate infrastructure for utilities is a challenge. | Minor and temporary impact due to avoidance and/or relocation. |

| Impact Topics | JBM-HH Stormwater Retention | Millennium Area Headstone Removal Project | Millennium Project | Regional Development | Cumulative Impacts Summary |
|---|---|---|---|---|---|
| Noise | Temporary minor impacts due to construction equipment. | Temporary minor impacts due to construction equipment. | Temporary minor impacts due to construction equipment. | Increasing development leads to additional noise. ANC is comparatively a quiet, contemplative place of less noise. | Temporary minor impacts due to construction equipment. |
| Aesthetics | Insignificant impacts. | Beneficial impacts due to removal of retired headstones. | Beneficial impact due to restoration of stream and improved area for burials and internments. | Most regional development is not aesthetically pleasing to most. ANC remains a place of beauty and peace for all to enjoy. | Beneficial long-term impacts due to headstone removal and Millennium Projects. |

### 5.18.2 No-Action Alternative

Implementation of the No-Action Alternative would not result in any additional cumulative significant environmental impacts at the project area. However, over the long-term, if the Millennium and/or other expansion projects did not occur, burial space would no longer be available. This would greatly impact the usage of ANC. The cemetery would eventually move from an active and operating cemetery to a national memorial.

## 5.19 COMPLIANCE WITH ENVIRONMENTAL STATUTES

Table 10 outlines compliance with all applicable environmental laws and regulations. Those statutes marked as "pending" would be in full compliance before initiation of construction activities.

**Table 10 - Compliance of the Proposed Action with Environmental Protection Statutes and Other Environmental Requirements**

| Federal Statutes | Level of Compliance |
|---|---|
| Anadromous Fish Conservation Act | Full |
| Archeological and Historic Preservation Act | Full |
| Clean Air Act | Full |
| Clean Water Act | Full |
| Coastal Barrier Resources Act | N/A |
| Coastal Zone Management Act | Full |
| Comprehensive Environmental Response, Compensation and Liability Act | Full |
| Endangered Species Act | Full |
| Estuary Protection Act | Full |
| Federal Water Project Recreation Act | N/A |
| Fish and Wildlife Coordination Act | Full |
| Land and Water Conservation Fund Act | N/A |
| Magnuson-Stevens Act | N/A |
| Marine Mammal Protection Act | N/A |
| Migratory Bird Act | Full |
| National Historic Preservation Act | Full |
| National Environmental Policy Act | Full |
| Resource Conservation and Recovery Act | Full |
| Rivers and Harbors Act | Full |
| Watershed Protection and Flood Prevention Act | Full |
| Wild and Scenic Rivers Act | N/A |
| Protection and Enhancement of Cultural Environment (EO 11593) | Full |
| Floodplain Management (EO 11988) | Full |
| Protection of Wetlands (EO 11990) | Full |

| | |
|---|---|
| Prime and Unique Farmlands (Memorandum, Council on Environmental Quality, 11 August 1980 | N/A |
| Environmental Justice in Minority and Low-Income Populations (EO 12898) | Full |
| Protection of Children from Health and Safety Risks (EO 13045) | Full |
| Executive Order 13508 – Protecting and Restoring the Chesapeake Bay Watershed | Full |
| Section 438, Energy Independence and Security Act | Full |

# 6 CONCLUSIONS

The Norfolk District USACE has prepared this NEPA documentation on behalf of ANC for the construction of the Millennium Site Project at ANC, Arlington County, Virginia. NPS is a cooperating agency for this NEPA document. The purpose of the Proposed Action is to support the longevity of ANC, a significant National resource, by increasing the cemetery's total capacity for in-ground burials and inurnment space by 7 to 12 years. The need for the Proposed Action is based on the limited number of vacant burial sites and the current rate of burials.

Construction would include casket burial sections, in-ground sites for ashes of cremated service members, and both columbarium niche courts and niche walls. The site would include two assembly areas for service participants including Committal Service Shelters. Building and site element construction shall be suitable for the environment and compliment the architectural theme and considerations of ANC. Supporting facilities would include water features, waterlines, sanitary sewer, storm drainage, underground electrical information systems, stream restoration, landscaping, retaining walls, perimeter fencing, vehicle and pedestrian access roads and walks, and security systems. In addition, underground stormwater storage and modified stormwater conveyance would be constructed adjacent to the Chaffee Place parking lot.

The project would result in beneficial impacts to water quality and surface water from the stream restoration and modified stormwater conveyance system. Other benefits would include invasive species control for multiple years in a currently very highly invasive area as well as preservation of the area as "green space" amidst a very urbanized county. In addition, the maintenance yard which is currently highly disturbed would be restored as a tree-save area around the stream.

Short-term impacts associated with the Proposed Action include land use, topography, drainage, and surface water impacts, disturbance of soil and removal of vegetation, air and noise emissions, increased construction traffic, temporary closures or interruptions in the jogging path near the construction site, and altered aesthetics from the presence of a construction site. Short-term impacts to utilities such as water and electric service may also be encountered during construction. Short-term impacts would cease with the completion of construction.

Long-term impacts to land use, soils, topography and drainage, surface water, wetlands, vegetation, wildlife, cultural resources and aesthetics would be expected as a result of the Proposed Action. However, the negative impacts of the proposed action have been avoided and greatly minimized through much iteration of conceptual planning and design. Although some trees would be removed, the oldest trees were avoided and then impacts were minimized to the extent practicable during planning. Measures to offset for the tree impacts include the replanting of nearly 800 trees (1 1/2" to 5" caliper), plus more than 1600 tree seedlings, and 14,000 shrubs. ANC is committed to further minimize removal of trees during construction and a multiple-year invasive species control plan.

Based on comments submitted on the Draft EA, a more thorough inventory of natural resources was included in this EA. Also, based on concerns with the tree ages, a review was completed of the ages cited in the 1998 Garrow report to ensure that the documented ages of each section are accurate. In response to concerns with the tree removal, the team reviewed the plan to come up with additional measures to decrease the environmental impact of the project. Those measures include:

- Eastern portion of the Loop road reduced from 30 feet to 22 feet wide to reduce tree removal.
- Adjustments to road alignment in at least two locations to save higher quality trees and reduce impacts to the stream. This resulted in a reduction in the amount of trees impacted in total, and an overall reduction in the amount of linear feet of stream impacted (an approximate reduction from 288 linear feet to 165 linear feet, subject to final engineering).
- Adjustment of Columbaria locations so that the overall effect is more balanced and less Columbarium are located south of the stream.
- Based on a geologic inventory provided by Arlington County, a spring was identified within the impact area. This spring is at the head of an intermittent stream. The use of an arched bottomless span structure over the spring-fed intermittent stream will ensure that the spring will not be permanently or significantly impacted. In addition, the intermittent stream will now flow free, instead of being piped as was previously planned.

The Proposed Action would require coordination for federal, state, and local permits and/or approvals prior to the start of construction, including, but not limited to:

- General Permit for Discharges of Stormwater from Construction Activities issued by VDCR under its Virginia Stormwater Management Program (VSMP). Said VSMP Permit will include the preparation of a Stormwater Pollution Prevention Plan (SWPPP) and an Erosion and Sediment Control Plan (ESC) component;
- State Programmatic General Permit (SPGP) from Corps, issued by DEQ, or a combination of an SPGP and Nationwide Permit #27 from the Corps. No compensatory mitigation will be required given the minimal proposed impacts (<300 lf). Thus coincident with the SPGP issuance, DEQ would issue also a General Permit WP1 or WP4 for said impacts.

These permits and approvals would be obtained by the contractor prior to the start of construction. The Section 106 compliance process was completed among the appropriate consulting parties. ANC, VDHR and NPS signed a Memorandum of Agreement in June 2013 for the implementation of measures to mitigate any determined adverse effects prior to construction. This MOA can be found in Appendix B. The Hazardous, Toxic, and Radioactive Substance investigation within the Millennium Site must be completed prior to the start of construction and any contamination identified will be mitigated during construction through appropriate remediation techniques. In addition, coordination is required with the utility companies prior to and during construction.

This Environmental Assessment was prepared by USACE, ANC, and NPS in compliance with the NEPA and all applicable implementing regulations. A list of preparers is included as Appendix D. Based on the evaluation of environmental impacts described in Section 5, no significant impacts would be expected from the Proposed Action; therefore, an Environmental Impact Statement will not be prepared and a Finding of No Significant Impact will be prepared and signed.

# 7 CONTACT INFORMATION

If you have any questions or wish to provide comments, please contact Mrs. Susan Conner of the U.S. Army Corps of Engineers, Norfolk District, at Susan.L.Conner@usace.army.mil or 757-201-7390.

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