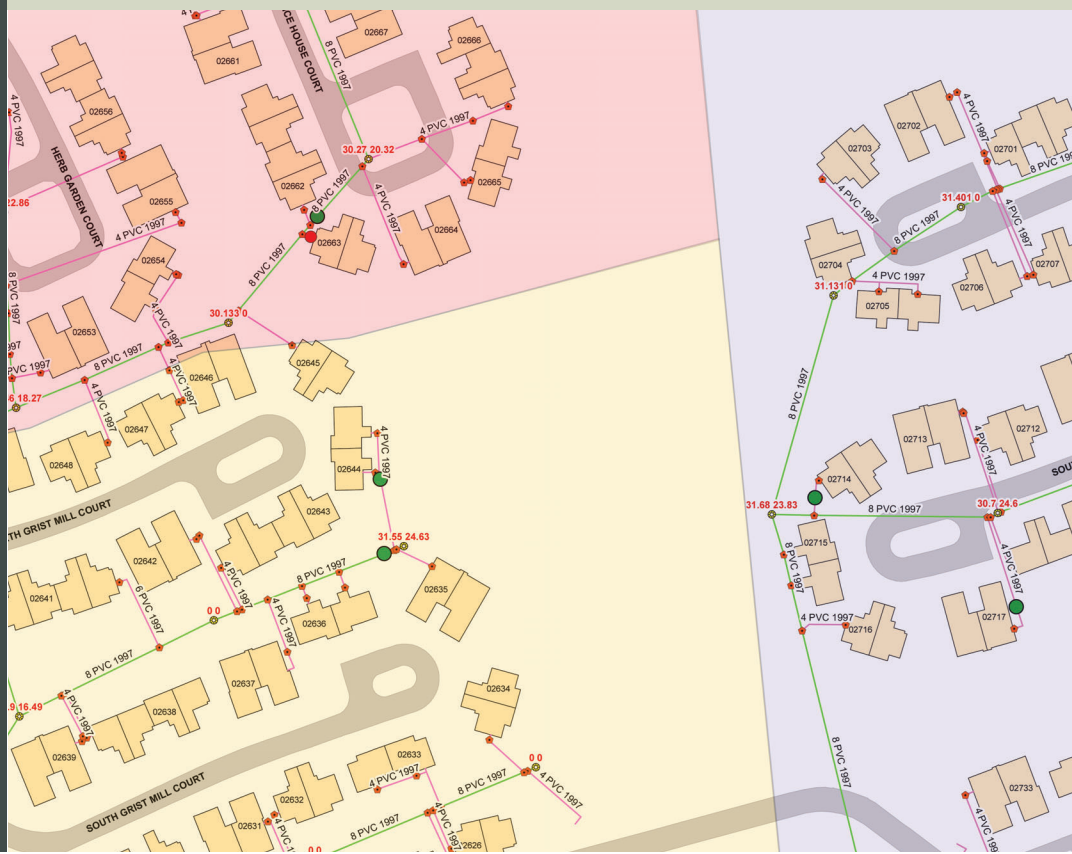
Water/ Wastewater Utility Upgrade
Fort Belvoir, Virginia

ENVIRONMENTAL ASSESSMENT

SEPTEMBER 2013



DEPARTMENT OF THE ARMY
U.S. ARMY GARRISON FORT BELVOIR

WATER/WASTEWATER UTILITY UPGRADE FORT BELVOIR, VIRGINIA

ENVIRONMENTAL ASSESSMENT

September 2013

Prepared for
U.S. Army Garrison Fort Belvoir, Virginia

Prepared by
The Louis Berger Group, Inc.
Washington, D.C.

ENVIRONMENTAL ASSESSMENT

WATER/WASTEWATER UTILITY UPGRADE AT FORT BELVOIR, VIRGINIA

Reviewed by:
U.S. Army Garrison Fort Belvoir

FOR

Patrick M. McLaughlin
Chief, Environmental and Natural Resources Division

Recommended for Approval:
U.S. Army Garrison Fort Belvoir

Bill Sanders
Director, Public Works

Approved by:
U.S. Army Garrison Fort Belvoir

Gregory D. Gadson
Colonel, U.S. Army
Garrison Commander

Finding of No Significant Impact

Water and Wastewater Utility Upgrade
U.S. Army Garrison Fort Belvoir
Directorate of Public Works
Fort Belvoir, Virginia

Name of Action: Water and Wastewater Utility Upgrade

Description of Proposed Action: The United States Army Garrison Fort Belvoir (Fort Belvoir) proposes to implement a number of projects to upgrade its water and wastewater system infrastructure through a utilities privatization contract. These projects include replacement of water storage tanks, replacement of force mains, maintenance of gravity sewer mains, reinstallation of aerial stream crossings with streambank repair, and implementation of additional projects identified in Fort Belvoir's 2012 Annual System Deficiency Corrections, Upgrades and Renewal & Replacement Plan for Fiscal Years 2013 through 2017.

The Environmental Assessment (EA) analyzed and documented the environmental impacts associated with the Proposed Action Alternative to upgrade outdated components of the installation's water and wastewater infrastructure. The Proposed Action would provide the required level of operability for the water and wastewater systems necessary to support Fort Belvoir in accomplishing its mission to provide reliable and compliant water and wastewater service to its water system users. Consideration was given to one additional alternative for replacement of the water storage tanks; however, analyses determined that a two-tank alternative, compared to a three-tank alternative, would have negative impacts on the water distribution system and would not be able to support Fort Belvoir's mission. A No Action Alternative was also considered but would not satisfy Fort Belvoir's mission to provide reliable and compliant water and wastewater services to its users.

Environmental Consequences: The EA identified and evaluated the potential impacts of the Proposed Action and No Action alternatives on land use; air quality; noise; geology, topography, and soils; water resources; biological resources; cultural resources; socioeconomic resources; traffic and transportation; utilities and infrastructure; and hazardous materials and waste.

There are no anticipated significant impacts that would require preparation of an environmental impact statement (EIS), best management practices (BMPs) would be employed, where appropriate, to reduce or minimize impacts. Any necessary mitigation for work that potentially impacts wetlands will be determined through the Joint Permit Application process.

Natural Resources: Grading, leveling, and excavation of soil would have the potential for increased sediment to be carried into the nearby streams. Removal of woody vegetation in maintenance right-of-ways (ROWs) could diminish soil productivity and increase potential for soil erosion; however, ROW routes would be sited to minimize tree removal. Implementation of soil erosion and sediment control (ESC) plans would ensure impacts to soils are temporary and minor. The ESC plans would be developed, approved, and permitted, and would involve BMPs, such as silt fencing, control matting, and storm drain outlet protection implemented throughout the construction of the project and maintained and not removed until the sites have been stabilized. Streambank repair and stabilization efforts would have long-term, beneficial impacts to soils as a result of stabilizing the soil structure and decreasing erosion potential.

Construction activities would result in minor, temporary impacts to surface water from the potential for sediment and construction contaminants to be carried into the nearby waterbodies. Use of directional

drilling technology, and plans for stormwater pollution prevention and ESC would minimize impacts to surface water. Streambank repair for the aerial stream crossings projects would result in short term adverse impacts to steams from the disturbance or relocation of the stream beds and long-term beneficial impacts from reduced likelihood of erosion. The Proposed Action Alternative would eliminate or substantially lower the probability of a sewer main break above streams that could result in Sanitary Sewer Overflows (SSO). Construction would result in short-term impacts to floodplains associated with three of the force main projects, and several of the aerial stream projects. Impacts to groundwater would be unlikely as the location and depth of groundwater would be taken into consideration during design to avoid groundwater impacts.

The Proposed Action would result in temporary and permanent impacts to wetlands and Resource Protection Areas (RPAs) from the aerial stream crossing projects and its associated streambank repairs and to forested wetlands in the area of the new access to Lift Station 584, the Meade Road water main replacement, and the Woodlawn Village water and sewer improvements project. Impacts to wetlands would be minimized by use of horizontal directional drill technology to the greatest extent practicable. Impacts to wetlands and RPAs would likely be below the thresholds for which mitigation is required. Potential impacts to wetlands and the RPAs would be reviewed through the Joint Permit Application process in order to conduct work in wetlands and RPAs.

The Proposed Action would result in minor impacts to vegetation and wildlife and wildlife habitat. Vegetation in the footprint of open trenches, bore pits, maintenance ROWs (wood vegetation only), and areas of streambank repair would be removed. Beneficial impacts as a result of force main replacements would occur to vegetation, wildlife habitat, and aquatic species as the probability of a sewer main break above streams that would result in SSOs would be eliminated or lowered. Time-of-year restrictions on in-stream work would be adhered to. Construction activities would likely temporarily displace wildlife and result in the removal of forested habitat. Cleared forested areas would be seeded with native seed mixes. Tree protection methods would be implemented to protect trees not proposed to be removed during construction activities. No impacts to threatened and endangered species are expected. Seasonal restriction would be adhered to on construction activities in vicinity of active bald eagle nests.

Air Quality: Air pollutant emissions from the Proposed Action would not be significant and would be below *de minimis levels* for general conformity. Fugitive dust would be minimized during construction by control methods outlined in 9 Virginia Administrative Code 5–130 et seq. of the Regulations for the Control and Abatement of Air Pollution. These precautions could include methods, such as using water for dust control, covering open equipment for conveying materials, and promptly removing spilled or tracked dirt or other materials from paved streets or dried sediments resulting from soil erosion.

Coastal Zone Management: The Proposed Action would be consistent with enforceable policies of the Virginia Coastal Zone Management Program.

Cultural Resources: The Proposed Action would result in adverse impacts to the historic viewshed of the Fort Belvoir Historic District and to the district itself, as a result of the loss of water storage tank 188. Impacts, however, would not be significant as adverse impacts would be minimized and mitigated through measures as agreed upon in a Memorandum of Agreement between the U.S. Army and the Virginia Department of Historic Resources.

Impacts to National Register of Historic Places-listed sites and formally unevaluated sites from the replacement of force main would be avoided by horizontal drilling underneath the site, rerouting the pipes, relining the existing pipe in situ, or by other means. Measures to avoid or mitigate any impact would be developed through Section 106 consultation with the Virginia Department of Historic Resources to protect archaeological resources.

Infrastructure and Utilities: The Proposed Action would have long-term, beneficial impacts to Fort Belvoir's water and wastewater utility system as a result of improved reliability and capacity of water storage tanks, replacement of aging sanitary sewer mains, construction of permanent access for sewer main maintenance, protection of water and sewer lines from erosion, and proper preventative maintenance of aging infrastructure elements.

Minimal impacts to noise, geography and topography, land use, socioeconomics including community facilities and services, environmental justice, hazardous materials and wastes, and traffic and transportation as a result of the Proposed Action.

Summary of Environmental Impacts: The Proposed Action would not generate significant impacts on human health or the environment. No significant cumulative impacts or indirect impacts are anticipated.

Conclusion: On reviewing the EA and other project information, the Garrison Commander of Fort Belvoir has concluded that the Proposed Action would not have a significant effect on the human environment. Therefore, an Environmental Impact Statement is not needed.

Notice of availability: The EA was available for public review at the Directorate of Public Works, Fort Belvoir, Virginia; the Fort Belvoir Van Noy Library; the Fairfax County Library - Kingstowne Branch, Lorton Branch, and the Sherwood Regional Branch; and on the installation's web site at: http://www.belvoir.army.mil/environdocssection2.asp

Newspaper notices of the availability of the EA were published in the Mount Vernon Voice, the Gazette, and the Springfield Connection newspapers.

Response to Comments: Comments from federal, state, and local agencies were received during the public review period and addressed by Fort Belvoir. For more information, contact Mr. Patrick McLaughlin, Chief of Environmental and Natural Resources Division, at 703-806-4007.

Approved by:
U.S. Army Garrison Fort Belvoir

Date:

12 Sep 2013

Gregory D. Gadson
Colonel, U.S. Army
Commanding

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ENVIRONMENTAL ASSESSMENT

Lead Agency: Department of Army

Title of Proposed Action: Environmental Assessment for the Water/Wastewater Utility Upgrade at Fort Belvoir, Virginia

Affected Jurisdiction: Fort Belvoir, Virginia

Prepared By: The Louis Berger Group, Inc., Washington, D.C.

Approved By: Colonel Gregory D. Gadson, Commander, Fort Belvoir, Virginia

Abstract: This environmental assessment (EA) analyzes and documents the impacts of the Proposed Action to upgrade aging water and wastewater infrastructure at Fort Belvoir. A No Action Alternative is also evaluated to serve as a baseline against which the impacts of the Proposed Action are evaluated.

None of the predicted impacts of the Proposed Action would result in significant impacts at Fort Belvoir. Best management practices, however, would be employed to reduce or minimize impacts. Adverse impacts to historic resources would be minimized and compensated through mitigation measures as agreed upon in a Memorandum of Agreement between the Army and the Virginia Department of Historic Resources. As a result, preparation of an environmental impact statement is not required and a Finding of No Significant Impact (FNSI) will be published in accordance with the National Environmental Policy Act of 1969.

Review Period: Interested parties are invited to review and comment on the EA and draft FNSI during a 30-day period. Please submit any comments to Commander, U.S. Army Garrison Fort Belvoir, ATTN: Directorate of Public Works, Building 1442, 9430 Jackson Loop, Fort Belvoir, VA 22060-5116 or email your comments to imcom.fortbelvoir.dpw.environmental@us.army.mil. For further information, contact Mr. Patrick McLaughlin, Chief of Environmental and Natural Resources Division at (703) 806-4007.

The EA and draft FNSI were available for review on the internet at: http://www.belvoir.army.mil/environdocssection2.asp.

The EA and draft FNSI were also available for review at the following libraries:

Van Noy Library
5966 12th St., Building 1024
Fort Belvoir, VA 22060

Fairfax County Library
Sherwood Regional Branch
2501 Sherwood Hall Lane
Alexandria, VA 22306-2799

Fairfax County Library
Lorton Branch
9520 Richmond Highway
Lorton, VA 22079-2124

Fairfax County Library
Kingstowne Branch
6500 Landsdowne Centre
Alexandria, VA 22315-5011

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EXECUTIVE SUMMARY

ES.1 Introduction

This environmental assessment (EA) analyzes and documents environmental impacts associated with proposed projects to be carried out by the United States Army Garrison Fort Belvoir's (Fort Belvoir's) utility privatization (UP) partner American Operations and Maintenance, Inc. (American Water) to upgrade outdated components of the installation's water and wastewater infrastructure.

This EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (Title 42, United States Code [USC] §4321 et seq.), NEPA-implementing regulations of the Council on Environmental Quality (40 Code of Federal Regulations [CFR] Parts 1500–1508), and the Army's NEPA-implementing regulations (32 CFR §651, *Environmental Analysis of Army Actions*). This EA was prepared concurrently with and integrated with environmental impact analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (16 USC §661 et seq.), the National Historic Preservation Act of 1966 (16 USC 470 et seq.), the Endangered Species Act of 1973 (16 USC §1531 et seq.), and other environmental review laws (and their implementing regulations), and Executive Orders.

ES.2 Proposed Action

Fort Belvoir proposes to implement a number of projects to upgrade the water and wastewater system infrastructure through the UP contract. These projects include replacement of water storage tanks, replacement of force mains, annual maintenance of gravity sewer mains (general maintenance), reinstallation of aerial stream crossings with streambank repair, and implementation of additional projects identified in Fort Belvoir's 2012 Annual System Deficiency Corrections, Upgrades and Renewal & Replacement Plan for fiscal years 13 through 17 that are currently in the conceptual phase.

ES.3 Purpose and Need

The purpose of the proposed action is to upgrade aging water and wastewater infrastructure at Fort Belvoir. As part of Fort Belvoir's mission, it must provide reliable and compliant water and wastewater service to its tenants. Therefore, this action is needed to upgrade outdated components, correct existing problems, and maintain Fort Belvoir's water and wastewater utility systems in order to meet Fort Belvoir's mission. The proposed projects would provide the required level of operability for the water and wastewater systems necessary for Fort Belvoir to manage and maintain and provide utility services to the installation

ES.4 Alternatives

One alternative, the Proposed Action Alternative, was identified that would meet the purpose and need for upgrade of the water and wastewater system infrastructure at Fort Belvoir. The Proposed Action Alternative would replace all system components of a certain age and make corrections for potential future deficiencies. The Proposed Action Alternative would also provide the required level of operability for the water and wastewater systems necessary to support Fort Belvoir in accomplishing its mission to provide reliable and compliant water and wastewater service to its tenants.

Proposed Action Alternative

Fort Belvoir proposes to implement a number of projects to upgrade its water and wastewater system infrastructure, including replacement of water storage tanks, replacement of force mains, annual maintenance of gravity sewer mains, reinstallation of aerial stream crossings with streambank repair,

replacement of water mains, improvements to water and sewer system, rediversion of force main discharge, and construction of new access to a lift station.

Water Storage Tanks—Fort Belvoir would demolish four existing water storage tanks—WSTs 188, 591, 2428, and 2429—with a total capacity of 2.3 million gallons and construct three replacement water tanks, with supporting water lines and equipment. The new water storage tanks would have a total capacity of 3 million gallons and provide adequate water storage for the installation's Main Post.

Force Main Replacement—Six sections of aging sanitary sewer force mains would be replaced to prevent possible rupture and subsequent discharges to the environment. All six sites are located on Main Post, south of U.S. Route 1. The new pipes would be installed adjacent to the route of the existing force main. The exception is Lift Station 584 where the replacement force main would be re-routed to avoid and archaeological site. The existing force main sections will then be abandoned in place. Replacing the force mains would utilize a conventional open trench method in upland areas and horizontal directional drilling technology under sensitive areas such as streams, wetlands, and archaeological sites.

Gravity Sewer Main Maintenance— As part of general maintenance of the installation's wastewater infrastructure, annual inspections and maintenance are conducted of the installation's sewer lines via manholes that are accessible by right-of-way (ROW) corridors. ROW corridors that are currently located in forested areas would be maintained at a 20-foot width (15-foot width in wetlands areas) for vehicles to pass. All woody vegetation would be removed within the ROW corridors, but all vegetation would not be stripped. The exception would be of areas of vegetated wetlands or Waters of the United States, where no vegetation would be cleared. Additionally, there are seven locations where access would require vehicles to cross streams and/or wetlands. A culvert would be installed at six sites and a temporary erosion mat would be installed at one site to enable vehicle access over streams and wetlands.

Aerial Stream Crossing—Nine sections of water and gravity sewer lines that cross above intermittent and perennial streams require repair or reinstallation below the streambed and may require streambank repair and stabilization in order to prevent erosion of soil around the concrete piers that support the water and sewer lines. All designs for pipe reinstallation or repair and any associated streambank repair would be reviewed by the U.S. Army Corps of Engineers and will require obtaining all necessary permits through the Joint Permit Application process in order to conduct work in the waters of the United States (including wetlands) within Virginia.

2012 Annual System Deficiency Corrections, Upgrades and Renewal & Replacement Plan Projects—Fort Belvoir prepares an ASDC each year that details their proposed capital upgrades and major renewals and replacements of the water and wastewater utility system for the next five years. Four projects, currently in the conceptual stages and planned to occur between fiscal year (FY) 13 and FY17, are considered covered in this EA.

- *Meade Road Water Main Replacement:* Fort Belvoir would replace approximately 3,138 linear feet of 6-inch, pre-1960 water main along with approximately 750 linear feet of pre-1960 water service lines. Replacing the water mains would utilize a conventional open trench method.
- *Woodlawn Village Water and Sewer System Improvements Phases 1, 2, and 3:* The Woodlawn Village Water and Sewer Improvement project would consist of raising and increasing the slope of the sanitary sewer system to reduce sewer backups and the replacement of the existing substandard water main material to reduce the frequency of water main breaks. Phase 1 would consist of approximately 4,460 linear feet of 8-inch water main and 4,270 linear feet of 8-inch sewer main. This project would also include the replacement of the individual building water and sewer service connections up to 5 feet from the building. Phase 2 would consist of approximately

3,200 linear feet of 8-inch water main and 2,300 linear feet of 8-inch, 10-inch, and 12-inch sewer main. Phase 3 would consist of approximately 5,100 linear feet of 8-inch and 10-inch water main and 5,700 linear feet of 8-inch and 10-inch sewer main. Replacing the water and sewer mains would utilize a conventional open trench method.

- *Rediversion of Force Main Discharge:* Fort Belvoir would install an additional 2,675 linear feet of 6-inch water force main to divert flow from Lift Station 1575 away from Lift Station 97 to new hospital lift station. Installing the water mains would utilize a conventional open trench method and horizontal directional drilling where feasible.
- *New Access to Lift Station 584:* Fort Belvoir would construct a new access road and bridge over a stream to Lift Station 584.

No Action Alternative

The No Action Alternative would maintain the status quo. Under the No Action Alternative, the proposed projects to upgrade the water and wastewater utility system at Fort Belvoir would not occur, and Fort Belvoir would not be able to satisfy their mission to provide reliable and compliant water and wastewater services to their tenants.

ES.4 Environmental Consequences

The proposed action would involve several projects to upgrade the water and wastewater utility system at Fort Belvoir. Table ES-1 presents the proposed action and the No Action alternatives and their potential impacts to the natural and human environments.

ES.5 Conclusion

In summary, implementation of projects to upgrade the water and wastewater system infrastructure at Fort Belvoir, including replacement of water storage tanks, replacement of force mains, annual maintenance of gravity sewer mains (general maintenance), reinstallation of aerial stream crossings with streambank repair, and implementation of additional projects identified in Fort Belvoir's 2012 Annual System Deficiency Corrections, Upgrades and Renewal & Replacement Plan, is not expected to result in significant impacts on the environment; therefore, an environmental impact statement is not required.

Table ES-1: Summary of Impacts of the Proposed Action and the No Action Alternative

Resource	Proposed Action	No Action Alternative
Soils	Grading, leveling, and excavation of soil would have the potential for increased sediment to be carried into the nearby streams. Removal of woody vegetation in maintenance ROWs could diminish soil productivity and increase potential for soil erosion. ROW routes would be sited to minimize tree removal. Required soil erosion and sediment control plans would ensure impacts to soils are temporary and minor. Streambank repair and stabilization efforts would have long-term, beneficial impacts to soils as a result of stabilizing the soil structure and decreasing erosion potential.	Erosion would continue to occur in the areas of water and gravity waste lines that cross above perennial streams and the concrete piers that support the lines, resulting in adverse impacts to soils.
Water Resources, Groundwater, and Floodplains	Construction activities would result in minor, temporary impacts to surface water from the potential for sediment and construction contaminants to be carried into the nearby waterbodies. Use of horizontal directional drilling technology, and plans for stormwater pollution prevention and ESC would minimize impacts to surface water. The Proposed Action would result in 800 square feet of permanent impacts to perennial, intermittent, and ephemeral streams and 120 square feet of temporary impacts to an intermittent stream from gravity sewer main maintenance and could permanently impact up to 3,600 linear feet of perennial and intermittent streams from aerial stream crossing projects and its	Potential for ongoing issues with erosion and deposition of sediments into streams and other waterways around aerial stream crossing that would continue to adversely affect water quality and the integrity of the stream channels. There would also be continued adverse impacts to water quality due to wastewater-related pollution from potential force main ruptures that could allow discharge of untreated wastewater into streams. No noticeable adverse impacts floodplains. Impacts to groundwater would be unlikely.

Resource	Proposed Action	No Action Alternative
	associated streambank repairs. Construction activities for the aerial stream crossings projects would result in short–term, adverse impacts to steams from the disturbance or relocation of the stream beds and long-term beneficial impacts from reduced likelihood of erosion. The Proposed Action would eliminate or substantially lower the probability of a sewer main break above streams that would result in SSOs. Construction would result in short-term impacts to floodplain associated with three of the force main projects and several of the aerial stream projects. Impacts to groundwater would be unlikely.	
Wetlands and Chesapeake Bay Preservation Areas	Proposed Action would result in temporary and permanent impacts to wetlands and RPAs from aerial stream crossing projects and its associated streambank repairs and to forested wetlands in the area of the new access to Lift Station 584, Meade Road water main replacement, and the Woodlawn Village water and sewer improvements project. Impacts to wetlands and RPAs would likely be below the thresholds for which mitigations is required. Potential impacts to wetlands and the RPAs will be reviewed through the Joint Permit Application process in order to conduct work in wetlands and RPAs.	Potential for adverse impacts to wetlands could occur as a result of continued streambank erosion around aerial stream crossing that could lead to erosion of adjacent wetlands.

Resource	Proposed Action	No Action Alternative
Biological Resources	Proposed Action would result in minor impacts to vegetation and wildlife habitat. Vegetation in the footprint of open trenches, bore pits, maintenance ROWs, streambank repair areas would be removed. Beneficial impacts as a result of force main replacements would occur to vegetation, wildlife habitat, and aquatic species because the probability of a sewer main break above streams that would result in SSOs would be eliminated or lowered. Construction activities would likely temporarily displace wildlife and result in the removal of forested habitat. No impacts to threatened and endangered species are expected.	Potential for adverse impacts to vegetation and aquatic species and habitat as a result of continued erosion, deposition of sediments into streams in the area of aerial stream crossings, and the continued potential for SSO stemming from the continued use of aging sanitary sewer force mains.
Air Quality	Air pollutant emissions would be below *de minimis* levels for general conformity. Record of Non-Applicability is in Appendix B.	No impact.
Coastal Zone Management	Proposed Action is consistent with enforceable policies of the Virginia Coastal Zone Management Program.	No impact.
Cultural Resources	The loss of water storage tank 188 would result in adverse impacts to the historic viewshed of the Fort Belvoir Historic District and to the district itself. Impacts, however, would not be significant as adverse impacts would be minimized and compensated through mitigation measures as agreed upon in a Memorandum of Agreement between the Army and the	No impact.

Resource	Proposed Action	No Action Alternative
	Virginia Department of Historic Resources. Impacts to National Register of Historic Places-listed sites and unevaluated sites from the replacement of force main would be avoided by horizontal drilling underneath the site, rerouting the pipes, relining the existing pipe *in situ*, or by other means. Measures to avoid or mitigate any impact would be developed through Section 106 consultation with the Virginia Department of Historic Resources to protect archaeological resources.	
Infrastructure and Utilities	Long-term, beneficial impacts to Fort Belvoir's water and wastewater utility system as a result of improved reliability and capacity of water storage tanks, replacement of aging sanitary sewer mains, construction of permanent access for sewer main maintenance, protection of water and sewer lines from erosion, and proper preventative maintenance of aging infrastructure elements.	The existing water storage tanks would not be able to provide sufficient storage capacity to support the future needs and mission of Fort Belvoir. Rupture of aging force mains would release untreated wastewater to the environment and require costly emergency repair, cleanup, and could result in property damage and interruption of sewer service. No permanent access to manholes would hinder future maintenance activities of these sewer sections. Unrepaired aerial stream crossing could result in breakage or collapse of the water and/or sewer lines causing interruption in service, the need for costly emergency repair, release of untreated wastewater into the environment, and possible introduction of contaminants into the water distribution system. The reliability of Fort Belvoir's aging water

Resource	Proposed Action	No Action Alternative
		and wastewater infrastructure would continue to decline and future demands for service would not be met. Missed opportunities to repair and upgrade the existing system systematically could lead to emergency repairs, potential releases to the environment and larger more complex and costly system upgrades in the future.

Notes: ESC – erosion and sediment control, ROW – right of way, RPA – resource protection area, SSO – Sanitary Sewer Overflows

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1.0 PURPOSE AND NEED

The United States (U.S.) Army Garrison Fort Belvoir (Fort Belvoir) prepared this environmental assessment (EA) to assess the potential environmental impacts of proposed projects to be carried out by the utility privatization (UP) partner to upgrade outdated components of the installation's water and wastewater infrastructure. The U.S. Department of the Army (Army) awarded a UP contract to American Water Operations and Maintenance, Inc. (American Water), for the water and wastewater infrastructure at Fort Belvoir, Virginia, in September 2009. Under a 50-year lease, American Water assumed ownership and maintenance of the potable water distribution and wastewater collection systems at Fort Belvoir and is required to initially replace all system components that have reached the end of their useful life, implement a life-cycle-based replacement program, and conduct general maintenance. Certain upgrade projects have the potential to impact the environment, and as a result, Fort Belvoir has prepared this EA to analyze those potential impacts.

This EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (Title 42, United States Code [USC] §4321 et seq.), NEPA-implementing regulations of the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] Parts 1500–1508), and the Army's NEPA-implementing regulations (32 CFR Part 651, *Environmental Analysis of Army Actions*). This EA was prepared concurrently, and integrated, with environmental impact analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (16 USC §661 *et seq*.), the National Historic Preservation Act of 1966 (16 USC §470 *et seq*.), the Endangered Species Act of 1973 (16 USC §1531 *et seq*.), the Coastal Zone Management Act (16 USC §1451 *et seq*.) and other environmental review laws (and their implementing regulations), and executive orders.

1.1 Purpose and Need for the Proposed Action

The purpose of the proposed action is to upgrade aging water and wastewater infrastructure at Fort Belvoir. As part of Fort Belvoir's mission, it must provide reliable and compliant water and wastewater service to its tenants. Therefore, this action is needed to upgrade outdated components, correct existing problems, and maintain Fort Belvoir's water and wastewater utility systems to meet Fort Belvoir's mission. The proposed projects would provide the required level of operability for the water and wastewater systems necessary for Fort Belvoir to manage and maintain and provide utility services to the installation. Water and wastewater upgrade projects fall into four categories, as stated within the UP contract conditions:

1. Initial system deficiency corrections (ISDC) projects
2. Renewals and replacement (R&R) projects
3. Future system deficiency corrections/upgrades (FSDC)
4. General maintenance

Several of these projects are identified in Fort Belvoir's 2012 Annual System Deficiency Corrections, Upgrades and Renewal & Replacement (ASDC) Plan, which documents proposed capital upgrades and major renewals and replacements for the next five years (fiscal years [FY] 13 through FY17). The following proposed projects addressed in this EA include:

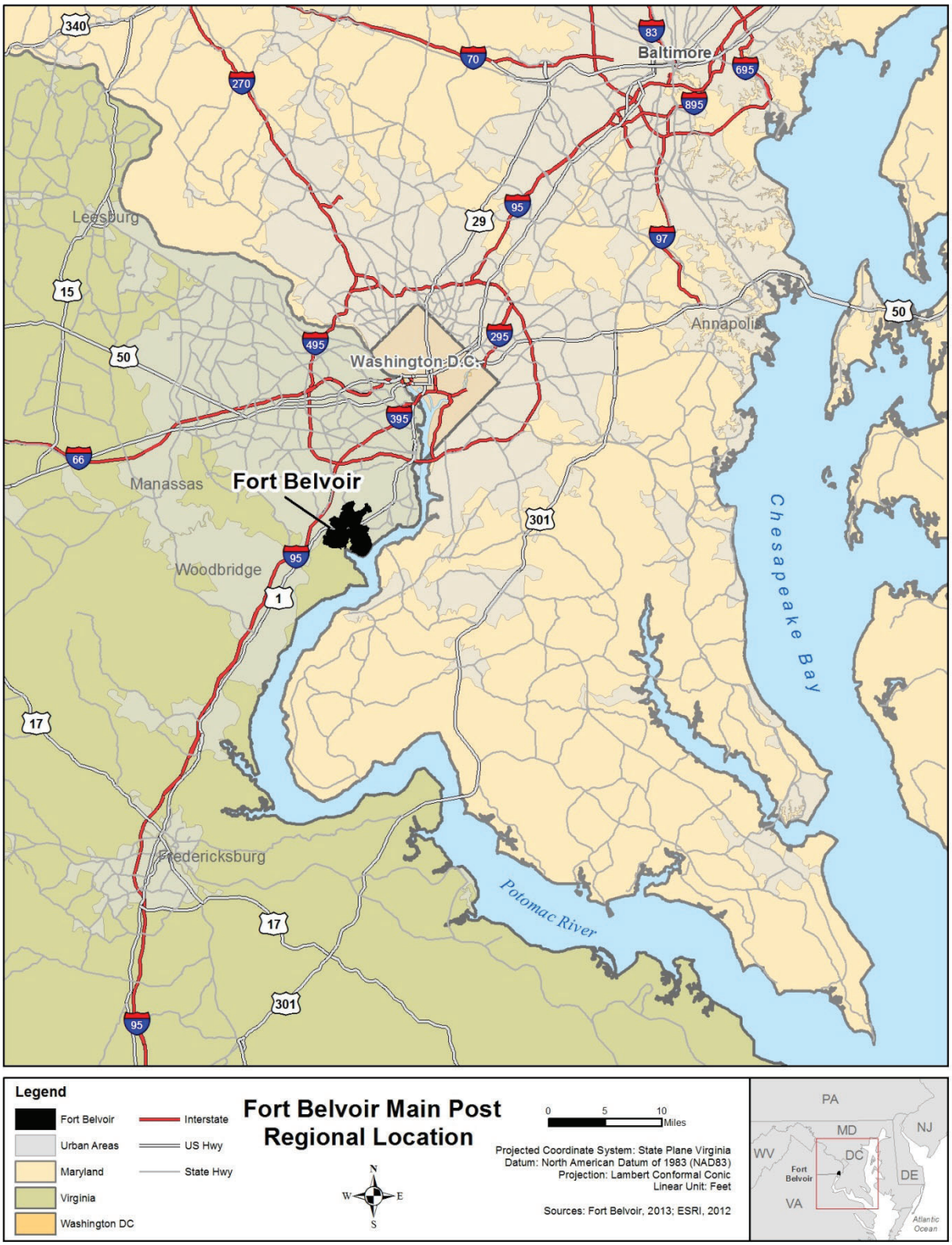
- Demolition of four water storage tanks and construction of three new water storage tanks (ISDC)
- Replacement of six sections of sewer force mains (R&R)

- Maintenance of seven sections of gravity sewer mains (General Maintenance)
- Reinstallation or repair of nine aerial stream crossings with associated streambank repair (ISDC)
- Implementation of four R&R and FSDC projects identified in the 2012 ASDC

This EA analyzes and documents environmental impacts associated with the Proposed Action to implement select projects to upgrade water and wastewater infrastructure at Fort Belvoir. Several ASDC projects have already been analyzed under separate NEPA documentation or were eligible for Categorical Exclusion under the provisions of 32 CFR Part 651, Appendix B, Section II, and documented under a Record of Environmental Consideration (see Section 2.3.1.5). ASDC projects that are not analyzed within this EA will be evaluated under separate NEPA documentation when project information is available.

1.2 Location and Background

Fort Belvoir is located in Fairfax County Virginia, approximately 20 miles south of Washington, D.C. (Figure 1-1). Fort Belvoir is host to elements of 10 U.S. Army commands; 19 different agencies and direct reporting units of the Army; eight elements of the U.S. Army Reserve and the Army National Guard; and 26 Department of Defense agencies. A Marine Corps detachment, a U.S. Air Force activity, and an agency of the Department of the Treasury also are located on Fort Belvoir. Fort Belvoir has a current population of approximately 39,000, including approximately 7,000 residents. This area includes the Main Post and the Fort Belvoir North Area (Russell 2013a).



Note: Fort Belvoir North Area and Mark Center are not shown

Figure 1-1: Location of Main Post, Fort Belvoir

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2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

Fort Belvoir proposes to implement several projects that would upgrade its water/wastewater infrastructure through a utilities privatization (UP) contract. Under the UP contract, the contractor (American Water Operations and Maintenance, Inc. [American Water]) is required to initially replace outdated system components, implement a life-cycle-based replacement program, and conduct general maintenance. These projects are organized into four categories: (1) initial system deficiency corrections (ISDC) projects, (2) renewals and replacement (R&R) projects, (3) future system deficiency corrections/upgrades (FSDC), and (4) general maintenance.

- **ISDC projects—**These improvements are necessary to bring existing infrastructure into compliance with modern standards and codes that will permit the long-term safe and reliable operations of the utility system.

- **R&R projects—**Investments in the utility system are needed to renew or replace system components as they fail or reach the end of their useful life.

- **FSDC projects—**Investment in the utility system is necessary because of changes in the service requirements, laws, or regulations and may include the implementation of new technologies.

- **General maintenance projects—**Projects and activities are needed so that Fort Belvoir can operate and maintain the water and wastewater systems and provide utility services to Fort Belvoir.

2.2 Proposed Action

The Proposed Action is to implement a number of projects to upgrade the water and wastewater system infrastructure at Fort Belvoir, including replacement of water storage tanks (ISDC), replacement of force mains (R&R), annual maintenance of gravity sewer mains (general maintenance), reinstallation of aerial stream crossings with streambank repair (ISDC), and implementation of additional R&R and FSDC projects identified in Fort Belvoir's 2012 Annual System Deficiency Corrections, Upgrades and Renewal & Replacement Plan (ASDC) for fiscal years (FY) 13 through FY17 that are currently in the conceptual phase. The Proposed Action would be implemented during a period of approximately 18 to 24 months. Additional National Environmental Policy Act (NEPA) documentation may be necessary for FY13 to FY17 projects identified in the ASDC as they move forward into the design and construction phases. Furthermore, depending on bank and stream restoration methods, additional NEPA analyses may be necessary for the aerial stream crossing projects as they move into the design and construction phases, if significant changes to the scopes of the projects are made.

2.3 Alternatives

One alternative—the Proposed Action Alternative—was identified that would meet the purpose and need for upgrading the water and wastewater system infrastructure at Fort Belvoir. The Proposed Action would provide the required level of operability for the water and wastewater systems necessary to support Fort Belvoir in accomplishing its mission to provide reliable and compliant water and wastewater service to its tenants.

One other alternative was considered for replacement of the water storage tanks but not carried forward for further analysis. The alternative of constructing two new water storage tanks was dismissed because it does not meet the purpose and need to provide adequate water storage for the installation's Main Post (discussed further in Section 2.3.2).

2.3.1 Proposed Action Alternative

2.3.1.1 Water Storage Tank Replacements (ISDC)

Fort Belvoir would demolish the following four existing water storage tanks—WSTs 188, 591, 2428, and 2429—with a total capacity of 2.3 million gallons and construct three replacement water tanks with supporting water lines and equipment. The new water storage tanks would have a total capacity of 3 million gallons and provide adequate water storage for the installation's Main Post (USAG Fort Belvoir 2012). The locations of the four existing water storage tanks on Fort Belvoir are shown in Figure 2-1, and as shown on Figure 2-2, the multi-column, prototypical style replacement tanks would be constructed adjacent to the existing tanks.

- WST 188, a 300,000-gallon, elevated steel water tank constructed in 1918 during the initial development of Fort Belvoir, is located off 16th Street in the Fort Belvoir Historic District (Figure 2-3). The replacement tank would be a 1-million-gallon, multi-column tank located just southeast of the current location of WST 188 (Figure 2-4).
- WSTs 2428 and 2429 were both constructed in 1948. WST 2428 is a 500,000-gallon, elevated tank located adjacent to WST 2429, a 1-million-gallon, ground tank (Figure 2-5). Both tanks, located on North Post, would be demolished and replaced with a 1-million-gallon, multi-column tank, located just to the north of the current site of WST 2428 and WST 2429 (Figure 2-6).
- WST 591, constructed in 1957, is a 500,000-gallon, elevated tank located in the southern portion of Main Post (Figure 2-7). WST 591 would be removed, replaced with a multi-column tank, and located just to the southeast of the current site of WST 591 (Figure 2-8).

The three replacement tanks would be larger in capacity but would be constructed to the same height as the existing tanks. They would be erected on 100-foot by 100-foot lots. Once the replacement tanks are constructed and in service, existing WSTs 188, 591, 2428, and 2429 would be demolished, and the sites on which they stand would be restored to grass and landscape vegetation and maintained as open/green space. Eliminating the four existing tanks would require removing a number of existing trees and existing infrastructure, including pipes, utility lines, concrete slabs, sidewalks, fences, and lights. Fort Belvoir would be responsible for relocating any affected electrical and communications utilities and would coordinate the relocation of utilities in advance of construction. In addition, as part of demolition, the related potable water pipe systems would be removed, and the existing storm drain excavation trenches backfilled after pipe removal. The estimated amount of demolition debris to be recycled is approximately 240 tons of steel and 50 tons of concrete foundation. The estimated time for constructing the replacement water storage tanks and demolishing the existing water storage tanks is 6 to 8 months per site, approximately 18 to 24 months for the entire construction period.

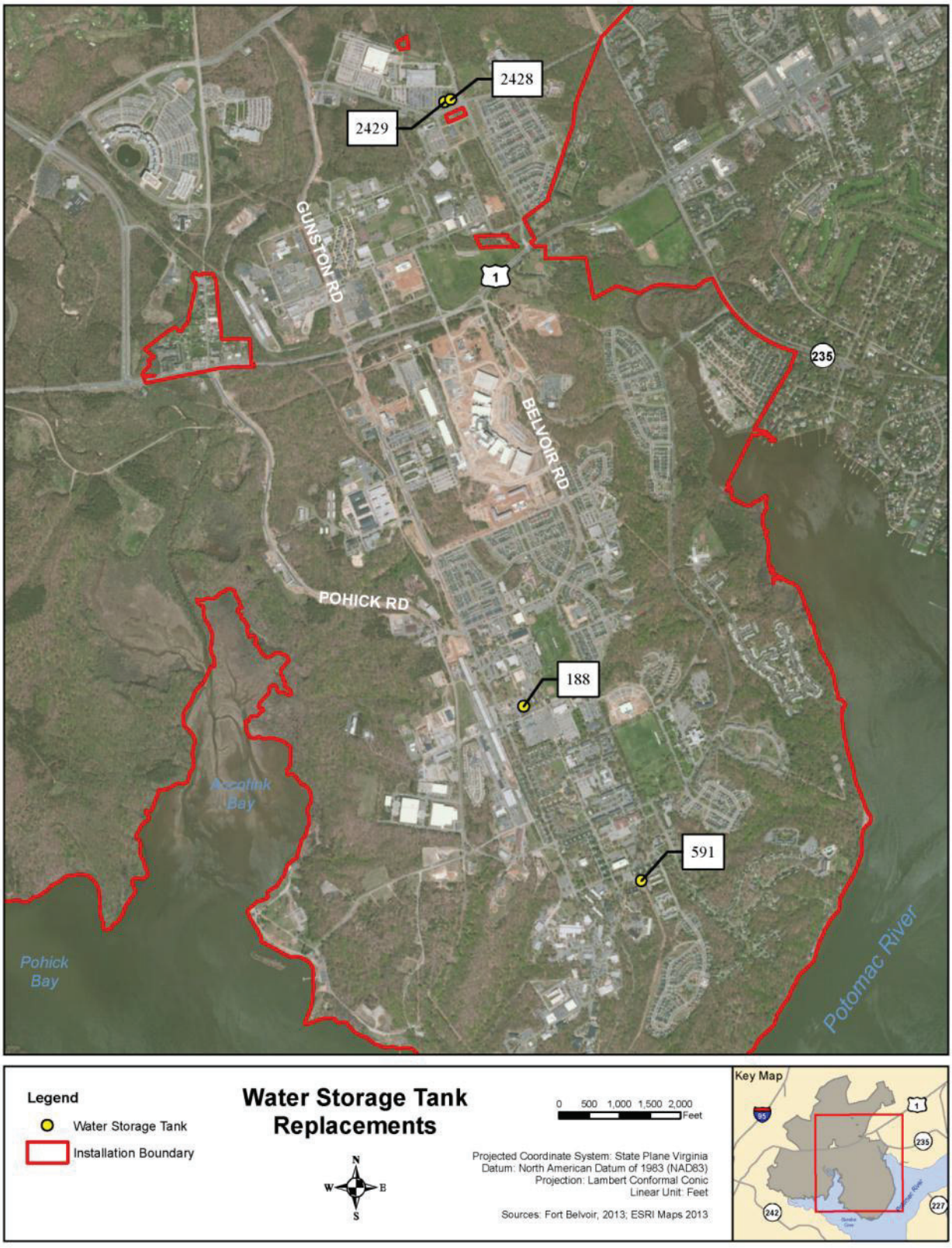


Figure 2-1: Overview of Water Storage Tank Locations on Fort Belvoir

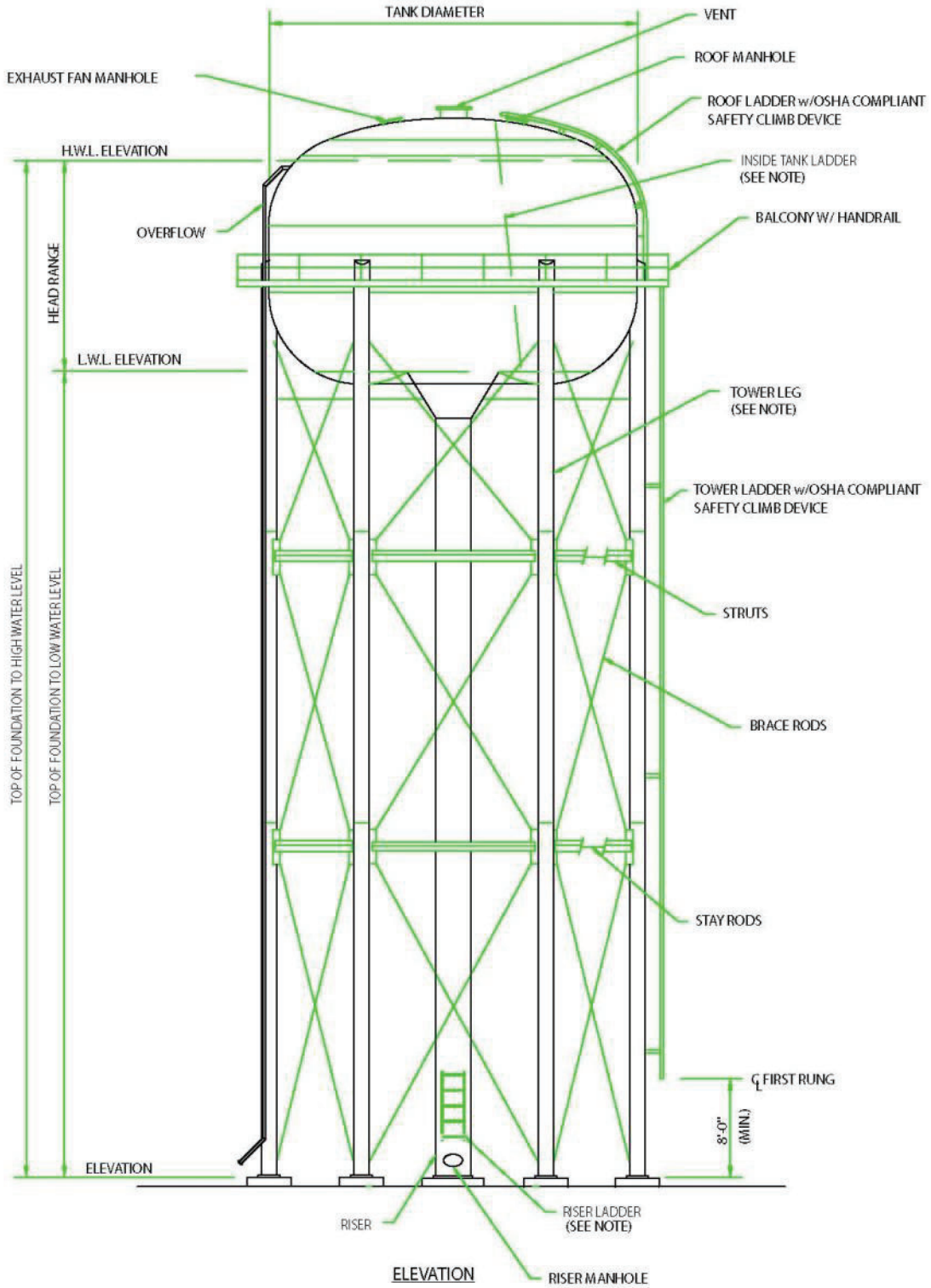
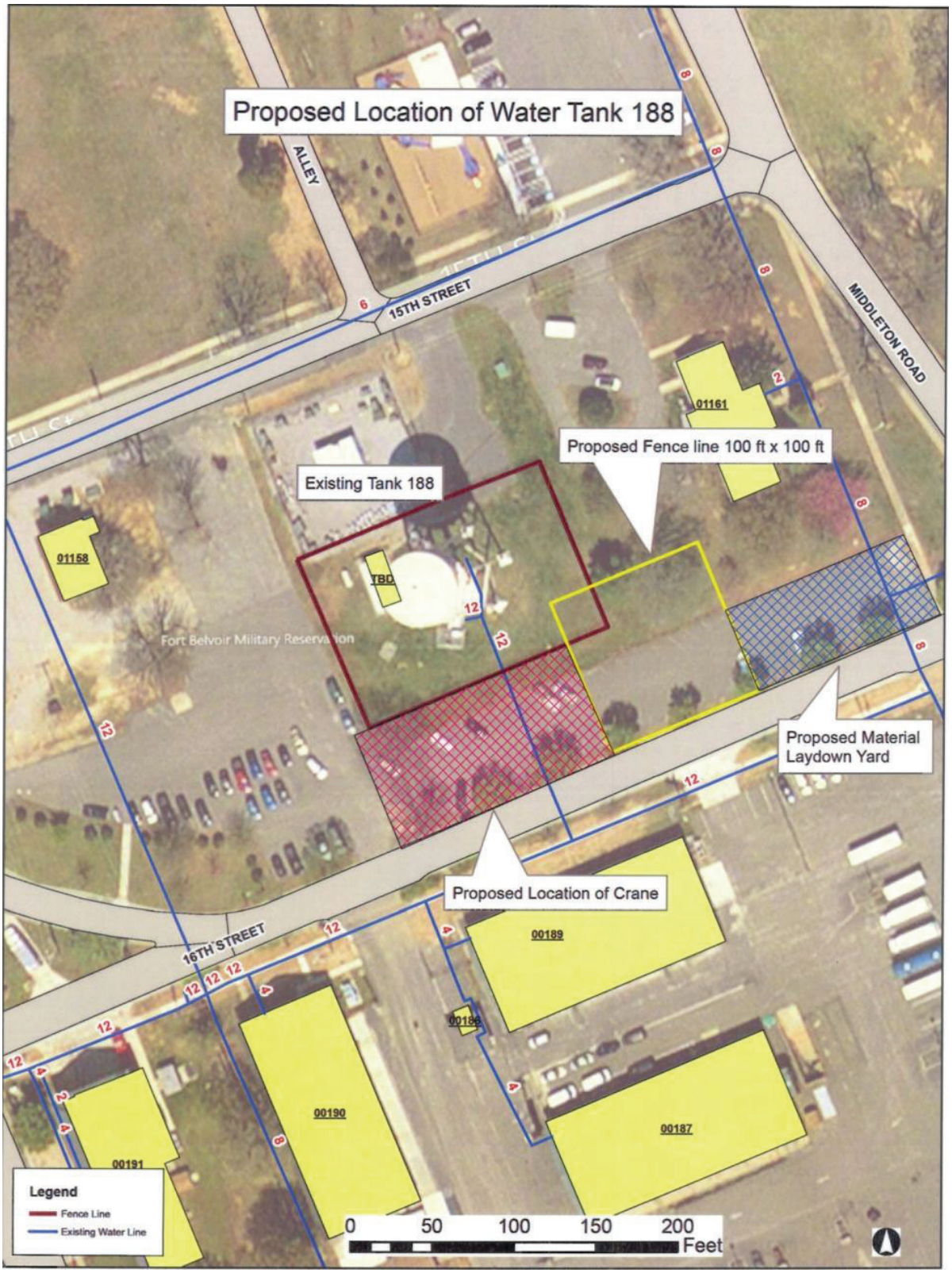


Figure 2-2: Multi-column Tank Elevation Drawing

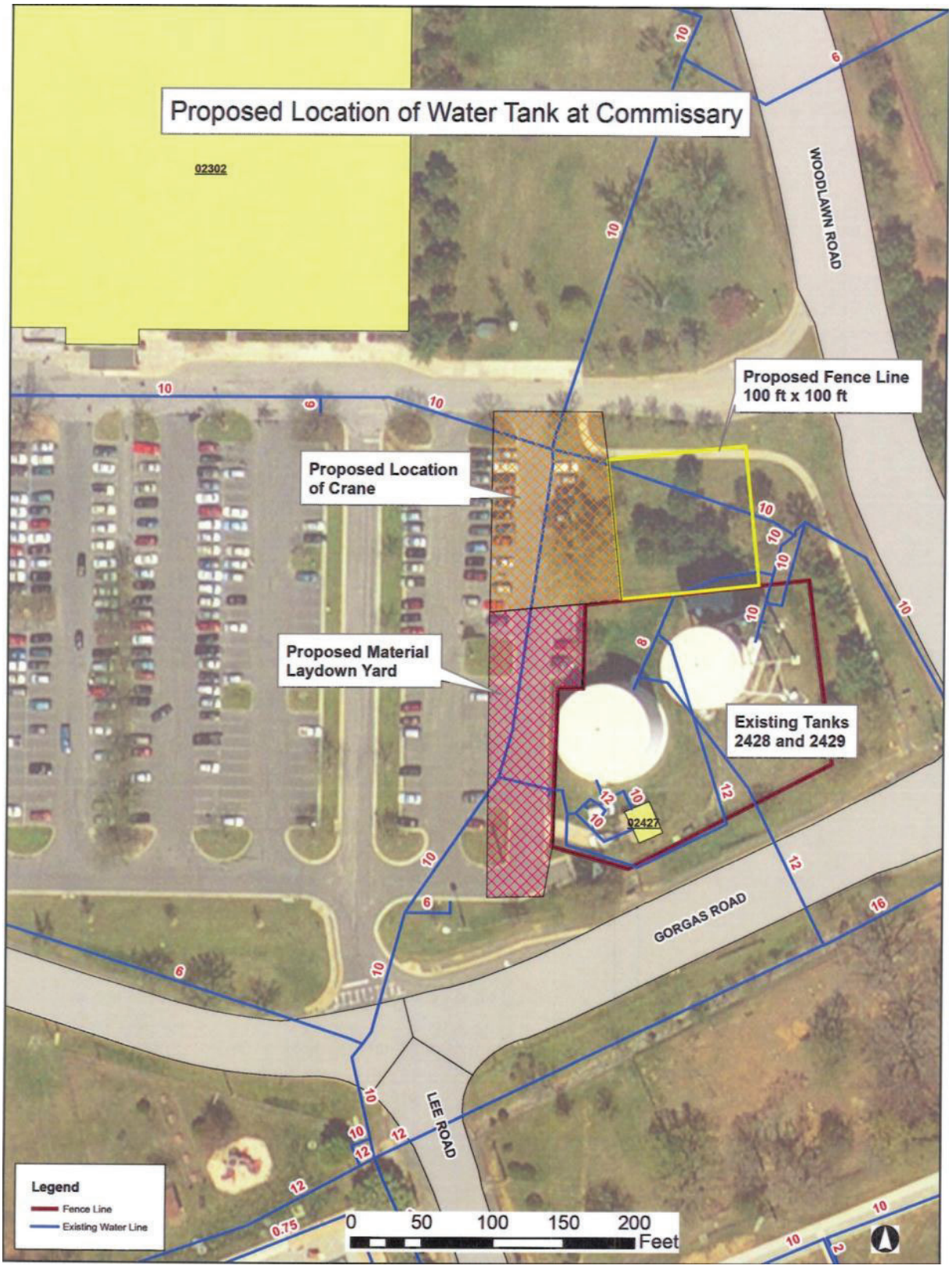
Figure 2-3: Water Storage Tank 188



Note: Proposed fence line encompasses the proposed location of the replacement tank.

Figure 2-4: Proposed Site for Replacement Water Storage Tank 188

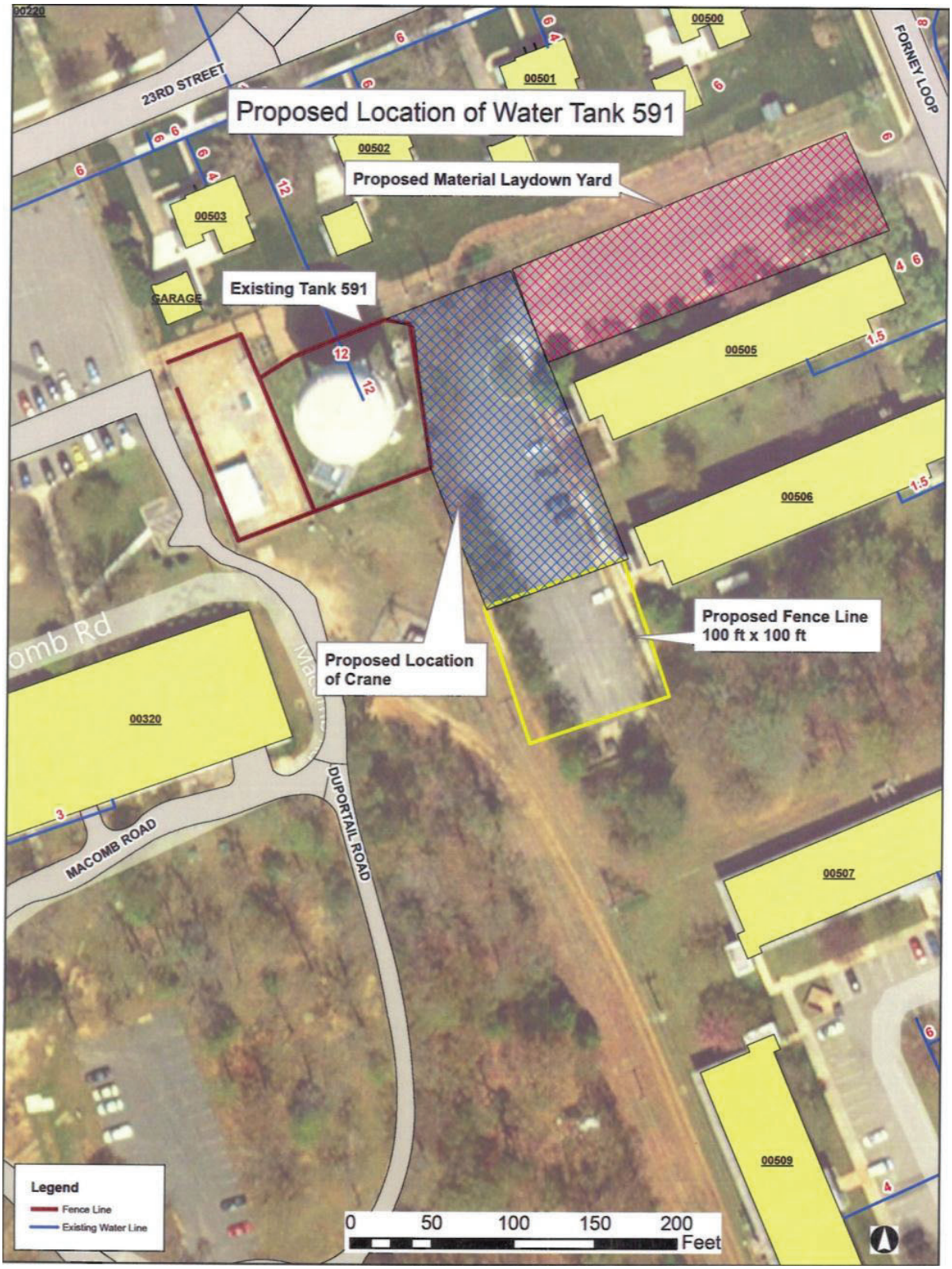
Figure 2-5: Water Storage Tanks 2428 and 2429



Note: proposed fence line encompasses the proposed location of the replacement tank.

Figure 2-6: Proposed Site for Replacement Water Storage Tanks 2428 and 2429

Figure 2-7: Water Storage Tank 591



Note: Proposed fence line encompasses the proposed location of the replacement tank.

Figure 2-8: Proposed Site for Replacement Water Storage Tank 591

2.3.1.2 Force Main Replacements

Six sections of aging sanitary sewer force mains would be replaced to prevent possible rupture and subsequent discharges to the environment. All six sites are located on the Main Post, south of U.S. Route 1 (Figure 2-9); detailed site plans for each section of sanitary sewer force main to be replaced are shown in Figures 2-10 through 2-15. Replacement pipes will be installed adjacent to the route of the existing force main. The exception is Lift Station (LS) 584 where the replacement force replacement would be re-routed to avoid an archaeological site. The existing force main sections will then be abandoned in place. Sections of sanitary sewer force mains to be replaced include the following:

- LS 7350 to LS 687
- LS 584 (Fairfax Village)
- LS 76 to LS 77
- LS 606
- LS 952 at Dogue Creek
- LS 1695 (River Village) to LS1575 (George Washington Village)

For the replacement of the force mains, a conventional open trench method would be used in upland areas, while horizontal directional drilling (HDD) technology would be used to place pipe under sensitive areas, such as streams, wetlands, and archaeological sites. The estimated time for construction to be completed would be approximately 3 months.

Conventional open trench method involves excavating a linear trench using equipment that is sized appropriately for the depth and terrain (e.g., excavator, backhoe, or mini-excavator). The force mains would be installed at an average of 4 feet deep. The width of the trench would vary depending on the depth of the cut through the varying upland terrain. The maximum width of the trench at grade would be approximately 10 feet (36 inches to accommodate the width of a standard backhoe bucket, plus 36 inches on either side). Appropriate bedding material would be placed in the trench to adequately support the pipe. Then, the pipe would be placed in the trench, joints would be secured appropriately, and finally, the trench would be backfilled with appropriate material.

HDD technology would employ a surface-launched drill rig that would cause minimal impact to the surrounding environment. The depth of the pipe would vary between 4 to 10 feet based on topography, soil conditions, and above-ground land use (e.g., road, parking lot, and wetland). The HDD method would use drilling fluids, which lubricate and cool the drill bit and help to carry the materials drilled to the surface. The resultant drilling muds would be transported to a dewatering facility on the installation and then to the local landfill for disposal.

HDD would involve excavating bore pits on the insertion and receiving ends of the pipe lengths. The bore pits would vary in size based on the size of pipe and length to be drilled but would be expected to range from 100 square feet (10 feet x 10 feet) up to 1,000 square feet (approximately 32 feet x 32 feet). All bore pits would be located outside of streams, wetlands, or sensitive areas. Areas surrounding the insertion pit would be used to stage the drilling equipment and pipe. Once the pipe has been drilled through to the receiving pit, it would be flushed and pressure tested, then connected to the lift station and receiving pipe.

For both methods, erosion and sediment control (ESC) best management practices (BMPs), such as silt fencing, would be installed in areas to be disturbed. After pipe installation, all disturbed areas would be stabilized with appropriate measures and revegetated as needed by seeding with Fort Belvoir-approved seed mix. ESC BMPs would be removed after stabilization is achieved. Fort Belvoir Directorate of Public Works would review all design specifications, including all areas that would be disturbed from construction and construction staging, to minimize impacts to vegetation.

Figure 2-9: Proposed Sites for Force Main Replacements

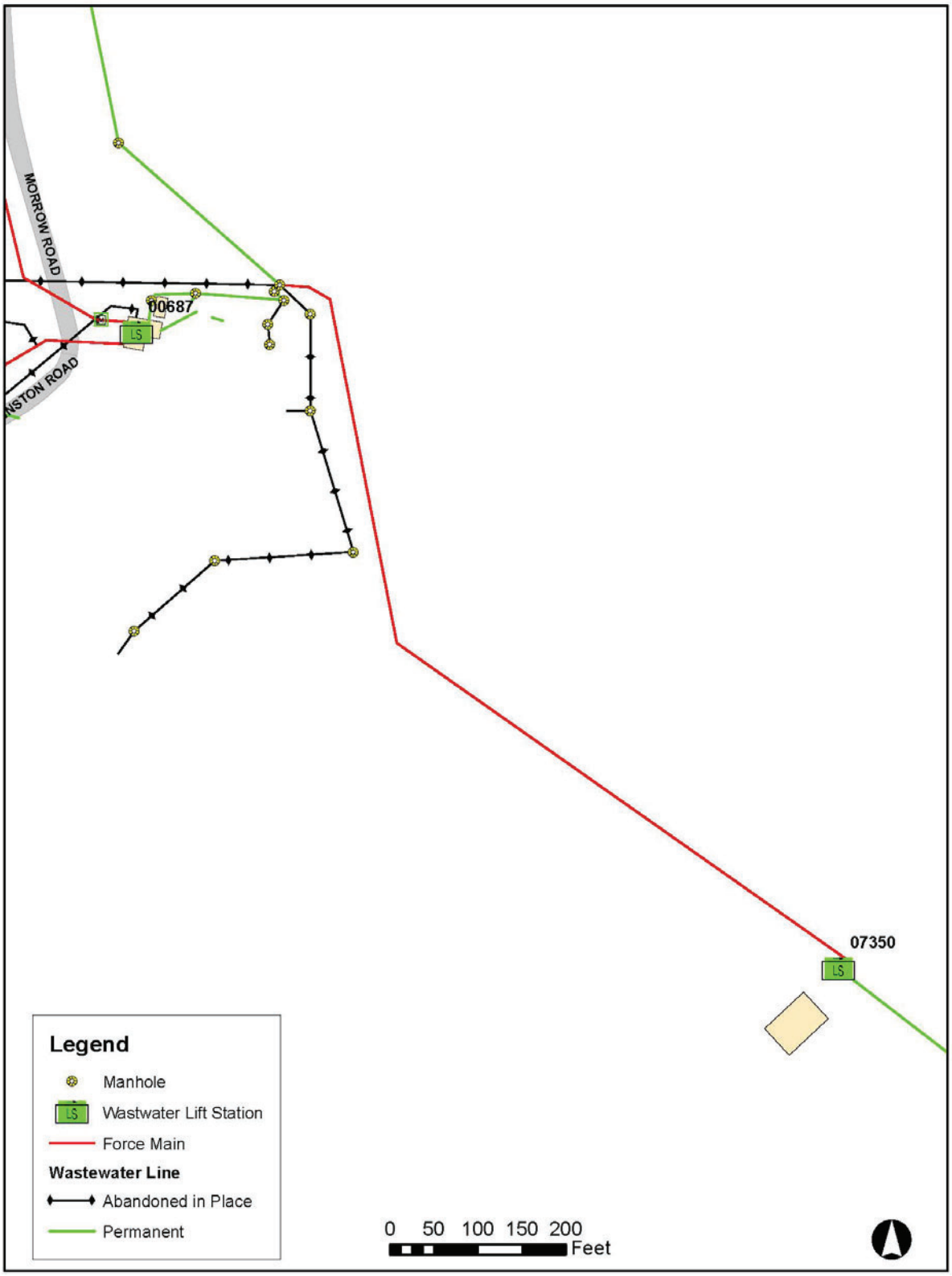


Figure 2-10: Site Design for Lift Station 7350 300 Area West to 687

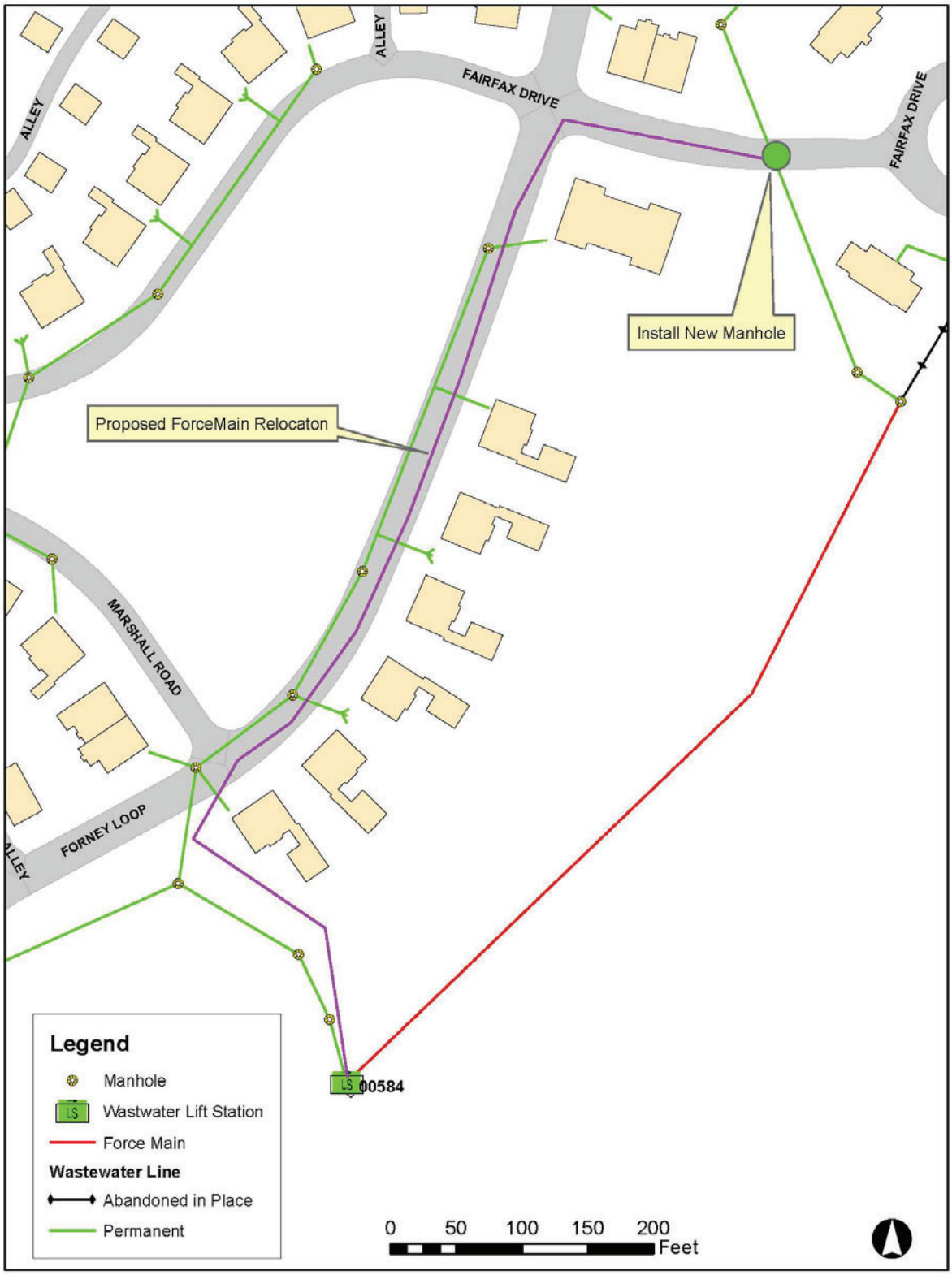


Figure 2-11: Site Design for Lift Station 584 Fairfax Village

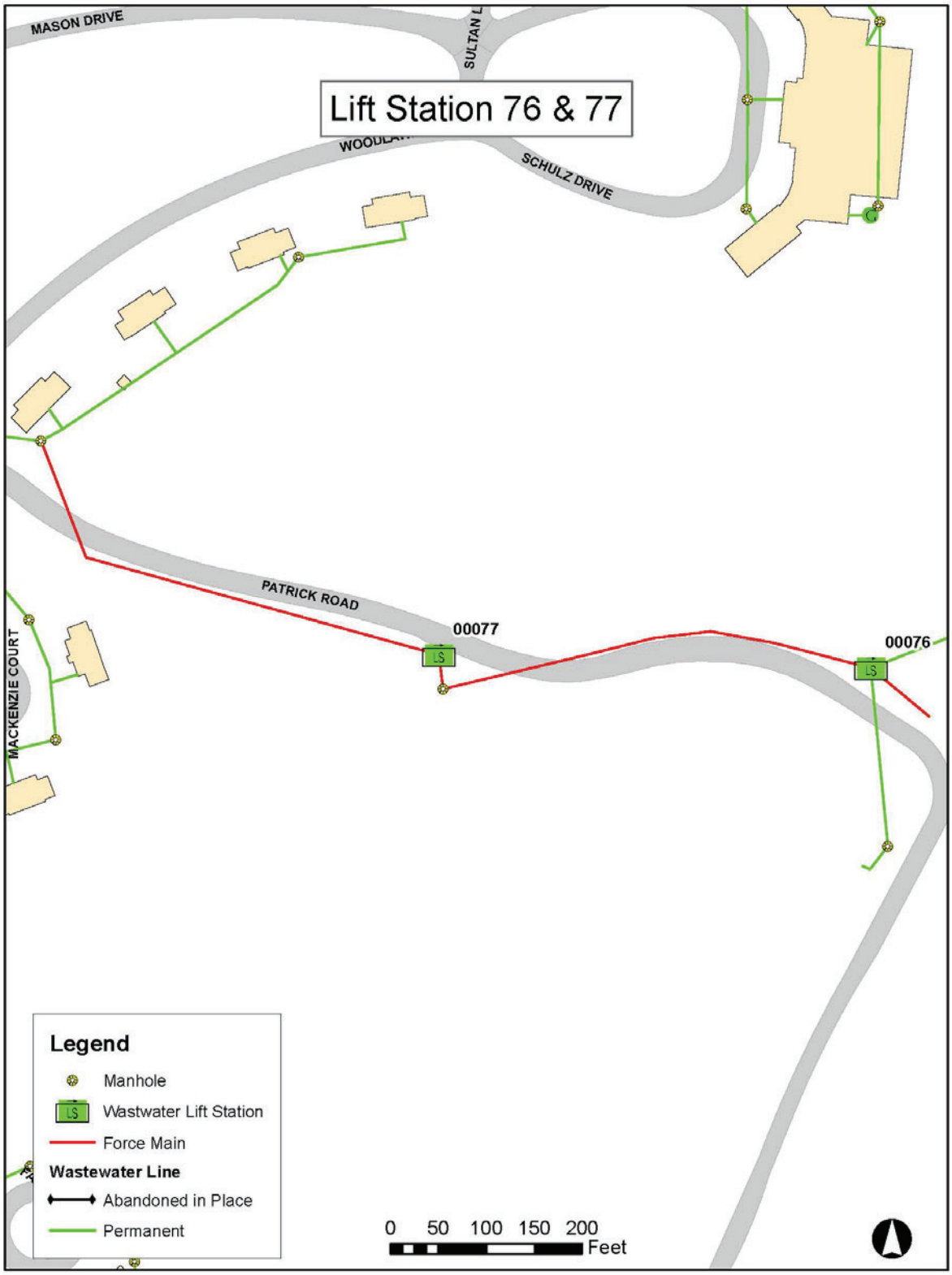


Figure 2-12: Site Design for Lift Station 76 to Lift Station 77

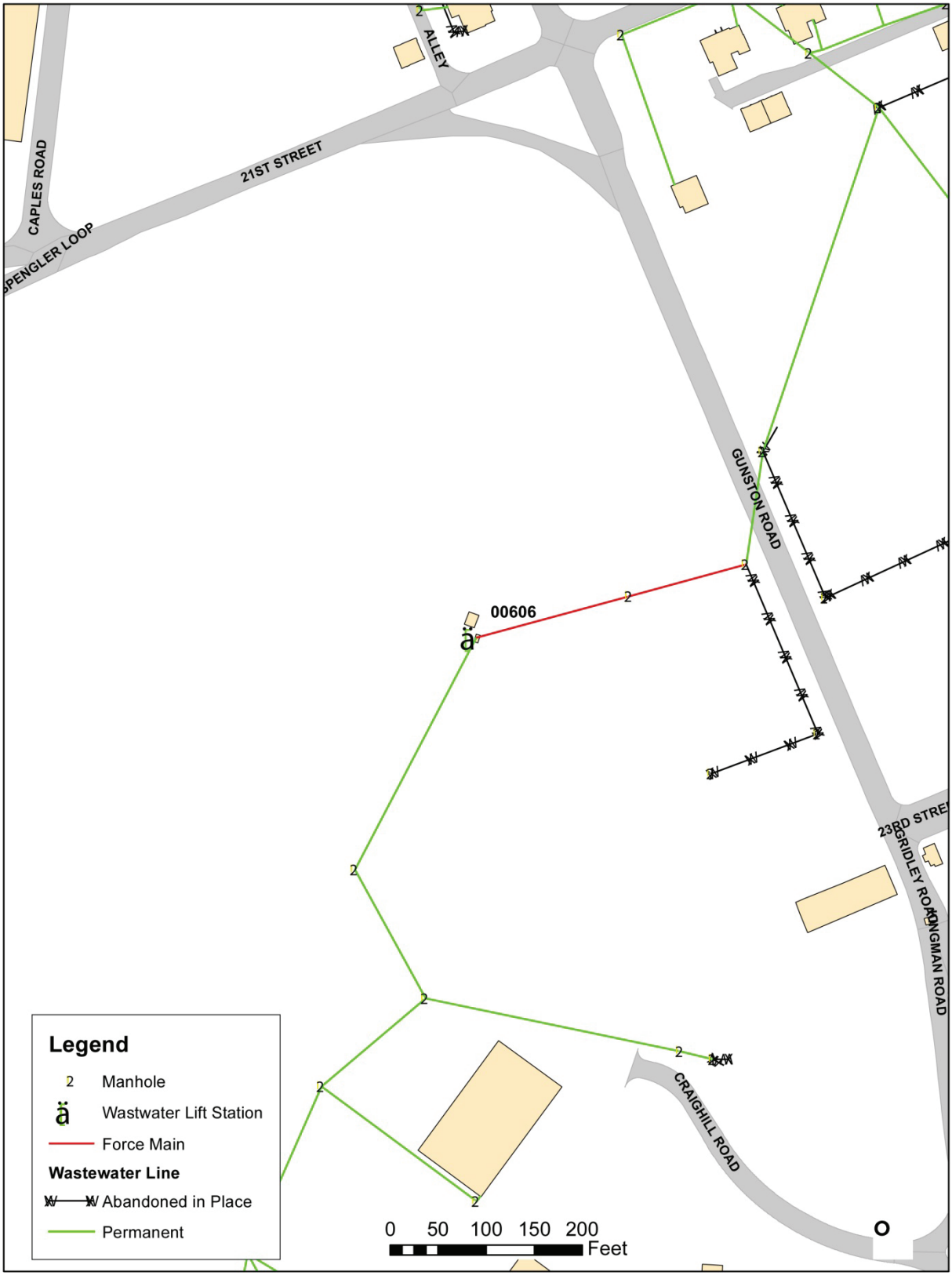


Figure 2-13: Site Design for Lift Station 606

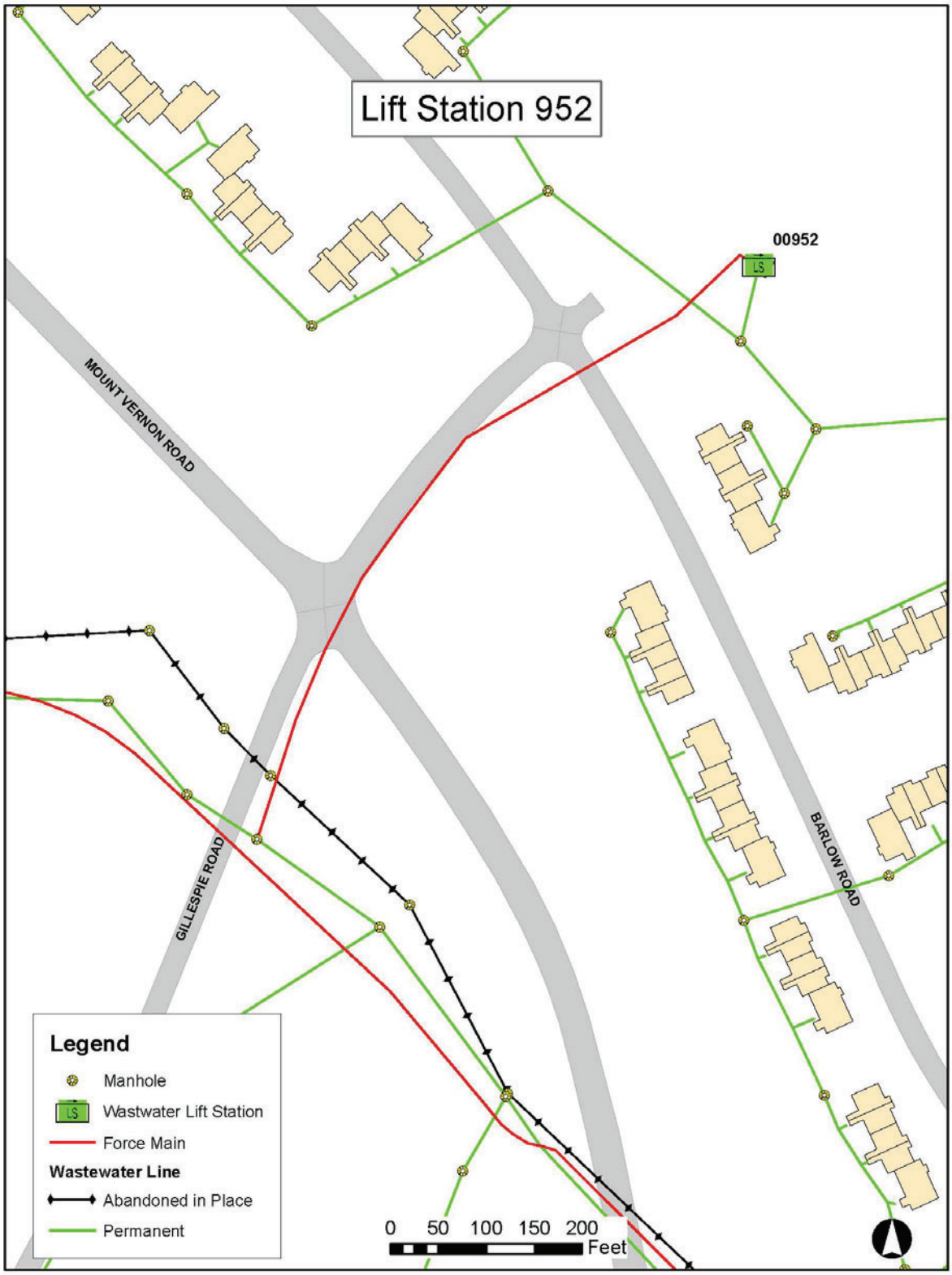


Figure 2-14: Site Design for Lift Station 952 Dogue Creek

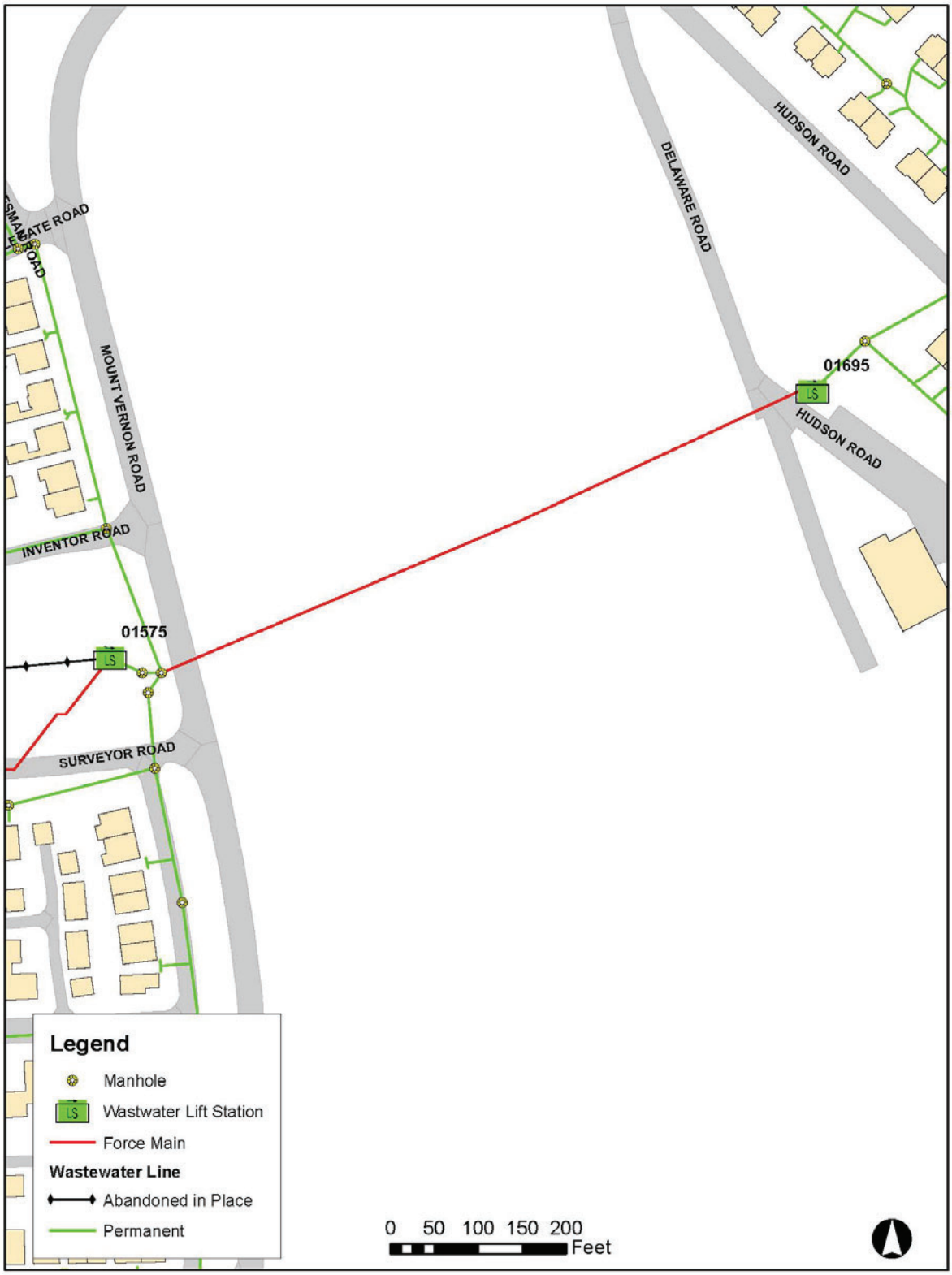


Figure 2-15: Site Design for Lift Station 1695 River Village to LS1575 George Washington Village

2.3.1.3 Gravity Sewer Main Annual Maintenance

As part of general maintenance of the installation's wastewater infrastructure, Fort Belvoir uses manholes located in the right-of-way (ROW) corridors to access the installation's sewer lines to conduct annual inspections and maintenance activities. The majority of the installation's sewer system is located in developed areas, where access is established and American Water uses, to the maximum extent practicable, existing access roads. However, a small portion of Fort Belvoir's sewer system was installed in areas that are now forested, and as a result, it is necessary for these ROW corridors to be maintained so that they are accessible for inspection and maintenance activities. These ROW corridors that are currently located in forested areas would be maintained at a 20-foot width (15-foot width in wetlands areas) for vehicles to pass. All woody vegetation would be removed within the ROW corridors, but all vegetation would not be stripped. The exception would be of areas of vegetated wetlands or Waters of the United States, where no vegetation would be cleared.

The total length of the ROW corridors has not been established because each ROW would be evaluated on a case-by-case basis. Only the sewer lines that are located in forested areas would require clearing of its ROWs, and routes would be chosen to limit the amount of mature tree loss. The ROWs would be maintained annually by mowing to clear woody vegetation.

Additionally, at seven locations, vehicles would be required to cross streams and/or wetlands to access sewer lines (Figure 2-16). A culvert would be installed at six sites and a temporary erosion mat would be installed at one site to enable vehicle access over streams and wetlands, respectively. Figures 2-17 to 2-23 provide the schematics showing where culverts or erosion matting would be placed at each of the sites to establish access. The expected impacts are small, ranging from 110 to 200 square feet of stream/wetland impact at each location. Approximately 800 square feet of permanent impacts and 120 square feet of temporary impacts are anticipated by this project. Fort Belvoir is in the process of permitting these actions; the Joint Permit Application is currently under review by the U.S. Army Corps of Engineers (USACE). The estimated time to complete construction is approximately 6 months.

Figure 2-16: Proposed Sites for Manhole Access Points and ROW Maintenance

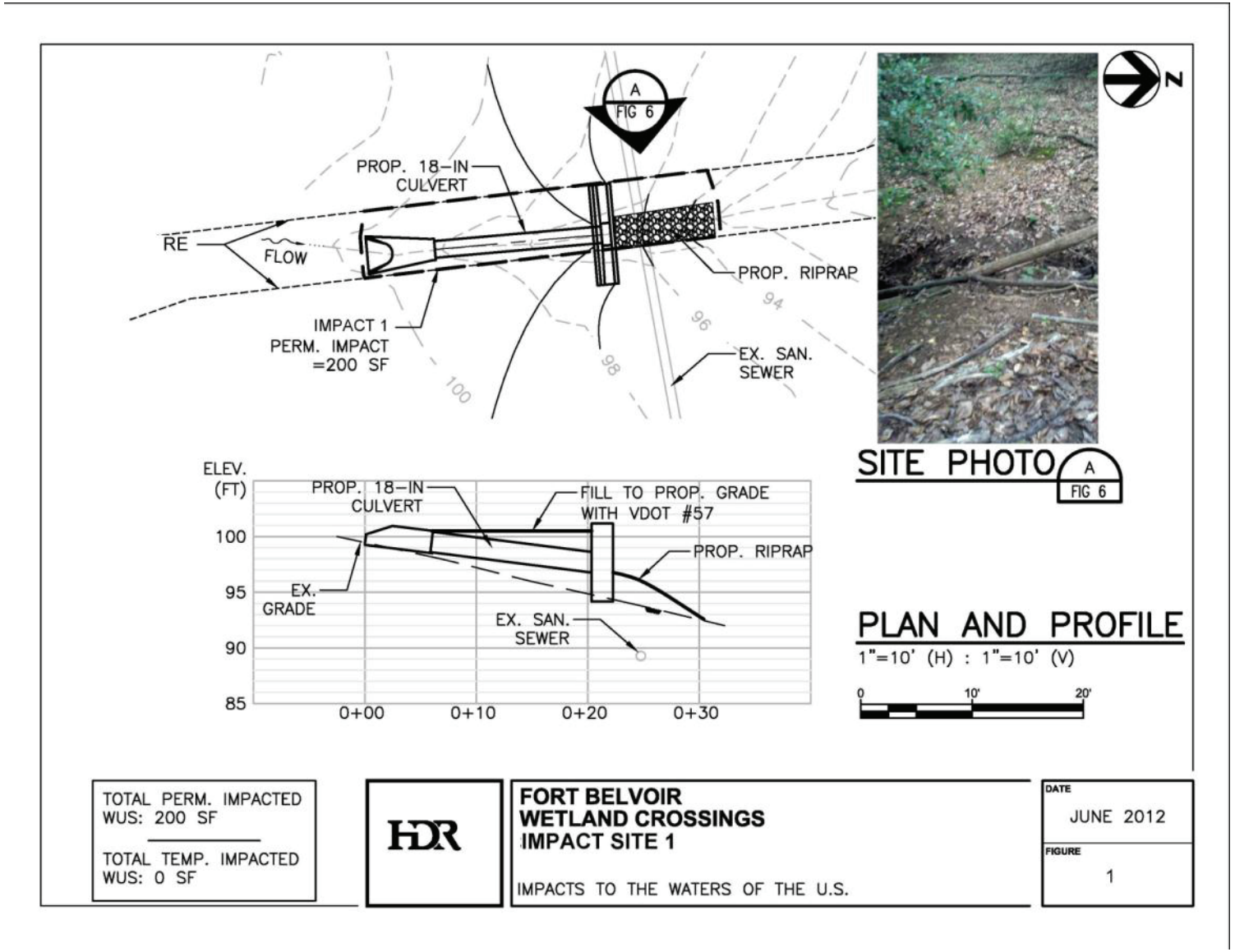


Figure 2-17: Manhole Access Points and ROW Maintenance at Site 1

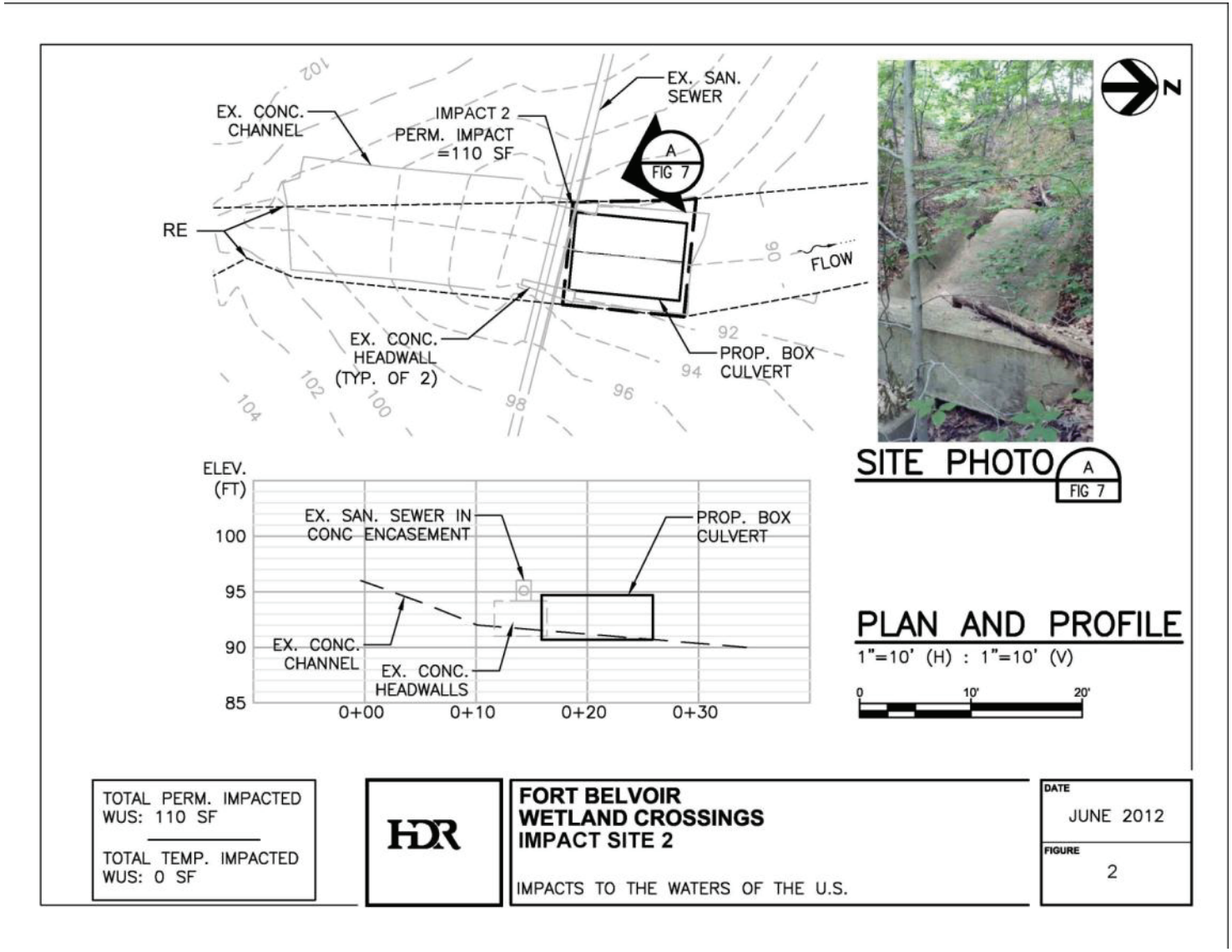


Figure 2-18: Manhole Access Points and ROW Maintenance at Site 2

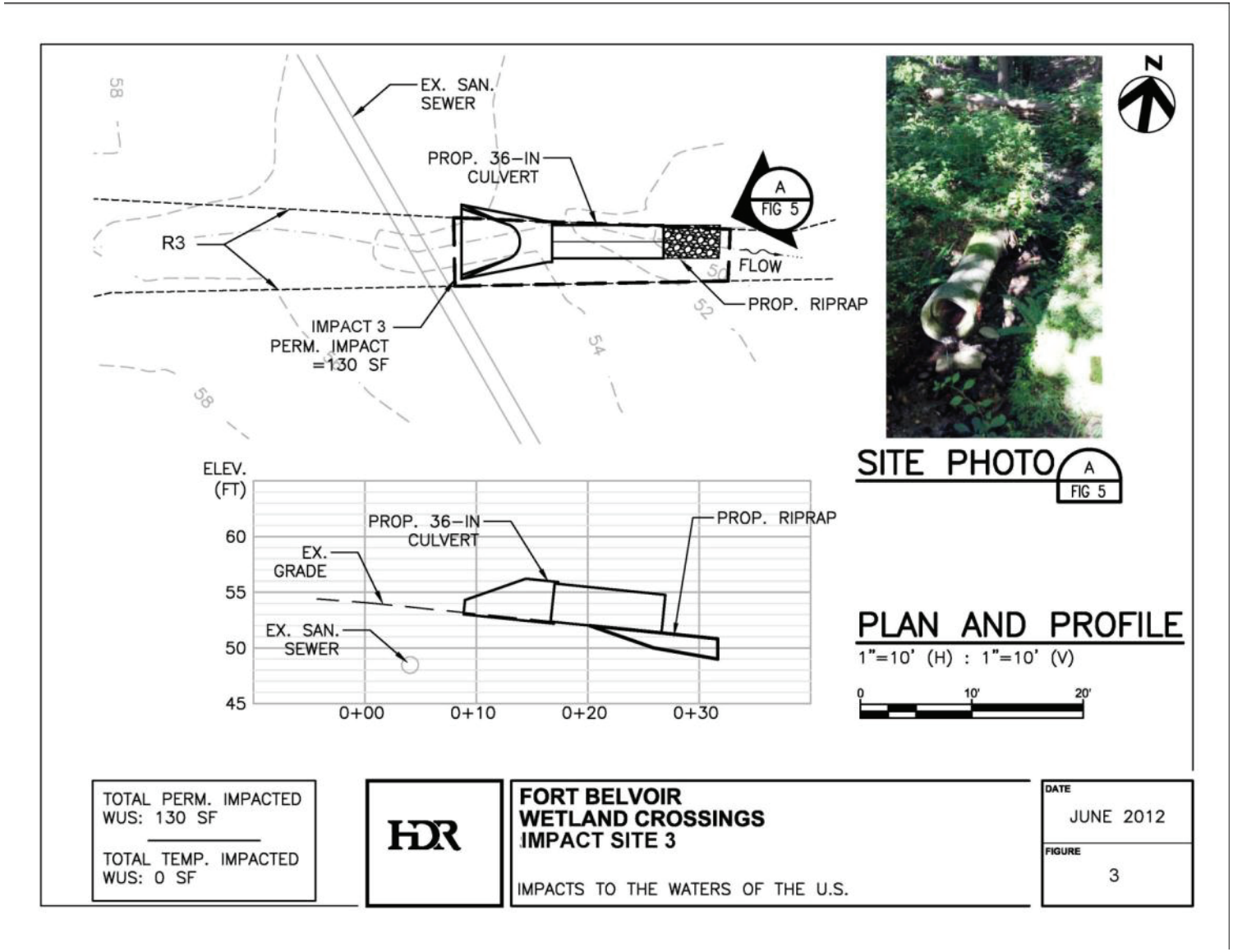


Figure 2-19: Manhole Access Points and ROW Maintenance at Site 3

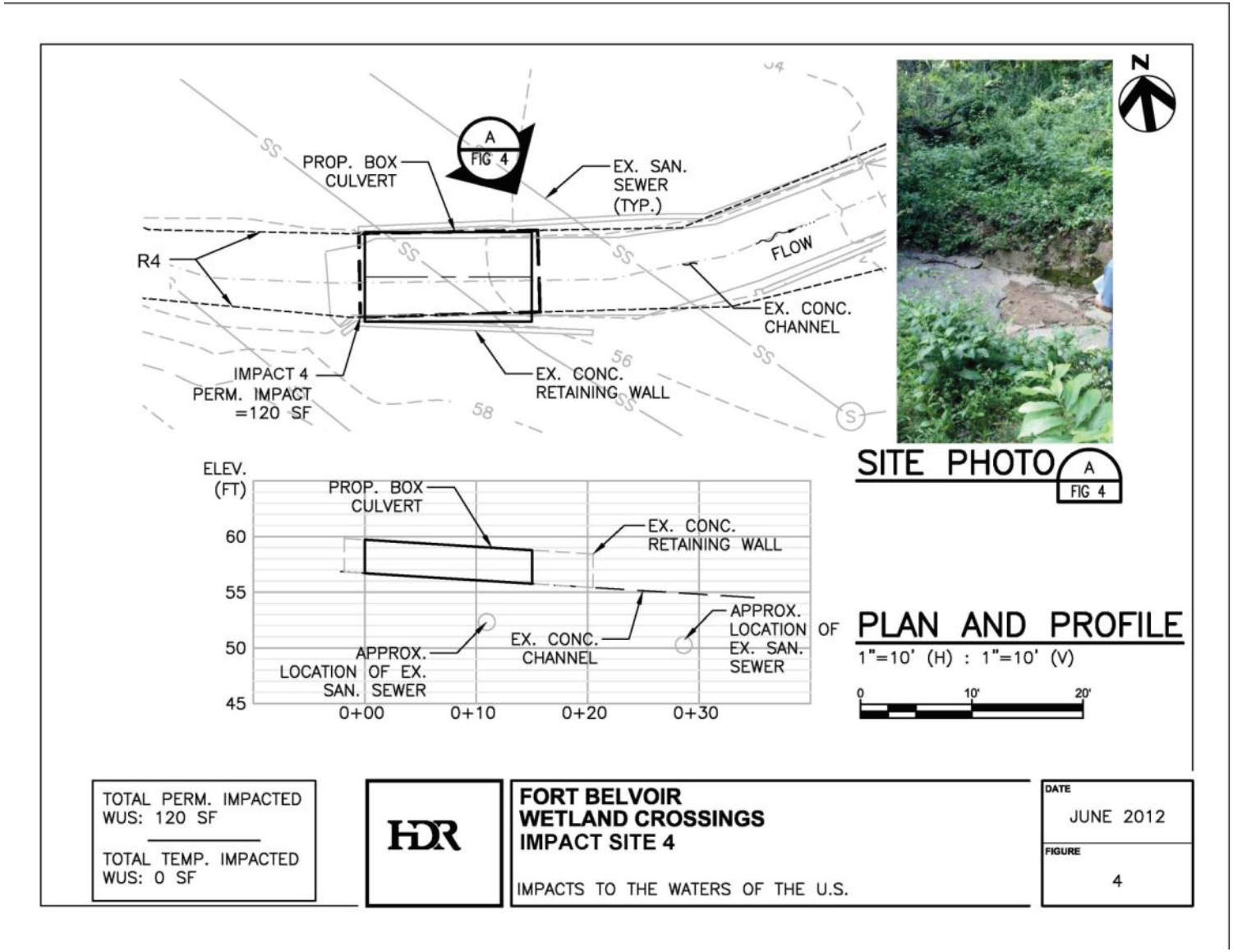


Figure 2-20: Manhole Access Points and ROW Maintenance at Site 4

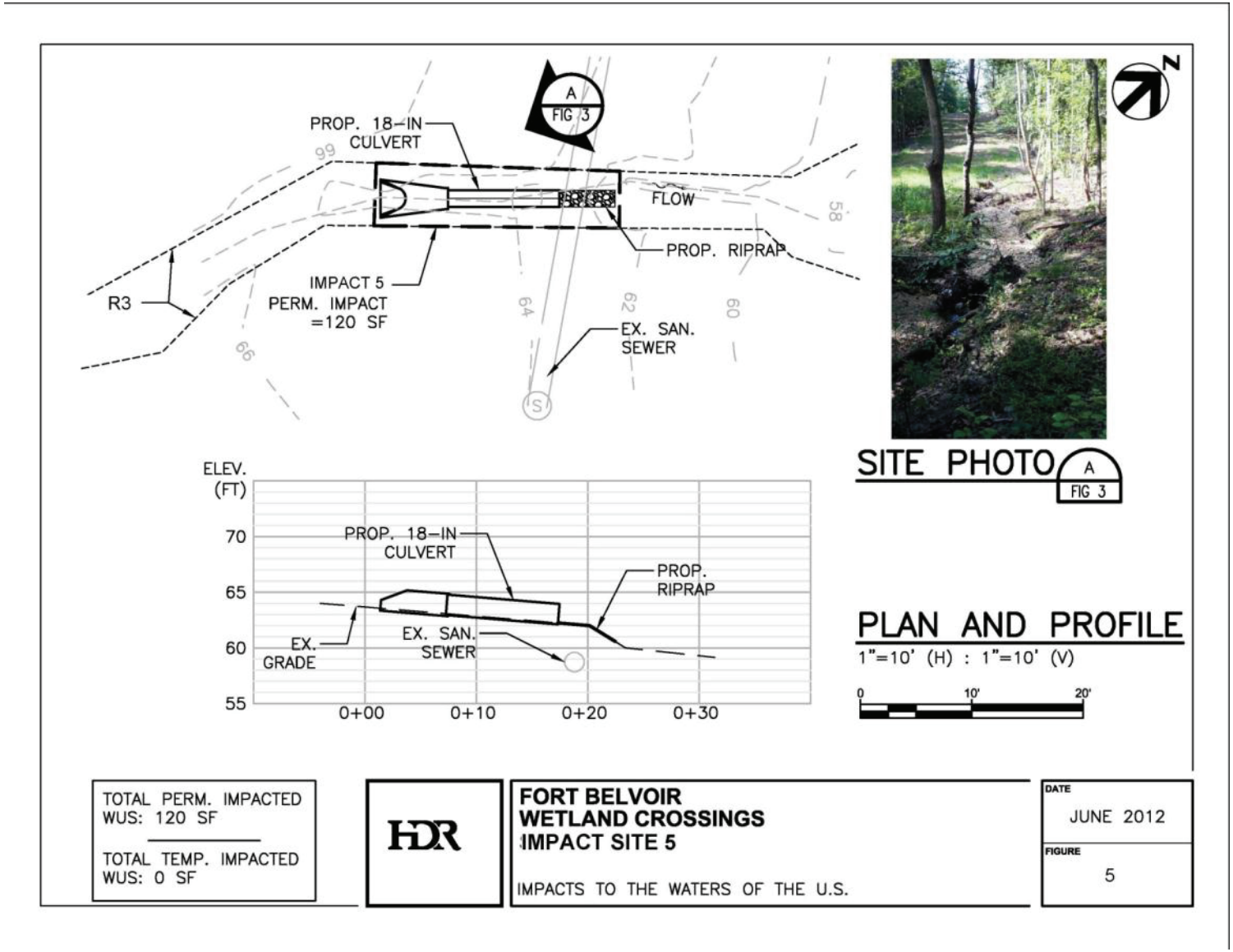


Figure 2-21: Manhole Access Points and ROW Maintenance at Site 5

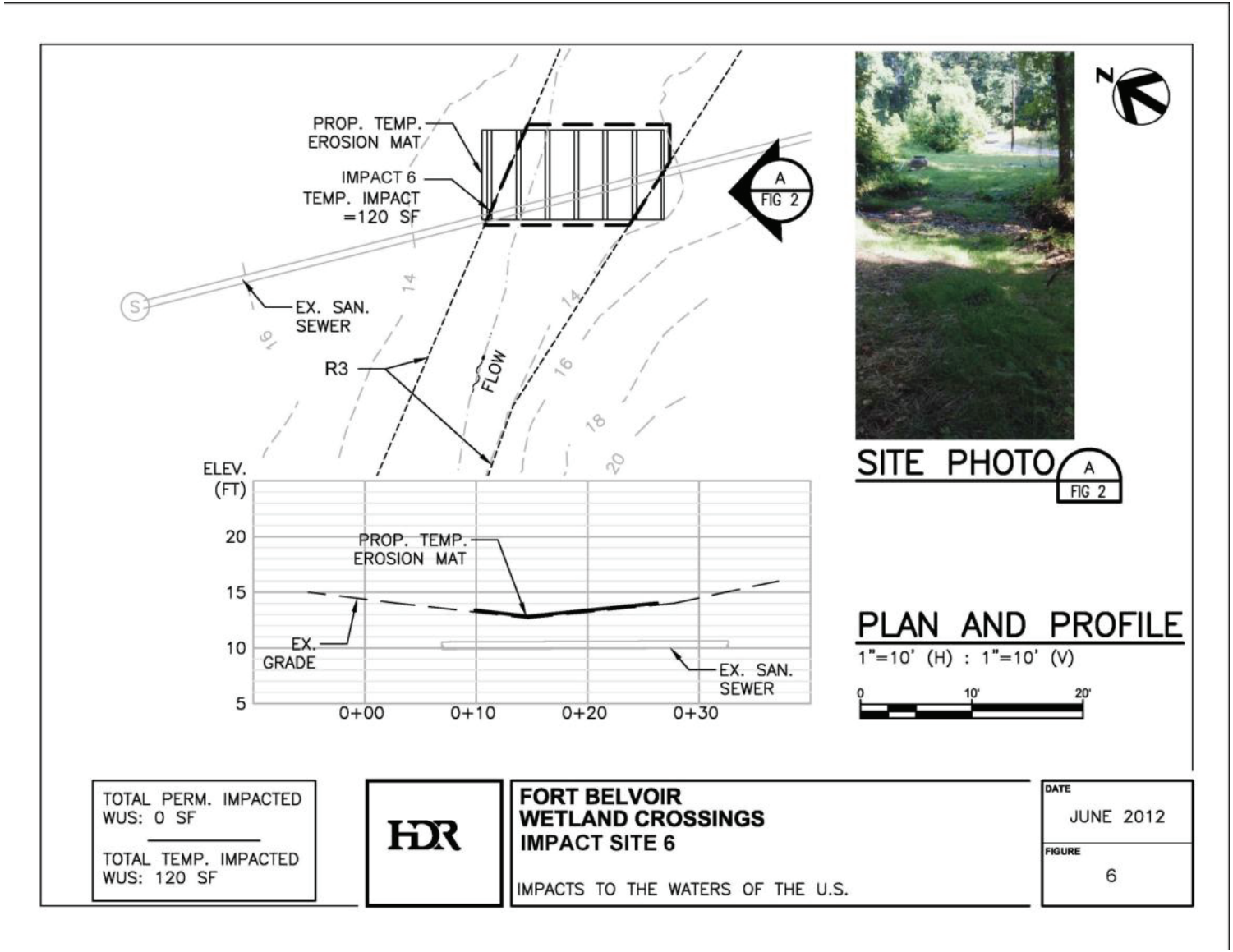


Figure 2-22: Manhole Access Points and ROW Maintenance at Site 6

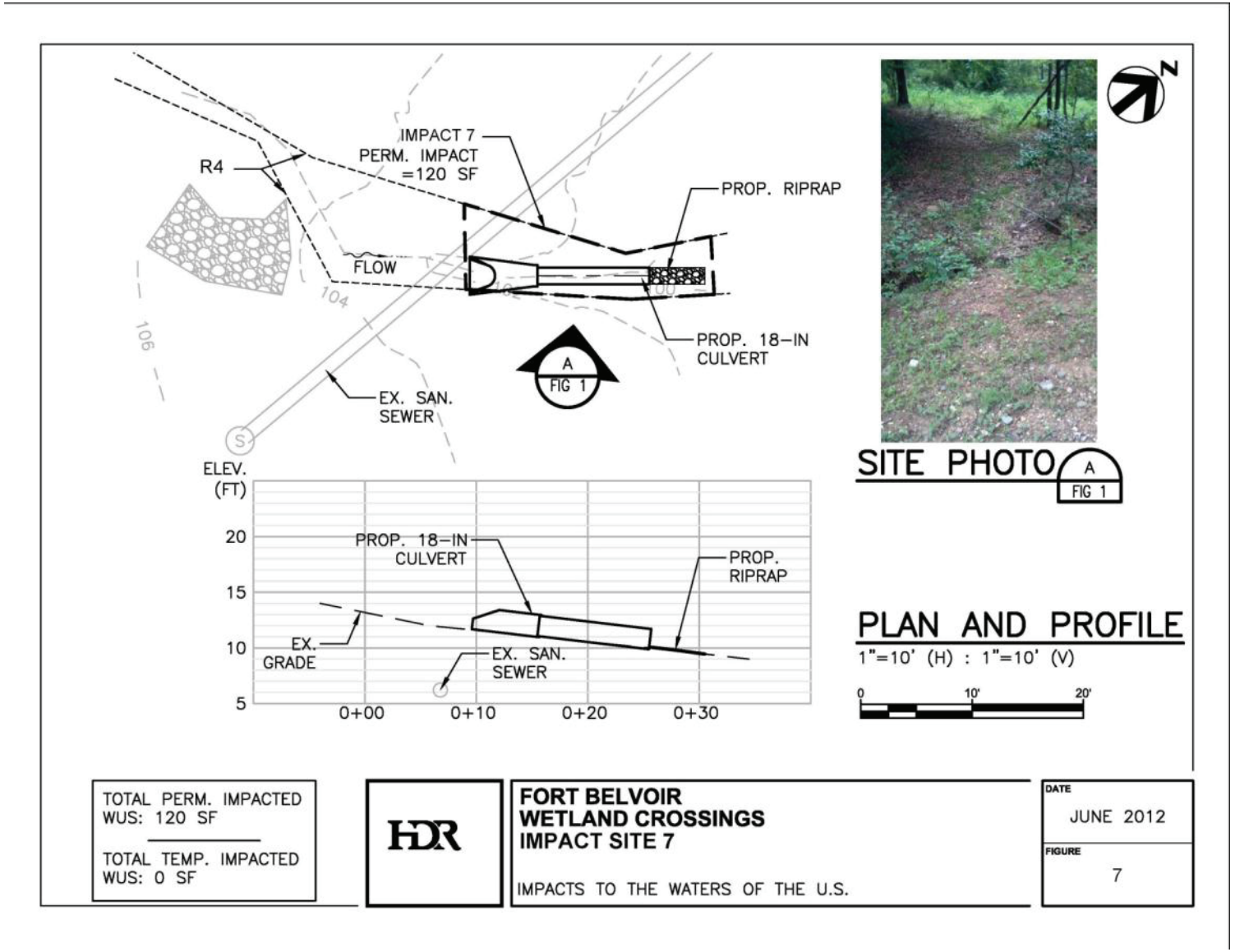


Figure 2-23: Manhole Access Points and ROW Maintenance at Site 7

2.3.1.4 Aerial Stream Crossings

Because of changing natural conditions and historical and ongoing erosion, certain water and wastewater infrastructure have become compromised. As a result, nine sections of water lines and gravity sewer mains that cross above intermittent and perennial streams now require reinstallation below the streambed or structural reinforcement, which may require streambank repair and stabilization to prevent erosion of soil around the concrete piers that support the water and sewer lines (Figure 2-24). Water lines are pressurized and can be replaced by pipes at different elevations; however, gravity sewer mains cannot.

Final designs will be included in the Joint Permit Application at which time the USACE, Virginia Department of Environmental Quality (Virginia DEQ) and Virginia Marine Resources Commission will review the designs and issue a permit to Fort Belvoir. The estimated time to complete construction is approximately 12 months. Additional information about these project sites is presented below. At this time, the information presented is conceptual and final designs will be developed and included with the Joint Permit Application.

Site 1 – Sultan Loop Water

There are no "stream crossings" at this site; instead, pipes run under an existing foot bridge that connects a footpath from the Bachelor Officer's Quarters west parking area to Russell Loop. Nevertheless, this site would require that a new water line be horizontally drilled and installed from the existing parking lot down to the bottom of the streambank slope into the existing concrete structure at the base of the footbridge. In addition, the proposed water line would be covered, and the slope would be re-established and stabilized. The existing water line would be abandoned in place. A vegetated screen would be planted to keep pedestrians from straying off the footpath and to protect the streambank slope from further erosion. This project area is located on a slope that is approximately 100 yards from the stream channel. No stream stabilization would occur on this project site (Figure 2-25).

Site 2 – Jadwin Loop Sanitary and Jadwin Loop Water

At this site, an exposed gravity sanitary main, located upstream of Manhole 4-66, would be replaced with a ductile iron pipe, and Manhole 4-66 would be replaced by a pre-cast manhole prior to stream restoration work. Stream restoration would occur approximately 275 feet upstream and downstream of the gravity sewer main and include raising the streambed grade to 2 to 3 feet above the new pipe. A measure, such as the use of articulated concrete mats, would be installed from the existing stormwater headwall to approximately 80 feet downstream and extend 20 feet past the gravity sewer main to provide protection against future streambank erosion.

Further, a stormwater swale is currently undercutting Manhole 4-65, and a dropstructure would be installed at the southwest headwall above Manhole 4-65 to decrease the velocity of the stormwater. The streambed would be shifted away from Manhole 4-65 and protective measures, including a riprap bank, would be added for future protection.

Finally, an abandoned water pipe is exposed in the stream. For this work, portions of the pipe (potentially spanning approximately 375 feet upstream and downstream of the gravity sewer main) would be removed during stream repair efforts. (Figure 2-26).

Site 3 – MDA Sanitary 1

At this site, a gravity sewer main with existing Manhole 2-01 and an aerial gravity sewer main have become exposed as a result of bank erosion. Consequently, Manhole 2-01 and all associated aerial gravity sewer mains would be replaced with new ductile iron pipes and piers using directional drill technology. The existing lines would be removed. In addition, the existing streambank slope around Manhole 2-01

would be re-established and riprap would be installed to provide protection from future erosion. The south bank repair would be approximately 64 feet in length. The north side of this channel, where the aerial gravity sewer main comes out of the bank to cross the stream, would require 50 linear feet of bank re-establishment. Both of these banks would be stabilized with rock at the bottom and the re-established slope would be planted with vegetation to provide further bank stabilization.

Additionally, a downstream section of 12-inch gravity sewer main from Manhole 10-24 is exposed and previous repairs have been unsuccessful. Consequently, the pipe would be replaced with ductile iron pipe, the existing pipe would be removed, the streambed in this area would be raised, and a protection measure, such as the use of articulated concrete mats, would be employed to provide stabilization. This same gravity sewer main section also crosses (an aerial crossing) another drainage swale to the east. Three abandoned piers would be removed from the swale.

Furthermore, the stream bank in this area is severely downcut, having 8-foot-tall banks, and would be restored; however, the gravity sewer main would remain as an aerial crossing and the existing piers also would remain. A protection measure, such as the use of articulated concrete mats, would be employed to stabilize the area directly around the gravity sewer main. As a result of the current repairs, three large trees on the slope would be removed (Figure 2-27).

Site 4 – Gillespie Water

At this site, two exposed water lines cross a drainage ditch on the north side of Gillespie Road. One of the water lines would be abandoned, and the other would be replaced using horizontally drill technology. Stream repair efforts would include protective measures, such as the use of articulated concrete mats, to provide future protection for the new water pipe that would be drilled under the stream and to prevent any future/additional downcutting of the stream. (Figure 2-28).

Site 5 – Dogue Creek Sanitary 1 and 2

At Dogue Creek Sanitary 1, the upstream gravity sewer main crossing has been previously replaced with ductile iron pipe, but the site would be further secured through stream restoration. Stream restoration would involve raising the streambed and employing protective measures, such as the use of concrete mats, to help prevent future erosion. No other restoration efforts would be required.

At Dogue Creek Sanitary 2, the downstream gravity sewer main crossing has already been replaced with ductile iron. Nevertheless, protective measures, such as articulated concrete mats, would be used to protect and to help prevent future erosion (Figure 2-29).

Site 6 – Dogue Creek Sanitary 3

Dogue Creek Sanitary 3 consists of two 6-inch gravity sewer main aerial crossings that would be secured by raising the streambed to provide cover for the exposed pipes. Protective measures, such as the use of articulated concrete matts, would be added for protection and stabilization of the banks. Bank protection would also be installed at the downstream sewer main crossing. At the northernmost sewer main crossing, the streambed would be raised approximately 3 feet to cover the existing pipe (Figure 2-30).

Figure 2-24: Proposed Sites of Aerial Stream Crossings and Streambank Repair

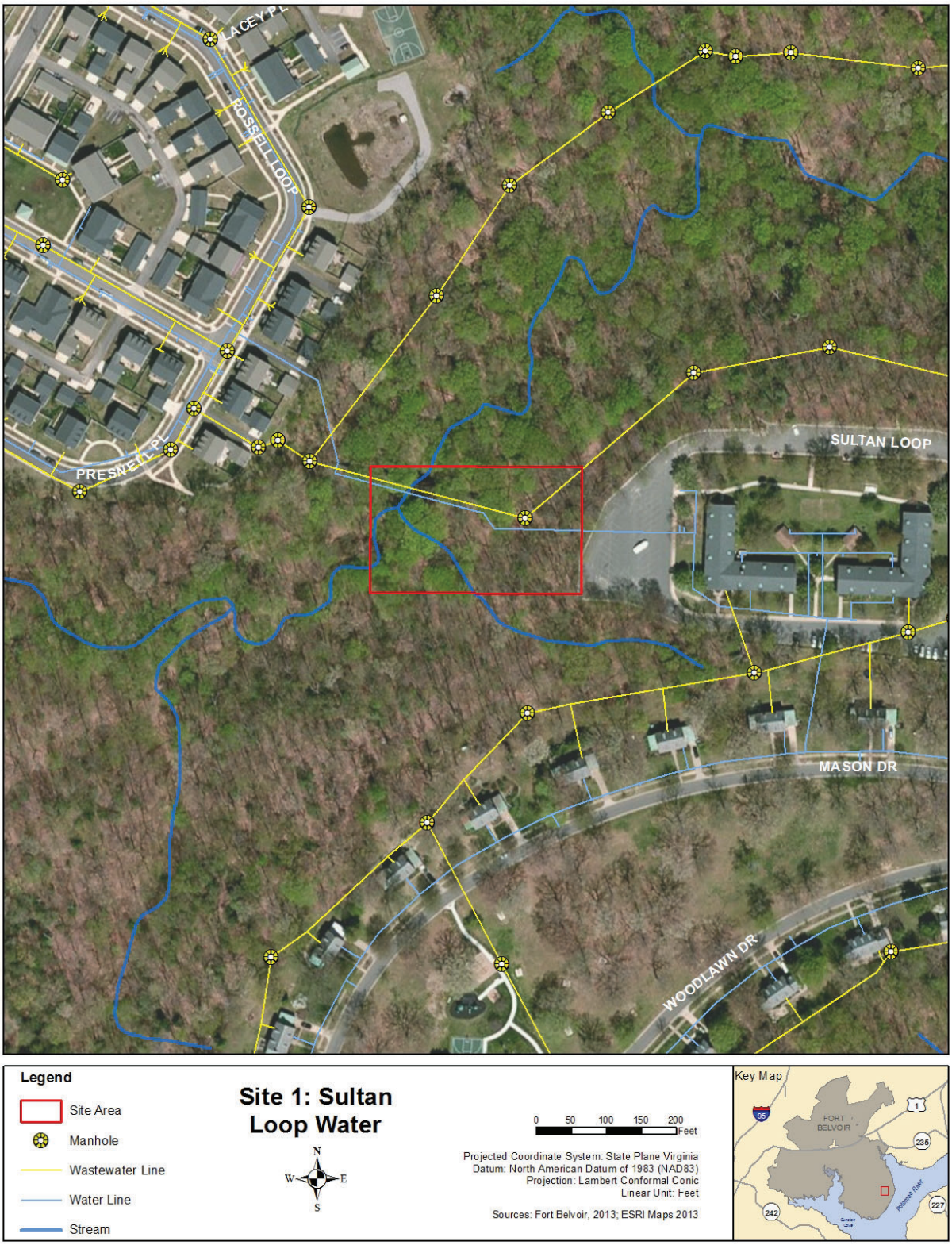


Figure 2-25: Site 1: Sultan Loop Water

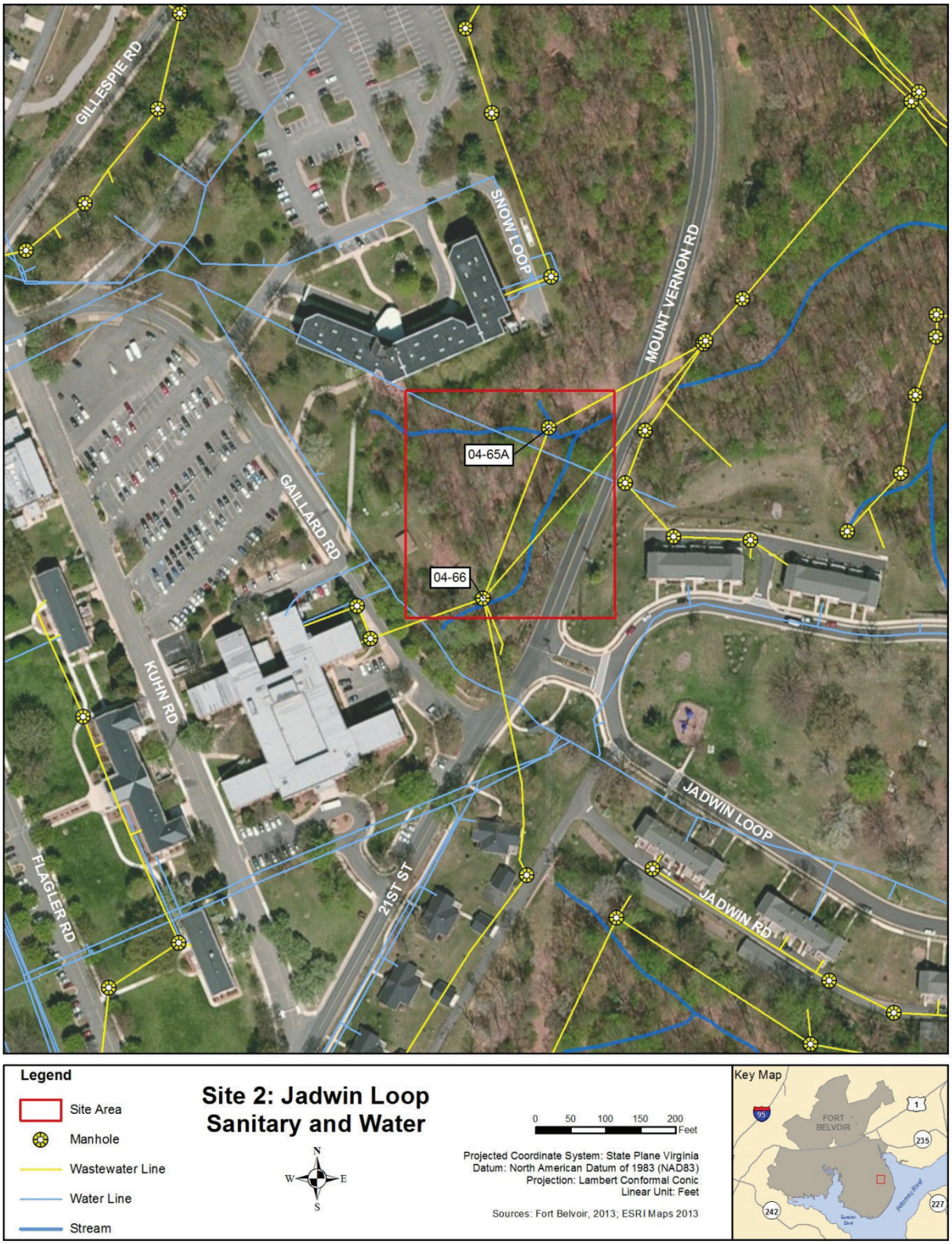


Figure 2-26: Site 2: Jadwin Loop Sanitary and Water

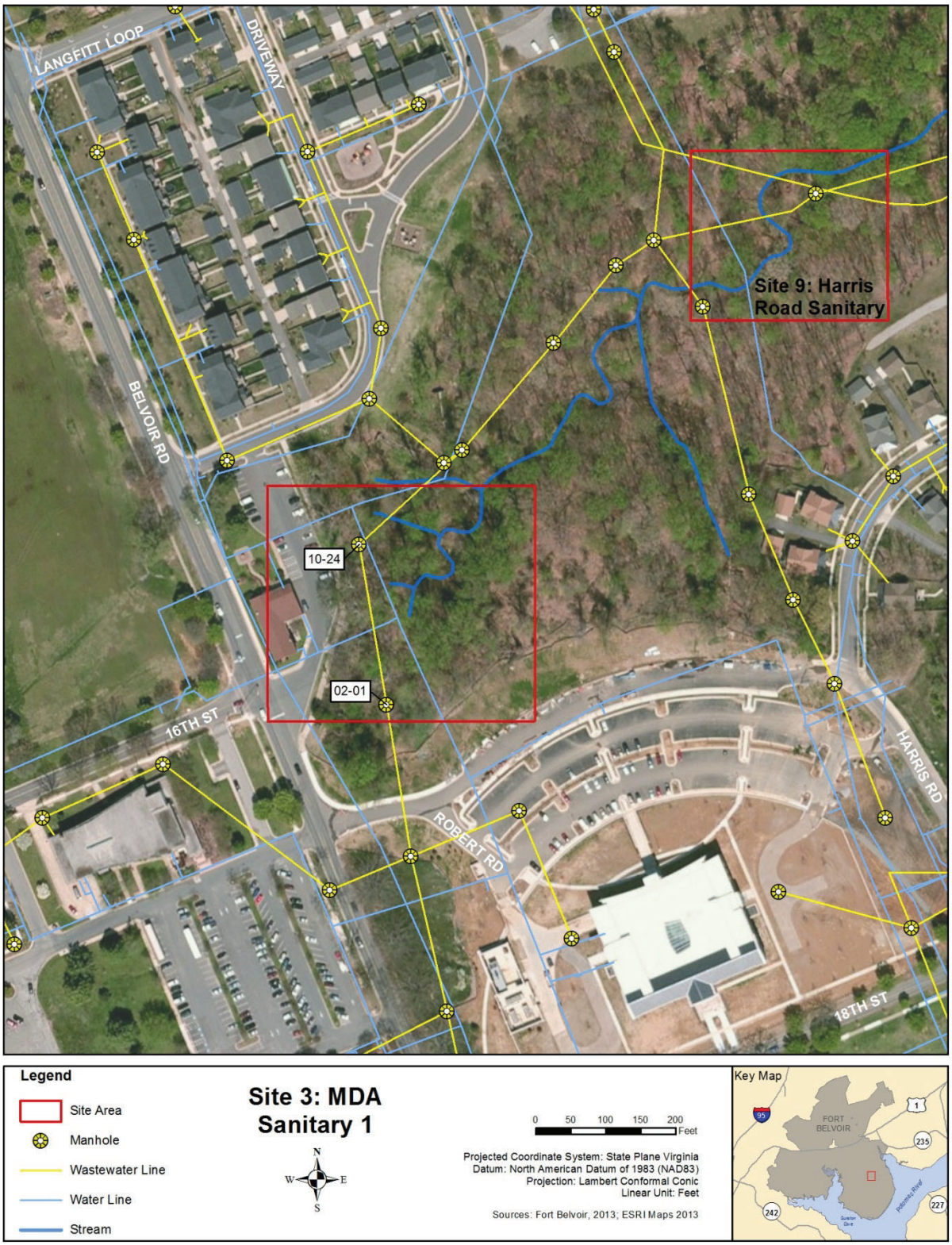


Figure 2-27: Site 3: MDA Sanitary 1

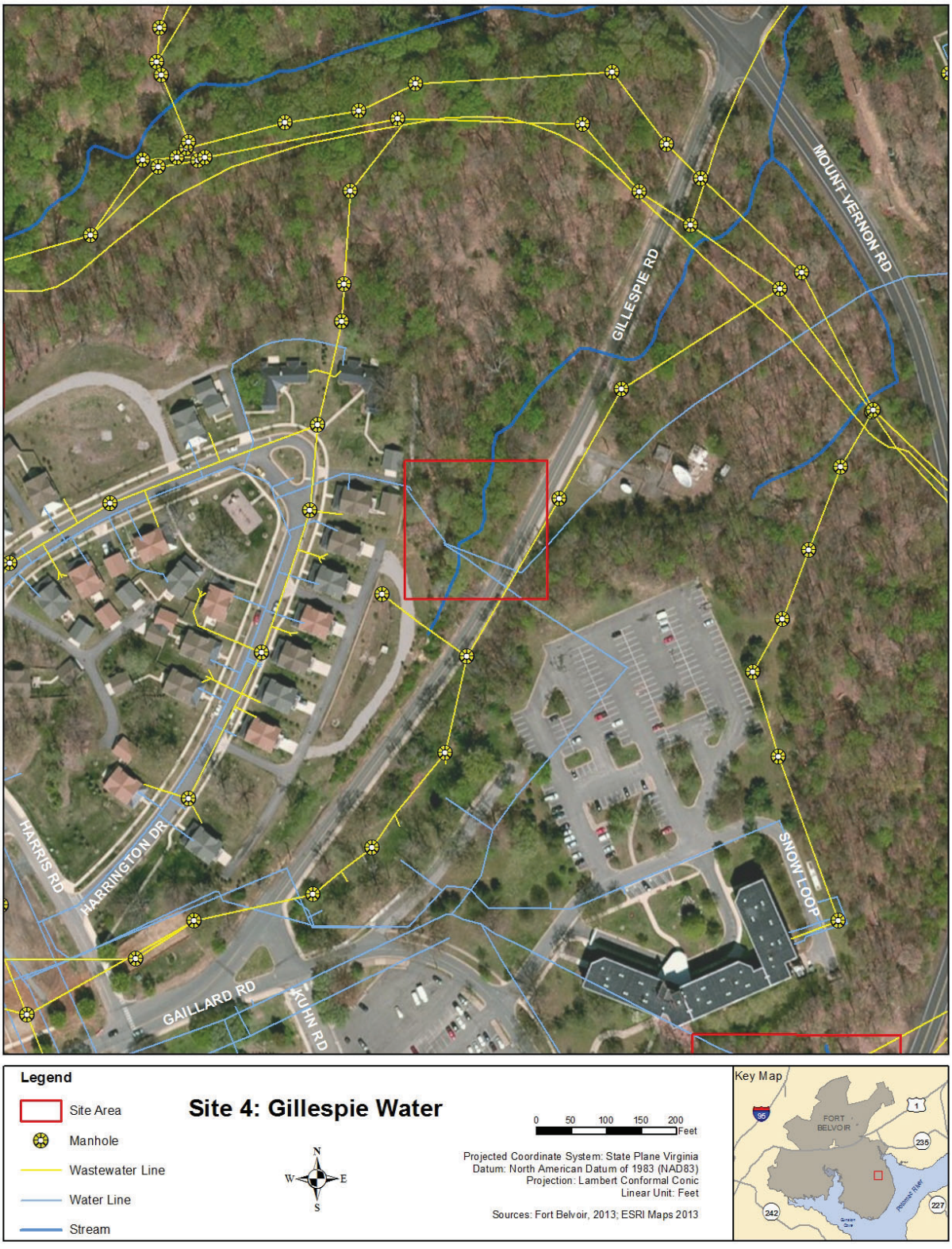


Figure 2-28: Site 4: Gillespie Water

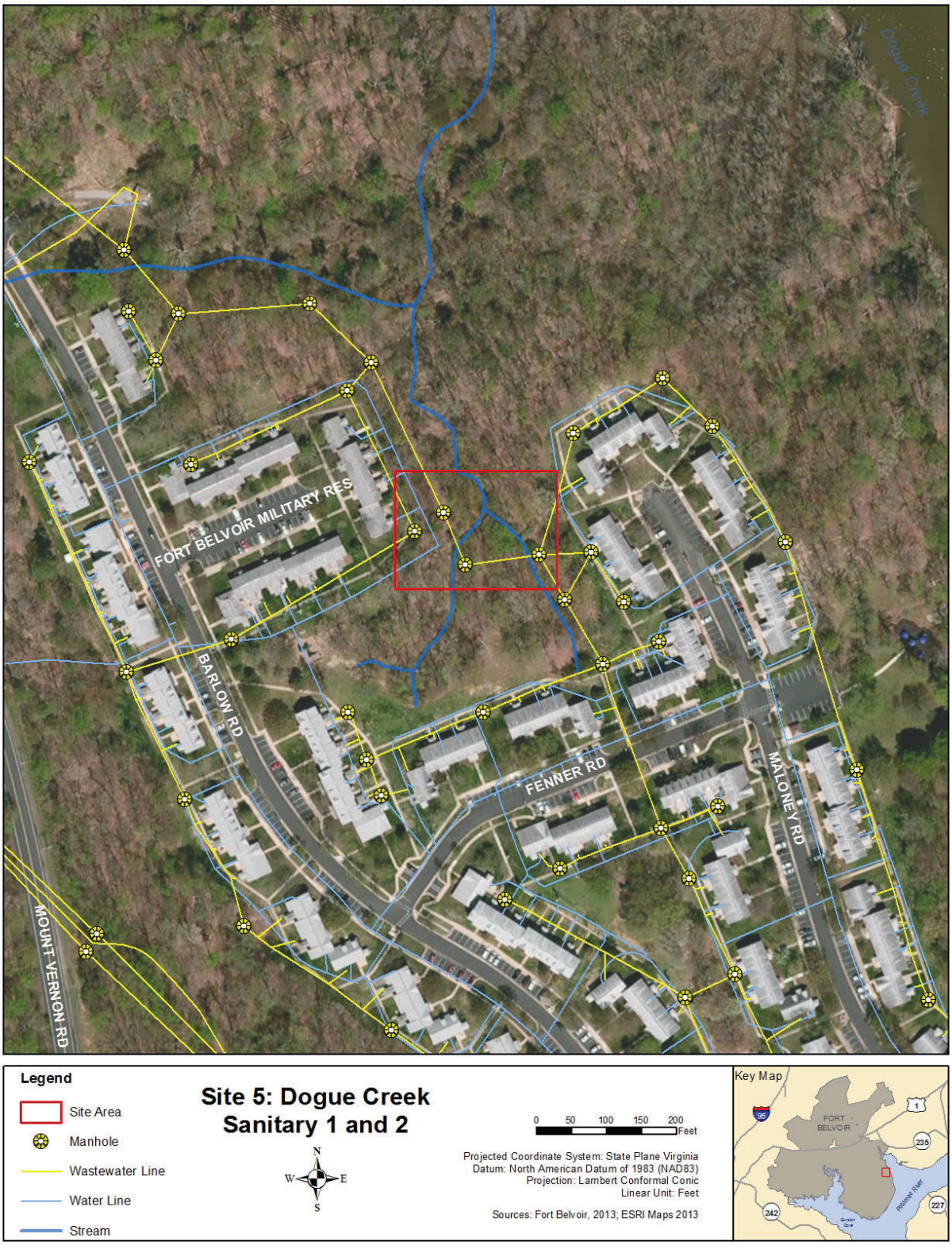


Figure 2-29: Site 5: Dogue Creek Sanitary 1 and 2

Figure 2-30: Site 6: Dogue Creek Sanitary 3

Site 7 – Hurley Sanitary

Two gravity sewer mains, one concrete encased and one in wrapped steel, at this location would be replaced and secured. The concrete-encased pipe would be abandoned and the existing aqueduct and all piers would be removed. The wrapped-steel pipe would be retained, and the stream channel would be relocated away from Hurley Road to protect the piers supporting it. The streambed would be re-established along with the bank next to Hurley Road.

The new stream channel would be protected through approximately 169 feet of stone bank stabilization on the Hurley Road side and approximately 86 feet of stone bank stabilization on the opposite bank. The sides of the stream channel would connect to a stone grade control structure to prevent any future head cuts in this area. All of the larger stones/boulders that are currently in the stream would be reused to establish the bottom of the relocated streambed. The upper portion of the stream would include siltation pools that would include plantings to provide stabilization. The portion just above the pipe would include live dikes composed of native vegetative plantings to stabilize the slopes (Figure 2-31).

Site 8 – Colyer Village

Two gravity sewer main crossings exist at this site, one 15-inch pipe that would be removed and one18-inch pipe that would be secured. The 15-inch pipe and associated piers would be abandoned and removed. The stream channel would be shifted into a central position between the piers of the 18-inch pipe. The stream channel would be raised approximately 1 foot and one of the piers would be relocated. Stream stabilization and bank protection would be installed in the area where the stream passes through the remaining piers. Approximately 150 feet of stream would be restored.

Rock bank protection and native vegetative plantings would be used from 15 feet above the existing pipe to 15 feet down stream of the last plunge pool. A protective method, such as engineered rock riffle, would be installed to drop the grade of the stream to a plunge pool. An additional engineered rock riffle and plunge pool would be installed to restore the stream to existing grade and prevent any future head cut in this location (Figure 2-32).

Site 9 – Harris Road Sanitary

This site includes two exposed gravity sewer main crossings, including one 20-inch force main that would be repaired and one 12-inch main encased in a concrete aqueduct structure that would be replaced. The 20-inch force main crosses the smaller 12-inch gravity sewer main supported by concrete stockades, which constrict the stream channel. Stream repair would involve removing the stockades, widening the streambed, and reconstructing the streambanks. In addition, pier supports for the 20-inch force main would be repaired because the existing streambank has eroded toward the piers. Stockades would be removed and the gravity sewer main would be replaced with a section of ductile iron pipe.

The lower portion of the site would require restoration of the streambank upstream and downstream of the aqueduct, including the possible replacement of the existing concrete ditch between the piers of the aqueduct. The stream channel would be shifted away from the eroded hill side. The hill side would be rebuilt using point bar material. Rock bank protection would then be installed to prevent future erosion of the bank with a series of live dikes planted with vegetation. Live dikes also would be installed running uphill (perpendicular) to the stream channel to prevent future storm surges from eroding the hill side. No pipe repairs are anticipated at this site (Figure 2-33).

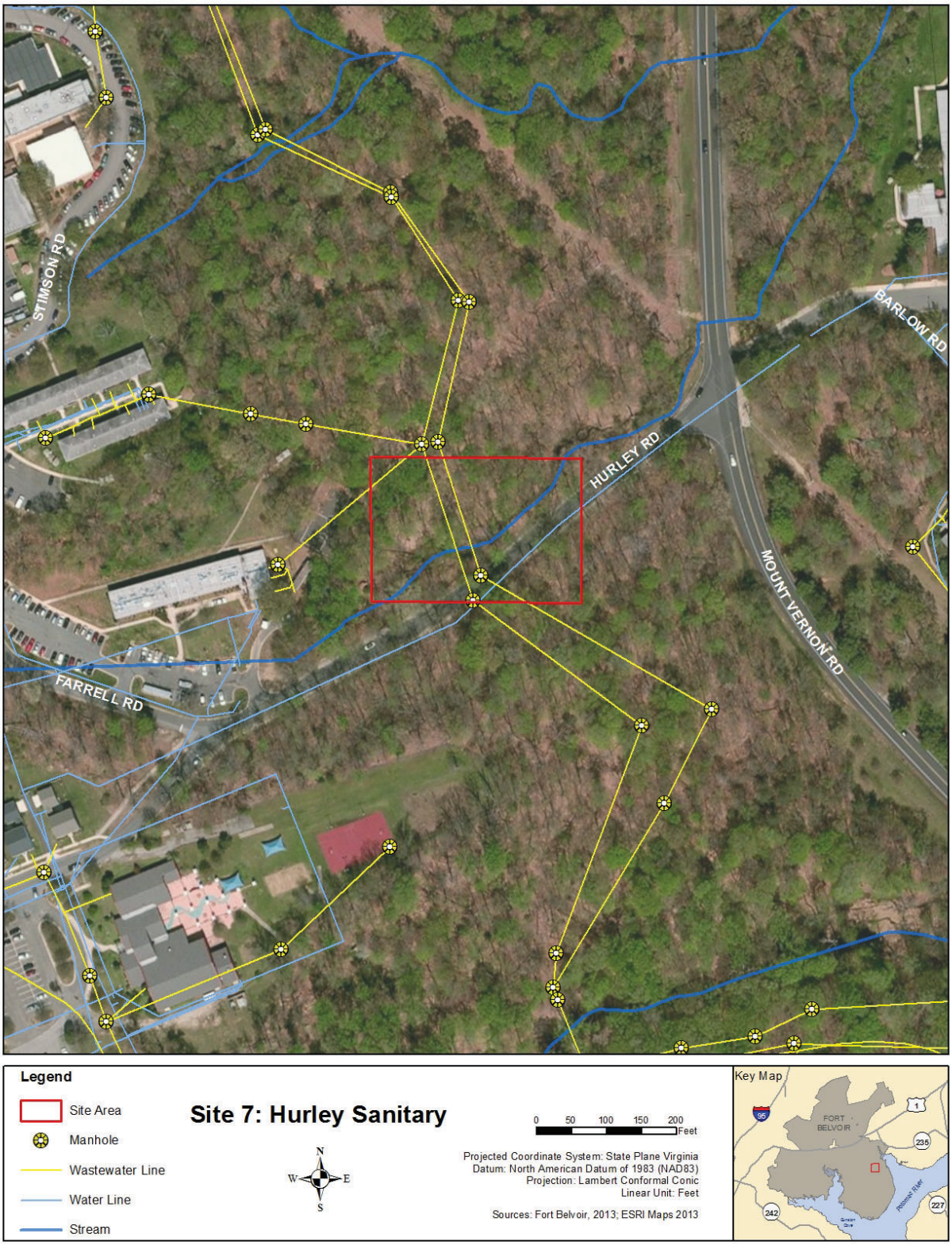


Figure 2-31: Site 7: Hurley Sanitary

Figure 2-32: Site 8: Colyer Village

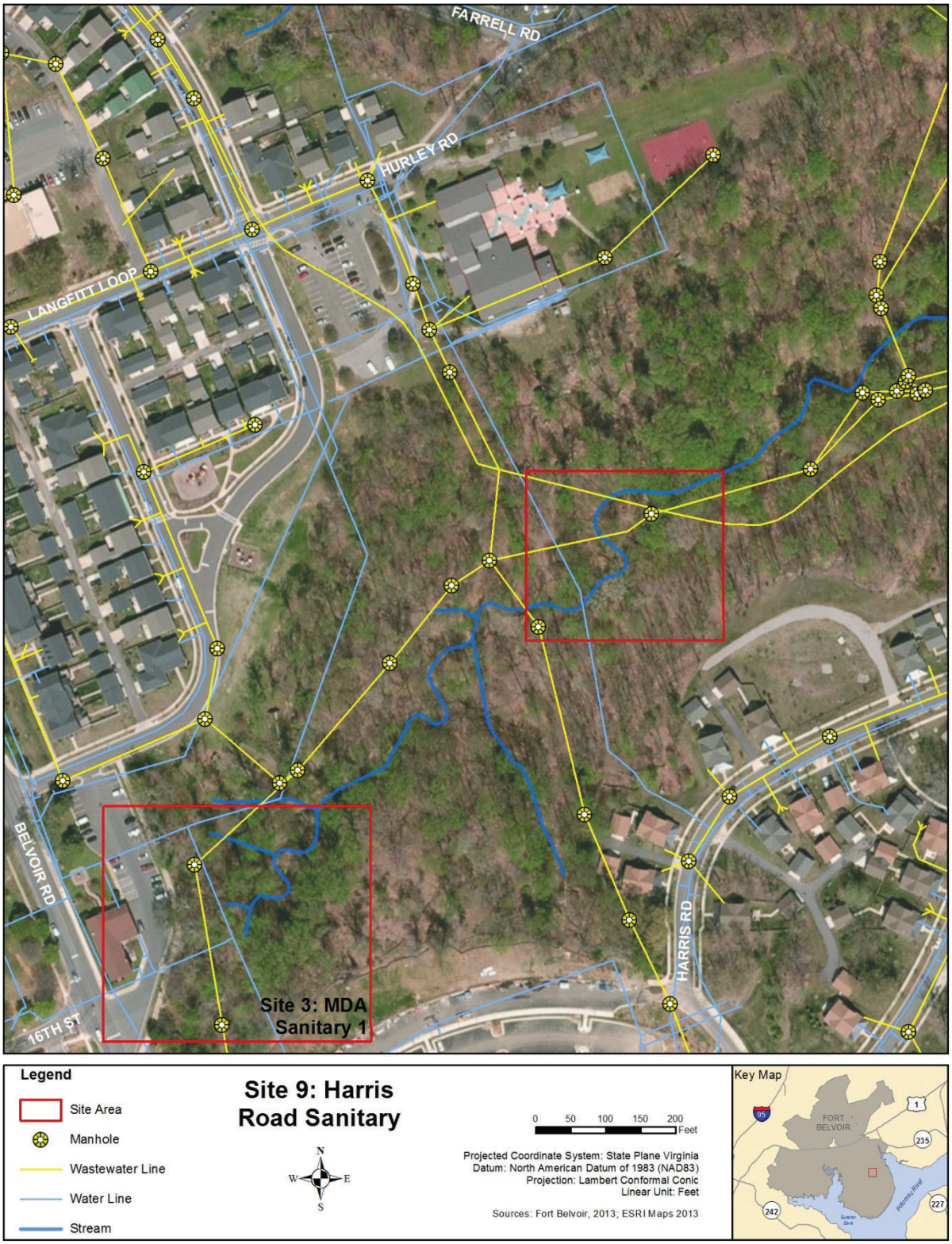


Figure 2-33: Site 9: Harris Road Sanitary

2.3.1.5 2012 ASDC — R&R and FSDC Projects

Fort Belvoir prepares an annual ASDC report that details its proposed capital upgrades and major renewals and replacements of the water and wastewater utility system for the next five years. Four projects, currently in the conceptual stages and planned to occur between FY13 and FY17, are analyzed in this EA. All of the projects under the ASDC are listed in Table 2-1 and shown in Figure 2-34. Site plans for the four projects (one R&R and three FSDC projects) detailed in the ASDC and analyzed in this EA are illustrated below (Figures 2-34 through 2-38).

Several projects identified in the 2012 ASDC have already been analyzed under separate NEPA documentation or were eligible for Categorical Exclusion under the provisions of 32 CFR Part 651, Appendix B, Section II, and documented under a Record of Environmental Consideration. Projects that are not analyzed within this EA or have not been previously covered under separate NEPA documentation will be evaluated under separate NEPA documentation when project information is available. Additional NEPA documentation, such as a Supplemental EA, may also be necessary for the FY13 to FY17 projects analyzed within this EA if unforeseen impacts come to light as the projects move forward into the design and construction phases.

Table 2.1: R&R and FSDC Projects from the 2012 ASDC

Project	Description	Project Type
Meade Road water main replacement (Figure 2-35)	Replace approximately 3,138 linear feet of 6-inch pre-1960 water main along with approximately 750 linear feet of pre-1960 water service lines. Replacing the water mains would employ a conventional open trench method.	R&R
Woodlawn Village water and sewer system improvements, Phase 1, 2, and 3 (Figure 2-36)	The Woodlawn Village Water and Sewer Improvement project would consist of raising and increasing the slope of the sanitary sewer system to reduce sewer backups and the replacement of the existing substandard water main material to reduce the frequency of water main breaks. Phase 1 would consist of approximately 4,460 linear feet of 8-inch DIP water main and 4,270 linear feet of 8-inch SDR 26 sewer main. This project would also include the replacement of the individual building water and sewer service connections up to 5 feet from the building. Phase 2 would consist of approximately 3,200 linear feet of 8-inch DIP water main and 2,300 linear feet of 8-inch, 10-inch, and 12-inch SDR 26 sewer main. Phase 3 would consist of approximately 5,100 linear feet of 8-inch and 10-inch DIP water main and 5,700 linear feet of 8-inch and 10-inch SDR 26 sewer main. Replacing the water and sewer mains would employ a conventional open trench method.	FSDC

Project	Description	Project Type
Rediversion of force main discharge (Figure 2-37)	This project would involve the installation of an additional 2,675 linear feet of 6-inch water force main to divert flow from Lift Station 1575 away from Lift Station 97 to new Hospital Lift Station. Installing the sewer mains would employ a conventional open trench method.	FSDC
New access to Lift Station 584 (Figure 2-38)	This project would involve constructing a new access road and bridge over a stream to Lift Station 584.	FSDC

Source: USAG Fort Belvoir (2012)

Note: DIP – ductile iron pipe, SDR – standard dimension ratio

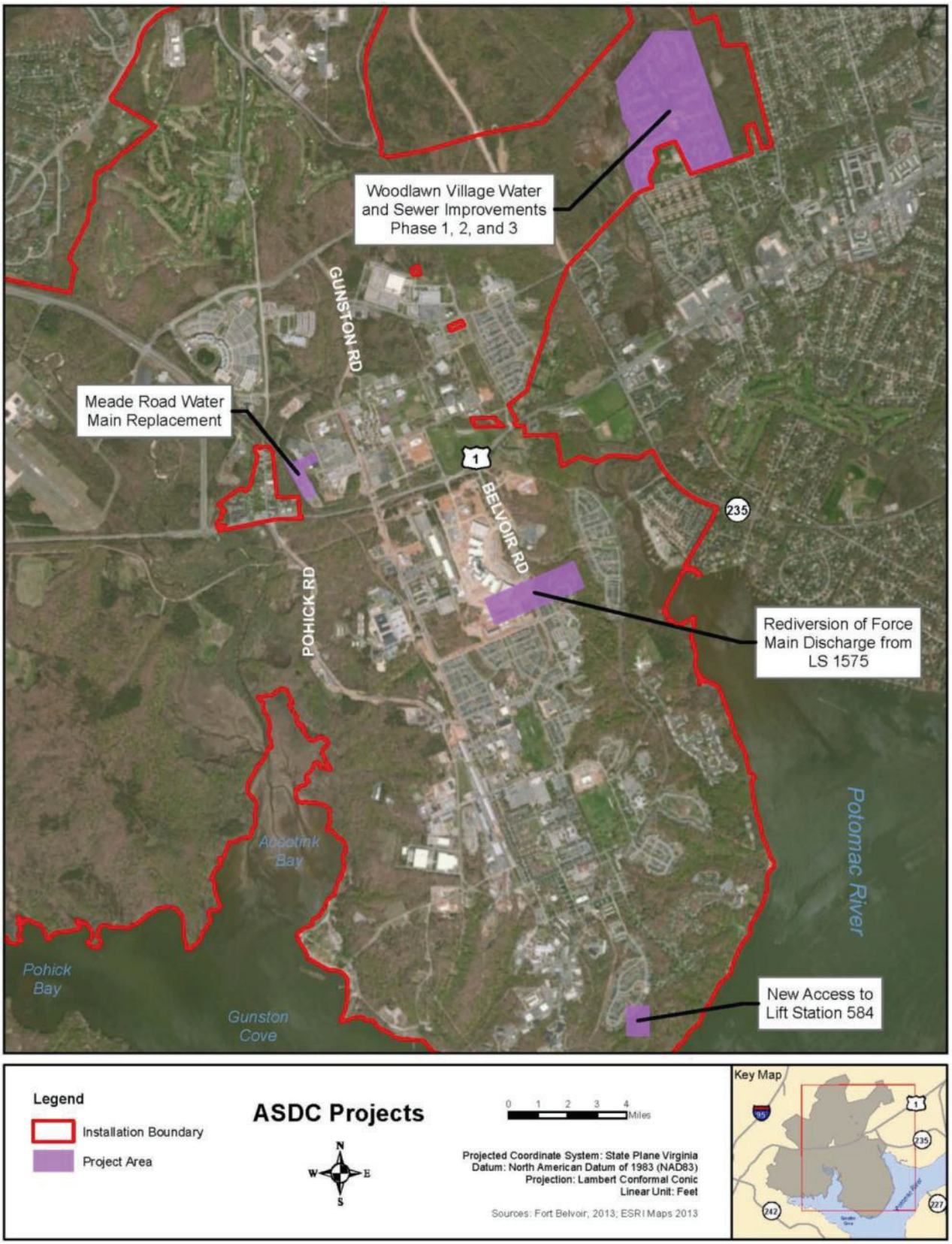


Figure 2-34: Overview of Additional R&R and FSDC Projects

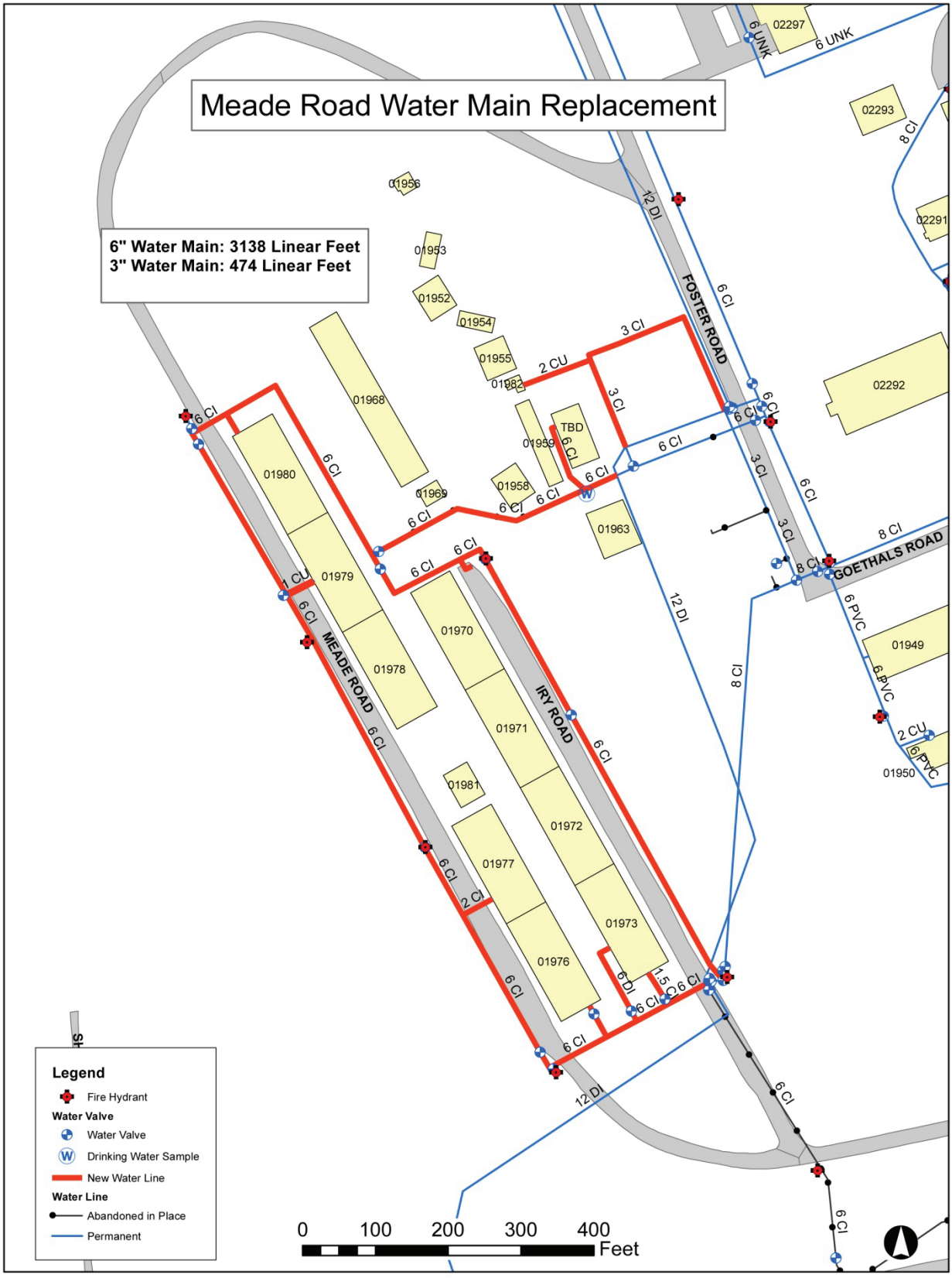


Figure 2-35: Meade Road Water Main Replacement Site Plan

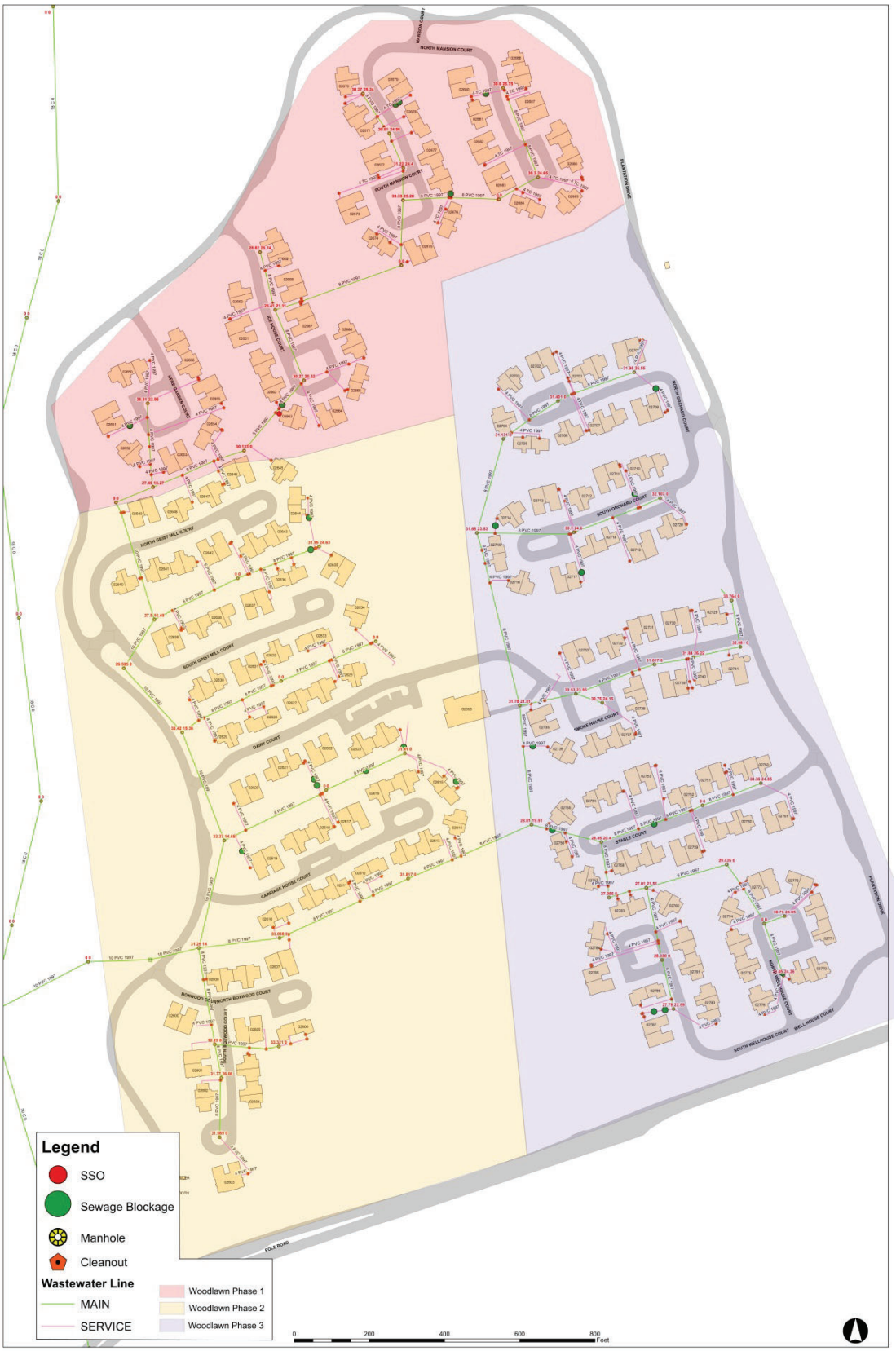


Figure 2-36: Woodlawn Village Water and Sewer System Improvements Site Plan

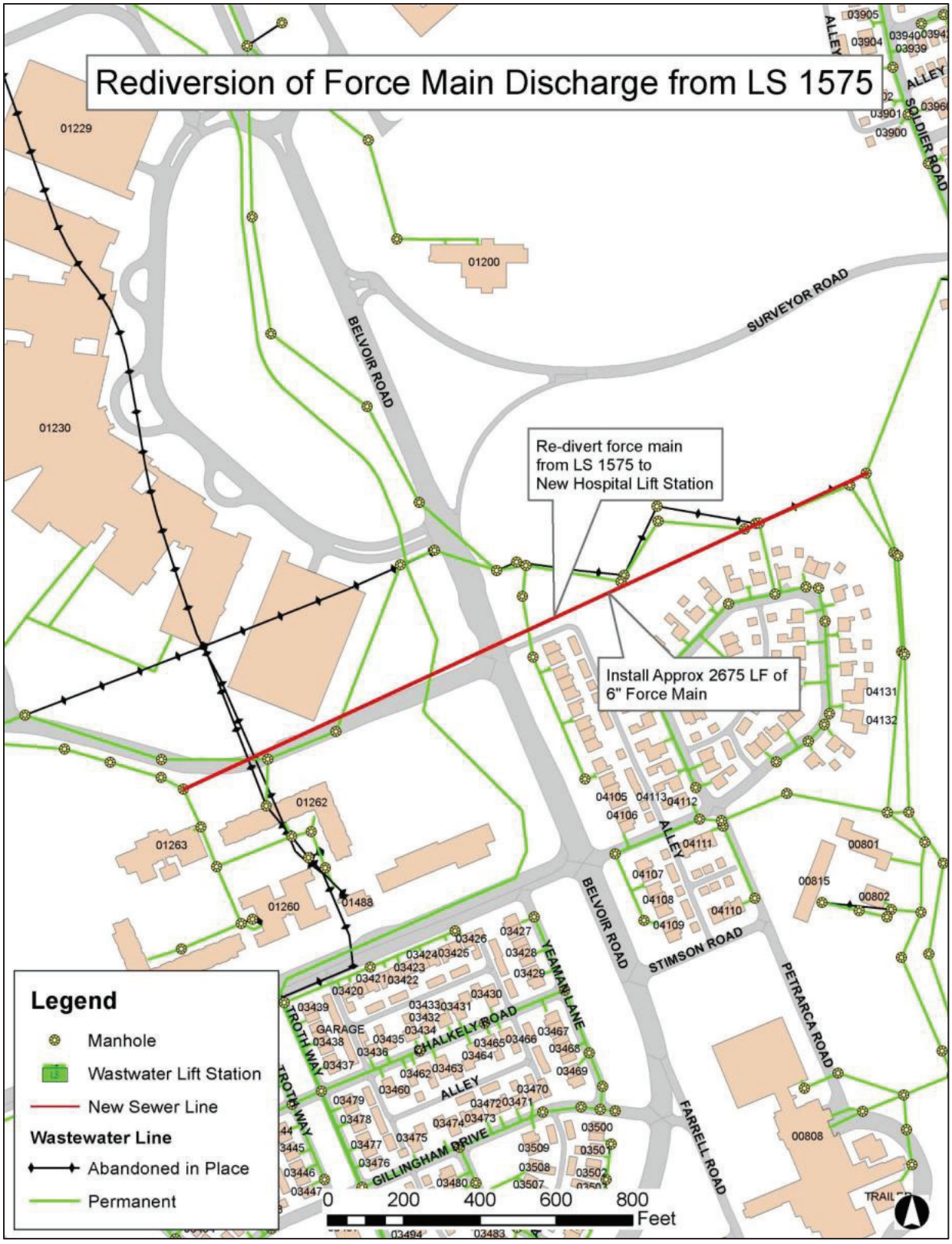


Figure 2-37: Rediversion of Force Main Discharge from Lift Station 1575 Site Plan

Figure 2-38: New Access to Lift Station Site Plan

2.3.2 Alternatives Considered but Dismissed

One additional alternative was considered for replacing the water storage tanks. No additional alternatives were considered for replacing force mains, constructing gravity sewer main maintenance access, reinstalling aerial stream crossings with streambank repair/stabilization, and the 2012 ASDC projects.

Fort Belvoir requested that American Water conduct an engineering analysis of the water distribution system to determine if two water storage tanks would adequately serve the Fort Belvoir water system (USAG Fort Belvoir 2012). The two tank alternative examined the effects on delivery of fire flows, peak and average day water demands, and ability of the water system to support mission critical facilities on the installation. In addition to hydraulic effects, American Water considered operational impacts related to routine maintenance and periodic maintenance, including removal of a tank from service for inspection and painting. Analyses showed that the two tank alternative, compared to a three tank alternative, would have negative impacts, such as:

- The available fire flow on the installation would be reduced by 6.5 percent.
- Available fire flow is significantly reduced to the family housing areas.
- The two-tank alternative would not provide the needed water storage volume to support the Fort Belvoir Community Hospital and the needs of other critical users.

As a result, the engineering analysis concluded that the two tank alternative would not support Fort Belvoir's mission. Consequently, this alternative for tank replacement was eliminated from further analysis.

2.3.3 No Action Alternative

The No Action Alternative would maintain the status quo. Under the No Action Alternative, the proposed projects to upgrade the water and wastewater utility system at Fort Belvoir would not occur, and Fort Belvoir would not be able to satisfy its mission to provide reliable and compliant water and wastewater services to its tenants.

Under this alternative, the existing water storage tanks would not be replaced and capacity would remain inadequate to support the future needs of the installation; aging sanitary sewer force mains would not be replaced and the potential for possible discharges to the environment would continue; annual inspections of sewer lines via existing manholes would continue to be conducted via temporary routes; erosion would continue to affect the integrity of water and gravity sewer lines that cross above perennial streams and the concrete piers that support the lines; and proposed capital upgrades and major renewals and replacements of the water and wastewater utility system would not occur. As a result, the No Action Alternative represents no changes to the aging infrastructure and the continuation of the existing operations and maintenance of the water and wastewater infrastructure at Fort Belvoir and does not meet the purpose and need for the Proposed Action. Nevertheless, the No Action Alternative has been retained for full analysis as required by CEQ guidance because it performs the important function of serving as an environmental baseline against which the environmental consequences of other alternatives are measured.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

This section describes the current environmental conditions of the areas that would be affected if the Proposed Action be implemented and the analysis of potential effects arising from the implementation of the Proposed Action.

3.1 Resources Not Evaluated in this Environmental Assessment

To the extent possible, analyses of the various resources presented in this environmental assessment (EA) are streamlined based on the anticipated level of potential impact. The focus of this EA is on the potential environmental impacts associated with the proposed projects to upgrade the United States (U.S.) Army Garrison Fort Belvoir's (Fort Belvoir's) water and wastewater utility system. Consistent with 40 Code of Federal Regulations (CFR) Part 1501.7(a)(3), the following resource areas are not analyzed in this EA because the Proposed Action either has no potential to affect them or the potential impacts would be negligible:

- **Noise—**The Noise Control Act of 1972 (Public Law 92-574) directs federal agencies to comply with applicable federal, state, interstate, and local noise control regulations. Fairfax County Code prohibits creating sounds louder than 55 decibels (dB) in a residential area and 60 dB in a commercial area. It also prohibits creating any excessive noise on any street adjacent to any school, institution of learning, court, or hospital that interferes with its function (Fairfax County Code Section 108-4-1). Construction and demolition activities are, however, exempt from the Fairfax County ordinance if they occur between 7:00 a.m. and 9:00 p.m. Construction and demolition activities under the Proposed Action would require using heavy machinery and equipment that would generate short-term increases in noise at construction sites within Fort Belvoir. However, construction would be performed during the noted hours and would comply with all noise ordinances and regulations; therefore, impacts would be negligible. Long-term operation of the water and wastewater utility system would not impact the noise environment at Fort Belvoir, so noise impacts are not analyzed in this EA.

- **Geology and Topography**—The natural geologic character and the general topography of the installation would not be impacted under the Proposed Action, including reinstallation of aerial stream crossings and their associated streambank repairs. As a result, impacts to geology and topography are not analyzed in this EA.

- **Land Use—**In 2007 in response to the 2005 Base Realignment and Closure actions, the United States (U.S.) Department of the Army (Army) updated and amended the land use plan in Fort Belvoir's 1993 Real Property Master Plan. The *Final Environmental Impact Statement (FEIS) for Implementation of the 2005 Base Realignment and Closure Recommendations and Related Army Actions at Fort Belvoir, Virginia* addressed the adoption of the amended land use plan was well as the Base Realignment and Closure realignment actions at Fort Belvoir (USACE 2007). Currently, the Army is in the process of preparing an update of Fort Belvoir's Real Property Master Plan to address future growth on the installation through 2030. Implementation of the Proposed Action would not impact current or future land use because implementation of water and wastewater utility infrastructure upgrades would not change land use designations on Fort Belvoir.

  Additionally, the National Capital Planning Commission (NCPC) provides planning guidance for federal land and building in the National Capital Region through its document, *Comprehensive Plan for the National Capital: Federal Elements* (NCPC 2004). NCPC will be afforded the opportunity to review this EA; assess the Proposed Action's compatibility with federal planning

goals, guidelines, and initiatives; and provide comments before a decision is made on the final action. As a result, impacts to land use are not analyzed in this EA.

- **Socioeconomics, including community services and facilities**—The Proposed Action to upgrade the water and wastewater utility infrastructure would not result in changes to population, demographics, income, community services and facilities, or housing. Personnel hired for construction and maintenance activities are unlikely to change their place of residence. Additionally, the Proposed Action would result in only temporary and negligible additive impacts to the local economy from the proposed upgrade projects. As a result, socioeconomics are not analyzed in this EA.

- **Environmental Justice**—Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations,* directs agencies to address environmental and human health conditions in minority and low-income communities to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. Local residents may include low-income populations, but these populations would not be particularly or disproportionately affected by the demolition and construction activities, and as a result, this impact topic is not analyzed further. The proposed water and wastewater utility infrastructure upgrades would not disproportionally affect minority populations or low-income communities; consequently, Environmental Justice is not analyzed in this EA.

- **Hazardous Materials and Wastes**—Fort Belvoir conducts its hazardous waste management program in compliance with the Resource Conservation and Recovery Act. The installation has a Hazardous Waste Management/Waste Minimization Plan and a Master Spill Plan. Fort Belvoir complies with EO 13423, *Strengthening Federal Environmental, Energy and Transportation Management* by promoting the use of products to reduce solid and hazardous waste. In addition, the cleaning and maintenance departments have replaced toxic and hazardous materials with environmentally friendly chemicals and adhere to an Integrated Pest Management Plan. Fort Belvoir, Environmental and Natural Resources Division (ENRD), also files annual hazardous material and toxic chemical reports in compliance with the Emergency Planning and Community Right-to-Know Act.

  With regard to activities conducted by the utility privatization partner, American Operations and Maintenance, Inc. (American Water), Fort Belvoir ENRD staff reviews all project plans and identifies where areas of petroleum contamination, Solid Waste Management Units, or other hazardous materials may be encountered. Appropriate measures can then be taken by project staff, such as rerouting pipe to avoid contamination, incorporating bentonite plugs in trenches to limit migration of pollutants, and measures to ensure worker safety. A standard provision applies to all excavation work on Fort Belvoir: "If soil staining, odor, or obvious contamination (free product) is unexpectedly encountered during excavation, work shall cease immediately and the Fort Belvoir ENRD will be contacted and will provide further instruction." Further actions could include sampling, stockpiling of soil, and preparation of a worker health and safety plan prior to continuing work. All hazardous materials would be handled and stored according to Army regulations and all applicable federal, state, and local laws and regulations. All hazardous wastes would be disposed of at permitted treatment, storage, and disposal facilities in compliance with all applicable regulations. As a result, hazardous materials and wastes are not analyzed in this EA.

- **Traffic and Transportation—**Implementation of the Proposed Action would require the use of construction vehicles to remove approximately 290 tons of demolition debris from the water storage tanks and to bring in construction materials. It would also require the use of privately owned vehicles to bring the construction crew onto the installation. Even with the potential overlap in project schedules of the various water and wastewater infrastructure upgrade projects,

it is expected that a maximum of 12 new vehicles would be added to the intersections serving Fort Belvoir during the a.m. and p.m. peak hours. This translates to one new vehicle for every five minutes during the peak hours, which would be a negligible impact to the existing traffic patterns. As a result, transportation is not analyzed in this EA.

3.2 Soils

3.2.1 Affected Environment

The study area for soils includes the areas within the construction boundaries of the proposed projects for water tank replacement, force main replacement, gravity sewer main maintenance, aerial stream crossings, and the four Annual System Deficiency Corrections, Upgrades and Renewal & Replacement (ASDC) projects. Overall, soils throughout the majority of Fort Belvoir, particularly on the peninsula and in the locations of the Proposed Action, are on steep slopes and are moderate to highly erodible. With the exception of the tank replacements, all of the projects are located on sloped areas with moderate to highly erodible soils.

To help estimate a soils potential for erosion, a K-factor is used. The K-factor is a soil erodibility factor, which represents both susceptibility of undisturbed soil to erosion and the rate of runoff as measured under the standard unit plot condition. K-factors range from 0.02 to 0.69 with a higher value having more susceptibility to erosion. Soils high in clay have low K-factors, about 0.05 to 0.15, because they are resistant to detachment. Coarsely textured soils, such as sandy soils, have low K-factors, about 0.05 to 0.2, because of low runoff even though these soils are easily detached. Medium textured soils, such as the silt loam soils, have a moderate K-factors, about 0.25 to 0.4, because they are moderately susceptible to detachment and they produce moderate runoff. Soils having high silt content are the most erodible of all soils because they are easily detached, tend to crust, and produce high rates of runoff. K-factors for soils with high silt content tend to be greater than 0.4. For soil types occurring within the project areas, the K-factor is listed below by specific project (IWR 2010).

3.2.1.1 Water Storage Tanks

The proposed water storage tank replacements are all located in areas that are classified by the U.S. Department of Agriculture as urban land (NRCS 2013) (Figure 3-1). This classification refers to areas where soil has been previously disturbed and the project area now consists almost entirely of human-made surfaces, such as pavement or concrete, or grass and landscape vegetation. Soils classified as urban land are not given a K-factor because the soils are disturbed and the project areas for the water tanks and its replacement are relatively flat.

3.2.1.2 Force Main Replacement

Soil units located within the force main replacement project areas by prominence include: Sassafras-Marumsco Complex 7 to 45 percent slopes; urban land; Mattapex loam 0 to 2 percent slopes; and Codorus and Hatboro 0 to 2 percent slopes (Figure 3-2). The Sassafras-Marumsco Complex is located along coasts and occurs in each of the force main replacement areas, except the segment between LS 1575-1695, which occurs over urban land and the Mattapex soil unit, and the segment between LS 606-06-64, which occurs on urban land. Part of the segment between LS 687-7350 occurs on the Codorus and Hatboro soil unit.

The Sassafras-Marumsco Complex is typically located on steeper slopes and separate higher and lower elevations in the coastal plain. This soil type tends to be highly variable, moderately to moderately well drained, very deep, with a low flooding potential and a slight susceptibility to water erosion and slightly higher comparable susceptibility to wind erosion. The Mattapex soil unit is moderately well drained and very deep, with low flooding potential and a slightly higher susceptibility to water erosion and a slightly lower susceptibility to wind erosion when compared to the Sassafras-Marumsco Complex. The Codorus

and Hatboro soils are somewhat poorly drained and very deep, with an occasional frequency for flooding and has a slightly lower potential for water erosion than the Mattapex soil unit and a similar potential for wind erosion. All of these soil units are not limited in building potential (Fairfax County of Public Works 2011; NRCS 2013).

The Sassafras-Marumsco Complex has a K-factor of 0.28, the Mattapex loam has a K-factor of 0.43 and the Codorus and Hatboro has a K factor of 0.32. Both the Sassafras-Marumsco Complex and Codorus and Hatboro soil unit have K-factors that can be considered moderate, whereas the Mattapex loam has a high susceptibility to erosion (NRCS 2013).

3.2.1.3 Gravity Sewer Main Maintenance

The proposed locations for gravity sewer main maintenance occur primarily on the Sassafras-Marumsco Complex 7 to 45 percent slopes with Sites 6 and 7 being partially located on urban land (Figure 3-3). The potential for erosion of the Sassafras-Marumsco Complex is the same as described above for the force main replacements.

3.2.1.4 Aerial Stream Crossing

The proposed aerial stream crossings occur on Sassafras-Marumsco Complex and urban land, with the exception of site 8, which occurs slightly on Beltsville silt loam, 2 to 7 percent slopes (Figure 3-4). This soil unit is moderately well drained and very deep with a low flooding potential and a moderate susceptibility to wind and water erosion. The K-factor and erosion potential for the Sassafras-Marumsco Complex is the same as described above. Beltsville silt loam has a K-factor of 0.37, which classifies it as moderately susceptible to erosion (NRCS 2013).

3.2.1.5 ASDC Projects

The Woodlawn Village water and sewer system improvements and the Meade Road Water main replacement projects occur primarily on urban land. Rediversion of force main Discharge occurs on Sassafras-Marumsco Complex 7 to 25 percent slopes, Beltsville silt loam, 2 to 7 percent slopes and Mattapex, 0 to 2 percent slopes. The new access to the Lift Station (LS) is proposed to occur on Sassafras-Marumsco Complex 15 to 25 percent Beltsville silt loam, 2 to 7 percent slopes and urban land (Figure 3-5). K-factors for the soil units and complexes present in the location of the ASDC projects are the same as those presented above, with erosion potential based on K-factors ranging from moderate for Sassafras-Marumsco Complex to high susceptibility to erosion for Mattapex soils.

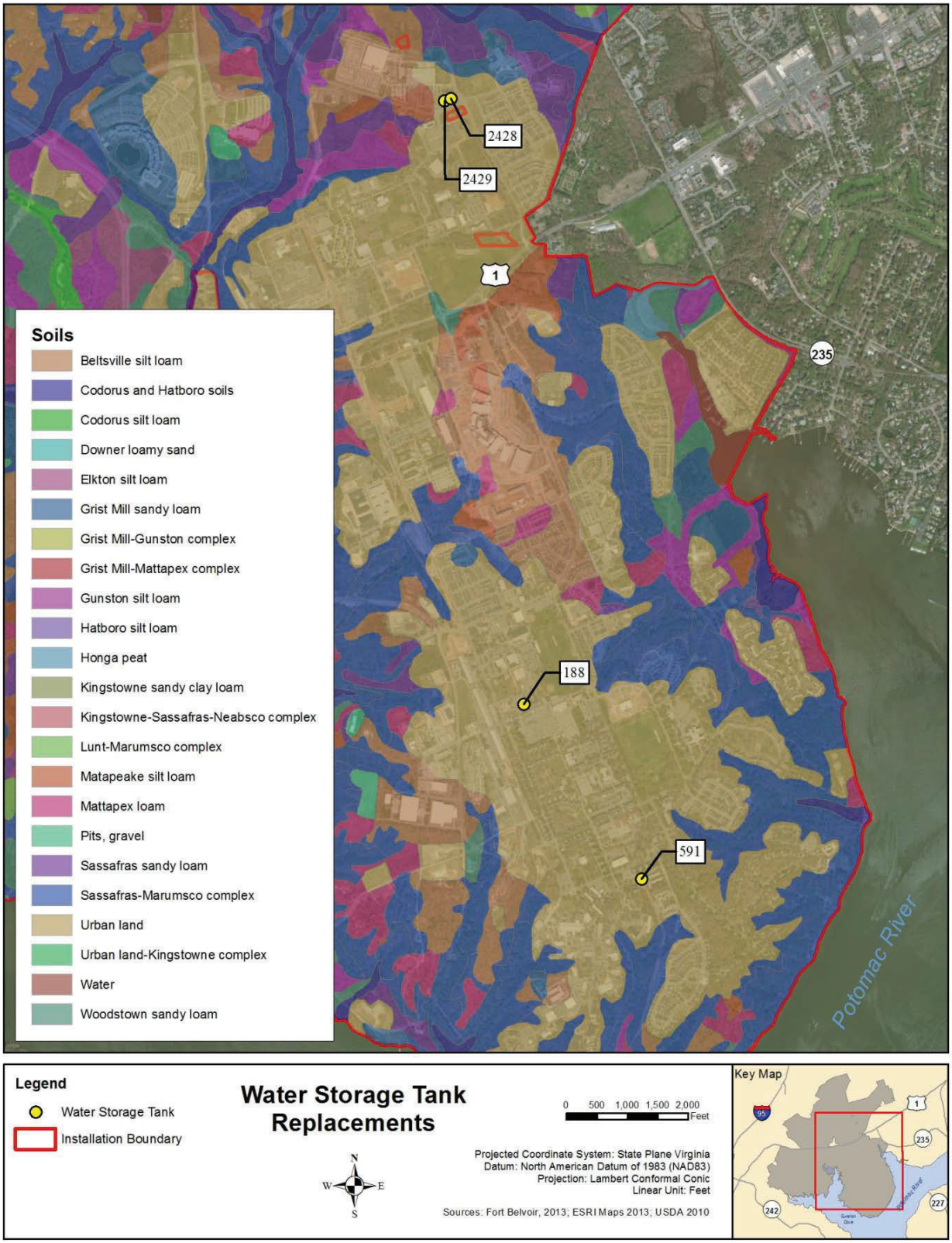


Figure 3-1: Soils – Water Tank Replacement

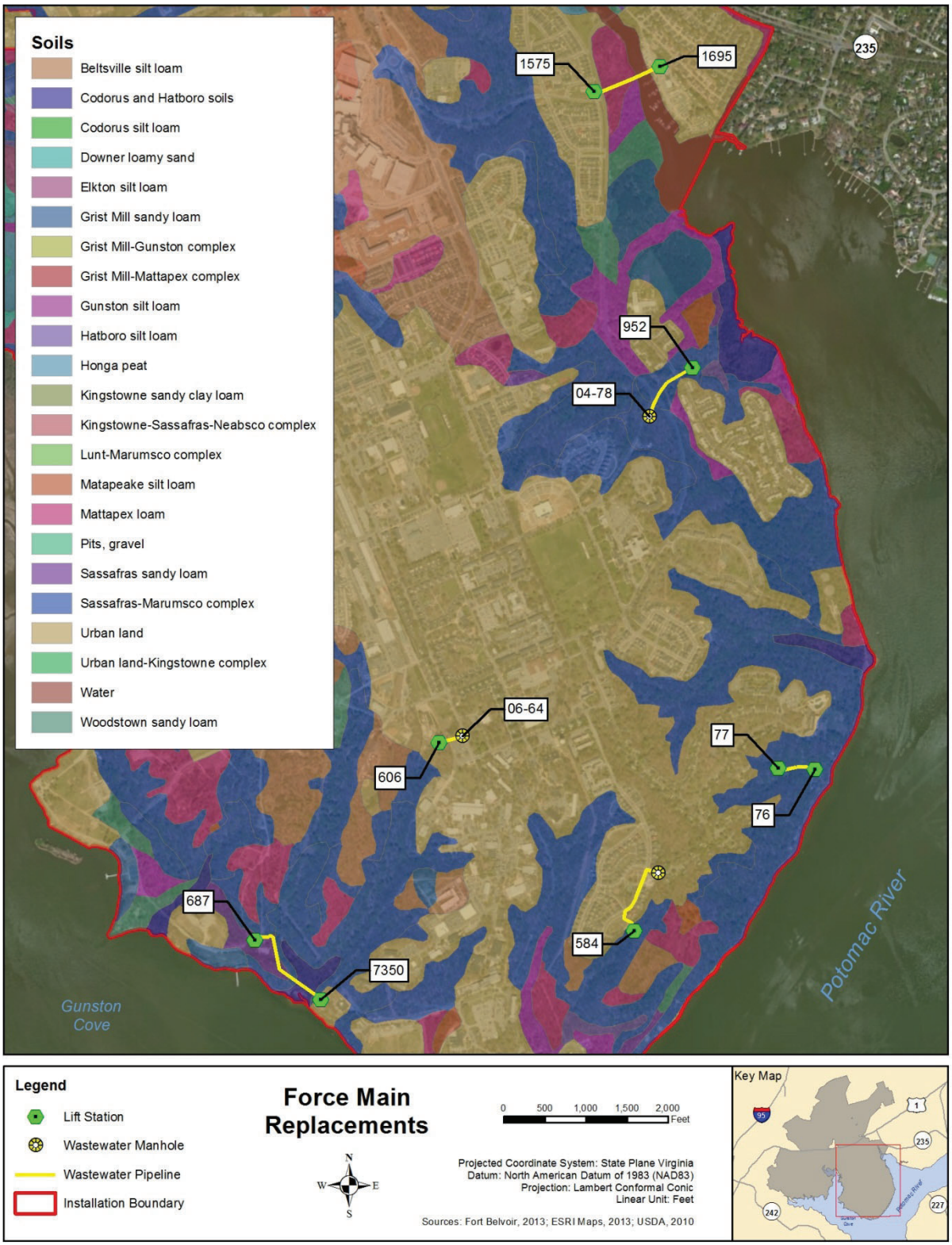


Figure 3-2: Soils – Force Main Replacement

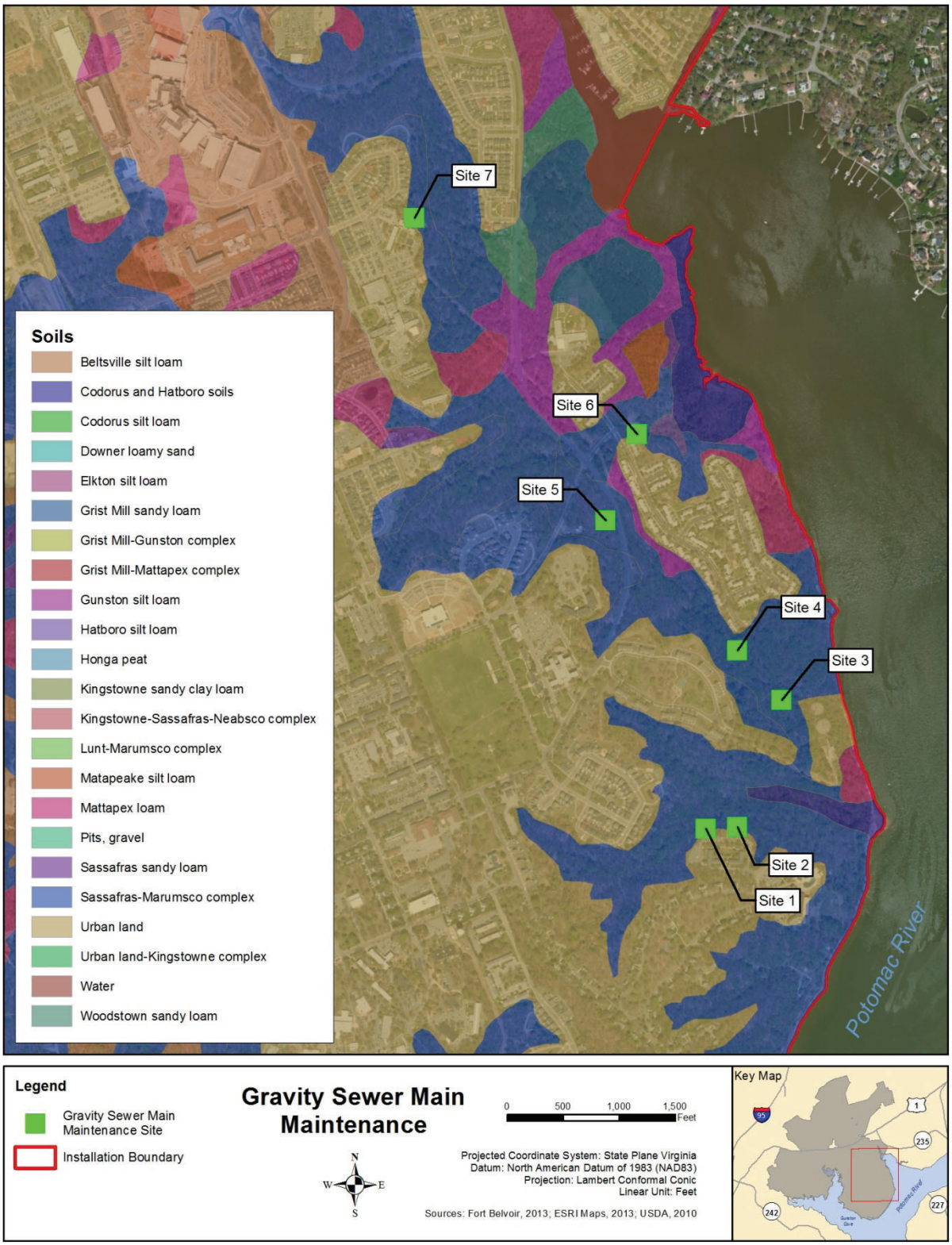


Figure 3-3: Soils – Gravity Sewer Main Maintenance

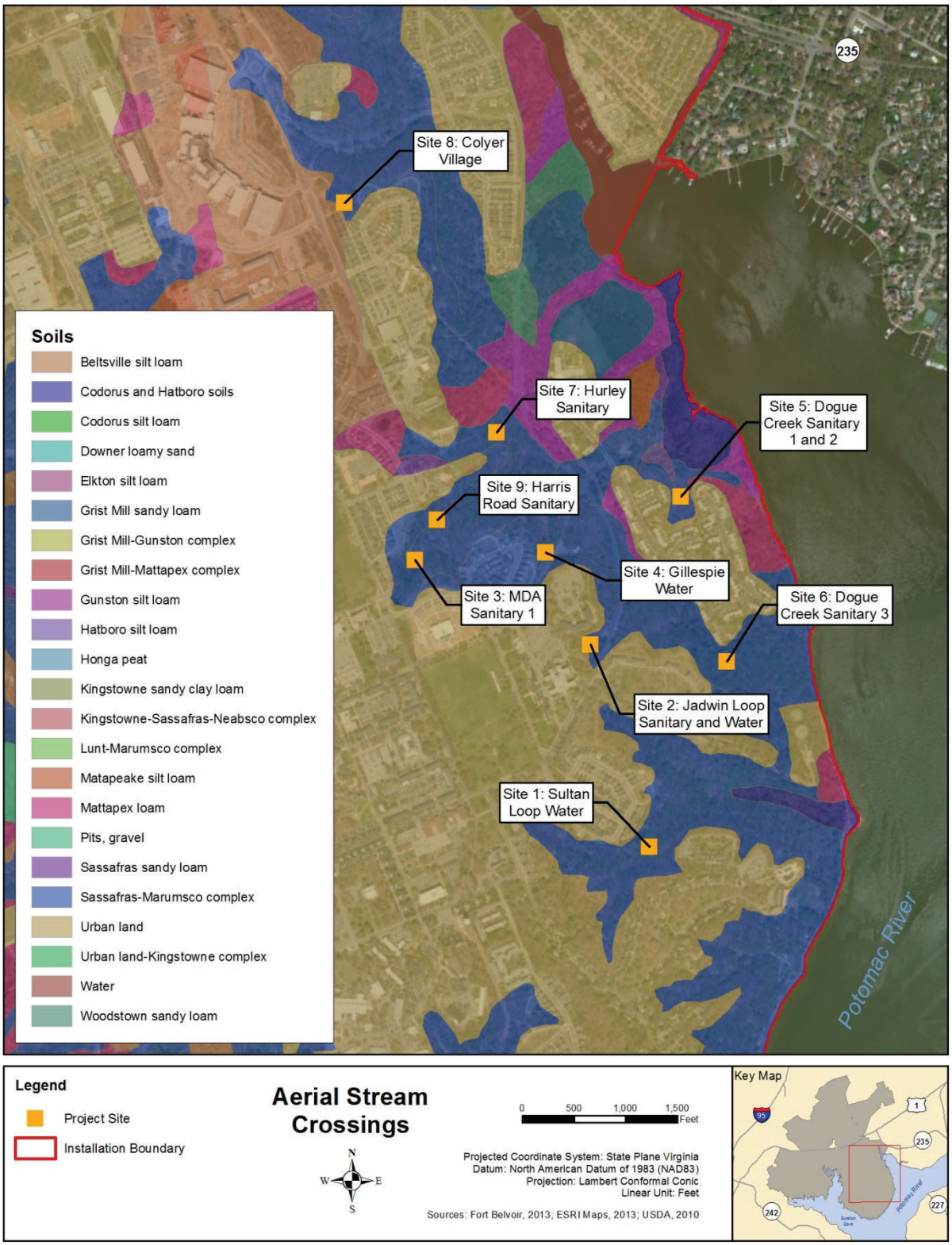


Figure 3-4: Soils – Aerial Stream Crossings

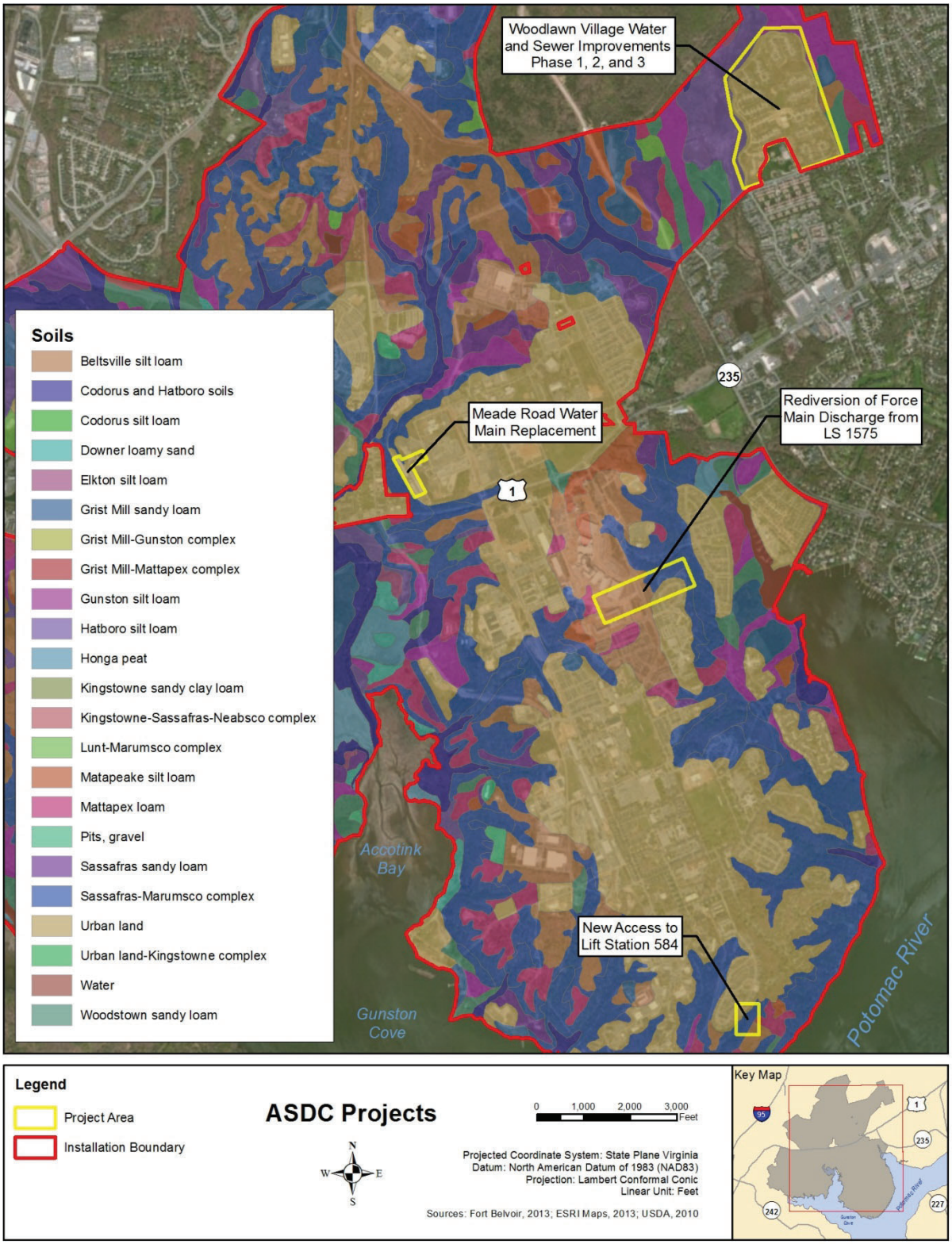


Figure 3-5: Soils – ASDC Projects

3.2.2 Environmental Consequences

3.2.2.1 Impacts of No Action Alternative

Under the No Action Alternative, the current conditions in the project areas would persist, and Fort Belvoir would not pursue any upgrades to its water and wastewater infrastructure. The excavation of soils or removal of vegetation would not occur under this alternative. However, erosion would continue to in the areas of water and gravity waste lines that cross above perennial streams and the concrete piers that support the lines, resulting in noticeable, adverse impacts to soils.

3.2.2.2 Impacts of the Proposed Action Alternative

Water Storage Tanks

Under the proposed water storage tank actions, impacts to soils would occur as a result of demolition and construction activities. Demolition of the existing water storage tanks would require the removal of existing trees and infrastructure that includes pipes, utility lines, concrete slabs, sidewalks, fences, and lights. These activities would remove, compact, expose, disturb, and modify the structure of soils due to earth-moving activities. However, because of the relatively small size (approximately 2,000 to 3,000 square feet) per site of soil to be affected as a result of demolition activities when compared to Fort Belvoir as a whole and that the soils in the area are considered urban land and thus have already been disturbed, impacts as a result of these activities would not be significant. All existing water storage tank sites and their soils would be restored after demolition to be maintained as open/green space, resulting in beneficial impacts to soils in these footprints.

Construction activities associated with the new water storage tanks would similarly result in the removal, compaction, exposure, and disturbance and modification of soils in the footprint of the new tanks. Soils in these areas are classified as urban land and thus have been previously disturbed and have diminished soil productivity. The overall amount of soils being impacted, approximately 1,000 square feet per site when compared to soils at Fort Belvoir as whole is relatively small, and impacts from the water storage tanks would not be significant. In addition, it is not expected that the construction of the new storage tanks would result in an increase in stormwater runoff or soil erosion potential as the footprint of the new towers and surrounding areas are primarily already covered with impervious surfaces and any new impervious surface from the replacement tank would be offset by the reduction in impervious surface at the old tank sites.

Erosion and sediment control (ESC) best management practices (BMPs) would be used during demolition and construction. To be in compliance with the Virginia Erosion and Sediment Control Laws and Regulations and the Fort Belvoir Municipal Separate Storm Sewer System (MS4) Permit and procedures, construction contractors would be required to develop an ESC Plan because the project would disturb greater than 2,500 square feet. In addition, a Stormwater Pollution Prevention Plan would be developed and a Virginia Stormwater Management Program General Permit for discharges of stormwater and construction activities would be required of the contractor. Possible BMPs, such as erosion control matting, silt fencing, using storm drain outlet protection, stone check dams, construction exits, and temporary and permanent seeding, would reduce the potential for erosion from construction, construction activities, as well as from the slight possibility of wind erosion. All construction activities would be conducted in adherence to approved Fort Belvoir stormwater and erosion control guidelines. No additional mitigation measures would be necessary.

Force Main Replacement

Activities associated with the replacement of aging sanitary sewer force mains could compact, expose, disturb, and modify the structure of soils from earth moving activities. Trenching and drilling to install the replacement of force mains would disturb previously undisturbed soils, many of which exist in

forested/wooded areas with several traversing steep terrain. Soils in the areas of the proposed force main replacements and throughout Fort Belvoir all have varying degrees of considerable erosion potential characteristics with the LS 1575-1695 occurring partially in an area that has a high susceptibility to erosion. The potential for erosion and destabilization of steep slopes where force mains would be replaced would be accentuated by the removal of vegetation. However, areas where vegetation is removed would be reseeded after construction and tree protection methods would be implemented to protect trees during construction activities. In the area of wetlands, resource protection areas (RPAs), and archeological sites soils would be impacted by horizontal directional drilling (HDD) technology. It is anticipated that approximately 3,500 linear feet would be impacted by HDD technologies and 1,000 linear feet would be disturbed through the application of a 10-foot wide trench, for a total approximate impact of 10,000 square feet impacted by trenching. The use of HDD technology would also require the establishment of bore pits at the insertion and receiving end of the pipe lengths that are expected to be between 100 square feet to 1,000 square feet. Soils would be temporarily displaced in the footprint of the bore pits, and would be restored and stabilized after construction, resulting in less than significant impacts. Similarly, soils in the footprint of trenches would be temporarily displaced during construction and would be stabilized after, resulting in less than significant impacts.

Displacement of soils in the location of force main replacements would disturb and permanently remove soils. However, the amount of soils impacted is relatively small when compared to soils in vicinity of the force main replacements and to Fort Belvoir as a whole.. The replacement of existing force mains, once complete, would not add impervious surfaces because the areas would be reseeded after pipe installation and is not expected to add to the potential for stormwater runoff or increase the potential for erosion. Because erosion at Fort Belvoir and in the proposed force main replacement areas is a concern, all replacement activities would adhere to the Virginia Erosion and Sediment Control Laws and Regulations and the existing MS4 Permit. ESC and stormwater pollution prevention BMPs would be employed as well and could include silt fencing and the stabilization and revegetation of disturbed areas. It is not expected that impacts to soils as a result of force main replacement would be significant. No additional mitigation measures would be necessary.

Gravity Sewer Main Maintenance

Impacts to soils as a result of maintenance activities would be temporary, occurring only during maintenance. Impacts to soils would occur primarily on already disturbed areas and activities associated with maintenance are expected to be minor and would be not be significant. The maintenance of permanent 20-foot-wide rights-of-way (ROWs) (15-foot ROWs in wetland areas) would compact, expose, disturb, and modify the structure of soils during construction and would diminish soil productivity in the footprint of the access route. In addition, continued maintenance of the ROW leads to a long-term risk for increased soil erosion from maintenance activities carried out by heavy machinery and the potential increased risk of trespassing by unauthorized vehicles, which in turn increases erosion potential. All activities occurring in the ROW would be reviewed internally by the Fort Belvoir Directorate of Public Works, and ROW routes would be sited to minimize impacts to trees to ensure that potential adverse impacts are minor and not significant. In addition, Fort Belvoir would monitor and respond accordingly to situations in which increases in erosion are identified.

The establishment of culverts and erosion control mats over streams would displace soils in the direct footprint. The use of these technologies would have some beneficial impacts to soils by working to lessen the potential impact for erosion. The amount of soil impacted and displaced would be minimal when compared to Fort Belvoir as a whole, and appropriate ESC BMPs potentially including the use of erosion control matting, silt fencing, and storm drain outlet protection measures would result in overall less than significant impacts. No additional mitigation measures would be necessary.

Aerial Stream Crossing

Activities associated with aerial stream crossings would compact, expose, disturb, and modify the structure of soils due to earth-moving activities. The replacement of existing pipes would occur on some previously disturbed soils and soils in the direct footprint of the pipe have already been displaced, leading to less than significant impacts to soils from replacement activities. For soils that have not been previously disturbed, earth-moving activities would similarly compact, expose, disturb soils, and modify the soil structure and could result in the permanent removal of some soils in the footprints of the crossings. Typically, construction impacts are temporary in nature, however, based on the nature of the stream work associated with this proposed action, long-term changes to soils could occur. These long-term changes could result from compaction and soil moisture content changes, which are accentuated by steep slopes like those present in the project area and impact overall soil productivity and structure. Additionally, construction and construction activities associated on soils with high potential for erodibility could exacerbate any erosion problems that may currently be occurring.

For the most part, impacts would affect a small portion of undisturbed soils when compared to Fort Belvoir as a whole for which impacts would be less than significant. All activities associated with aerial stream crossings are not expected to increase the amount of impervious surfaces in the area and are not expected to increase the potential for stormwater runoff or erosion. For all activities associated with aerial stream crossings that would disturb soils over the long term, stabilization of the soils via seeding would occur after construction and construction activities are completed.

Steam bank repair and stabilization to prevent continued erosion of soil around the concrete piers would have less than significant impacts to soils. Impacts expected during the construction of stabilization efforts range from soil disturbance and compaction to the removal of soils for the placement of stabilization measures, such as articulated concrete mats. Regardless the amount of soil disturbed, approximately 7,200 linear feet total (800 linear feet of streambank for each site) would be minimal when compared to Fort Belvoir as a whole. Streambank repair and stabilization efforts are expected to have an overall beneficial impact to soils from stabilizing the soil structure and decreasing erosion potential.

ASDC Projects

Under the proposed R&R and FSDC projects, impacts to soils would occur as a result of construction activities. The replacement of the existing Meade Road water main would temporarily compact, expose, disturb, and modify the structure of soils from earth-moving activities associated with the 10 foot wide and approximately 3,900 linear feet of trenching, for a total approximate impact of 39,000 square feet impacted by trenching. Soils in the footprint of the proposed replacement have already been disturbed and would be restored after construction, resulting in less than significant impacts.

The construction of Phases I to III of the Woodlawn Village water and sewer system improvement project, rediversion of force main discharge, and the new access to LF 584 would occur primarily on already disturbed land and would require proximately 31,000 linear feet of trenching, for a total approximate impact of 320,000 square feet impacted by trenching . Construction would result in the temporary compaction, exposure, disturbance, and modification of soils and would remove soils in the direct footprint of the components proposed for construction. The amount of soils removed in the direct footprint of the sewer improvements, force main discharge, and new access road are relatively small when compared to Fort Belvoir soils as a whole. Soils temporarily disturbed would be stabilized by reseeding after construction and impacts are expected to be less than significant. The construction of a new access road and bridge would increase the amount of impervious surfaces in the area and could increase the potential for increased stormwater runoff and erosion. However, based on the relatively small scale of these projects and the requirement to adhere to the existing MS4 Permit and erosion, sediment and stormwater control procedures and regulations, it is not expected that impacts would be significant. BMPs

presented above for force main replacements would be used. No additional mitigation measures would be necessary.

3.3 Water Resources

The study area for this analysis includes the drainages for Dogue Creek, Accotink Creek, and the portion of the installation that drains into the Potomac River, the streams near to or in which construction activities would occur, and the Potomac River in the vicinity of the installation. The proposed replacement of the water storage tanks, gravity sewer maintenance, force main replacements, and aerial stream crossing projects all would occur in the drainage for both Dogue Creek and the Potomac River/Gunston Cove. The ASDC projects would occur in the Dogue Creek, Potomac River/Gunston Cove, and Accotink Creek drainages. The location of all projects and their drainages are shown in Figures 3-6 through 3-10.

3.3.1 Affected Environment

3.3.1.1 Surface Water

Fort Belvoir is located on the Potomac River in the Chesapeake Bay watershed. There are three named tributaries to the Potomac River on the installation: Accotink Creek, Pohick Creek, and Dogue Creek. Accotink Creek and Pohick Creek flow into the Potomac River near each other and form Gunston Cove on the Potomac River. The installation also contains the headwaters to Mason Run, which is a tributary to Accotink Creek, and several other unnamed tributaries. Accotink Creek flows through the center of the installation, and both Dogue Creek and Pohick Creeks form the northeast and southwest boundaries of Fort Belvoir, respectively. A total of 106 miles of streams occur on the installation, including 28 miles of perennial stream, and 32 miles of intermittent streams (USAG Fort Belvoir 2001).

As part of the Joint Permit Application for Water and Wastewater Infrastructure Upgrades (Paciulli, Simmons, and Associates 2012), which included the gravity sewer main maintenance project, the installation characterized streams and wetlands in the study area. Overall, approximately 27 miles of streams occur within the study area, including 9.5 miles of perennial streams, 17 miles of intermittent streams, and the remainder being ephemeral streams (USAG Fort Belvoir 2013a). Wetland features are discussed in the Section 3.4.

Water quality problems in the waterways on the installation relate mostly to urbanization, including issues related to bacteria, changes in stream morphology from increased impervious surface, and sedimentation. Within the installation, according to the draft 2012 Virginia Water Quality Assessment 305(b)/303(d) Integrated Report (Virginia DEQ 2012), Accotink Creek is listed as impaired for recreation because of the presence of *Escherichia coli* (*E. coli*) bacteria and for benthic macroinvertebrate aquatic life because of:

- Channel erosion/incision from upstream hydromodifications
- Post-development erosion and sedimentation
- Streambank modifications/destabilization
- Urban runoff/storm sewers

Accotink Creek and Dogue Creek are also listed as impaired for fish consumption due to high levels of polychlorinated biphenyls in fish tissue (Haywood and Buchanan 2007). In spite of these impairments under the Clean Water Act (33 USC §1251 et seq.), the waterways on the installation still possess significant water resources with high conservation priority (USAG Fort Belvoir 2001).

Under the installation's MS4 Permit, the Commonwealth of Virginia requires that compliance procedures for ESC be followed during construction to minimize deposition of sediment in streams.

3.3.1.2 Groundwater

Fort Belvoir is underlain by three main aquifers: lower Potomac aquifer, middle Potomac aquifer, and Bacons Castle Formation. The lower Potomac aquifer is the primary aquifer on the installation and in eastern Fairfax County. The lower Potomac aquifer exists between a layer of crystalline bedrock and a thick wedge of clay that contains interbedded layers of sand. Water in this aquifer flows to the southeast; it is recharged in the western section of Fort Belvoir (USAG Fort Belvoir 2001), outside the study area for this project. Depth to the water table on the installation fluctuates, but it is typically 10 to 35 feet below ground surface. However, the water table may be at or near the surface near streams in the form of shallow, unconfined aquifers or perched water tables (USAG Fort Belvoir 2001).

3.3.1.3 Floodplains

A small amount of land lies in the 100-year floodplain on the peninsula that constitutes the main portion of the Fort Belvoir Installation (USAG Fort Belvoir 2013). An area of the 100-year floodplain is located due east of the intersection of Barlow and Gillespie roads, and a fairly broad 100-year floodplain is located where Dogue Creek discharges to the Potomac River that abuts Mount Vernon Road by George Washington Village. The extent of the 100-year floodplain (Zone A) adjacent to Gunston Cove and Accotink Creek is more substantial around the confluence of the Accotink and the Potomac River that extends north and upstream to U.S. Route 1 and narrows on the far side of U.S. Route 1. The 500-year floodplain is also regulated, although installation data indicate that no 500-year floodplain is present within the study area. The location of all projects in relationship to mapped floodplains are shown in Figures 3-6 to 3-10. Site 6 of the gravity sewer main maintenance projects, Site 5 of the aerial stream crossing projects, a very small portion at the western edges of the water and sewer improvement at Woodlawn Village (ASDC projects), and three of the force main replacement projects (LFs 1575 to 1695, LFs 687 to 7350, and LS 952) would be located within the 100-year floodplain.

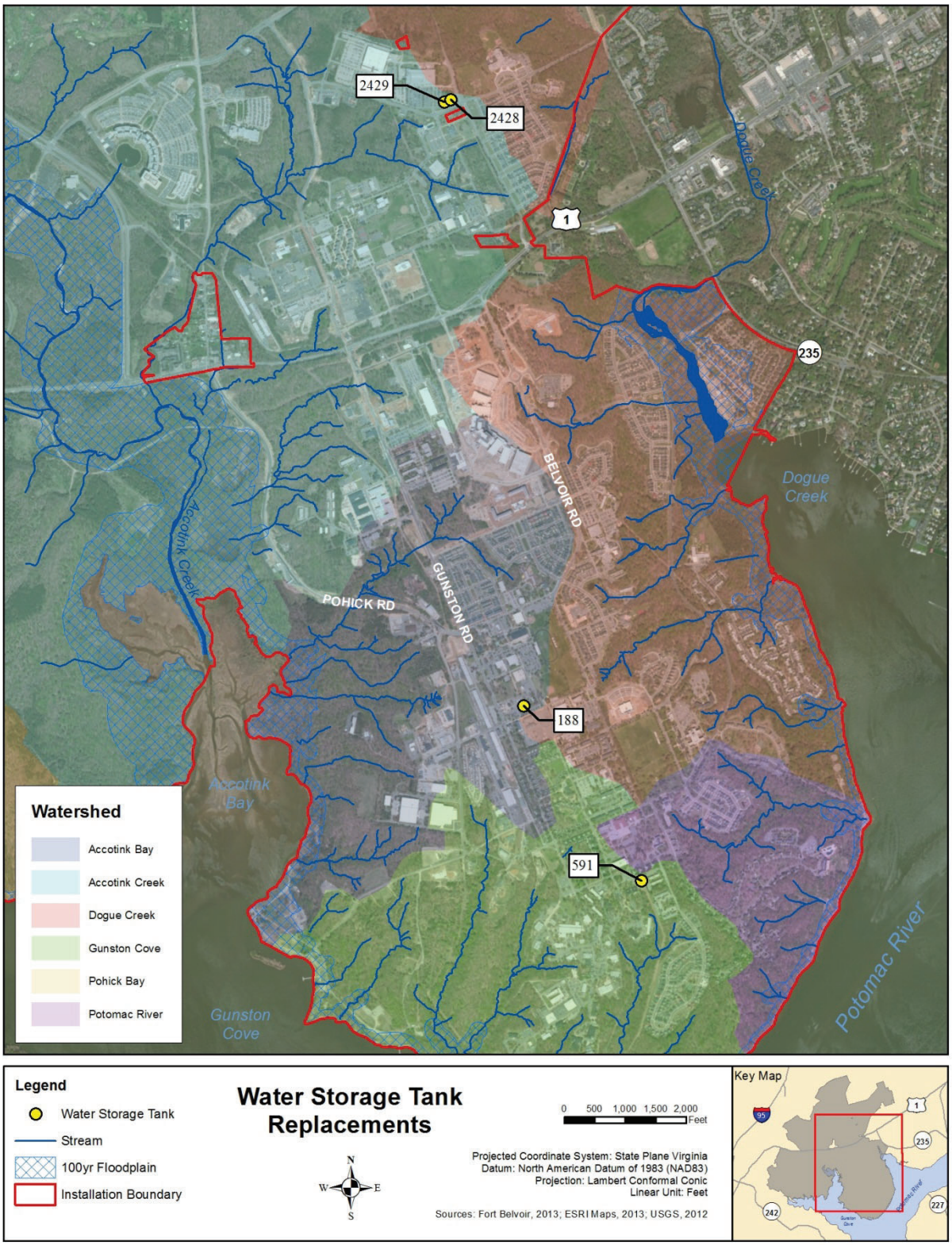


Figure 3-6: Waterways and Watersheds – Water Tank Replacement

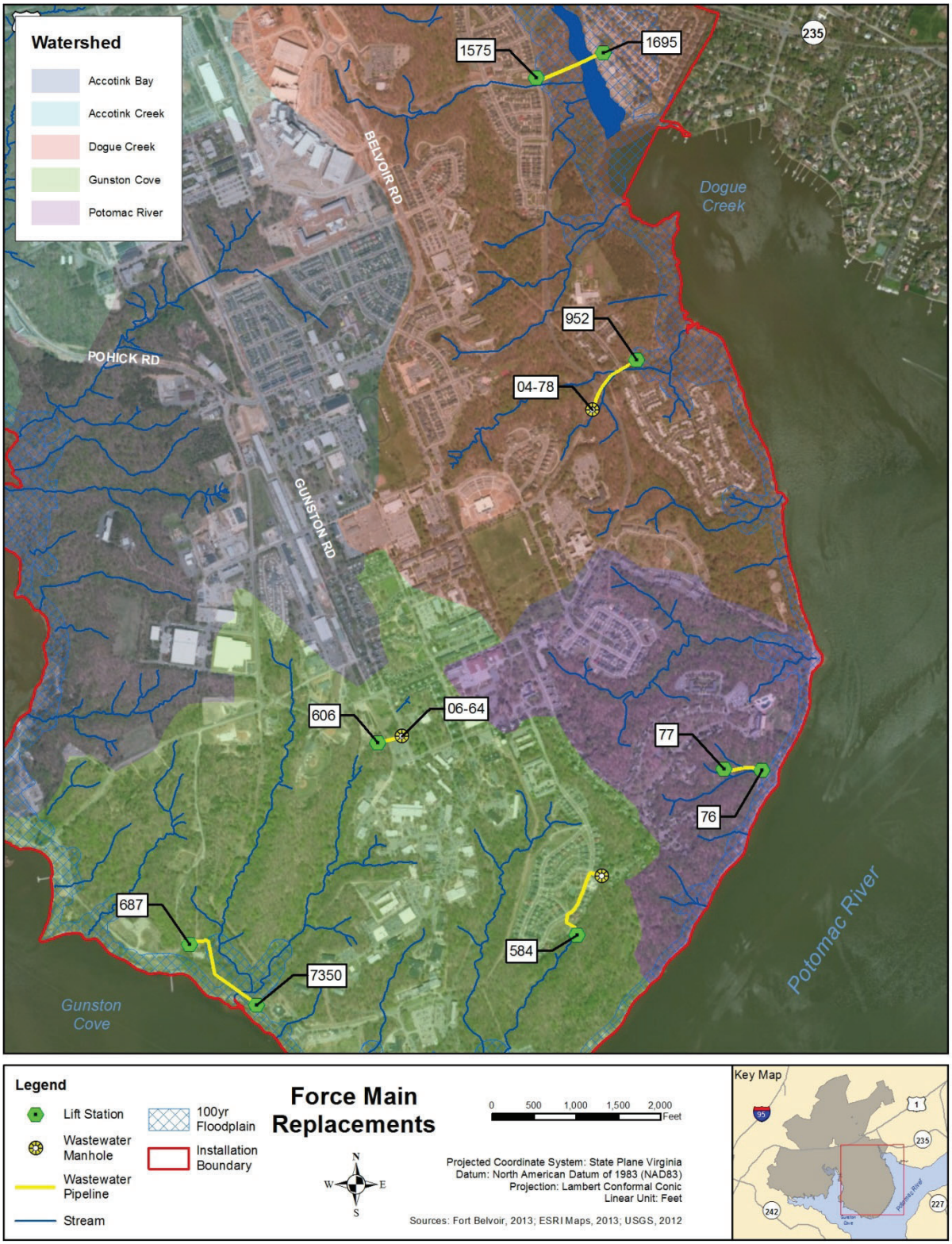


Figure 3-7: Waterways and Watersheds –Force Main Replacement

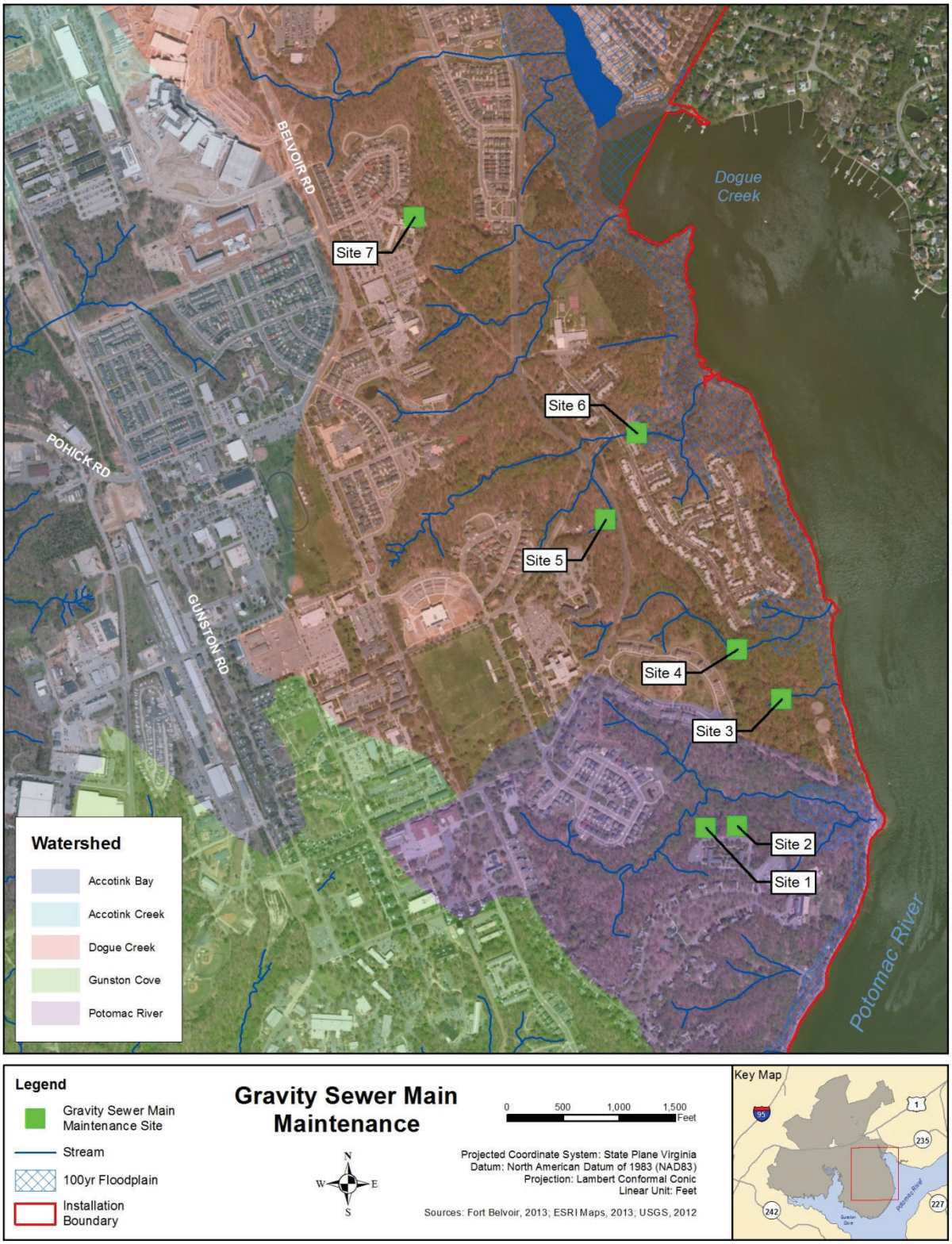


Figure 3-8: Waterways and Watersheds – Gravity Sewer Main Maintenance

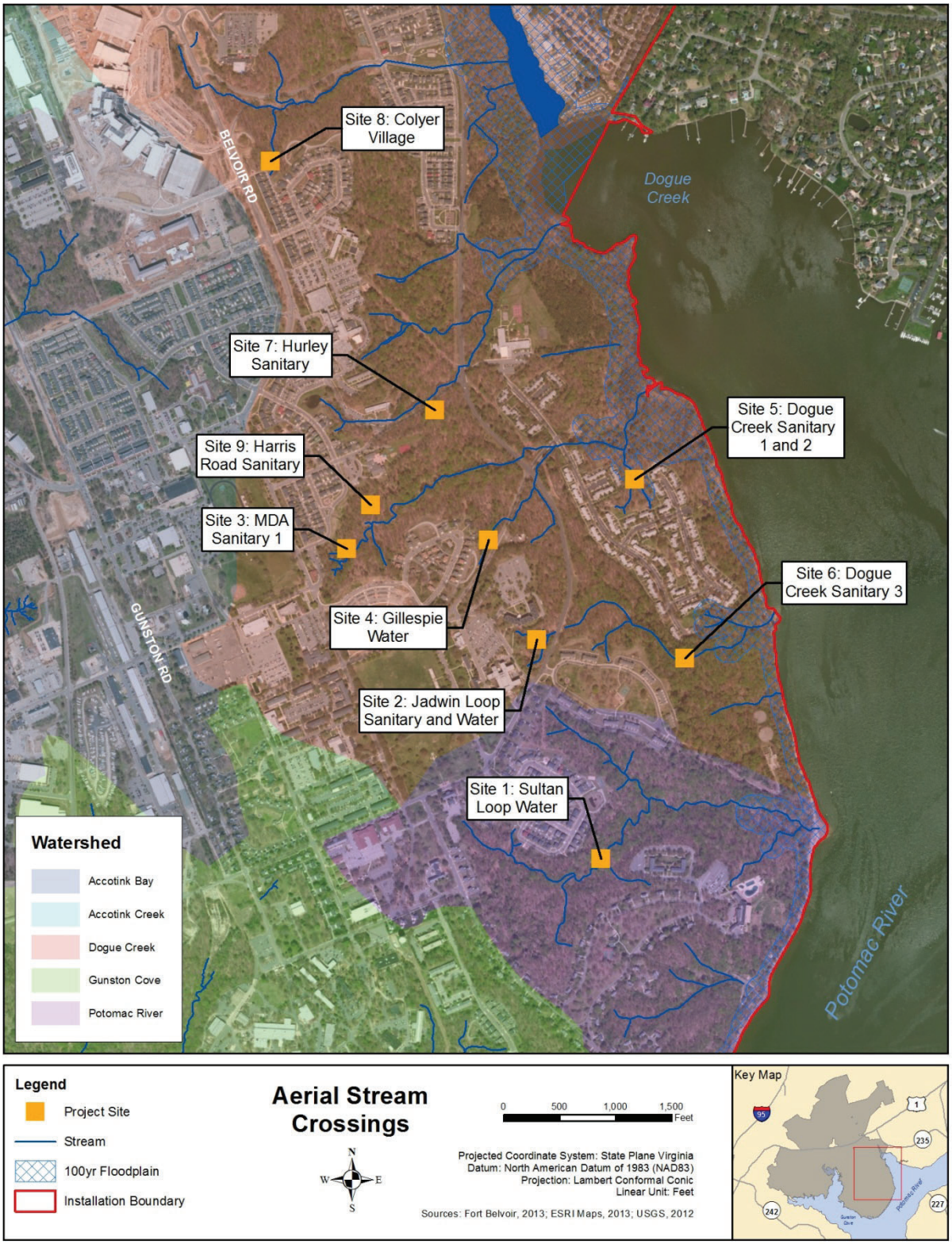


Figure 3-9: Waterways and Watersheds – Aerial Stream Crossings

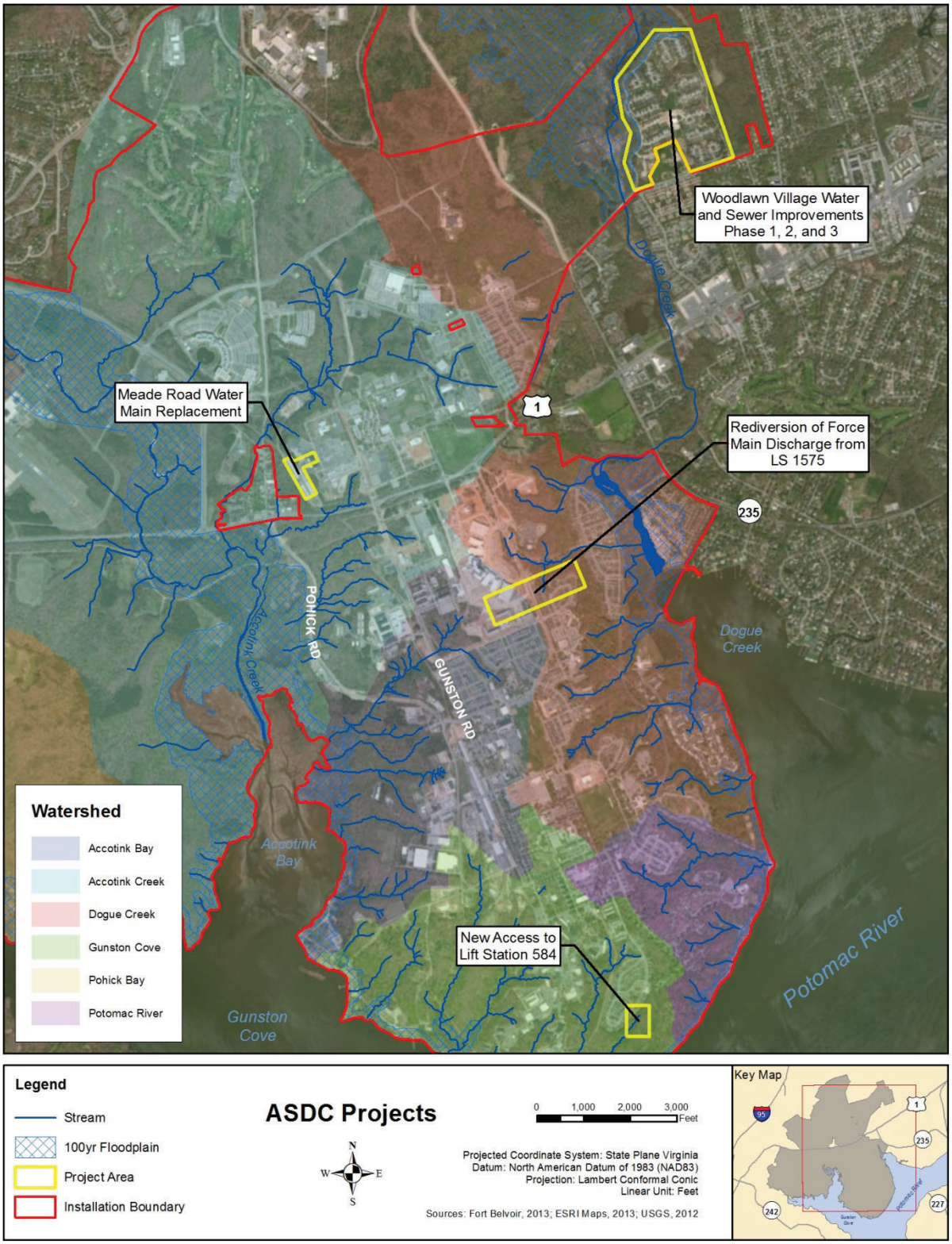


Figure 3-10: Waterways and Watersheds – ASDC Projects

3.3.2 Environmental Consequences

3.3.2.1 Impacts of No Action Alternative

Under the No Action alternative, proposed upgrades to the water and wastewater system at Fort Belvoir would not occur. Aging sanitary force mains would not be replaced and the potential for possible discharges of untreated wastewater into the environment could continue. Erosion would continue to affect the integrity of water and gravity waste lines that cross above perennial streams and the concrete piers that support the lines, and erosion in and around the water and sewer infrastructure would continue to affect water quality through the contribution of sediment to the stream and changing geomorphology in the stream. In addition, proposed capital upgrades and major renewals and replacement of the water and wastewater utility system would not occur.

As a result, ongoing issues with erosion and deposition of sediments into streams and other waterways, and the potential for wastewater-related water pollution would continue to adversely affect the integrity of the stream channels and ambient water quality. No noticeable adverse impacts to groundwater or floodplains would occur under the No Action Alternative because no ground disturbance and no construction activities in the floodplain would occur.

3.3.2.2 Impacts of the Proposed Action Alternative

Water Storage Tanks

Surface Water

Under the Proposed Action Alternative, none of the proposed storage tanks would be located near waterbodies, although there is the potential for soil erosion during construction that could result in soil washing into storm drains. To minimize potential impacts, ESC BMPs would be used, however, in compliance with the installation's MS4 Permit and the Virginia ESC regulations (Fort Belvoir 2013b, Virginia DCR 1992). Such measures may include the use of silt fencing around the construction zone, erosion control matting, stone check dams, and storm drain outlet protection. Additionally, the contractor must submit a Stormwater Pollution Prevention Plan and obtain a Virginia Stormwater Management Program permit prior to beginning construction to protect water quality (Virginia DCR 2013). With the implementation of appropriate ESC BMPs and any measures outlined in a Stormwater Pollution Prevention Plan, impacts to surface water would not be noticeable or significant.

Groundwater

Groundwater resources would not be disturbed, and therefore, would not be impacted.

Floodplains

The water storage tank sites would not be located in the 100-year floodplain, so floodplains would not be impacted by the replacement of the water storage tanks.

Force Main Replacement

Under the Proposed Action Alternative, six sections of aging sanitary sewer force mains would be replaced to prevent potential accidental discharge of wastewater into the environment. Where these force mains cross streams or wetlands, they would be installed using HDD. Bore pits, which would need to be excavated at the insertion and receiving ends of the pipe lengths, would vary in size based on the size of the pipe and length to be drilled but are expected to range from 100 square feet to 1,000 square feet.

Surface Water

Several of the force main replacement projects would occur in the vicinity of streams. As discussed in Section 3.2, *Soils*, the soils and slopes along the streambanks combine to present a meaningful risk of streambank erosion that could result in sediment deposition and water quality impacts if not managed correctly. However, HDD technology would be used to avoid direct impacts to streams and minimize impacts to streambanks and adjacent slopes. HDD involves drilling beneath the sensitive features without disturbing the surface, so impacts to surface water are minimized. HDD would be used near and under streams in the Gunston Cove watershed for the force main replacement between LS 687 and LS 7350, as well as in the Dogue Creek watershed, including under Dogue Creek itself, for the force main replacement between LS 1575 and LS 1695. The remaining construction actions associated with force main replacement are not near waterbodies and would not affect streams, other than by runoff of sediment. However, ESC BMPs would be employed along all trenches and around the bore pits to minimize any potential impacts. With HDD technology, minimal disturbance to plants and trees would occur, and deposition of fill material would be reduced, thereby reducing the potential for runoff as compared to open trench techniques.

The resultant drilling mud for the HDD would be contained and spill control standard operating procedures would be followed to prevent discharge of drilling mud into the environment and to ensure water resources would not be adversely impacted from the drilling muds. The drilling mud would be removed from the project site to a dewatering facility on the installation where it would be treated and then disposed of at the local landfill.

Groundwater

While site-specific information on depth to groundwater resources is not available, depth to groundwater resources typically range from 10 to 35 feet on the installation, although groundwater can be closer to the surface in sloped areas and near surface waterbodies, such as streams. Excavation and boring activities associated with the force main replacement would range in depth from 4 to 10 feet. Therefore, the excavation and boring activities would likely not be deep enough to affect groundwater resources. However, the location and depth of groundwater would be taken into consideration during design to avoid groundwater impacts.

Floodplain

Three of the force main replacement projects (LSs 1575 to 1695 that bores under Dogue Creek; LSs 687 to 7350 in the Gunston Cove drainage; and LS 952 in the Dogue Creek drainage) would be located within the 100-year floodplain; however, adverse impacts to the floodplain would be temporary and confined to the construction period and general disturbance in the floodplain. Once construction is complete, the sites would be stabilized and reseeded, and floodplain functions and values would not be affected in the long term. A Joint Permit Application has been filed for several of the force main replacement projects, and the remaining projects will require a permit if they affect streams or wetlands. For those projects requiring permits, there would be further review by state and federal permitting agencies when final designs for individual projects are completed. These reviews would ensure impacts are minimized and mitigated as necessary, and not be significant.

Gravity Sewer Main Maintenance

Under the Proposed Action, Fort Belvoir would inspect the installation's wastewater infrastructure and maintain the ROW easements. Pipes would be accessed using manholes; seven of these manholes are currently either in jurisdictional wetlands or waters of the United States. Permanent access to these manholes is required and would be constructed. Impacts to water resources would vary by site. Overall, 800 square feet of perennial, intermittent, and ephemeral streams would be permanently impacted, and 120 square feet of an intermittent stream would be temporarily impacted across the seven sites (Paciulli, Simmons, and Associates 2012). These impacts are detailed in Table 3-1. There would also be temporary

construction-related impacts. One project at Site 6 involves placing a temporary mat across the streambed, two projects at Sites 2 and 4 involve installing a box culvert in the streambed where the sanitary line crosses under the stream, and the remaining sites involve installing an 18-inch culvert and riprap in the stream or drainage swale where the sanitary sewer line crosses under the streambed or channel (Paciulli, Simmons, and Associates 2012). All of these projects would occur directly in the stream channel and would require flowing streams to be diverted around construction activities. For ephemeral streams, more common ESC BMPs would be required. Appropriate ESC BMPs, including appropriate in-stream measures to avoid, minimize or mitigate impacts, would be determined during the Joint Permit Application process. As a result, there would be minor, short-term, adverse impacts from construction in a water body on water quality and hydrology.

Groundwater

No impacts on groundwater resources are anticipated because the disturbance associated with gravity sewer main maintenance would occur mostly on the ground surface. No excavation or boring activities at the depth of groundwater would occur.

Floodplains

Site 6 of the gravity sewer main maintenance projects would be located within the 100-year floodplain. Adverse impacts to the floodplain would be temporary and related to construction and general disturbance in the floodplain. Once construction is complete, the sites would be stabilized and reseeded and floodplain functions and values would not be affected in the long term. The remaining sites are located outside regulated floodplains.

Table 3-1: Summary of Impacts to Streams Associated with Gravity Sewer Main Maintenance Projects

Site Number	Proposed Action	Permanent Impacts (square feet)	Temporary Impacts (square feet)
1	Installation of an 18-inch culvert in the drainage swale and placement of riprap where the sanitary sewer pipe crosses the drainage swale	200	0
2	Installation of a box culvert in an existing concrete stream channel where it crosses the sanitary sewer pipe	110	0
3	Installation of an 18-inch culvert and riprap in the channel where it crosses over the sanitary sewer pipe	130	0
4	Installation of a box culvert in an existing concrete stream channel where it crosses the sanitary sewer pipe	120	0
5	Installation of an 18-inch culvert and riprap in the channel where it crosses over the sanitary sewer pipe	120	0
6	Placement of temporary erosion mat across streambed over existing sanitary sewer pipe	0	120
7	Installation of an 18-inch culvert and riprap in the drainage swale where it crosses over the sanitary sewer pipe	120	0
Total		**800**	**120**

Aerial Stream Crossing

Nine sites have been identified that have water or gravity sewer lines that are exposed where they cross perennial stream channels. These lines must either be reinstalled below ground or the streambanks in the areas around the concrete piers that support these elevated lines need to be repaired and stabilized, or both. Stream repair/stabilization measures would vary according to each site and would be determined at the time of design, but would be conducted in accordance with conditions that would be stipulated in the Joint Permit. Typical streambank stabilization and repair activities could include grading and revegetating streambanks, using protective measures such as articulated concrete mats near vulnerable infrastructure, and introducing meanders into streambeds. Impacts to water resources would vary by project and site. Overall, up to 3,600 linear feet of stream channel would be affected by this set of projects.

Surface Water

Site 1 – Sultan Loop Water—At this site, a new pipe would be horizontally drilled under the existing streambank and connected to the existing structure at the base of the footbridge; no stream restoration would be needed. To minimize adverse impacts to the streambanks and minimize risk of erosion, a bore hole would be placed at the existing concrete footers and at the top of the hill where the drilling would occur, with disturbances similar to those discussed for the force main replacement projects. The slope would be re-established and stabilized; the specific methods for stabilization would be determined at the time of design and permitting. Stabilization of the streambank, particularly with vegetation, would reduce the likelihood of erosion and minimize channelization that could adversely affect downstream hydraulics. Decreasing the likelihood of erosion would reduce sediment loads into the stream and provide water quality benefits in the long term. There would be potential short-term, adverse impacts related to construction, but these impacts would be minimized through the use of appropriate ESC BMPs and any measures called for in the final Joint Permit Application process. These impacts would not be significant.

Site 2 – Jadwin Loop Sanitary and Jadwin Loop Water—At this site, the exposed gravity sanitary pipe and manhole would be replaced with ductile iron pipe and a precast manhole, using HDD with some trenching away from the stream, and portions of a water pipe abandoned in the project would be removed to facilitate stream restoration. ESC BMPs consistent with Army regulations and state policies and regulations would be used to prevent discharge of sediment from construction areas into the stream. The stream would be restored both upstream and downstream of the replacement pipe. Approximately 650 linear feet of stream would be restored (275 up and downstream of the sanitary pipe and 375 feet up and downstream of the water pipe). Proposed restoration activities would include raising the grade of the streambed to 2 to 3 feet above the new pipe and installing protective features such as articulated concrete mats from the stormwater headwall approximately 80 feet downstream and 20 feet beyond the new sewer pipe to protect it from erosion. A new drop structure (such as a sill or weir) at the southwest headwall above Manhole 4-65 would decrease the velocity of stormwater and reduce undercut beneath the manhole.

Streambank erosion and downstream consequences related to scour, sediment deposition, and water pollution associated with these problems, including higher nutrient loading, bacteria, and impacts to aquatic life would be reduced in the long term by the restoration. Assuming that the protective measures such as articulated concrete mats would eventually be partially vegetated to attenuate flow energy and models are run on the design at the time of permitting to ensure that downstream flows would not be increased, long-term impacts on the stream would be beneficial.

Although the restoration activities have not yet been selected, any restoration construction would require the use of heavy equipment in the streambed and cut-and-fill activities that without erosion and sediment control measures in place could cause short-term water quality issues downstream. Some siltation in the stream would be unavoidable. With use of appropriate ESC BMPs, the potential for adverse impacts

would be minimized and would not be significant. Work would be performed in accordance with the Joint Permit.

Site 3 – MDA Sanitary 1—At this site, impacts would be similar to those discussed for the Jadwin Loop site with ESC BMPs minimizing adverse, short-term, construction-related impacts. The long-term impacts on surface water and water quality would be beneficial because erosion would be slowed and downstream sedimentation and delivery of soil bound pollutants would be reduced.

Site 4 – Gillespie Water—At the Gillespie Water site, one pipe would be abandoned and a second water pipe would be replaced by drilling it under the stream using HDD. The stream would then be restored with an approach that would be determined at the time of permitting, although it is currently anticipated that approximately three sections of articulated concrete mats would be used to protect the proposed new water pipe and prevent head cuts.[1] ESC BMPs would be used, and short-term, adverse impacts related to construction would be minimized and would not be significant. The long-term effects from the stream restoration would be beneficial.

Site 5 – Dogue Creek Sanitary 1 and 2—At this site, the pipe has already been replaced, but stream restoration has not yet occurred. Restoration would include measures similar to those described for the Jadwin Loop site, including raising the streambed and using an approach such as articulated concrete mats to prevent future head cuts in the stream. Impacts would also be similar to the Jadwin Loop site, and ESC BMPs would be used with specific measures and approaches to be determined at the time of design and permitting to ensure impacts would not be significant.*Site 6 – Dogue Creek Sanitary 3*—Impacts to surface water resources at this site would be similar to those described for the Jadwin Loop project as restoration measures would be similar to those described for the Jadwin Loop site, and thus would not be significant.

Site 7 – Hurley Sanitary—This project entails removal of piers and an aqueduct. The streambed and banks would be re-established in a new location with several possible approaches to stabilization for the new stream banks. Additional measures could include such features as a stone grade control structure to prevent future head cuts, and siltation pools with plantings to provide additional stabilization. Large machinery and appropriate ESC BMPs would be required, so impacts would be similar to those discussed for the Jadwin Loop project with the specific restoration design and corresponding ESC BMPs to be determined at the time of permitting to ensure impacts would not be significant.

Site 8 – Colyer Village—Sewer infrastructure would be removed at this site, and the stream channel would be relocated. Extensive grading in the stream channel would be necessary. As with Site 7, additional measures would include such features as a stone grade control structure to prevent future head cuts and siltation pools with plantings to provide additional stabilization. Impacts would be similar to those described for the Jadwin Loop project, but more noticeable, due to the relocation of the stream channel. ESC BMPs would be used with specific restoration design and corresponding ESC measures would be determined at the time of permitting to ensure adverse impacts are not significant.

Site 9 – Harris Road Sanitary—The streambed would be widened at this site, streambanks would be reconstructed, and pier supports for the force main would be repaired. Impacts would be similar to those discussed under the Jadwin Loop project with design specifics, and ESC BMPs would be determined at the time of permitting to ensure that impacts would not be significant.

[1] Head cuts are erosional features of some intermittent streams and perennial streams where there is an abrupt vertical drop in the stream.

Groundwater

For all projects, there would not likely be impacts to groundwater resources because groundwater would not be disturbed. Depth to groundwater resources typically range from 10 to 35 feet on the installation, although groundwater can be closer to the surface in sloped areas and near surface waterbodies, such as streams. For the most part, groundwater is deeper than any work anticipated with these projects. However, the location and depth of groundwater would be taken into consideration during design to avoid groundwater impacts.

Floodplains

For all projects, there would be no impacts to the floodplain, except for Site 5, because none of the other sites are in the 100-year floodplains.

Adverse impacts to the floodplain at Site 5, Dogue Creek Sanitary 1 and 2, would be short term and related to construction activities that could create localized disruptions to floodplain functions and values through the removal of vegetation and disturbance of soils. Once construction is complete, the restoration activities would restore the site's floodplain functions and values, and the floodplain would not be affected in the long term. Additionally, protective measures that could be used, such as articulated concrete mats, could eventually be partially vegetated, which would result in long-term, beneficial impacts on floodplain functions and values.

ASDC Projects

These projects include various capital improvement projects, such as replacement of the water main, water and sewer improvements in Woodlawn Village, rediversion of force main discharge, and construction of a new access road and bridge over a seasonal stream to a lift station.

These projects would require trenching to place pipes, and grading and construction activities would occur at and near streams. Short-term, adverse impacts to surface water related to construction would be minimized by the use of ESC BMPs, which would be subject to further review during the design and permitting process.

Groundwater

These projects would not likely affect groundwater resources because ground-disturbing activities would be too shallow to impact groundwater. For the most part, groundwater is deeper than any work anticipated for these projects.

Floodplains

There could be minimal, short-term impacts to the floodplain associated with the construction of the Woodlawn Village project because the project area contains a small portion of the Dogue Creek 100-year floodplain and construction would disturb soil and vegetation, potentially creating localized limitations on floodplain functions and values. Once construction is complete, the sites would be restored and planted or seeded, and there would be no additional impervious surface because all of the infrastructure would be buried. Floodplain functions and values would therefore not be affected in the long term.

3.4 Wetlands and Chesapeake Bay Preservation Areas

Construction in jurisdictional wetlands and streams is regulated by the USACE pursuant to Section 404 of the Clean Water Act as implemented in regulations contained in 33 CFR, Parts 320–330. Impacts to state waters, including wetlands, are regulated by the Virginia Water Protection Permit Program (9 Virginia Administrative Code [VAC] 25-210-10 et seq.), which serves as Virginia's 401 Water Quality Certification Program for federal Section 404 Permits. The Virginia Marine Resources Commission

regulates activities in submerged lands, marine fisheries, and coastal resources (tidal wetlands and coastal sand dunes/beaches) under the Code of Virginia Title 28.2, Chapters 12,13, and 14.

Virginia's Chesapeake Bay Preservation Act (CBPA), Virginia Code 10.1-2100 et seq., and its implementing Chesapeake Bay Preservation Area Designation and Management Regulations, 9 VAC 10-20-120 et seq., protect certain lands, designated as Chesapeake Bay Preservation Areas, which if improperly developed could result in substantial damage to the water quality of the Chesapeake Bay and its tributaries. Projects that occur on lands that are protected under the CBPA must be consistent with the Act and may be subject to the performance criteria for Resource Protection Areas (RPAs), as specified in 9 VAC 10-20-130 of the regulations. Under the CBPA, Fairfax County adopted a Chesapeake Bay Preservation Ordinance that designates RPAs and Resource Management Areas (RMAs) within in the county.

RPAs are sensitive lands at or near the shoreline that have an intrinsic water quality value due to the ecological and biological processes they perform. RPAs include tidal wetlands, tidal shores, nontidal wetlands connected by surface flow and contiguous to tidal wetlands or tributary streams, and a minimum 100-foot buffer landward of the previous RPA components, riparian areas, and major floodplains (USAG Fort Belvoir 2001). All lands not designated as RPAs in Fairfax County are classified as RMAs. Fort Belvoir recognizes the RPA designation but, being a federal entity, is not subject to the provisions of the Fairfax County ordinance. As a result, Fort Belvoir does not use RPA maps produced by Fairfax County; instead, the Army delineates the RPA on the installation. In addition to RPA areas, Fort Belvoir places a 35-foot buffer around all intermittent and ephemeral streams.

The study area for this analysis broadly includes the wetlands and RPAs located in the eastern portion of Fort Belvoir. Broadly speaking, all of the wetlands and RPAs between Pohick Road to the west and Dogue Creek to the east and between the Potomac River to the south and U.S. Route 1 to the north are included in the Affected Environment discussion. Additionally, projects along Meade Road and within Woodlawn Village are analyzed for the presence of wetlands and RPAs. The analysis of impacts to wetlands and RPAs focuses on more specific areas, those areas of wetlands and RPAs where construction activity would occur.

3.4.1 Affected Environment

3.4.1.1 Wetlands

Wetlands have been delineated for the entire study area. Field wetland delineations identified approximately 265 wetlands totaling approximately 566 acres (Paciulli, Simmons, and Associates 2012; USAG Fort Belvoir 2013a). The delineated wetlands include palustrine forested wetlands, palustrine scrub-shrub wetlands, palustrine emergent wetlands, and palustrine open water wetlands. Table 3-2 summarizes the wetlands identified in the field. Figures 3-11 through 3-15 shows the location of the proposed actions in reference to delineated wetlands, and RPAs.

Table 3-2: Summary of Wetland Features within the Study Area

Wetland Type/Cowardin Classification	Amount of Wetlands and Other Waters of the United States
Field Delineated	
Palustrine forested	478 acres
Palustrine scrub-shrub	0.05 acre
Palustrine emergent	59 acres
Palustrine open water	29 acres

Source: Paciulli, Simmons, and Associates (2012), USAG Fort Belvoir (2013a)

Wetlands perform a variety of functions important in maintaining the quality of natural and cultural resources on Department of Defense (DoD) lands and in supporting the military mission and quality of life for Soldiers (USAG Fort Belvoir 2001). Wetlands located within the study area, as well as wetlands located on the rest of the installation, serve as habitat for fish and wildlife, and wetland-dependent plant communities, protect against erosion, improve water quality, provide stormwater and flood water management, and provide aesthetic value.

3.4.1.2 Chesapeake Bay Resource Protection Areas

Fort Belvoir conducted an RPA analysis of the entire installation (Fort Belvoir 2013a). Within the study area for this analysis, there are approximately 774 acres of land that qualify as RPAs. The RPAs are associated primarily with unnamed tidal rivers or upper perennial streams (perennial flow) and their abutting wetlands that flow in to Dogue Creek, the Potomac River, Gunston Cove, and Accotink Bay.

Figure 3-11: Wetlands and RPAs – Water Tank Replacement

Figure 3-12: Wetlands and RPAs – Force Main Replacement

Figure 3-13: Wetlands and RPAs – Gravity Sewer Main Maintenance

Figure 3-14: Wetlands and RPAs – Aerial Stream Crossings

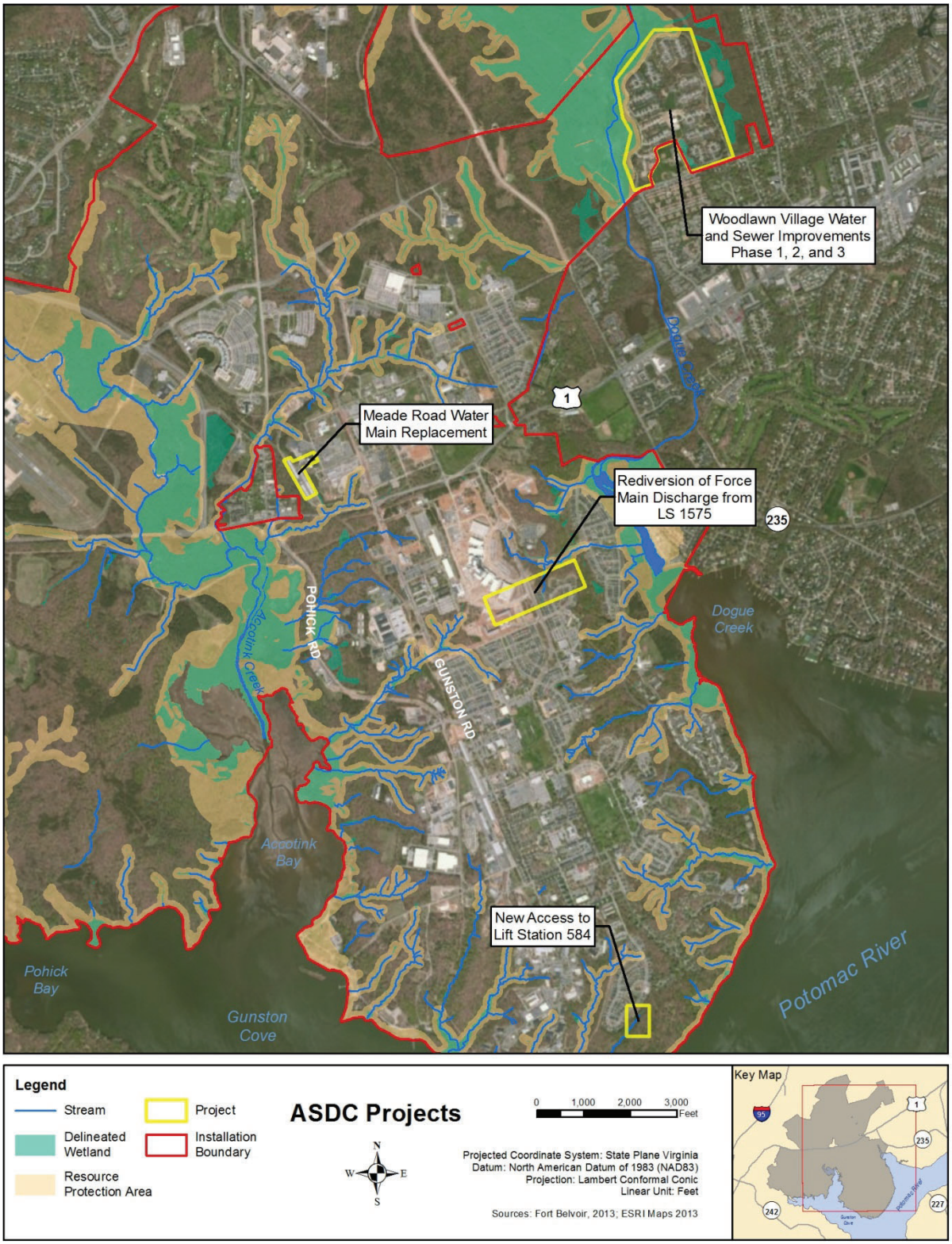


Figure 3-15: Wetlands and RPAs – ASDC Projects

3.4.2 Environmental Consequences

3.4.2.1 Impacts of No Action Alternative

Under the No Action alternative, no upgrades to Fort Belvoir's aging water and wastewater infrastructure would be made. As a result, streams beneath aerial crossings would continue to undergo bed and bank erosion, force mains may rupture and leak effluent into streams, and major capital investment upgrades would not occur. Streambank erosion could lead to erosion of adjacent wetlands; thus, under the No Action alternative, potential adverse effects to wetlands could occur.

3.4.2.2 Impacts of the Proposed Action Alternative

For several of the projects discussed below, final design plans are not available; however, prior to construction, the USACE and State of Virginia will review final designs through the Joint Permit Application process to assess specific impacts to wetlands and RPAs. Although impacts to RPAs are expected from the Proposed Action Alternative, public utilities are allowable construction within designated RPA areas.

RPAs serve to protect local water bodies and, ultimately, the Chesapeake Bay from further physical and chemical degradation. Without protecting RPAs, contaminants become a potential threat to the health of perennial waters, and physical characteristics such as bed and bank stability are more prone to becoming eroded, increasing the rate of sedimentation downstream (Fairfax County 2005). Similarly, wetlands also protect perennial waters from increased physical and chemical degradation. Besides providing habitat to animals and plants, wetlands also function as buffers against pollutants entering streams, rivers, and other waterbodies. Sediment is trapped in wetlands and chemicals are often sequestered in wetland soils or converted to less harmful materials. Thus, it is clear that permanent impacts to RPAs and wetlands could lead to increased degradation of the perennial waters that these features are buffering from negative impacts.

Water Storage Tanks

Four water storage tanks are proposed to be demolished and replaced—water storage tanks (WSTs) 2429 and 2428 are located north of U.S. Route 1 and WSTs 188 and 591 are located south of U.S. Route 1. Neither the existing water storage tank sites, the proposed sites for replacement tanks, the material laydown yards, or the crane pads are proposed to be in wetlands or an RPA. Therefore, the Proposed Action Alternative would have no impact on wetlands or RPAs.

Force Main Replacement

Four of the six proposed force main replacement activities would occur beneath wetlands and RPAs. The linear feet of wetlands and RPAs under which the proposed activity would occur are estimated because final design plans are not available. Figure 3-12 shows the location of the proposed activity in reference to delineated streams, wetlands, and RPAs.

Construction of the force main replacements would employ HDD technology in wetlands, to the extent practicable. HDD techniques minimize the surface area that could be disturbed by subsurface piping. HDD involves drilling beneath the sensitive features without disturbing the surface, thus impacts to wetlands would be minimized because there would be minimal disturbance to plants and trees and reduced deposition of fill material. The construction of the force mains within RPAs may or may not employ HDD techniques; however, Fort Belvoir intends to use HDD techniques to the maximum extent practicable, but the exact locations of open trenches and HDD areas will not be determined until the final design is completed.

The four locations where force main replacement construction would occur beneath wetlands and/or RPAs include between LS 7350 and LS 687, between LS 77 and LS 76, between LS 952 and manhole 04-78, and between LS 1575 and LS 1695. In each of these locations, the replaced force main would be

inserted beneath an unnamed perennial stream abutted by palustrine forested wetlands and their associated RPA. As stated above, to the extent practicable, HDD techniques would be used in wetland areas to prevent trenching and other disturbance. As a result, impacts to wetlands would be minimal because most of the activity would occur beneath the soil surface. The bore holes required to initiate the HDD technique would not be placed in wetlands; however, they may be placed in RPAs. As a result of land disturbance in the RPA, there could be potential, temporary impacts to the RPA; however, where practicable, the RPA could be restored to its original condition, thus the land disturbance would be a minimal impact. Where forested areas are cleared, those areas would not be allowed to return to the original conditions, but soils would be stabilized and seeded both during and after construction to minimize erosion and sedimentation.

Any loss of wetlands and RPAs as a result of replacing force mains could affect perennial waters downslope. Where these projects are proposed to occur in wetlands and/or RPAs, the wetlands and RPAs directly abut tidal waters or their perennial tributaries. Permanently removing portions of the wetlands or RPAs would diminish their functions as buffers against pollutants and contaminants entering tidal waters. Additionally, conversion of forested wetlands and riparian buffers to cleared fields would impact habitat quality and would change the type of faunal assemblage in these areas. However, it is anticipated that permanent impacts would be minimized to the extent practicable and would, therefore, be not significant.

Table 3-3 identifies, the linear feet of wetlands and RPAs that would have force main pipe placed beneath their surface. A Joint Permit Application to the USACE and Commonwealth of Virginia was prepared in September 2012 for the installation of force mains LS 7350 to LS 687 and LS 1575 to LS 1695 (Paciulli, Simmons, and Associates 2012). Upon determination of final designs for the remaining projects, the exact acreage of wetlands and RPAs impacted will be calculated. If necessary, a project specific Joint Permit Application will be filed with the USACE and the State of Virginia to cover those impacts.

Table 3-3: Summary of Linear Feet of Force Main Pipes to be Placed under Wetlands and RPA

Project	Linear Feet Beneath Wetlands (approximate)	Linear Feet beneath RPAs (approximate)
Lift Stations 7350 and 687	200	850
Lift Stations 77 and 76	10	500
Lift Station 952 and Manhole 04-78	50	550
Lift Stations 1575 and 1695	35	850
Total	**610**	**2,750**

Gravity Sewer Main Maintenance

Permanent access to manholes would be constructed for future maintenance activities. This activity would require placing matting or culverts in streams and wetlands so that access to the manholes is possible. The majority of the work would be contained to stream channels, some of which contain small areas of vegetated wetlands. The only wetlands in the vicinity of the projects are those that are located on the streambanks and/or channels, thus there would be no impacts to additional wetlands beyond the streambanks (Russell 2013b). Additionally, because the wetlands are part of the streams, it is assumed that there would be no impacts to wetlands, only streams, which are covered under Section 3.2 *Surface Water, Water Quality, and Floodplains*.

A Joint Permit Application to the USACE and Commonwealth of Virginia was prepared in September 2012 for the construction of culverts and temporary mats in ROW corridors for permanent maintenance (Paciulli, Simmons, and Associates 2012). The Joint Permit Application included a complete wetland and

waters of the United States delineation report, as well as plan and profile drawings that indicate the type and area of impacts.

Sites 1 through 4 and Site 7 are located in either intermittent or ephemeral waters, thus they are not regulated under the RPA language contained within the CBPA.

The proposed activity at Site 5 includes placing an 18-inch culvert and riprap within an intermittent stream. Currently, the proposed activity includes 120 square feet of permanent impacts to waters of the United States. `

The proposed activity at Site 6 includes placing temporary erosion matting inside the channel of a perennial stream. Currently, the proposed activity includes 120 square feet of temporary impacts to waters of the United States. Because this activity would occur in a perennial stream, the impacts described also apply to the RPA associated with the perennial stream.

Overall, creating permanent access to gravity sewer mains for maintenance activities would involve 800 square feet of permanent impacts and 120 square feet of temporary impacts to delineated waters of the U.S. The impacts include permanently placing culverts and/or riprap or temporarily placing protective erosion matting on the interior of streambanks located within a delineated RPA; however, since the activity would occur entirely in the stream, there are no anticipated impacts to RPAs. These impacts would not be significant because the proposed activities must comply with Fort Belvoir's MS4 Permit. The MS4 Permit was developed in part to require contactors to submit an ESC Plan prior to beginning construction. The ESC Plan would include BMPs, such as silt fencing, control matting, and storm drain outlet protection, which minimize soil from entering wetlands and streams. Additionally, the contractor must submit a Stormwater Pollution Prevention Plan prior to beginning construction to maintain water quality.

Aerial Stream Crossing

Currently, nine sections of water lines and gravity sewer mains that cross above intermittent and perennial streams now require reinstallation below the streambed or structural reinforcement, which may require streambank repair and stabilization to prevent erosion of soil around the concrete piers that support the water and sewer lines. Similar to the gravity sewer main maintenance action, the proposed construction activities would be contained primarily to streambanks and channels; however, there are potential impacts to wetlands abutting the streams if avoidance and minimization techniques are not employed. Two of the projects involve either relocating or widening the stream channel; this could have permanent impacts to wetlands (i.e., loss of wetlands) if they are removed to accommodate the new location of the streams. Additionally, there would be permanent, minimal impacts to the associated RPAs, whose boundaries would change. Once the activity is completed, it is assumed that a new RPA boundary would be delineated and that the new boundary would be similar to the original RPA, thus the impacts would be minimal. Furthermore, it is assumed that the activity would be covered under a Joint Permit Application that would be filed separately, and in addition to, the Joint Permit Application previously filed for the gravity sewer main maintenance.

Most of the streams impacted under this alternative have an associated RPA, which could also be impacted. It is estimated that no more than 800 linear feet of streambank would be impacted per project, approximately 400 linear feet per side of stream (Russell 2013b). Because RPAs begin at the streambank, for each project under this alternative action no more than 800 linear feet of RPA would be impacted at each site, if present. The impacts to the RPAs, which could include land disturbance from bore holes and altering the boundary because of stream relocations, are likely minor and would be covered under a Joint Permit Application. Overall, impacts to wetlands and RPAs would be minimized to the extent practicable. The few permanent impacts to wetlands would be negligible and likely minimized and mitigated for according to the scope of the Joint Permit Application.

Construction activities at Sites 1, 2, 4, 5, 6, and 8 all involve replacing various damaged pipes with new pipes in streams that are abutted by wetlands and/or have an associated RPA. Although the proposed impacts are to streams, potential impacts to wetlands and RPAs could occur if avoidance and minimization techniques are not employed. Wetlands could be impacted by surface trenching, potentially displacing vegetation and soil; however, it is assumed that HDD technology would be employed so that wetland surfaces are not impacted by disturbing the surface. Additionally, construction equipment could impact wetland surfaces by destroying vegetation and compacting the soil as the equipment moves in and out of the streams. To protect wetlands from being impacted by construction equipment, it would be necessary for the equipment to enter the stream from an area not abutted by wetlands or to employ BMPs, such as placing timber matting over the wetlands. Assuming that boring holes are constructed in the RPA to install the water line, temporary, minimal impacts from land disturbance to the RPA could occur; however, the potential impacts would be assumed to be covered under the JPA.

Site 3, MDA Sanitary 1, involves removing three trees along an intermittent streambank, replacing a 12-inch pipe raising the streambed, and removing concrete piers from the stream swale. Additionally, the streambank would be restored; however, plans would not be finalized until a Joint Permit Application has been submitted for this activity. The proposed impacts are to streams only; however, there are potential impacts to wetlands and RPAs if avoidance and minimization techniques are not used. Placement of the pipe beneath wetlands would employ HDD techniques to avoid trenching. In order to protect adjacent wetlands from being impacted by construction equipment used for instream work, it would be necessary for the equipment to enter the stream from an area not abutted by wetlands or to use BMPs, such as placing timber matting over the wetlands.

Site 7, Hurley Sanitary, involves replacing existing pipes and relocating stream channel. This activity may cause permanent impacts to the palustrine forested wetlands that are dependent on the stream to maintain their hydrology; additionally, relocating the stream would have permanent impacts in the existing RPA and would cause there to be a new RPA boundary once the stream relocation is complete. These impacts may require mitigation; any mitigation measures would be finalized upon submission of the Joint Permit Application for this activity.

Site 8, Colyer Village, involves replacing existing pipes and raising the streambed. Palustrine forested wetlands are adjacent to the intermittent stream; however, it is assumed that the proposed activity would be contained to the stream and there would be no permanent impacts to wetlands. There is no delineated RPA associated with this activity, thus there are no anticipated impacts to the RPA.

Site 9, Harris Road Sanitary, involves replacing existing pipes, widening the streambed, and reconstructing the streambanks. The proposed activity may have permanent impacts to forested wetlands adjacent to the intermittent stream; however, the impacts should be minor provided the scope of activity is small.

R&R and FSDC Projects

The Meade Road water main replacement activity involves replacing approximately 3,800 linear feet of water mains. The boundary of the proposed activity intersects approximately 0.004 acre of an isolated wetland. Potential impacts to the forested/emergent wetland could be permanent and the area could be converted to emergent wetlands. Conversion of forested/emergent wetlands to emergent wetlands would result in a loss of forested habitat, potentially affecting species that require forests for breeding, foraging, or living. However, because the area that could be converted is small, it is expected that the impacts would be negligible and covered under a Joint Permit Application. The Meade Road water main replacement project activities are not located in any RPAs, so there would be no impacts to RPAs from this project.

The rediversion of force main discharge activity involves installing approximately 2,675 linear feet of forced water main pipes between LS 1575 to the new hospital lift station. The project area contains

approximately 0.18 acre of palustrine forested wetlands. The force mains would be installed beneath wetlands using HDD technology, discussed above. As such, impacts to wetlands should be minimal.

The new access to LS 584 activity involves constructing a new access road over a stream abutted by a palustrine forested wetland. If tree clearing is required to construct the access road, forested wetlands could be converted to emergent wetlands, which could be a permanent wetland impact. Impacts to forested wetlands could be permanent, and the area of forested wetlands could be converted to emergent wetlands. Conversion of forested wetlands to emergent wetlands would result in a loss of forested habitat, potentially affecting species that require forests for breeding, foraging, or living. However, because the area that would be converted is small, it is expected that the impacts would be negligible and covered under a Joint Permit Application. Neither the wetlands nor the stream are in a delineated RPA, thus there would be no impacts to RPAs.

The Woodlawn Village water and sewer improvements involve replacing the water and sewer system in Woodlawn Village. Approximately 4.4 acres of palustrine forested wetlands are located along the northern and western boundaries of Woodlawn Village. Additionally, approximately 1.8 acres of palustrine emergent wetlands are located in the southeastern portion of Woodlawn Village. The palustrine forested wetlands have an associated RPA buffer; however, there is no RPA associated with the palustrine emergent wetlands. During construction for this project, potential impacts to wetlands and RPAs are likely; however, the magnitude and type of impacts would not be known until design plans are finalized. Similar to the other projects on Fort Belvoir, design plans would minimize impacts to wetlands and RPAs to the extent practicable. Approved ESC plans would also be required and would be utilized to minimize impacts to water quality.

3.5 Biological Resources (Vegetation, Wildlife, and Special Status Species)

The study area for biological resources includes the proposed project sites for water tank replacement, force main replacement, gravity sewer main maintenance, aerial stream crossings, and the four ASDC projects, including all areas impacted by project activities.

3.5.1 Affected Environment

3.5.1.1 Vegetation

Fort Belvoir is home to multiple plant communities and vegetative species. An installation-wide vegetation study of Fort Belvoir conducted in 1998 identified 17 plant community types, four of which possess species with state conservation rankings of rare or very rare. These 17 types are included in the broader categories of mixed hardwood forests, pine forests, floodplain hardwood forests, wetlands, old-field grasslands and urban land, which describes land that has been developed (USAG Fort Belvoir 2001). A large portion (approximately 70 percent) of Fort Belvoir is undeveloped and supports predominantly forest communities, as well as tidally flooded marsh and shrub-scrub communities. Within Fort Belvoir's Main Post, areas of native vegetation occur in large tracts, aligned from the northeast to the southwest. Vegetation cover in the remaining 30 percent of Fort Belvoir consists primarily of improved and semi-improved grounds associated with the installation's developed land uses that includes administration, housing and community service facilities, developed training areas, golf courses, and other recreational facilities (USAG Fort Belvoir 2001). Plant communities, their acreage, and their distribution at Fort Belvoir are listed in Table 3-4.

Table 3-4: Plant Communities Acreage and Distribution

Plant Community	Acreages	Distribution
Oak/ericad forest	1,480	Upland areas of gravelly ridges and dry slopes
Beech mixed oak forest	1,158	Upland areas of gradual, well-drained ravine slopes
Tulip poplar mixed hardwood forest	1,062	Moist, fertile ravine slopes and ravine bottoms
Seep forest	40	Groundwater-saturated flats and slopes
Mixed pine hardwood forest	245	Previously disturbed areas in late succession
Virginia pine forest	610	Previously disturbed areas in mid-succession
Loblolly pine forest	256	Planted stands
White pine forest	6	Planted stands
Floodplain hardwood forest	648	Very poorly drained to Moderately well-drained floodplain bottomlands and sloughs
Non-tidal marsh/beaver pond	134	Above tidal limits of Accotink, Pohick, and Dogue creeks
Tidal marsh	96	Shallow tidal areas of Accotink and Pohick creeks and at the mouths of several small streams
Freshwater tidal swamp forest	45	Tidally influenced palustrine areas
Tidal scrub/shrub wetland	16	Edges of tidal swamp forests neat the transition to tidal marsh
Oil field grassland	286	Previously disturbed areas in early successional stages
Urban land	2,930	All developed areas including improved and semi-improved grounds

Source: USAG Fort Belvoir (2001)

The water storage tank replacements are all proposed to occur on what is considered to be urban land. Much of the vegetation in these areas has been previously disturbed and no longer remains in its natural state. The proposed force main replacements would occur on some urban land; however, the majority of replacements would occur on undeveloped, vegetated areas. Plant communities in the areas of the force main replacements, listed by prominence, are oak/ericad forest, floodplain hardwood forests, beech mixed oak forest and tulip poplar mixed hardwood forest. Gravity sewer maintenance and aerial stream crossing activities would be located in undeveloped, vegetated areas and include the same plant communities as identified above for the force main replacements. The majority of ASDC projects would occur on urban land with the new access to LS 584 occurring on urban land and oak/ericad forest and the rediversion of force main discharge from LS 1575 occurring slightly on beech mixed oak forest. Figures 3-16 through 3-20 show the distribution of plant communities in the study area. None of the vegetative communities in the proposed project areas are considered rare by the State of Virginia (USAG Fort Belvoir 2001).

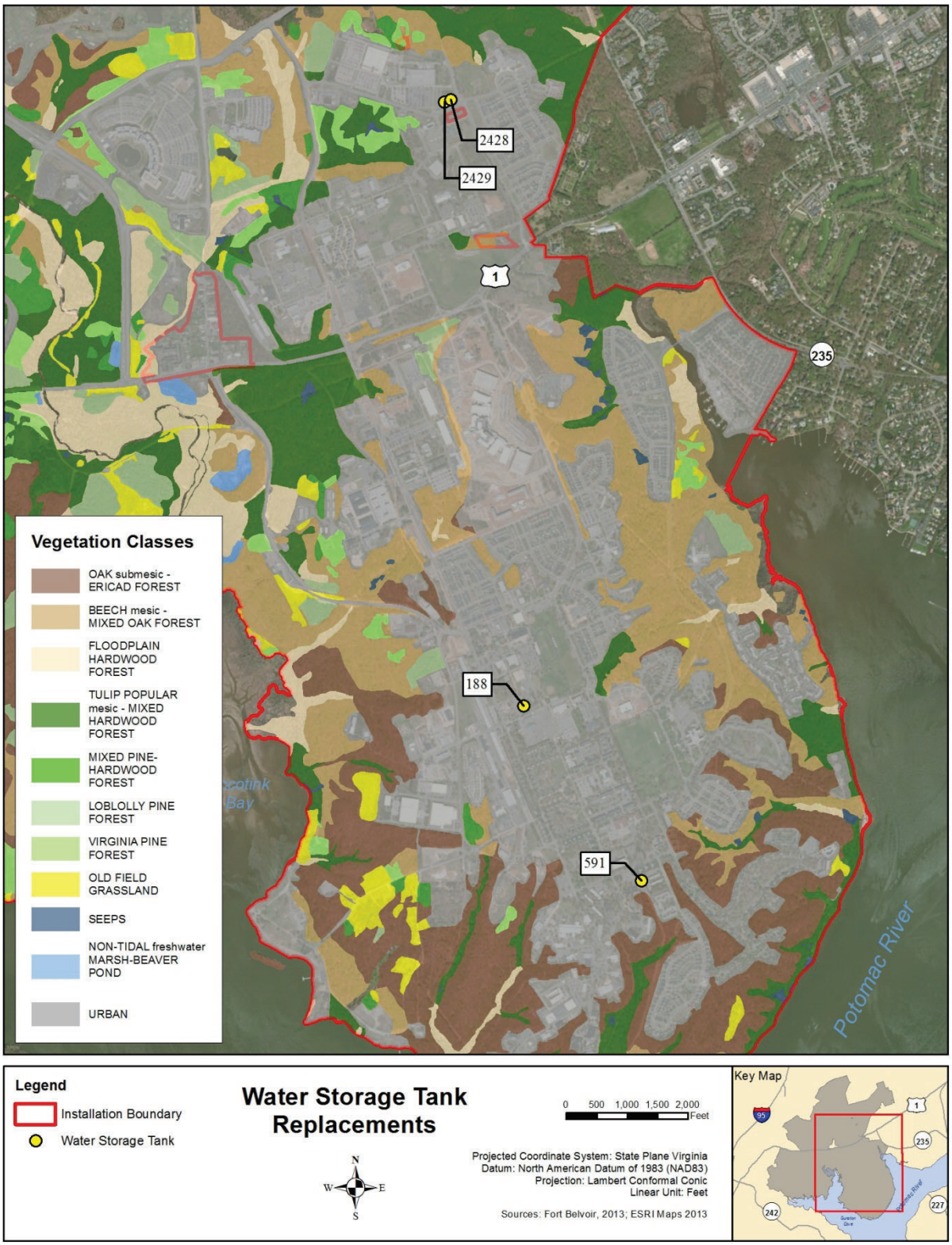


Figure 3-16: Vegetation – Water Tank Replacement

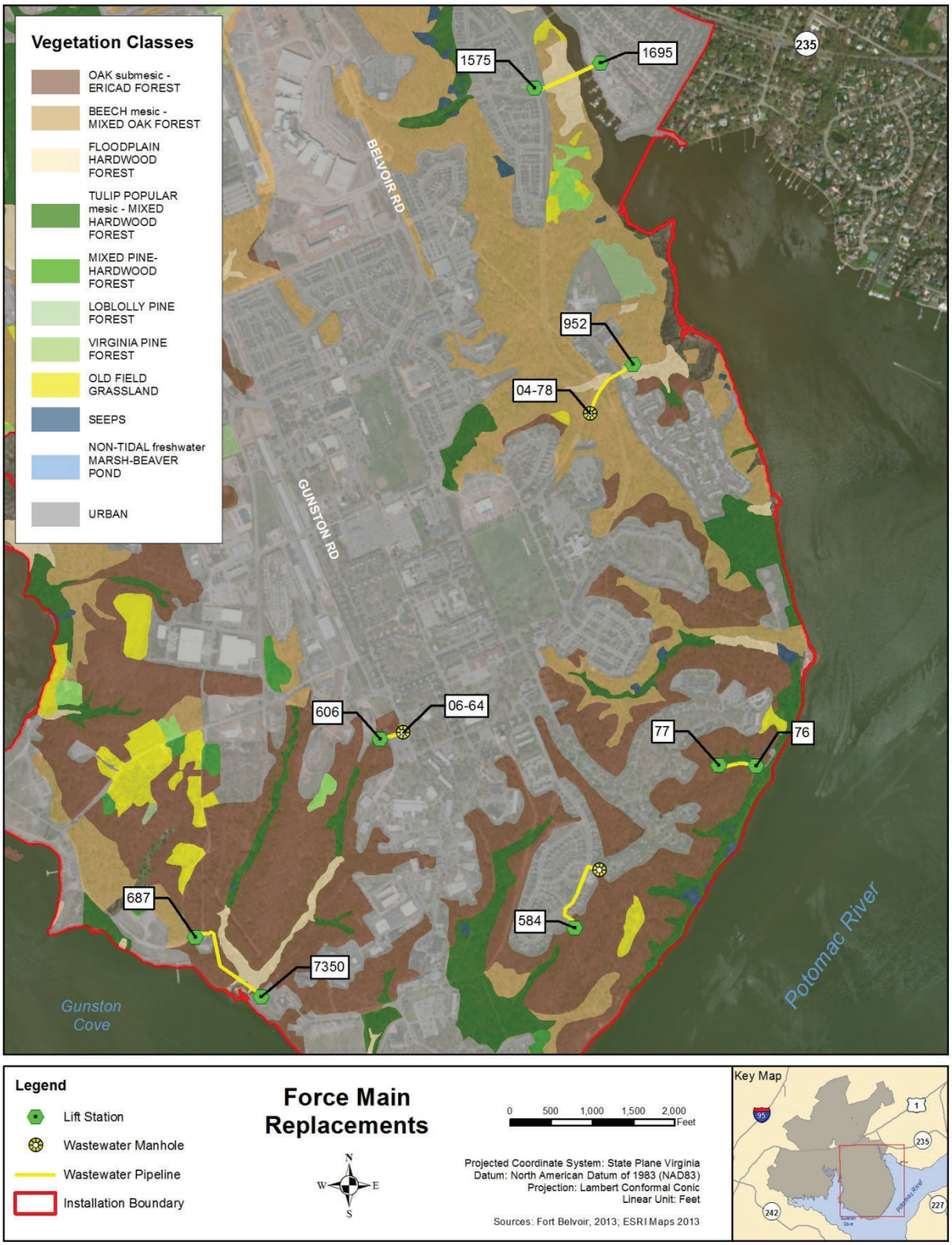


Figure 3-17: Vegetation – Force Main Replacement

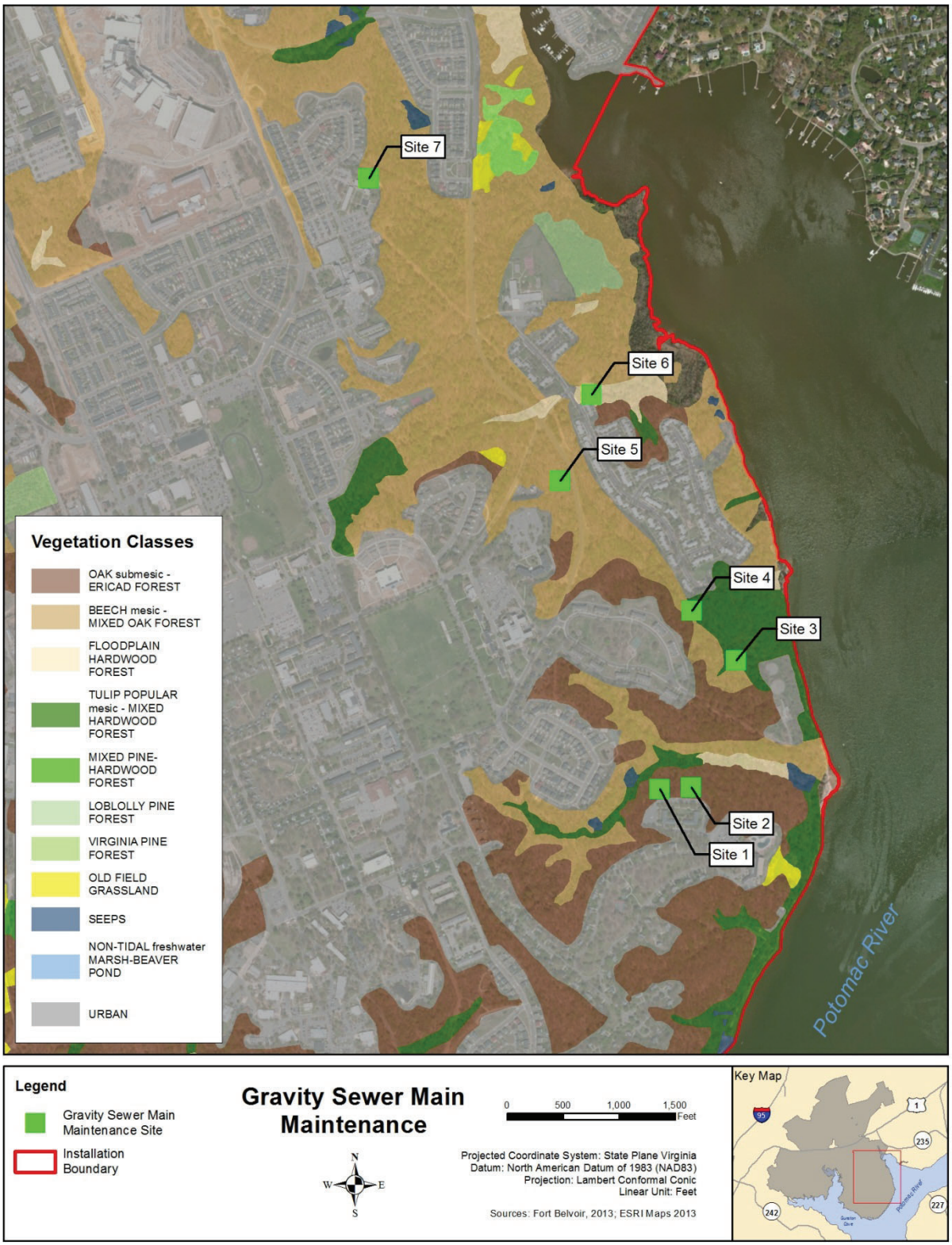


Figure 3-18: Vegetation – Gravity Sewer Main Maintenance

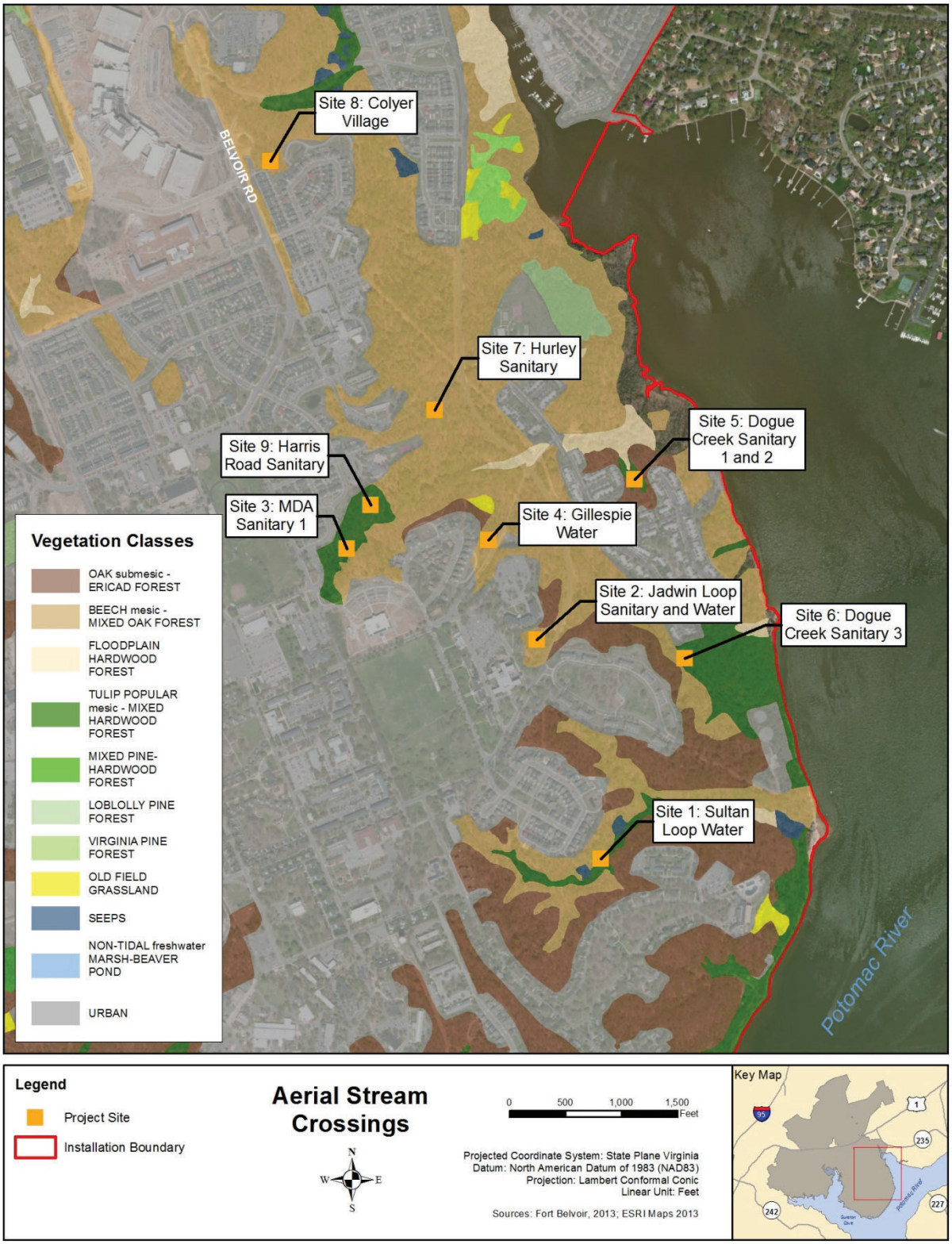


Figure 3-19: Vegetation – Aerial Stream Crossings

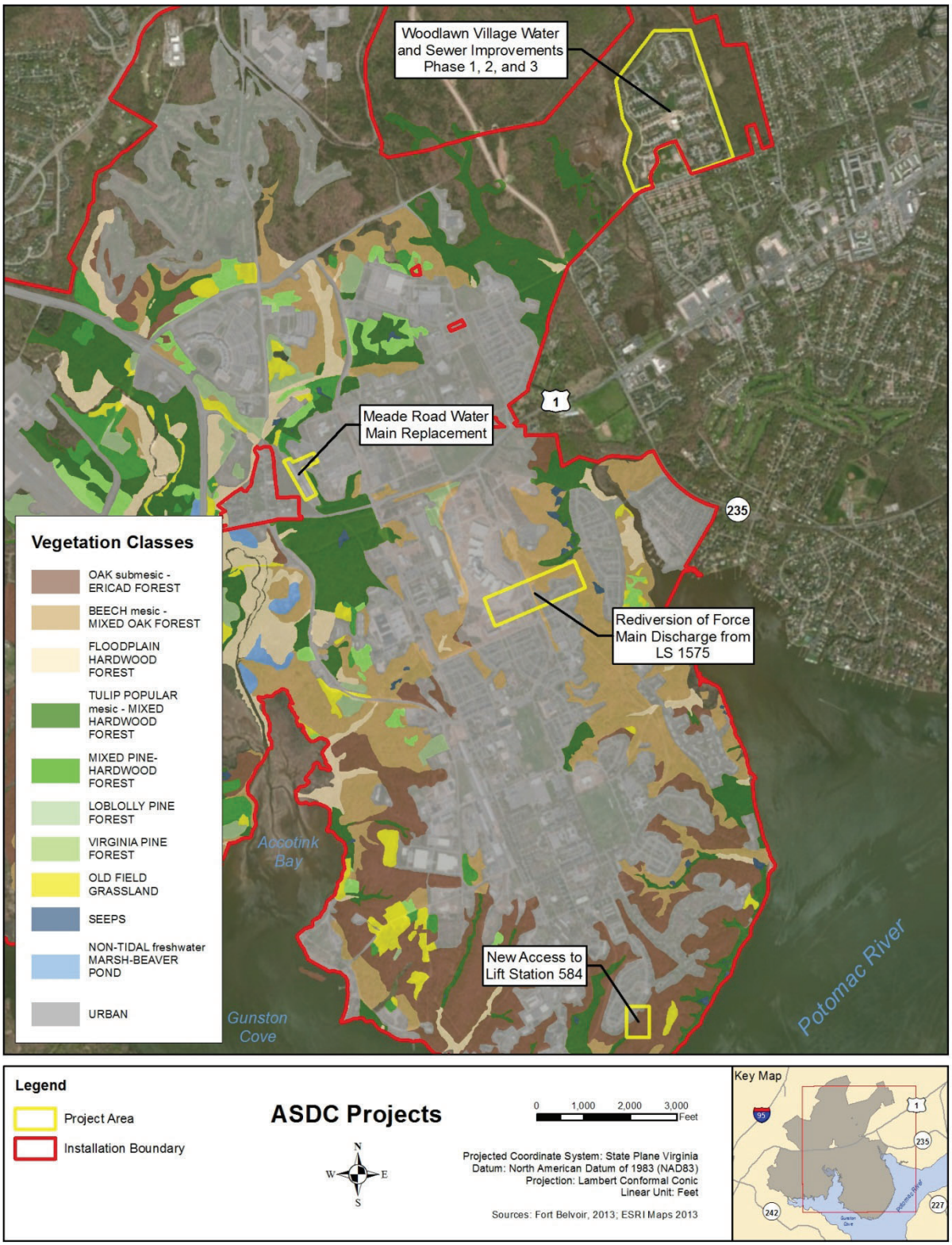


Figure 3-20: Vegetation – ASDC Projects

3.5.1.2 Wildlife and Wildlife Habitat

Fort Belvoir is home to numerous wildlife species. Based on installation-wide surveys, Fort Belvoir contains the potential habitat for 43 species of mammals, 274 species of birds, 32 species of reptiles, 27 species of amphibians and 60 species of fish (USAG Fort Belvoir 2001). More than 2,500 acres of land have been set aside on Fort Belvoir for wildlife including the Accotink Bay Wildlife Refuge, the Jackson Miles Abbott Wildlife Refuge, and a Forest and Wildlife Corridor. Fort Belvoir also participates in the Partners in Flight Program. Partners in Flight is a partnership between federal and state agencies, industry, non-governmental organizations and others, with the goal of conserving North American birds.

None of the proposed project areas are within the wildlife corridor, refuges, or Partners in Flight habitat areas; however, the proposed Woodlawn Village water and sewer improvements are located in proximity to the Jackson Miles Abbott Wetland Refuge, which sits to the north. With the exception of the water tank replacement sites, which occur on urban land, most of the project sites occur within or adjacent to forested lands on Fort Belvoir. With the broad variety of habitats and food sources available on the project sites, many of the wildlife species associated with forests on Fort Belvoir can be found on or near the project sites.

A number of aquatic species and their habitat exist in the streams, creeks, and wetlands within or near the proposed force main replacement, gravity sewer main maintenance, aerial stream crossings, and the ASDC projects. Full listing of species and habitat are found in the installation's Integrated Natural Resources Management Plan (USAG Fort Belvoir 2001). However, based on the locations of the proposed projects and the streams potentially impacted, it is not anticipated that impacts would occur as none of the proposed projects are located in areas that are considered to have high quality aquatic habitat (USAG Fort Belvoir 2001).

3.5.1.3 Special Status Species

Federally-listed Species

The Endangered Species Act of 1973 (ESA) requires federal agencies to ensure that their action is not likely to jeopardize the continued existence of any endangered or threatened species (animal and plant species) or result in the destruction or adverse modification of designated critical habitat. Special status species include species listed under the ESA as endangered, threatened, proposed endangered, proposed threatened, candidate, and species of special concern; and species listed by the Virginia Department of Conservation and Recreation (Virginia DCR) as endangered, threatened, or rare.

The small whorled pogonia (*Isotria medeoloides*), an orchid found in deciduous woods, can occur in the proposed project areas, except the water storage tanks sites and aerial stream crossings. It is considered threatened throughout its range by the USFWS, and endangered by the State of Virginia. Their habitat at Fort Belvoir has been mapped previously and was characterized by low, medium, and high quality. A field survey was conducted for the proposed force main replacement project sites that were considered to have medium to high potential for small whorled pogonia and included certain site locations for the force main replacements including LS 584, and LFS 76 and 77, and gravity sewer main maintenance sites 1-6. During the survey, no small whorled pogonia were identified. In all other areas, small whorled pogonia habitat is classified as poor and no survey of the site was conducted (Paciulli, Simmons, and Associates 2012).

State-listed Species

Fort Belvoir has two state-listed animal species that occur on the installation and include the state-listed threatened wood turtle (*Glyptemys insculpt*), and the state-listed endangered peregrine falcon (*Falco peregrinus,* during fall migration). Of these two species only the wood turtle has the potential to occur

and be impacted by some of the proposed force main replacements, gravity sewer maintenance and aerial stream crossings. Potential habitat for the wood turtle is primarily located along Accotink Creek and its tributaries. A 2012 survey was conducted along the proposed water and wastewater line work on Davison Army Airfield to the northeast of the proposed project areas, and no turtles were observed. In addition, the Northern Virginia well amphipod (*Stygobromis phreaticus*), a subterranean crustacean limited to groundwater seeps, was collected at Fort Belvoir's T-17 Training Area in 1996, one of only three records of collection since 1922. While, not state or federally listed as threatened or endangered, this critically imperiled amphipod is considered to be a species of special concern (Paciulli, Simmons, and Associates 2012). Force main replacement from LSs 687 to 7350 is located in T-17 and could potentially impact the Northern Virginia well amphipod.

The bald eagle (*Haliaeetus leucocephalus*) was delisted by the State of Virginia in 2013, however, it is still protected by the Bald and Golden Eagle Protection Act. The bald eagle occurs on the installation and has the potential to be impacted by some of the proposed projects. Known bald eagle nesting sites are found in the eastern portion of Fort Belvoir along shore areas in the proposed location of some gravity sewer maintenance, aerial stream crossings, and force main replacements, particularly the force main replacement from LSs 1575 to LS 1695, LS 687 to LS 7350, LS 584, and LS 953. Gravity sewer maintenance Sites 1 through 6 and aerial stream crossings Sites 1, 5, and 6 also are located in potential bald eagle habitat (Paciulli, Simmons, and Associates 2012).

3.5.2 Environmental Consequences

3.5.2.1 Impacts of No Action Alternative

Under the No Action alternative, no upgrades to Fort Belvoir's aging water and wasterwater infrastructure would be made and current environmental conditions would persist. As a result, streams beneath aerial crossings would continue to undergo bed and bank erosion, force mains may rupture and leak effluent into streams, and major capital investment upgrades would not occur. As a result, potential adverse impacts to biological resources, including vegetation, wildlife , and aquatic species could occur. Based on the characteristics of species of special concern and the location of the potential areas impacted, it is not expected that the No Action alternative would result in any impacts to species of special concern. In addition, as a result of the No Action Alternative, there is a continued potential for a sanitary sewer overflow (SSO) stemming from the continued use of aging sanitary sewer force mains, which could impact the quality of aquatic wildlife habitat. All biological resources would continue to be managed in accordance with the Fort Belvoir Integrated Natural Resources Management Plan.

3.5.2.2 Impacts of the Proposed Action Alternative

Water Storage Tanks

Four water storage tanks are proposed to be demolished and three new storage tanks would be constructed. The water storage tanks, their material laydown yards, and their crane pads are proposed to be on urban land where little to no vegetation currently exists; however, existing trees and vegetation would be removed. All vegetation in the footprint of newly constructed water towers would be removed; however, the only several trees and landscape vegetation would be impacted, resulting in less than significant impacts. After the existing water towers are demolished, the areas would be restored with landscape vegetation, resulting in potential beneficial impacts to vegetation.

Demolition and construction activities would result in the small, short-term reduction in areas of landscape vegetation and in turn would result in short-term, less than significant, adverse impacts to wildlife populations, which could be impacted by construction activities and noise and the loss of several trees. By being constructed in areas where development has already occurred, where natural

vegetation/habitat is limited, and where wildlife is used to human interactions, impacts on wildlife from the proposed project would be limited.

Special status species are not anticipated to occur in the proposed water storage tank areas, resulting in no impacts.

Force Main Replacement

Six sections of aging sanitary sewer force mains are proposed to be replaced to prevent accidental discharge of wastewater into the environment. Where they cross streams or wetlands, the force mains would be installed using HDD technology. In all other locations conventional open trench methods would be used with a maximum trench width of 10 feet. Underground drilling would not impact vegetation; however, drilling mud from the use of HDD technology would be transported to a dewatering facility on the installation and then transported to the local landfill for disposal. However, impacts to vegetation would be minimal as the drilling mud treatment sites would be restored and revegetated once construction activities are complete.

Vegetation in the footprint of open trenches and in the area of the bore pits would be removed. The amount of vegetation removed is relatively small when compared to Fort Belvoir as a whole and all disturbed areas would be stabilized and reseeded after construction. HDD technology would be used in sensitive areas and would utilize site-specific strategies or re-routing the pipe route to minimize tree loss. As a result, site-specific and less than significant adverse impacts would be expected.

Utility operations associated with force main replacements require that the ROW be kept free of woody vegetation and be maintained as grassed areas. The conversion from woody vegetation to grassed areas would likely lead to some habitat fragmentation and increased edge habitat and could result in adverse impacts to wildlife and wildlife habitat. However, because the area of habitat to be impacted would be small and because other suitable habitat is present in adjacent areas, it is not anticipated that the removal of forested habitat and the creation of edge habitat would have a substantial adverse impact to wildlife. Additionally, cleared forested areas would be seeded with wildlife seed mixes to minimize impacts to wildlife, and wildlife habitat and tree protection methods would be implemented to protect trees during construction activities.

Construction activities would temporarily displace wildlife and could remove some forested habitat. However, based on the relatively small area affected, the short-term nature of the Proposed Action, the likelihood that wildlife has previously come across human interactions, and the proximity of other wildlife habitat in the area, impacts to wildlife are expected to be less than significant. Force main replacement from LSs 7350 to 687 would occur in T-17; however, it is anticipated that no impacts to the Northern Virginia well amphipod would occur based on the assumption that bore pits would not be located in areas with seeps, where the amphipod is found. In addition, the use of HDD technology eliminates impacts to streams and wetland habitats. Force main replacements located along the eastern portion of Fort Belvoir would occur in potential bald eagle habitat and the LSs 1575 to 1695 replacement would occur in wood turtle habitat. However, based on the relatively small scale of construction and the amount of suitable habitat in the nearby area, adverse impacts to these species are not anticipated. Similarly, LS 584 and LSs 76 to 77 are located in suitable habitat for small whorled pogonia. However, no small whorled pogonias were identified at the sites and adverse impacts are not anticipated. Replacing the old force mains with new ones would also eliminate or lower the probability of a sewer main break and the resultant SSO occurring above streams, providing beneficial impacts to vegetation, wildlife habitat, and aquatic species.

Gravity Sewer Main Maintenance

Under this action alternative, Fort Belvoir's sewer lines would be inspected, and ROW easements would be permanently maintained Permanent access would be constructed for future maintenance and all ROWs would be maintained at a 20-foot width and a 15-foot width in wetlands. All woody vegetation, including trees, within these areas would be removed. Some of the gravity sewer mains are located in wooded, steeply sloped areas. However, based on the relatively small size of the project that would occur on forested areas compared to approximately 5,550 forested acres of Fort Belvoir as a whole, and adherence to Fort Belvoir ESC plans, impacts to vegetation would be localized and less than significant. The operation of the ROW requires that the area be kept clear of woody vegetation and would be maintained as grassed areas. The continued mowing of vegetation associated with the ROW would lead to localized less than significant adverse impacts. To minimize impacts associated with the ROW, Fort Belvoir has reduced the ROW width to 20 feet (15 feet in wetlands) from the originally proposed 40 feet. Each ROW would be reviewed internally by Fort Belvoir Directorate of Public Works and ROW routes sited to minimize mature tree loss.

Impacts to wildlife would occur from disturbance stemming from the presence of individuals and equipment as well as from the potential loss or disturbance of some habitat. These impacts would be localized and short term, occurring only during the maintenance, including the annual mowing of the ROW and the construction period. In addition, ROW operations require that the area be kept clear of woody vegetation and be maintained as grassed areas. This would lead to habitat fragmentation and increased edge habitat, potentially resulting in adverse, long-term impacts to wildlife. It is expected that impacts from the above actions would be less than significant based on the relatively small size of the habitat impacted, the large amount of nearby suitable habitat, and the habituation of wildlife to human activities in this urban environment.. Additionally, cleared forested areas would be seeded with wildlife seed mixes to minimize impacts to wildlife and wildlife habitat, and tree protection methods would be implemented to protect trees during construction activities.

The construction of riprap and culverts has the potential to impact aquatic species from the loss of habitat the displacement of species and while not anticipated the potential for direct mortality of species. However, based on the relatively small size of area that would be permanently impacted, approximately 800 square feet, it is expected that impacts would be less than significant to aquatic species and habitat. Appropriate ESC BMPs, including appropriate in-stream measures to avoid and minimize impacts to water bodies and wetlands would be employed. As a result, there would be minimal, short-term, adverse impacts to aquatic species from construction of culverts.

A small whorled pogonia survey was conducted in late winter of 2011 in support of a Joint Permit Application for Water and Wastewater Infrastructure Upgrades. During field surveys, no small whorled pogonia were identified. In addition, no high potential habitat exists in the project areas for the small whorled pogonia or wood turtle. Therefore, no adverse impacts are expected. In the location of Sites 1 through 6, potential bald eagle habitat exists, however, because bald eagles do not nest in the location of the proposed projects and based on the small scale of projects and the abundance of other suitable habitat in the vicinity, adverse impacts are not anticipated.

Aerial Stream Crossing

Currently, there are nine streams crossed by aerial gravity sewer lines; these lines require reinstallation to avoid further erosion. The proposed activity would be contained primarily to streambanks and channels and any vegetation impacted associated with the proposed activity likely are primarily contained to the streambanks and channels. Vegetation removal as a result of aerial stream crossings could lead to habitat fragmentation and increased edge habitat, leading to adverse, long-term impacts. Overall impacts to wildlife would likely be contained to the surrounding project areas. Stream repair/stabilization measures

would vary according to each site and would be determined at the time of design, as well as would be reviewed by the USACE and impacts to aquatic habitat would be minimized through the Joint Permit Application process.

Site 1, Sultan Loop Water, involves placing a new pipe within the streambank slope of a perennial stream and connecting it to an existing concrete structure located in the adjacent footbridge, then the slope would be re-established and stabilized. All vegetation within the footprint would be removed; however, based on the small footprint, the re-establishment/stabilization of the area and the use of a vegetated screened, impacts to vegetation would be less than significant. Impacts to wildlife and aquatic species are expected to occur only during the construction period, temporarily disturbing habitat and displacing species. Based on the abundance of habitat in the area, the small scope of the project, and the re-establishment/stabilization of the area, it is not anticipated that these impacts would be significant. Neither the small whorled pogonia or wood turtle species nor suitable habitat for these species has been found to occur in the area; therefore, there would be no adverse impacts. Suitable habitat for the bald eagle does exist, however, based on the small scale of the project and the abundance of suitable nearby habitat, adverse impacts are not expected.

Site 2, Jadwin Loop Sanitary and Jadwin Loop Water, involves replacing an exposed gravity sanitary pipe and manhole with a ductile iron pipe and precast manhole. This work would be done with HDD technology and some trenching. Vegetation in the area to be trenched would be removed, resulting in less than significant impacts, based on the small scale of vegetation to be removed.

Streambank erosion and downstream consequences would be reduced by stream restoration in the long term, resulting in beneficial impacts to vegetation and aquatic species from the decreased potential for erosion and the subsequent loss of vegetated species and from improved water and habitat quality from stream restoration. Impacts to terrestrial wildlife would occur during the construction period, temporarily disturbing habitat and species and resulting in their temporary displacement. Based on the small scale of construction and available habitat in the area impacts are not expected to be significant. Impacts to aquatic wildlife would similarly take place during the construction period and would alter the habitat during this time. Adherence to ESC BMPs as prescribed by the Fort Belvoir MS4 Permit would prevent significant water quality issues from occurring and could include silt fencing, storm drain outlet protections, and stone check dams, all of which work to protect vegetation, wildlife, and aquatic species and their habitat. Based on the small scale of impacted areas, adverse impacts would be less than significant. Once construction is completed approximately 650 linear feet of stream would be restored resulting in reduced erosion and improvements in water quality and habitat, all of which would result in beneficial impacts to the stream and aquatic habitat. It is not expected that any threatened or endangered species would occur in the area, resulting in no adverse impacts.

Site 3, MDA Sanitary 1, involves removing three trees along the streambank, replacing a 12-inch pipe raising the streambed and removing concrete piers from the stream swale. Impacts to vegetation from removal as a result of construction would be localized and less than significant and adverse. Impacts to wildlife both terrestrial and aquatic would be similar to those presented under Site 2 and it is not expected that there would be any impacts to threatened or endangered species.

Site 4, Gillespie Water, involves removing one existing pipe and redrilling a second beneath a perennial stream. It is assumed that there would be permanent impacts to the perennial stream from the establishment of a second pipe, disturbing aquatic species and their habitat, but that they would be mitigated by stream restoration. Impacts to vegetation, wildlife, and threatened and endangered species would be the same as those discussed under Site 2.

Site 5, Dogue Creek Sanitary 1 and 2, involves replacing the existing pipes with ductile iron pipes and raising the streambed. Impacts to vegetation, wildlife, and threatened and endangered species would be the same as those discussed under Site 2.

Site 6, Dogue Creek Sanitary 4, involves replacing existing pipes and raising the streambed. Palustrine forested wetlands are adjacent to the intermittent stream; however, it is assumed that the proposed activity would be contained to the stream and there would be no permanent impacts to vegetation in this area. Impacts to vegetation, wildlife and threatened and endangered species would be the same as those presented under Site 2.

Site 7, Hurley Sanitary, involves replacing existing pipes and relocating the stream channel. Construction activities and the relocation of the stream channel would remove vegetation or alter its natural state, resulting in less than significant adverse impacts. Aquatic wildlife would be impacted through temporary displacement and while not anticipated from the potential for direct mortality of species during construction and relocation of the stream channel and during the relocation of the stream channel. However, based on the relocation of the existing stream, it is anticipated that aquatic species would readily recolonize the stream and it is not expected that overall impacts would be significant. Impacts to terrestrial wildlife and threatened and endangered species would be the same as those presented for Site 2.

Site 8, Colyer Village, involves replacing existing pipes and raising the streambed. Impacts to vegetation, wildlife, and threatened and endangered species would be the same as those presented under Site 2.

Site 9, Harris Road Sanitary, involves replacing existing pipes, widening the streambed, and reconstructing the streambanks. Impacts to vegetation, wildlife and threatened and endangered species would be the same as those presented under Site 2.

ASDC Projects

The amount of vegetation and trees to be removed would depend on individual projects; however, each of the projects would result in some tree and wildlife habitat loss, as well as an increase in habitat fragmentation and edge habitat. All projects would require trenching to place pipes and grading and construction activities that would remove vegetation and impact wildlife during the construction period. Cleared forested areas would be seeded with wildlife seed mixes to minimize impacts to wildlife and wildlife habitat, and tree protection methods would be implemented to protect trees during construction activities. Impacts to trees, wildlife, and wildlife habitat from the Woodlawn Village and Meade Road projects are anticipated to be less than the other two projects because they would occur in mostly developed areas. The rediversion of force main discharge would require the clearance of a steeply sloped, wooded area, fragmenting an already shrinking wooded area. The new access to LS 584 would similarly remove an area of existing woodlands, all permanently reducing forest cover.

All construction would adhere to all applicable Fort Belvoir plans and would utilize site-specific strategies or re-routing the pipe route to minimize tree loss. Overall, impacts are expected to be localized and less than significant to vegetation and wildlife because of the relatively small amount of vegetation and wildlife habitat impacted and the proposed seeding with wildlife mixes and tree protection measures implemented during construction activities to help to minimize impacts. No special status species, nor suitable habitat for special status species, have been found to occur in the project areas, therefore, there would be no adverse impacts.

3.6 Air Quality

The study area for this analysis includes Fairfax County as a portion of the Washington, D.C., Maryland-Virginia airshed.

3.6.1 Affected Environment

The U.S. Environmental Protection Agency (USEPA) defines ambient air in 40 CFR Part 50 as: "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act (CAA) and the 1977 and 1990 CAA Amendments, the USEPA has promulgated National Ambient Air Quality Standards (NAAQS). The NAAQS were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, the USEPA has issued NAAQS for the following criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (particles with a diameter less than or equal to a nominal 10 micrometers [PM_{10}] and particles with a diameter less than or equal to nominal 2.5 micrometers [$PM_{2.5}$]), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb).

3.6.1.1 Air Quality General Conformity

Federal regulations designate Air Quality Control Regions (AQCRs) in violation of the NAAQS as nonattainment areas. According to the severity of the pollution problem, nonattainment areas can be categorized as marginal, moderate, serious, severe, or extreme. Severity categories have not yet been applied to $PM_{2.5}$ nonattainment areas. The USEPA classifies AQCR 47, which includes Fairfax County, as in marginal nonattainment for O_3 and as in nonattainment for $PM_{2.5}$. Fairfax County is in attainment for all other criteria pollutants. AQCR 47 was previously in nonattainment for CO, however, that portion of the airshed does not include Fairfax County.

AQCR 47 is also in the Ozone Transport Region. The Ozone Transport Region includes states in the northeast United States that must adhere to stricter conformity thresholds for nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which are precursors for O_3.

The NAAQS for $PM_{2.5}$ and O_3 are listed in Table 3-5.

Table 3-5: Ambient Air Quality Standards

Pollutant	Federal Standard	Virginia Standard
$PM_{2.5}$ – 24-hour average	35 µg/m^3	35 µg/m^3
Ozone – 8-hour average	0.075 ppm	0.075 ppm

Sources: USEPA (2012a), Commonwealth of Virginia (2012)

Notes: µg/m3 – micrograms per cubic meter; ppm – parts per million

To regulate the emission levels resulting from a project, federal actions located in nonattainment or maintenance areas are required to demonstrate compliance with the general conformity guidelines established in 40 CFR Part 93, *Determining Conformity of Federal Actions to State or Federal Implementation Plans* (the Rule).

AQCR 47 is in nonattainment for O_3 and $PM_{2.5}$; therefore, a General Conformity Rule applicability analysis to evaluate any impact to air quality is required. A summary of the analysis results is presented below, while detail of the methodology and calculations can be found in Appendix B. Emissions have been estimated for the O_3 precursor pollutants NO_x and VOCs, along with $PM_{2.5}$. Annual emissions for these compounds were estimated for each of the project actions (construction and operation) and compared to the *de minimis* levels established in the Rule. The *de minimis* level for marginal O_3 nonattainment areas is 100 tons per year for NO_x and 50 tons per year for VOCs. Sources of NO_x and VOCs associated with the proposed project would include emissions from demolition and construction equipment, construction worker commuter vehicles and trenching.

On July 11, 2006 USEPA established *de minimis* levels for $PM_{2.5}$. The final rule established 100 tons per year as the *de minimis* emission level for directly emitted $PM_{2.5}$ and each of the precursors that form it (sulfur dioxide [SO_2], NO_x, VOCs, and ammonia). This 100 tons per year threshold applies separately to each precursor, meaning that if an action's direct or indirect emissions of $PM_{2.5}$, SO_2, NO_x, VOC, and ammonia cumulatively exceed 100 tons per year, but the emissions of no single precursor exceeds 100 tons per year, and a general conformity determination would not be required. Neither the USEPA nor Virginia have found VOCs or ammonia to be a significant precursor of $PM_{2.5}$ in AQCR 47; therefore, VOCs and ammonia are not required to be evaluated for $PM_{2.5}$ under the Rule. Ammonia is not further addressed in this EA (VOCs are addressed as an O_3 precursor).

3.6.1.2 Air Permit Requirements

Title V Permit

The Virginia Department of Environmental Quality (Virginia DEQ) administers a program for permitting the construction and operation of new, existing, and modified stationary sources of air emissions in Virginia. Air permitting is required for many industries and facilities that emit regulated pollutants. The Virginia DEQ sets permit rules and standards for emissions sources on the basis of the age and size of the emitting units, attainment status of the region where the source is located, dates of equipment installation and/or modification, and type and quantities of pollutants emitted.

As a major stationary source for emissions, Fort Belvoir operates under a Title V Permit. The current installation-wide Title V Permit had an expiration date of March 21, 2008, but because Fort Belvoir submitted a renewal application by the regulatory deadline, the current permit does not expire until the Virginia DEQ either issues or denies a renewal permit, which it has not done to date. All terms and conditions of the Title V Permit issued on March 21, 2003, remain in effect. The installation is required to submit a comprehensive emission statement annually.

Existing Ambient Air Quality Concentrations

Stations that meet the USEPA's design criteria for state and local air monitoring stations and national air monitoring stations monitor ambient air quality in Fairfax County. Currently, one $PM_{2.5}$ and O_3 monitoring station operates in Fairfax County; however, previously, there were five active monitoring stations. The number of exceedances, or times the monitor recorded a concentration above the NAAQS, recorded at each monitor during the period 2008 through 2012 are shown in Table 3-6.

Table 3-6: $PM_{2.5}$ and Ozone Number of Exceedances, 2008 to 2012

Monitoring Station	Year				
	2008	2009	2010	2011	2012
#510590030 – Sta. 46 – B9, Lee Park, Telegraph Road					
Ozone – 8-hour	6	1	13	11	12
$PM_{2.5}$ – 24-hour	0	0	0	0	0
#510590018 – Mt. Vernon 2675 Shrewood Hall Lane					
Ozone – 8-hour	7	0	0	N/A	N/A
#510590005 – Cub Run Lee Road Chantilly					
Ozone – 8-hour	5	0	N/A	N/A	N/A
#510591005 – 6507 Columbia Pike					
Ozone – 8-hour	10	1	N/A	N/A	N/A
$PM_{2.5}$ – 24-hour	0	0	0	N/A	N/A
#510595001 – Lewinsville 1437 Balls Hill Rd.					
Ozone – 8-hour	6	0	N/A	N/A	N/A
$PM_{2.5}$ – 24-hour	0	0	0	N/A	N/A

Source: USEPA (2012b)

3.6.1.3 Meteorology/Climate

Temperature is a parameter used in calculations of emissions for air quality applicability. The climate at Fort Belvoir can be characterized as a humid, continental climate with a mean high temperature of 88 degrees Fahrenheit (°F) in July and a mean low temperature of 27°F in January. The average temperature is 57.5°F. Summers are warm with periods of high humidity and winters are cold with periods of snow cover. May is the month with the most precipitation, averaging 3.82 inches (The Weather Channel C undated).

3.6.1.4 Air Emissions at Fort Belvoir

As part of its Title V Permit, Fort Belvoir calculates permanent source emissions annually. Construction and vehicle emissions are not included in the calculation of annual emissions because these emission sources are temporary and not regulated by Title V of the CAA. Total emissions from significant sources at Fort Belvoir in 2008 are shown in Table 3-7.

Table 3-7: Emissions for Permitted Stationary Sources in 2011 (tons)

SO_2	CO	PM_{10}	$PM_{2.5}$	NOx	VOC
0.26	31.10	2.79	2.73	55.06	3.86

Source: Virginia DEQ (2011)

Note: Emission totals do not include emissions from stationary sources that are not significant under Title V and/or otherwise subject to permit terms or restrictions.

3.6.1.5 Regional Air Quality Index Summary

The USEPA calculates the Air Quality Index (AQI) for five major air pollutants regulated by the CAA: ground-level O_3, PM, CO, SO_2, and NO_2. The USEPA collects data daily to determine air quality for the region and releases it in the form of the AQI. The AQI ranges from zero to 500 with zero being no air pollution and 500 representing severely unhealthy air pollution levels. An AQI value between 101 and 150 indicates that air quality is unhealthy for sensitive groups, who may be subject to negative health effects. Sensitive groups may include those with lung or heart disease and would be more negatively affected by lower levels of ground level O_3 and particulate matter than the rest of the general public. An AQI value between 151 and 200 is considered to be unhealthy and may result in negative health effects for the general public with more severe effects possible for those in sensitive groups. AQI values above 200 are considered very unhealthy. An AQI greater than 300 represents hazardous air quality (AIRnow undated).

Table 3-8 presents the recent AQI data for Fairfax County. There were no days above AQI value of 300.

Table 3-8: Air Quality Index Data for Fairfax County, Virginia

Year	Air Quality Index Ranges		
	101 to 150, Unhealthy for Sensitive Groups (no. of days)	151 to 200, Unhealthy (no. of days)	201 to 300, Very Unhealthy (no. of days)
2008	10	2	0
2009	3	0	0
2010	13	0	0
2011	9	2	0
2012	10	3	0

Source: USEPA (2012c)

3.6.1.6 Greenhouse Gases

There is broad scientific consensus that humans are changing the chemical composition of the earth's atmosphere. Activities, such as fossil fuel combustion, deforestation, and other changes in land use, are resulting in the accumulation of trace greenhouse gases (GHGs), such as CO_2, in our atmosphere. An increase in GHG emissions is said to result in an increase in the earth's average surface temperature, which is commonly referred to as global warming. Global warming is expected, in turn, to affect weather patterns, the average sea level, ocean acidification, chemical reaction rates, and precipitation rates, all of which is commonly referred to as climate change. The Intergovernmental Panel on Climate Change's best estimates are that the average global temperature rise between 2000 and 2100 could range from 0.6 degrees Celsius (°C [1.08°F) (with no increase in GHG emissions above year 2000 levels) to 4.0°C (6.66°F) (with substantial increase in GHG emissions) (Intergovernmental Panel on Climate Change 2007). Even small increases in global temperatures could have considerable detrimental impacts on natural and human environments.

GHGs include water vapor, CO_2, methane, nitrous oxide, O_3, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential, which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth's surface. A gas's global warming potential provides a relative basis for calculating its carbon dioxide equivalent

(CO_2e), which is a metric measure used to compare the emissions from various GHGs based upon their global warming potential. CO_2 has a global warming potential of 1 and is therefore the standard to which all other GHGs are measured.

Water vapor is a naturally occurring GHG and accounts for the largest percentage of the greenhouse effect. Next to water vapor, CO_2 is the second-most abundant GHG. Uncontrolled CO_2 emissions from power plants, heating sources, and mobile sources are a function of the power rating of each source, the feedstock (fuel) consumed, and the source's net efficiency at converting the energy in the feedstock into other useful forms of energy (e.g., electricity, heat, and kinetic). Because CO_2 and the other GHGs are relatively stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of these emissions does not depend upon the source location on the earth (i.e., regional climatic impacts/changes will be a function of global emissions).

Regulatory Climate

In April 2007, the U.S. Supreme Court determined that the USEPA has the regulatory authority to list GHGs as pollutants under the federal CAA. Congress has considered numerous proposals and bills to regulate GHGs but has not adopted any legislation.

Currently, federal agencies address emissions of GHGs by reporting and meeting reductions mandated in laws, executive orders, and policies. The most recent of these are EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*, of October 5, 2009, and EO 13423, *Strengthening Federal Environmental, Energy, and Transportation Management*, of January 26, 2007.

The Energy Policy Act of 2005, Energy Independence and Security Act of 2007, and EOs 13514 and 13423 require an installation to adhere to specific energy improvements, which address waste reduction and improvements in efficiency. Specifically, the DoD Strategic Sustainability Performance Plan contains strategies to reduce energy waste and improve efficiency (DoD 2010).

On May 13, 2010, the USEPA issued the Tailoring Rule, which establishes a common sense approach to addressing GHG emissions from stationary sources under the CAA permitting programs. The rule includes three steps aimed at setting GHG thresholds for Prevention of Significant Deterioration (PSD)[2] and Title V Permits for new, modified, and existing sources. Steps 1 and 2 set thresholds for these major stationary sources. Step 3, finalized on June 29, 2012, did not revise the thresholds established under Steps 1 and 2 but opted not to apply PSD or Title V GHG permitting thresholds to smaller stationary sources at this time (USEPA 2012d). Under Steps 1 and 2, PSD requirements applied to new sources with the potential to emit at least 100,000 tons per year CO_2e or existing sources that emit 100,000 tons per year CO_2e and undertake modifications that increase emissions by at least 75,000 tons per year CO_2e. Title V GHG requirements apply to new or existing sources with the potential to emit 100,000 tons per year CO_2e (USEPA 2012d).

Baseline Greenhouse Gas Emissions at Fort Belvoir

GHG emission sources at Fort Belvoir include vehicle use, boilers, chillers, water heaters, and emergency generators. Current CO_2e emissions at Fort Belvoir in 2011 were 30,296.9 metric tons. The emission total is the amount reported annually under the requirements of 40 CFR Part 98 and does not include GHG emissions from mobile sources or emergency generator use.

[2] PSD is required for major source facilities in areas in attainment for all criteria pollutants. It requires the completion of a general conformity-like analysis for modifications to those facilities so that air quality does not deteriorate.

3.6.2 Environmental Consequences

3.6.2.1 Impacts of No Action Alternative

Under the No Action Alternative, there would be no upgrades to the water/wastewater infrastructure at Fort Belvoir. No construction projects would be completed. No additional emissions would be generated from Fort Belvoir, and as a result, there would be no impacts to air quality.

3.6.2.2 Impacts of the Proposed Action Alternative

A General Conformity Applicability Analysis was performed for the Proposed Action, which estimated the level of potential air emissions (NO_x, VOC, SO_2, and $PM_{2.5}$). Appendix B contains a detailed description of the assumptions and methodology used to estimate the potential emissions for the demolition and construction.

Construction-related emissions related to the water/wastewater utility system upgrade projects would be temporary and only occur during the construction period; however, a conservative approach was initially employed in the applicability analysis to ensure that construction scheduling would not result in higher levels of emissions than predicted. The analysis assumed that the construction emissions for all of the proposed projects would occur concurrently over the same one-year period. Operational emissions were not analyzed because the upgraded water and waste water utility systems would not result in an increase of long-term emissions over the operation of the existing system. Therefore, any change in existing emissions would be short term and temporary.

Emissions from construction activities are shown in Table 3-9.

Table 3-9: Total Annual Emissions from the Proposed Action

Construction Activity	Total Annual Emissions (tons per year)			
	NO_x	VOC	$PM_{2.5}$	SO_2
Use of heavy equipment	10.243	0.746	0.613	1.943
Fugitive emissions			2.336	
Construction crew, commuting	0.322	0.550	0.005	0.003
Painting (water storage tanks)		3.375		
Total Emissions from Construction and Demolition	**10.565**	**4.670**	**2.954**	**1.946**

Air emissions were also evaluated to determine regional significance. The Draft *Washington, DC-MD-VA Region 1997 $PM_{2.5}$ Maintenance Plan* (MWCOG 2013) and the *Plan to Improve Air Quality in the Washington, DC-MD-VA Region: State Implementation Plan for 8-Hour Ozone* (MWCOG 2007) set forth daily target levels for nonattainment pollutants within the Washington Metropolitan nonattainment region. Annual and daily emission inventories for each of the pollutants are available in Table 3-10.

The draft maintenance plan for $PM_{2.5}$ provides emission inventories for on-road (mobile) sources of pollution only. For point and non-road sources, the plan relies on the non-road diesel emission reduction program and point source federal regulations to reduce future emissions from these sources.

Table 3-10: State Implementation Plan Emission Inventories

Source of Emissions	$PM_{2.5}$ 2009 Emission Inventory (tons per year)		Ozone 2009 Emission Inventory (t)	
	$PM_{2.5}$	SO_2	NOx	VOCs
Point	N/A	N/A	N/A	113
Area	N/A	N/A	N/A	27
Non-road	N/A	N/A	N/A	75
On-road	1,350	27,400	531	146

Source: MWCOG (2013, 2007)

Emissions resulting from the construction of the Proposed Action would not exceed 10 percent of the emission inventories. Impacts to air quality would not be regionally significant.

Greenhouse Gases

Under the Proposed Action Alternative, short-term GHG emissions would be produced during the construction period. The Tailoring Rule requires GHG emissions be evaluated from long-term major or stationary sources. No Title V sources, such as boilers, would be impacted by the Proposed Action Alternative. Long-term GHG emissions would not increase under this alternative; therefore, the Proposed Action Alternative would have no significant, adverse impacts on GHG emissions.

The conclusion is that air quality impacts would not be significant on either a local or regional level from the construction of the Proposed Action. All construction emissions would be below *de minimis* levels and would also not be regionally significant for the pollutants of concern. A Record of Non-Applicability is available in Appendix B.

3.7 Coastal Zone Management

3.7.1 Affected Environment

The Coastal Zone Management Act) of 1972 (16 USC §1451 et seq., as amended) provides assistance to the states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. Section 307 (c)(1) of the Coastal Zone Management Act Reauthorization Amendment stipulates that federal projects that affect land uses, water uses, or coastal resources of a state's coastal zone must be consistent to the maximum extent practicable with the enforceable policies of that state's federally approved coastal management plan. The Commonwealth of Virginia has developed and implemented a federally approved Coastal Resources Management Program describing current coastal legislation and enforceable policies. There are enforceable policies for:

- Fisheries management
- Subaqueous lands management
- Wetlands management
- Dune management
- Non-point source pollution control
- Point source pollution control
- Shoreline sanitation

- Air pollution control
- Coastal lands management

Virginia's coastal zone includes all of Fairfax County, including Fort Belvoir; therefore, federal actions at Fort Belvoir are subject to federal consistency requirements. The Virginia DEQ serves as the lead agency for consistency reviews.

3.7.2 Environmental Consequences

3.7.2.1 Impacts of No Action Alternative

The No Action Alternative would have no impacts on the Virginia coastal zone or future implementation of the Coastal Resources Management Plan.

3.7.2.2 Impacts of the Proposed Action Alternative

The proposed water storage tanks demolition and replacement, force main replacement, gravity sewer main maintenance, aerial stream crossing, and ASDC projects would be consistent with Virginia's Coastal Resources Management Policies. A Federal Consistency Determination was submitted to Virginia DEQ, Virginia's Coastal Resources Management Program, to gain Virginia DEQ's concurrence that implementation of the Proposed Action would be consistent with the enforceable provisions of the state's coastal zone program. The Coastal Zone Consistency determination will be submitted to the State of Virginia as an appendix in the Final EA/Draft Finding of No Significant Impact Complete results of this coordination, including recommendations from Virginia DEQ, when received, are presented in Appendix C.

3.8 Cultural Resources

Federal actions that have the potential to affect cultural resources are subject to a variety of laws and regulations. The National Historic Preservation Act (NHPA) of 1966, as amended, is the principal legislative authority for managing cultural resources associated with federal projects. Section 106 of the NHPA requires all federal agencies to consider the effects of their actions on cultural resources listed and/or determined eligible for listing in the National Register of Historic Places (NRHP). Such resources are termed "historic properties" and may include buildings, sites, structures, districts, and objects that meet the NRHP's Criteria of Eligibility. The regulations that implement Section 106 (36 CFR Part 800) describe the process for identifying and evaluating cultural resources; assessing effects of federal actions on historic properties; and consulting to avoid, reduce, or mitigate adverse effects. The goal of the Section 106 process is to accommodate historic preservation concerns with the needs of federal undertakings through consultation with the State Historic Preservation Office (SHPO); Tribal Historic Preservation Office, if applicable; other parties with an interest in the effects of the undertaking; and as required, the Advisory Council on Historic Preservation.

Section 110 of the NHPA also charges federal agencies with the responsibility for establishing programs for the identification, evaluation, and nomination of historic properties on their land to the NRHP. Certain historic properties deemed to be of exceptional national significance have been designated National Historic Landmarks by the Department of the Interior. Additionally, Virginia and Fairfax County maintain their own lists, often overlapping with the NRHP, of historic properties worthy of protection.

In accordance with the regulations implementing Section 106 (36 CFR Part 800), impacts on cultural resources are identified and evaluated by (1) determining the area of potential effects (APE); (2) identifying historic properties present in the APE that are either listed in or eligible to be listed in the NRHP ; (3) applying the criteria of adverse effect to affected historic properties; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

The federal government has certain obligations with regard to items of cultural patrimony and sacred sites associated with Native Americans. Although these responsibilities are often included under the rubric of cultural resources compliance, they are defined in separate laws that afford federally recognized tribes status to engage in nation- nation consultations on matters for which the tribes' traditional practices and items of cultural patrimony are affected by the actions of federal agencies.

The analyses of impacts on cultural resources that are presented in this section respond to the requirements of both NEPA and Section 106 of the NHPA, although the Section 106 compliance is being handled separately. The diversity and scope of these projects requires that Section 106 be conducted separately for each undertaking.

3.8.1 Areas of Potential Effects

According to the regulations implementing Section 106, the APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE is influenced by the scale and nature of an undertaking and may be different for different effects caused by the undertaking (36 CFR Part 800.16 [d]). For National Environmental Policy Act (NEPA) purposes, the APE for cultural resources is the same as the study areas for the affected environment and NEPA analysis.

Water Storage Tank Replacements

Fort Belvoir, through its Section 106 consultation with the Virginia Department of Historic Resources (Virginia SHPO), has defined two APEs for the water tank replacements to include cultural resources located in the limits of construction disturbance and a visual APE. The construction disturbance APE includes the sites for the new replacement storage tanks and WSTs 188, 591, 2428, and 2429. The visual APE for this project is a one-mile line of sight set at the proposed replacement tank locations. In instances where the visual APE strikes a major body of water (e.g., the Potomac River), the width of the water body is excluded and the APE edge is defined where the body of water strikes land.

Force Main Replacement

Six sections of aging sanitary sewer force mains would be replaced to prevent possible rupture and subsequent discharges to the environment. All six sites are located on Main Post, south of U.S. Route 1. The APE would include a 40-foot-wide corridor along the sewer sections to be replaced.

Gravity Sewer Main Maintenance

Access to seven manholes used for regular sewer line maintenance located within or near jurisdictional wetlands would be established, which may require the installation of culverts or erosion mats at stream crossings and the clearing of vegetation. The APE for these access routes would include the 20-foot-wide access corridor.

Aerial Stream Crossing

Nine sections of water and gravity sewer lines cross above perennial streams require reinstallation below the streambed and/or streambank repair and stabilization to prevent erosion of soil around the concrete piers that support the water and sewer lines. Ground disturbance would occur at the construction site. The APEs for this Proposed Action includes all areas where construction activities would occur.

ASDC Projects

The APE for ASDC projects would include a 40-foot-wide corridor along the water and sewer main sections to be replaced, installed, or improved and the access road proposed to be constructed to LS 584.

3.8.2 Affected Environment

3.8.2.1 Historic Districts and Structures

Water Storage Tank Replacements

Through its Section 106 consultation with the Virginia Department of Historic Resources, Fort Belvoir has determined that the Fort Belvoir Historic District, Fort Washington, and Piscataway Park are located within the visual APE for WSTs 188 and 591; and the Woodlawn Historic District is located in the visual APE for WSTs 2428 and 2429.

The construction disturbance APE for WST 188 falls within the NRHP-eligible Fort Belvoir Historic District. No historic districts or structures are located with the construction disturbance APEs for WSTs 591, 2428, and 2429.

Fort Washington (MIHP No. PG:80-16)

Fort Washington stands on the eastern bank of the Potomac River in Prince Georges County, Maryland, approximately 10 miles south of Washington, D.C. The NRHP boundaries include what remains of the entire military reservation, more than 300 acres administered by the National Park Service. The primary resource is the main fort, a masonry fortification initially built in 1808 to 1810. Fort Washington was administratively listed in the NRHP in 1966, and a NRHP nomination was prepared in 1985. It is significant for its association with the initial establishment of Washington, D.C., and for its involvement in the War of 1812 and the Civil War. Additionally it is architecturally significant as a coastal defense fortification and for its archaeological record pertaining to the military occupation of the fort (Nickels and Korzen 1985).

The view from the Fort Washington across the Potomac River toward Fort Belvoir relates to Fort Washington's significant role in protecting Washington, D.C., from attack, particularly from a river approach. During the period of significance, views from Fort Washington's demi-bastions most likely would have illustrated a wooded shoreline or open farmland. Historic views to the west and southwest from Fort Washington remain largely intact today because Fort Hunt Park and the George Washington Memorial Parkway are located directly across the Potomac River from Fort Washington and they have restricted development.

Currently, views from Fort Washington toward points south and Fort Belvoir remain wooded, but they are interspersed with modern residential development and other intrusions that are visible along the shoreline. In addition to WSTs 188 and 591, modern water storage tanks can be seen northeast of Fort Belvoir. The Officer's Club at Fort Belvoir, built in 1935, sits prominently on a cliff along the river's shoreline and is also visible from Fort Washington.

The tops of WSTs 188 and 591 on Fort Belvoir are currently visible from Fort Washington. Because of the considerable distance between Fort Washington and the two tanks (approximately 5 to 6 miles), the tanks are difficult to discern. Trees and topography block a large portion of the tanks and their light color allows the tanks to blend into the horizon.

Fort Belvoir Historic District (DHR No. 029-0209)

The Fort Belvoir Historic District is located on the South Post of the Fort Belvoir in Fairfax County, Virginia. The historic district, which consists of approximately 269 acres, has been occupied by the Army since 1915 and encompasses resources dating from Camp Humphreys (1918 to 1922), Fort Humphreys (1922 to 1935), and Fort Belvoir (1935 to the present). The historic district boundaries contain 213 contributing and 92 non-contributing resources (Peeler and Crosby 2010).

The Fort Belvoir Historic District is nationally significant for association with the Army and its primary mission of training Army engineers. It is also architecturally significant for its collection of buildings that incorporate aspects of the Colonial Revival, Bungalow/Craftsman, and International styles and construction techniques into the typical building forms and types of an Army cantonment. Architecturally, the historic district also is significant for its incorporation of important planning principles of the Garden City and City Beautiful movements as applied to military construction and installation planning. The period of significance of the historic district begins in 1921 and ends in 1953 (Peeler and Crosby 2010). The Fort Belvoir Historic District was determined eligible for the NRHP in 1996 and a revised nomination form was prepared in 2010.

As a contributing resource of the Fort Belvoir Historic District, WST 188 is the oldest structure in the historic district remaining from the Camp Humphries era. Erected in 1918, the tank is a steel water tower supported by six steel lattice bracing legs that rest on concrete footings. The cylindrical tank has a conical top and is encircled by a metal catwalk. A central metal pipe connects the water reservoir to the pump station at ground level.

Historically, WST 188 has always been visible from various points within the Fort Belvoir Historic District as it predates all of the buildings and structures in the historic district. WST 188 represents the initial building campaign and infrastructural development at Fort Belvoir, when the post was Camp Humphries and home to the Army's Engineer School. WST 188 is the tallest structure in the historic district; however, topography, buildings, and vegetation screen views of the tank from many locations within the historic district.

Woodlawn Historic District (DHR No. 029-5181)

Fairfax County established the Woodlawn Historic District overlay in 1971. According to a 2009 study, the Woodlawn Historic District is significant as "an example of a rural agricultural crossroads community that demonstrates northern Virginia, and Fairfax County's, development from a society dominated by large estates, to an agrarian community of small farmers and timber merchants, to a suburban center with large government institutions" (JMA 2009). The Woodlawn Historic District includes several significant resources including Woodlawn Plantation (including the mansion house, Grand View, the Pope-Leighey House, and the Otis T. Mason House), and George Washington's Gristmill.

The 2009 Woodlawn Historic District Viewshed Study (JMA 2009) determined that the water storage tanks are not visible from other historic resources within the historic district, except the Woodlawn Quaker Meetinghouse, which is individually listed in the NRHP (discussed below).

Woodlawn Quaker Meetinghouse (DHR No. 029-0172)

The Woodlawn Quaker Meetinghouse, which sits at the end of a circle drive off of Woodlawn Road, north of U.S. Route 1 (Richmond Highway), is surrounded on the north, south, and west by Fort Belvoir. The Woodlawn Quaker Meetinghouse is significant as a rare example of the vernacular Quaker Plain Style in the architectural tradition of Delaware Valley Quakers. Built in two phases in 1851 and 1869, the building exemplifies the "cottage" meetinghouse type with entrances on the meetinghouse's long wall compared to the "chapel type," which is entered on the gable end. The Woodlawn Quaker Meetinghouse also is significant in the area of religion as a meetinghouse for the Hicksite branch and in the area of social history for its "central role in the spirit-led establishment of an agricultural settlement with the purpose of improving social welfare in antebellum" (Catlin 2008). The Woodlawn Quaker Meetinghouse was listed in the NRHP in 2009.

The 2009 Woodlawn Historic District Viewshed Study (JMA 2009) identified several historic views that are associated with the Woodlawn Quaker Meetinghouse. The study explains that although the period of

significance for the Woodlawn Quaker Meetinghouse as an individual property is 1851 to 1869, the period of significance for the Woodlawn Historic District, of which the meetinghouse contributes, is 1800 to 1964. Therefore, changes in the setting of the Woodlawn Quaker Meetinghouse that post-date its individual period of significance may be significant within the setting of the Woodland Historic District (JMA 2009).

Balloon testing, conducted as part of the 2009 Woodlawn Historic District Viewshed Study (JMA, 2009), determined that WSTs 2428 and 2429 are visible from the northern boundary of the Woodlawn Quaker Meetinghouse property, looking north on Franklin Road. This particular view, however, was not specified in the report as a significant, or contributing, historic view (JMA 2009).

A 2013 viewshed analysis confirmed that trees along the northern boundary of the parcel screen the view of WSTs 2428 and 2429 from the porch of the meetinghouse (LBG 2013). However, these existing tanks are visible from a path leading from the north side of the property near the horse shed to the cemetery. The path winds through a wooded buffer, and the existing tanks are visible at times through the trees looking north on Franklin Road.

The viewshed from the burial ground would most likely have been wooded and/or farmland until 1940 when the Army purchased 3,000 acres north of U.S. Route 1 for the development of the new Engineer Replacement Training Center. As late as the 1960s, densely spaced World War II-era buildings, mostly barracks (now demolished), occupied the area north of the Woodlawn Quaker Meetinghouse. WSTs 2428 and 2429 were built in 1948 and most likely would have been visible from the rear of the Woodlawn Quaker Meetinghouse property since their construction. Consequently, this view has changed outside the historic district's period of significance as buildings were demolished and new buildings constructed on Fort Belvoir.

The current view toward the two water storage tanks is partially blocked by trees along the northern boundary of the Woodlawn Quaker Meetinghouse. Modern intrusions (post 1964) within the viewshed include Building 1839 (built in 1998), located along the Woodlawn Quaker Meetinghouse's northern boundary, and Woodlawn Chapel (built in 2004), located at the northern end of Franklin Road. A wooded area along the east side of Franklin Road buffers views to the east and outside of Fort Belvoir.

Piscataway Park (PG:83-12, CH-668)

Piscataway Park comprises more than 4,000 acres on the eastern shore of the Potomac River in St Georges County and Charles County, Maryland. The significance of Piscataway Park lies in its purpose of preserving the historic vista across the Potomac River from Mount Vernon. In 1961, Congress authorized the National Park Service to acquire lands and scenic easements to prevent intrusive development along the river. The park, comprising public and private lands, preserves "the approximate character of the landscape as seen from Washington's estate, thereby safeguarding a vital and historic aspect of environment of one of America's greatest shrines" (Goeldner and Mackintosh 1979). Piscataway Park was administratively listed in the NRHP in 1966.

Although Piscataway Park is located within the viewshed APE, Fort Belvoir has determined that the water storage tanks are not visible from the park.

Force Main Replacement

Force main replacements would occur within the APEs of several historic districts and structures. The SM-1 Reactor Complex (DHR No. 029-0193) is located within the APE for LS 687 to LS 7350 and the Fort Belvoir Military Railroad (FBMRR) (DHR No. 029-5648) is within the APE for LS 606-06-64. In

addition, the LS 76-77 force main replacement would occur within the boundaries of the Fort Belvoir Historic District (see discussion above).

SM-1 Reactor Complex (DHR No. 029-0193)

The U.S. Army Package Power Reactor SM-1, constructed in 1957, is significant for its role as the first prototype power plant developed as a training facility for military personnel. The facility was taken offline in 1973. The SM-1 plant and the supporting buildings were determined eligible for listing in the NRHP in 1996 under Criterion G.

Fort Belvoir Military Railroad (DHR No. 029-5648).

Constructed beginning in 1918, the Fort Belvoir Military Railroad connected to existing state rail lines and provided much needed supplies and troops for the construction of Camp A.A. Humphreys (now Fort Belvoir). Boxcars, flatcars, day coaches and Pullmans were all used on the Fort Belvoir rail system. The railroad supported the installation for supplies, troop transportation and construction until its decommissioning in the 1980s. The Fort Belvoir Military Railroad track bed has been determined eligible for listing the National Register of Historic Places

Gravity Sewer Main Maintenance

No historic structures or districts are located in the APE for the gravity sewer main maintenance projects.

Aerial Stream Crossing

The Fort Belvoir Historic District (see above) is within the APE for the Sultan Loop Water stream crossing project site.

ASDC Projects

A portion of the Fort Belvoir Military Railroad (see discussion above) is located within the APE for the Meade Road water main replacement.

3.8.2.2 Archaeology

Previous archaeological surveys conducted for the installation encompasses the project areas (MAAR Associates 1993, R. Christopher Goodwin & Associates 2001). A total of 301 archaeological sites have been identified on the installation. Of these, approximately 40 percent have been formally evaluated as to whether they are eligible for listing in the NRHP. Eleven sites on the installation have been determined eligible for listing in the NRHP. Historic, prehistoric, and military sites have been identified on the base; both prehistoric and early historic sites are particularly numerous along the shores of the Potomac River. Of particular note is the Belvoir Plantation Site, 44FX0004, which includes the ruins of a large plantation house built for Lord Fairfax around 1740 and a small family cemetery. This large site is listed in the NRHP. Six historic cemeteries are present within the facility. Other than the Belvoir Plantation Site, no other eligible sites are in or near the project APEs.

Water Storage Tank Replacements

No archaeological resources are located in the APE for the water storage tank replacements.

Force Main Replacement

The section of force main from LS 584 to Manhole 00-91 proposed to be replaced crosses underneath the Belvoir Plantation site, archaeological site 44FX0004; however, this segment has been relocated to avoid impacting the site. The force main running from LS 687 to LS 7350 crosses archaeological site 44FX1330, a small prehistoric camp that has not been formally evaluated. No known archaeological sites are present in the APE for the other force main replacements sections.

Gravity Sewer Main Maintenance

No archaeological sites are located in the APE for the gravity sewer main maintenance projects.

Aerial Stream Crossing

No archaeological sites are located in the APE for the aerial stream crossing projects.

ASDC Projects

No archaeological sites are located in the APEs for the Meade Road water main replacement, Woodlawn Village water and sewer system improvements, and rediversion of force main discharge. The APE for the fourth new access road to LS 584 is located near the southern end of Pohick Neck in a wooded area near, but outside the boundaries of archaeological sites 44FX0004 (listed on the National Register), 44FX1505 (not yet formally evaluated), and 44FX1677 (not yet formally evaluated) (MAAR Associates 1993, R. Christopher Goodwin & Associates 2001).

3.8.3 Environmental Consequences

Under the No Action Alternative, none of the Proposed Actions would occur. Therefore, the No Action Alternative would not have any impacts on historic districts and structures or on archaeological resources.

3.8.3.1 Impacts of the Proposed Action Alternative

Water Storage Tank Replacements

Historic Districts and Structures

The Proposed Action Alternative would demolish four existing water storage tanks (WSTs 188, 591, 2428, and 2429) and replacement tanks would be constructed adjacent to the sites of the existing tanks. This action would have a minimal impact on the Woodlawn Historic District and the Woodlawn Quaker Meetinghouse. None of the replacement tanks would be visible from other contributing resources in the historic district, except the Woodlawn Quaker Meetinghouse. The proposed replacement tank for WSTs 2428 and 2429 would only visible from the rear of the Woodlawn Quaker Meetinghouse property and at this location views toward the replacement tank are screened by foliage. Additionally, this view has already been impacted by modern intrusions, including the existing tanks.

Implementing the Proposed Action Alternative would have a negligible impact on Fort Washington. Although the proposed replacement tanks for WSTs 591 and 188 are visible from the property, views toward the replacement tank are screened by topography and foliage, making them difficult to see. Additionally, this view has already been impacted by modern intrusions, including the existing tanks.

The Proposed Action Alternative would have no impact on Piscataway Park. None of the replacement tanks would be visible from this historic resource.

The loss of WST 188 as a contributing resource to the Fort Belvoir Historic District would be an adverse impact because the resource would lose its ability to convey its historic significance. The impact to the Fort Belvoir Historic District and to the historic viewshed from the Proposed Action Alternative would be adverse but not significant. The loss of WST 188 and the construction of the replacement tank would alter the visual and physical appearance of the historic district; however, the district would still retain sufficient historic integrity to convey its significance and would remain eligible for the NRHP.

In terms of the regulations implementing Section 106 of NHPA, the Proposed Action Alternative would affect historic properties listed in or eligible for listing in the NRHP. Adverse effects would be mitigated through the Section 106 process and the implementation of a Memorandum of Agreement between the

Army and the Virginia Department of Historic Resources. The final Memorandum of Agreement is included in Appendix E.

Archaeology

Replacement of the water tanks would not have an impact on archaeology because no archaeological resources have been identified in the APE.

Force Main Replacement

Historic Districts and Structures

Force main replacements would occur within the boundaries of the Fort Belvoir Historic District, the SM-1 Complex, and the Fort Belvoir Military Railroad. The replacement of the force mains would utilize horizontal drilling and construction activities and would be below ground; therefore, it would not impact historic districts and structures. Efforts to avoid effects on these historic properties will be coordinated with the SHPO separately through the Section 106 consultation process.

Archaeology

Previous archaeological surveys conducted for the installation encompasses the project areas (MAAR Associates 1993, R. Christopher Goodwin & Associates 2001). The project would be designed to avoid eligible and unevaluated sites whenever possible. The existing force main running from LS 584 to Manhole 00-91 crosses underneath the Belvoir Plantation Site, which is listed in the NRHP; this segment is being rerouted to avoid impact to the site. The force main running from LS 687 to LS 7350 crosses the unevaluated archaeological site 44FX1330. Impacts to this site would be avoided by horizontal drilling underneath the site, rerouting the pipes, relining the existing pipe *in situ*, or by other means. If archeological resources are discovered during construction, all work in the immediate vicinity of the discovery would be halted until the resources can be identified and documented and an appropriate mitigation strategy can be developed. Measures to avoid or mitigate any impact would be developed through the Section 106 consultation with the Virginia Department of Historic Resources to protect archaeological resources. Section 106 consultation is being conducted separately from the NEPA process.

While no known archaeological sites are present near the other sections of force main replacement, there is a chance that unrecorded archaeological sites might be found. When dig permits are issued for this work, the contractors would be issued with a copy of the installation's policy for unanticipated archaeological discoveries. If archaeological materials are found, work would stop and the finds would be investigated and evaluated according to the Section 106 process and all archaeological and Native American remains regulations (e.g. the Native American Graves Protection and Repatriation Act, the Archaeological Resources Protection Act of 1979). Therefore, the Proposed Action would have no significant impact on archaeological sites.

Gravity Sewer Main Maintenance

Gravity sewer main maintenance would have no impact on cultural resources as no historic structures or districts or archaeological resources are located in the APEs.

Aerial Stream Crossing

Historic Districts and Structures

The Fort Belvoir Historic District is within the APE for the Sultan Loop Water stream crossing site. Actions related to this undertaking would not impact the historic district. Efforts to avoid effects on historic properties will be coordinated with the SHPO separately through the Section 106 consultation process.

Archaeology

Repair of aerial stream crossings would involve construction activity on the banks of small streams within the installation. All of these areas have been surveyed for archaeological sites, and no sites have been defined within the APE for the aerial stream crossing sites. Therefore, there would be no impact on known archaeological resources.

While no known archaeological sites are present near the other replacements, there is a chance that unrecorded archaeological sites might be found. When dig permits are issued for this work, the contractors would be issued with a copy of the installation's policy for unanticipated archaeological discoveries. If archaeological materials are found, work would stop and the finds would be investigated and evaluated according to the Section 106 process and all archaeological and Native American remains regulations. Therefore, the Proposed Action would have no significant impact on archaeological sites.

ASDC Projects

Historic Districts and Structures

The FBMRR is located within the APE of the Meade Road Water Main Replacement. Construction activities proposed as part of this undertaking would occur below ground and would not impact the FBMRR. Efforts to avoid effects will be coordinated with the SHPO separately through the Section 106 consultation process.

Archaeology

ASDC projects would not have an impact on archaeology because no archaeological resources have been identified in the APE.

3.9 Infrastructure and Utilities

The study area for this analysis includes the proposed project sites where the upgrades to the water and wastewater systems would occur and the areas immediately surrounding the sites. The utilities assessed include: potable water distribution, wastewater collection, natural gas distribution, electric power distribution, communications, and solid waste collection and disposal. The Proposed Actions in this EA would not change the demand for utilities at Fort Belvoir, therefore, the major supply components of the utility systems were not evaluated.

3.9.1 Affected Environment

The water distribution and wastewater collection system would be directly affected by the Proposed Actions. Construction of the new water storage tanks and demolition of the old ones would indirectly affect the electric power (provided by Dominion Virginia Power) and communications systems. Some components of these systems within the projects sites would require relocation. The construction and demolition of the water tanks is expected to generate waste and recyclable materials that would affect solid waste disposal on the installation; however, all waste generated would be disposed of at permitted treatment, storage, and disposal facilities in compliance with all applicable regulations. The Proposed Action is not expected to affect the natural gas distribution system.

3.9.1.1 Potable Water Supply

American Water owns, operates, and maintains the water supply and distribution system on the installation under a 50-year contract. Fairfax Water (formerly Fairfax County Water Authority) provides potable water for Fort Belvoir through three entry locations, namely Pole Road, Telegraph Road, and Beulah Street. Demand for potable water at Fort Belvoir averaged approximately 1.8 million gallons per

day (mgd) in 2005 and 2.2 mgd in 2006 with a peak demand of 3.04 mgd (USACE 2007). Fort Belvoir's water system has a storage capacity of 2.3 million gallons. The system encompasses 78 miles of greater-than-6 inch-diameter water main pipes, two pumping stations, and four storage tanks (three elevated, free-standing aboveground tanks [WSTs 188, 591, and 2428] and one at ground level [WST 2429]).

WST 188 was constructed in 1918. WSTs 2428 and 2429 in 1948, and WST 591 in 1957. Currently, all of the water storage tanks are approaching or have reached the end of their useful life and their continued use would decrease the overall reliability of Fort Belvoir's water distribution system. Additionally, in order to meet current fire flow demands and future potable water demands to meet mission requirements, Fort Belvoir would require a water system with a storage capacity of 3 million gallons.

Sections of water lines cross above intermittent and perennial streams where erosion of the streambanks has affected the integrity of the lines.

3.9.1.2 Sanitary Sewer

American Water owns, operates and maintains sanitary sewer system on the installation, which includes 39 sewage pumping/lift stations and two main pumping stations. In fiscal years 2001 through 2003, the installation discharged an average of between 1.1 and 1.4 mgd with a maximum daily peak flow to the Fairfax County system of 6.0 mgd (USACE 2007).

Gravity sewer mains on Fort Belvoir were recently lined from 2010–2013 using Cured-in-Place Pipe technology. Sections of gravity sewer and water lines cross above intermittent and perennial streams where erosion of the streambanks has affected the integrity of the lines.

3.9.2 Environmental Consequences

3.9.2.1 Impacts of No Action Alternative

The No Action Alternative would have no impact on the natural gas distribution, electrical power distribution, communications, and solid waste collection and disposal systems on the installation, but would have noticeable adverse impacts on the water and wastewater systems at Fort Belvoir. The specific impacts are described by project below.

Water Storage Tanks

The No Action Alternative would retain four existing water storage tanks with a combined total capacity of 2.3 million gallons. These storage tanks are approaching or have reached the end of their useful life, and their continued use would decrease the overall reliability of Fort Belvoir's water distribution system. The existing tanks do not provide sufficient storage capacity to support the future needs and mission of Fort Belvoir.

Force Main Replacement

Under the No Action Alternative, aging sanitary sewer force mains would not be replaced and the potential for possible rupture would continue. Rupture of a force main would release untreated wastewater to the environment and require costly emergency repair and cleanup and could result in property damage and interruption of sewer service.

Gravity Sewer Main Maintenance

Under the No Action Alternative, manholes for seven specific sewer sections located in or near jurisdictional wetlands or waters of the United States would continue to be accessed via temporary routes. Permanent access is required and would not be constructed, which would hinder future maintenance

activities of these sewer sections. Improper inspection and maintenance of sewer lines could lead to clogs and backups and missed repair and rehabilitation opportunities.

Aerial Stream Crossing

The No Action Alternative would allow erosion to continue to affect the integrity of water and gravity sewer lines that cross above perennial and intermittent streams and the concrete piers that support the lines. Inaction could result in breakage or collapse of the water and/or sewer lines, causing interruption in service, the need for costly emergency repair, release of untreated wastewater into the environment, and possible introduction of contaminants into the water distribution system.

ASDC Projects

Under the No Action Alternative, the proposed capital upgrades and major renewals and replacements of the water and wastewater utility system would not occur. The reliability of Fort Belvoir's aging water and wastewater infrastructure would continue to decline and future demands for service would not be met. Missed opportunities to systematically repair and upgrade the existing system could lead to emergency repairs, potential releases to the environment, and larger more complex and costly system upgrades in the future.

3.9.2.2 Impacts of the Proposed Action Alternative

Water Storage Tank Replacement

Construction of the new water storage tanks would increase the total volume of potable water storage at Fort Belvoir from 2.3 million gallons to 3 million gallons. It would greatly improve the reliability of the water distribution system by replacing tanks that are approaching or have reached the end of their useful life. The new tanks would be less maintenance intensive and would better enable Fort Belvoir to meet current fire flow demands and future potable water demands to meet mission requirements. Overall, impacts from the construction of the new water tanks on the water system would be beneficial.

Some electrical and communications utilities in the direct vicinity of the tank sites would require protection and/or relocation prior to construction, potentially resulting in very minor and temporary service interruptions during relocation. Relocation of the affected electrical utilities would be the responsibility of Dominion Virginia Power who operates and maintains the electrical distribution systems at Fort Belvoir under a long-term contract. Relocation of the affected communications utilities would be the responsibility of the communications provider (Verizon Communications), also under contract. Fort Belvoir would coordinate utility relocations with the respective utility providers in advance of construction.

Construction of the new water storage tanks is expected to generate minimal amounts of construction waste, but demolition of the tanks is expected to generate approximately 240 tons of steel and 50 tons of concrete foundations. Construction and demolition debris from the replacement of water storage tanks project would be disposed of at the Rainwater Concrete Company Landfill in Fairfax County. This landfill receives 30,600 tons annually, on average (Fairfax County 2004). This landfill was estimated to have capacity through 2019, on the basis of expected county construction and demolition rates (Fairfax County 2004). Disposal of construction and demolition debris is not expected to have any long-term, adverse impacts on the capacity of the local landfills. The construction waste would be disposed of in accordance with applicable regulations. The steel and concrete would be recycled.

Force Main Replacement

Replacing aging sanitary sewer force mains would increase the reliability of sewer infrastructure in these areas and avoid the potential for rupture of aging pipes under pressure, resulting in beneficial impacts to the wastewater system. No impacts to the other utility systems are expected.

Gravity Sewer Main Maintenance

Construction of the permanent access routes to seven specific manholes located in or near jurisdictional wetlands or waters of the United States would have a beneficial impact on the operation of the sewer system by allowing safe, routine access to the manholes for inspection. Systematic inspection and maintenance of manholes and sewer lines can help to identify issues and avoid clogs and backups and identify needed repairs required to keep the system operating properly. No impacts to the other utility systems are expected.

Aerial Stream Crossing

Aside from the beneficial impacts on the integrity of the water and sewer lines at these crossings, there are no impacts to the other utility systems.

ASDC Projects

ASDC projects include maintenance activities and scheduled improvements to the water and wastewater systems and have direct positive impacts on those systems. Performing proper preventative maintenance is essential to protect investments in infrastructure. Replacing aging infrastructure systematically allows resources to be invested in a planned manner, adding value to the systems while minimizing the need to divert funds to costly emergency repairs. Aside from the beneficial impacts on the improved operation and reliability of the water and wastewater collection systems, the ASDC projects would have no impact to the utility systems.

3.10 Cumulative Impacts

In addition to identifying the direct and indirect environmental impacts of their actions, the Council on Environmental Quality's (CEQ's) NEPA regulations require federal agencies to address cumulative impacts related to their proposals. A cumulative impact is defined in the CEQ regulations (40 CFR Part 1508.7) as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." This section describes the process used to identify potential cumulative impacts related to the Proposed Action at Fort Belvoir and discusses those impacts for each of the resources analyzed in this EA.

The process outlined by CEQ includes identifying significant cumulative impacts issues, establishing the relevant geographic and temporal (time frame) extent of the cumulative effects analysis, identifying other actions affecting the resources of concern, establishing the cause-and-effect relationship between the Proposed Action and the cumulative impacts, determining the magnitude and significance of the cumulative impacts, and identifying ways in which the agency's proposal might be modified to avoid, minimize, or mitigate significant cumulative impacts.

CEQ regulations specify that cumulative impacts analyses encompass past, present, and reasonably foreseeable future actions. As a practical matter, the impacts of past actions on Fort Belvoir's water and wastewater utility system are already reflected in the conditions that currently exist, as described earlier in this chapter, in the Affected Environment section of each resource topic. For example, past actions on

Fort Belvoir affecting the wastewater utility system include rehabilitation of large sections of aging gravity sewer mains by relining the pipes using Cure In Place Pipe technology.

Present and reasonably foreseeable future actions on Fort Belvoir's water and wastewater utility system considered in the analysis are identified in Tables 3-11 and 3-12 below. In general, this EA considered present and reasonably foreseeable future actions as those that currently exist or are under construction, are the subject of an existing plan or proposal, or have identified funding. Actions beyond that become increasingly speculative and difficult to assess.

3.10.1 Present and Future R&R and FSDC Projects

Several projects identified in the 2012 ASDC have already been analyzed under separate NEPA documentation or have been eligible for Categorical Exclusion (CATEX) under the provisions of 32 CFR Part 651, Appendix B, Section II, and documented under a Record of Environmental Consideration (REC). Projects that are not analyzed within this EA or have not been previously covered under separate NEPA documentation will be evaluated when project information is available,

Table 3-11: Present R&R and FSDC Projects from the 2012 ASDC

Project	Description	Project Type	NEPA Action
Mcree Barracks water main replacement	This project is for the design and construction of approximately 1,600 linear feet of new 6-inch water main to replace the existing 6-inch, cast iron water main.	R&R	Previously evaluated and REC completed
U.S. Route 1 water main replacement	Replace 4,000 linear feet of circa-1954 cast iron water main in conjunction with the U.S. Route 1 widening project.	R&R	Evaluated in U.S. Route 1 widening EA by FHWA
Connect existing gravity to new Lift Station 774	Complete connection of existing gravity sewer main to new Lift Station 774 that was never completed by government.	FSDC	Previously evaluated and REC completed

Source: American Water (2012)

Note: EA – environmental assessment, FHWA – Federal Highway Administration, FSDC – Future System Deficiency Corrections/Upgrades, R&R – Removals and Replacement, REC – Record of Environmental Consideration

Table 3-12: Future R&R and FSDC Projects from the 2012 ASDC

Project	Description	Project Type	NEPA Action
Abbott Road water main replacement	Replace approximately 1,900 linear feet of 10-inch, pre-1960 water main.	R&R	Potentially Eligible for CATEX

Project	Description	Project Type	NEPA Action
Foster Road water main replacement	Replace approximately 786 linear feet of 8-inch, pre-1960 water main along with approximately 250 linear feet of 6-inch water line.	R&R	Potentially Eligible for CATEX
Goethals Road water main replacement	Replace approximately 1,870 linear feet of 8inches pre-1960 water main.	R&R	Potentially Eligible for CATEX
Replace existing 6-inch gravity sewer main between Manholes 01-45 and 01-47	Replace approximately 157 linear feet of 6-inch sewer main via open cut between Manholes 01-45 and 01-48 with 8-inch PVC.	R&R	Potentially Eligible for CATEX
Replace existing 6-inch gravity sewer main between Manholes 01-49 and 01-47	Replace approximately 175 linear feet of 8-inch sewer main via open cut between Manholes 01-49 and 01-47.	R&R	Potentially Eligible for CATEX
Replace existing 8-inch gravity sewer main between Manholes 01-64 and 01-46A	Replace approximately 94 linear feet of 6-inch sewer main via open cut between Manholes 01-64 and 01-46A; this case iron pipe is heavily tuberculated and cannot be lined.	R&R	Potentially Eligible for CATEX
Replace existing 8-inch gravity sewer main between Manholes 02-40 and 02-39	Replace approximately 143 linear feet of 8-inch sewer main via open cut between Manholes 02-40 and 02-39.	R&R	Potentially Eligible for CATEX
Replace existing 6-inch gravity sewer main between Manholes 08-48 and 08-75	Replace approximately 72 linear feet of 6-inch sewer main via open cut between Manholes 08-48A and 08-75. This main is cast iron and is heavily tuberculated and cannot be lined.	R&R	Potentially Eligible for CATEX
Replace existing 6-inch gravity sewer main between Manholes 08-75 and 08-74	Replace approximately 22 linear feet of 6-inch sewer main via open cut between Manholes 08-75 and 08-74. This main is cast iron and is heavily tuberculated and cannot be lined.	R&R	Potentially Eligible for CATEX
Gravity sewer cleaning and CCTV	Cleaning and CCTV inspection of gravity sewer main.	R&R	Potentially Eligible for CATEX
Replace existing 6-inch gravity sewer main between Manholes 14-38 and 14-146	Replace approximately 111 linear feet of 6-inch sewer main via open cut between Manholes 14-38 and 14-146. This main is VCP and has multiple offset joints and bellies.	R&R	Potentially Eligible for CATEX

Project	Description	Project Type	NEPA Action
Replace existing 6-inch gravity sewer main between Manholes 19-20 and 109-1-029	Replace approximately 142 linear feet of 6-inch sewer main via open cut between manholes 19-20 and 109-1-029. This main is cast iron line and is heavily tuberculated and cannot be lined.	R&R	Potentially Eligible for CATEX
Replace existing 12-inch gravity sewer main between Manholes 23-03 and 24-23	Replace approximately 372 linear feet of 12-inch sewer main via open cut between manholes 23-03 and 24-23.	R&R	Potentially Eligible for CATEX
Replace existing 6-inch gravity sewer main between Manholes 25-04A and 25-03	Replace approximately 156 linear feet of 6-inch sewer main via open cut between manholes 25-04A and 25-03. This main is VCP and is too small to line.	R&R	Potentially Eligible for CATEX
Replace lift station generator security fencing	Replace existing lift station generator fencing that is in poor condition.	R&R	Potentially Eligible for CATEX
Replace existing 15-inch gravity sewer main between Manholes 18-08 and 18-04	Replace approximately 360 linear feet of 15-inch sewer main via open cut between Manholes 18-08 and 18-04. This main is VCP and severe belly under an existing building and holds water.	R&R	Potentially Eligible for CATEX
Lift stations repair and replacement	Improvements to the mechanical, electrical, piping and structural components of the existing sewer lift stations.	R&R	Potentially Eligible for CATEX
Beulah Road PRV	Installation of a new 6-inch PRV and vault that would serve as a low flow by-pass around the existing 16-inch PRV and modifying the existing 16-inch PRV and installing a SCADA panel at the ADF-E flow meter.	FSDC	Potentially Eligible for CATEX
Building 2310 water service	Installation of a new 10-inch water main to building 2310. The new 10-inch main would run parallel to the existing sewer main from Building 2310 to Woodlawn Road. From Woodlawn Road the new main would be installed by directional drilling HDPE pipe cross country and connected to the water main on the east side of the new Post Exchange.	FSDC	Potentially Eligible for CATEX

Project	Description	Project Type	NEPA Action
Backflow preventer and Meter Study	Perform a study to identify missing and/or incorrectly installed backflow preventers, identify all service connections for each building, and make recommendations for meter installation. The study would require entering the mechanical rooms of all accessible buildings to identify and inspect all water connections. The approximate location of all building service connections (5 feet from building) would be located by GPS and GIS mapping would be updated.	FSDC	Potentially Eligible for CATEX
Installation of Muffin Monster at Lift Station 1832	Installation of Muffin Monster to chew up rags that are constantly clogging up the pumps at Lift Station 1832.	FSDC	Potentially Eligible for CATEX
Installation of Muffin Monster at Lift Station 1695	Installation of Muffin Monster to replace old Bar Screen at Lift Station 1695.	FSDC	Potentially Eligible for CATEX
Davison Army Air Field I&I study	I&I study of Davison Army Airfield Sanitary Sewer System to identify any cross connections between sanitary sewer and storm water collection systems.	FSDC	Potentially Eligible for CATEX
Re-route gravity sewer main between Manholes 00-39 and 04-07	Install new gravity sewer main through parking lot to replace existing gravity sewer that is located in a steep ravine and is inaccessible for maintenance and cleaning.	FSDC	Potentially Eligible for CATEX
Installation of additional security fencing at Lift Stations 97, 606, and 687 and inspection of concrete overflow basin	Installation of additional fencing to improve security at these locations.	FSDC	Potentially Eligible for CATEX
Waste Water System I&I Study – South Post	I&I study of wastewater collection system.	FSDC	Potentially Eligible for CATEX
Waste Water System I&I Study – North Post	I&I study of wastewater collection system.	FSDC	Potentially Eligible for CATEX
Inspection of concrete overflow basin at Lift Station 97	Inspection, testing, and structural report for concrete overflow basin.	FSDC	Potentially Eligible for CATEX
Installation of water tight frame and covers at River Village	Installation of water tight sewer manhole frame and covers.	FSDC	Potentially Eligible for CATEX

Project	Description	Project Type	NEPA Action
Installation of inflow protectors	Installation of Rain Guard inflow protectors at sanitary manholes located in pavement.	FSDC	Potentially Eligible for CATEX
Installation of debris basket at Lift Station 1745	Installation of debris basket at influent pipe to prevent rags from entering the wet well.	FSDC	Potentially Eligible for CATEX

Source: American Water, 2012

Note: CATEX – Categorical Exclusion, FSDC – Future System Deficiency Corrections/Upgrades, CCTV – closed circuit television, GPS – Global Positioning System, GIS – Geographic Information System, HDPE – high density polyethylene, I&I – Inflow and infiltration () PRV– pressure reducing valves, PVC – polyvinyl chloride, R&R – Removals and Replacement, SCADA - Supervisory Control and Data Acquisition

3.10.2 Proposed Action Alternative

3.10.2.1 Soils

Construction activities associated with present and future R&R and FSDC projects would compact, expose, disturb, and modify the structure of soils temporarily during construction and would be restored after construction. Many of the cumulative actions would occur on already disturbed soils and impacts to these soils would not be significant. Construction of present and future projects would require compliance with Virginia Stormwater Management regulations and Virginia Erosion and Sediment control regulations with an approved ESC Plan and Stormwater Pollution Prevention Plan. Construction activities associated with the Proposed Action would also involve soil disturbance, with areas restored after construction, and compliance with stormwater regulations and ESC regulations. The completion of the required Stormwater Pollution Prevention Plan and Soil Erosion and Sediment Control Plan and implementation of BMPs for these projects would be coordinated and minimize adverse impacts to soils, ensuring that potential impacts from soil disturbance would not be cumulatively significant.

3.10.2.2 Water Resources

Construction activities associated with present and future R&R and FSDC projects would temporarily impact water resources during construction. The Proposed Action would have short-term, adverse impacts on surface water resources related to construction activities. However, streambank restoration would result in long-term, beneficial impacts. All construction activities would be consistent with state and federal erosion control guidelines and would be conducted according to permit requirements, ensuring that adverse, cumulative impacts would be minimized and would not be significant.

3.10.2.3 Wetlands and RPAs

Construction activities associated with present and future R&R and FSDC projects could have the potential to temporarily or permanently impact wetlands and RPAs, but measures would be employed to avoid and minimize impacts to wetlands and RPAs. Under the Proposed Action, instream work would be limited to within the channel and the banks minimizing impacts to wetlands and RPAs. HDD technology would be used to replace force main pipes beneath sensitive areas to avoid and minimize impacts. For any impacts on the wetlands, the Army would submit a Joint Permit Application to the USACE. Permit conditions would be followed to minimize and reduce impacts to wetlands. As a result, any adverse, cumulative impacts would be minimized and would not be significant.

3.10.2.4 Biological Resources

Construction activities from present and future R&R and FSDC projects could disturb and remove vegetation and distract wildlife temporarily during construction. Most projects would occur in developed areas and would have minimal impacts wildlife and wildlife habitat. If vegetation clearing is necessary, these sites would be revegetated to the greatest extent possible, thus minimizing impacts of vegetation removal. Displaced wildlife would readily return to sites after construction activity is complete. However, many of the proposed cumulative projects would occur on previously disturbed areas and impacts to vegetation and wildlife in these areas would not be significant. Construction activities associated with the Proposed Action would result in minimal impacts to vegetation and wildlife on Fort Belvoir because minimal vegetation and wildlife habitat would be removed. As a result, adverse, cumulative impacts to vegetation and wildlife and wildlife habitat would not be significant.

3.10.2.5 Air Quality

The applicability analysis determined that peak year combined emissions due to construction and operation activities would be below the appropriate *de minimis* values for areas in nonattainment for O_3 and $PM_{2.5}$, demonstrating that a full conformity determination is not required. Air emissions were also evaluated to determine regional significance and found not to be regionally significant. As a result, cumulative impacts to air quality would not be significant. The Army has provided a Record of Non-Applicability in Appendix B.

3.10.3 Coastal Zone Managment

The Proposed Action would be consistent with the state's coastal zone program and not affect the following enforceable policies: fisheries management, subaqueous lands management, wetlands management, dunes management, point source pollution control, shoreline sanitation, and coastal lands management. No cumulative impacts to coastal zone management are expected.

3.10.3.1 Cultural Resources

Present and future R&R and FSDC projects within the project area would not adversely impact cultural resources. Future projects at Fort Belvoir would be constructed in accordance to Section 106 of the NHPA and evaluated in accordance with the Army's NEPA implementing regulations. As a result, No cumulative impacts to cultural resources are expected.

3.10.3.2 Infrastructure and Utilities

Present and future R&R and FSDC projects represent a combination of improvements to and systematic maintenance of the water and wastewater systems. These projects improve the operation and reliability of the water and wastewater infrastructure at Fort Belvoir. Impacts to the other utilities, such as protection or relocation of other utilities to facilitate construction, would minor and mostly temporary. The Proposed Action would result in short-term, negligible, adverse impacts on the installation's water and wastewater system and long-term, beneficial impacts that would not be cumulatively significant.

3.10.4 No Action Alternative

Implementation of the No Action Alternative would avoid new impacts for all resource areas, except the installation's water and wastewater utility system, and those impacts could interact with the impacts of other past, present, and reasonably foreseeable actions. The No Action Alternative would have noticeable, adverse impacts on the water and wastewater systems at Fort Belvoir. In combination with the cumulative actions, the No Action Alternative would have an adverse, cumulative impact on the water and wastewater systems.

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4.0 FINDINGS AND CONCLUSIONS

4.1 Unavoidable Adverse Impacts

Unavoidable impacts are those impacts that the United States (U.S.) Army Garrison Fort Belvoir (Fort Belvoir) would experience if the proposed water and wastewater utility system upgrades were implemented under the Proposed Action Alternative. There are potential for minimal, short-term (temporary) impacts associated with construction activities that would include soil disturbance; increased sedimentation; disturbance to vegetation, wildlife, and wildlife habitat; and increased air emissions. There is no occurrence of, nor high quality habitat for, federally or state-listed species at the project sites. The Proposed Action Alternative would not alter access to, or use of, coastal resources.

Construction of the replacement water tanks would permanently impact approximately 3,000 square feet of soil (1,000 square feet at three sites); however, construction of the new storage tanks would not result in an increase in stormwater runoff because any new impervious surface from the replacement tanks would be offset by the reduction in impervious surface of the existing water tanks that would be demolished. The loss of water storage tank (WST) 188 as a contributing resource to the Fort Belvoir Historic District would be an adverse impact because the resource would lose its ability to convey its historic significance; however, the impact would be minimized and compensated as the result of mitigation measures as agreed upon in a Memorandum of Agreement between the Army and the Virginia Department of Historic Resources. The final Memorandum of Agreement is included in Appendix E.

Construction of permanent future access for gravity sewer main maintenance would permanently impact forested areas. All woody vegetation within these areas would be removed and the areas would be mowed annually. Construction of new force mains as part of the Annual System Deficiency Corrections, Upgrades and Renewal & Replacement projects, such as the rediversion of force main discharge project, also would result in the removal of forest and wildlife habitat. It is expected that a relatively small size of forested areas would be disturbed, compared to approximately 5,550 forested acres of Fort Belvoir as a whole, and best management practices (BMPs), such as seeding cleared areas with wildlife seed mixes and minimizing the clearing width of right-of-way (ROW) corridors, would be employed where appropriate to reduce or minimize impacts. Additionally, adherence to the Fort Belvoir sediment and erosion control (ESC) plans would further ensure that impacts to vegetation and wildlife habitat would be localized.

Implementation of the Proposed Action would also result in 800 square feet of permanent impacts to perennial, intermittent, and ephemeral streams and 120 square feet of temporary impacts to an intermittent stream from gravity sewer main maintenance. The impacts would result from permanently placing culverts and/or riprap or temporarily placing protective erosion matting on the interior of streambanks located within a delineated Resource Protection Area (RPA); however, since the activity would occur entirely in the stream, there are no anticipated impacts to RPAs. Aerial stream crossing projects and associated streambank repairs could permanently impact up to 3,600 linear feet of perennial and intermittent streams. There also could be temporary and permanent impacts to wetlands and RPAs from aerial stream crossing projects and associated streambank repairs and to forested wetlands in the area of the new access to Lift Station (LS) 584, the Meade Road water main replacement, and the Woodlawn Village water and sewer system improvements. However, the impacts to wetlands and RPAs are likely below the thresholds for which mitigations is required.

Replacement of the force main sections would be designed to avoid eligible and unevaluated sites whenever possible. The replacement force main running from LS 584 would be re-routed from its existing alignment to avoid crossing underneath the Belvoir Plantation Site, which is listed in the National Register of Historic Places (NRHP). The force main running from LS 687 to LS 7350 crosses the NRHP-

unevaluated archaeological site 44FX1330. Impacts to these sites would be avoided by horizontal drilling underneath the site, rerouting the pipes, relining the existing pipe *in situ*, or by other means. If archeological resources are discovered during construction, all work in the immediate vicinity of the discovery would be halted until the resources can be identified and documented and an appropriate mitigation strategy can be developed. Measures to avoid or mitigate any impact would be developed through the Section 106 consultation with the Virginia Department of Historic Resources to protect archaeological resources.

Under the No Action Alternative, the water and wastewater utility systems would continue to operate at current conditions. The No Action Alternative would not provide the required level of operability and reliability for the water and wastewater systems to support Fort Belvoir in accomplishing its mission to provide reliable and compliant water and wastewater service to its tenants. Rupture of a force main would release untreated wastewater to the environment and require costly emergency repair and cleanup and could result in property damage and interruption of sewer service. Without the establishment of a permanent access to maintain manholes, there may not be systematic inspection and maintenance of manholes and sewer lines to prevent clogs and backups, as well as repairs required to keep the system operating properly may not occur. The integrity of water and sewer lines at stream crossing would continue to be compromised. There could also be substantial costs associated with emergency repairs of an aging infrastructure.

4.2 Best Management Practices and Mitigation Measures

There are no expected impacts that would require mitigation to avoid being considered significant. However, BMPs would be employed where appropriate to reduce or minimize impacts. The actions discussed below would be employed to minimize potential adverse impacts.

- Fugitive dust would be minimized during construction by control methods outlined in 9 Virginia Administrative Code 5–130 et seq. of the Regulations for the Control and Abatement of Air Pollution. These precautions could include methods, such as using water for dust control, covering open equipment for conveying materials, and promptly removing spilled or tracked dirt or other materials from paved streets or dried sediments resulting from soil erosion.
- Approved ESC plans would be required for implementation of the proposed action. The ESC plans would be developed, approved, and permitted, and would involve BMPs, such as silt fencing, control matting, and storm drain outlet protection throughout the construction of the project and maintained and not removed until the sites have been stabilized.
- Seasonal restrictions would be followed for construction activities occurring in the vicinity of active bald eagle nests.
- ROW corridors that are located in forested areas would be cleared and maintained at a 20-foot width (15-foot width in wetlands areas) for vehicles to pass.
- Cleared forested areas would be seeded with wildlife seed mixes.
- Impacts to wetlands would be minimized by use of horizontal directional drill technology.
- Tree protection methods would be coordinated with Fort Belvoir's Urban Forester and implemented to protect trees during construction activities.
- Time-of-year restrictions on in-stream work would be followed.

In addition to these BMPs and mitigation measures, all activities would be in compliance with the Federal Consistency Determination and the recommendations from Virginia Department of Environmental

Quality; and Occupational Safety and Health Administration regulations and standard operating procedures to ensure the safety of all installation and construction personnel.

4.3 Permits and Other Requirements

American Water is responsible for preparing and submitting permit applications and other information needed for water and wastewater utility system work to Virginia. USAG Fort Belvoir is responsible for preparing and submitting Joint Permit Applications for water and wastewater utility system work in wetlands and Waters of the U.S. to the U.S. Army Corps of Engineer. Permits or other requirements that could be required include, but not limited to:

- Virginia Stormwater Management Program, General Permit for Discharges of Stormwater and Construction Activities and associated Stormwater Pollution Prevention
- Stormwater Pollution Prevention Plan
- Fort Belvoir Excavation Permit
- Section 404 Wetlands Permit
- State Historic Preservation Office concurrence
- Federal Aviation Administration crane registration
- Permits for road closures, after-hours work or weekend work
- Virginia Department of Environmental Quality Construction Permit (sewer)
- Virginia Department of Health Construction Permit (potable water)

4.4 Conclusion

The implementation of water and wastewater utility system upgrades, as proposed under the Proposed Action Alternative, is not expected to result in significant impacts on the environment; therefore, an environmental impact statement is not required.

Table 4-1 provides a brief comparison of the environmental impacts associated with the Proposed Action and No Action alternatives.

Table 4-1: Summary of Impacts of the Proposed Action and the No Action Alternative

Resource	Proposed Action	No Action Alternative
Soils	Grading, leveling, and excavation of soil would have the potential for increased sediment to be carried into the nearby streams. Removal of woody vegetation in maintenance ROWs could diminish soil productivity and increase potential for soil erosion. ROW routes would be sited to minimize tree removal. Required soil erosion and sediment control plans would ensure impacts to soils are temporary and minor. Streambank repair and stabilization efforts would have long-term, beneficial impacts to soils as a result of stabilizing the soil structure and decreasing erosion potential.	Erosion would continue to occur in the areas of water and gravity waste lines that cross above perennial streams and the concrete piers that support the lines, resulting in adverse impacts to soils.
Water Resources, Groundwater, and Floodplains	Construction activities would result in minor, temporary impacts to surface water from the potential for sediment and construction contaminants to be carried into the nearby waterbodies. Use of horizontal directional drilling technology, and plans for stormwater pollution prevention and ESC would minimize impacts to surface water. The Proposed Action would result in 800 square feet of permanent impacts to perennial, intermittent, and ephemeral streams and 120 square feet of temporary impacts to an intermittent stream from gravity sewer main maintenance and could permanently impact up to 3,600 linear feet of perennial and intermittent streams from aerial stream crossing projects and its	Potential for ongoing issues with erosion and deposition of sediments into streams and other waterways around aerial stream crossing that would continue to adversely affect water quality and the integrity of the stream channels. There would also be continued adverse impacts to water quality due to wastewater-related pollution from potential force main ruptures that could allow discharge of untreated wastewater into streams. No noticeable adverse impacts floodplains. Impacts to groundwater would be unlikely.

Resource	Proposed Action	No Action Alternative
	associated streambank repairs. Construction activities for the aerial stream crossings projects would result in short–term, adverse impacts to steams from the disturbance or relocation of the stream beds and long-term beneficial impacts from reduced likelihood of erosion. The Proposed Action would eliminate or substantially lower the probability of a sewer main break above streams that would result in SSOs. Construction would result in short-term impacts to floodplain associated with three of the force main projects and several of the aerial stream projects. Impacts to groundwater would be unlikely.	
Wetlands and Chesapeake Bay Preservation Areas	Proposed Action would result in temporary and permanent impacts to wetlands and RPAs from aerial stream crossing projects and its associated streambank repairs and to forested wetlands in the area of the new access to Lift Station 584, Meade Road water main replacement, and the Woodlawn Village water and sewer improvements project. Impacts to wetlands and RPAs would likely be below the thresholds for which mitigations is required. Potential impacts to wetlands and the RPAs will be reviewed through the Joint Permit Application process in order to conduct work in wetlands and RPAs.	Potential for adverse impacts to wetlands could occur as a result of continued streambank erosion around aerial stream crossing that could lead to erosion of adjacent wetlands.

Resource	Proposed Action	No Action Alternative
Biological Resources	Proposed Action would result in minor impacts to vegetation and wildlife habitat. Vegetation in the footprint of open trenches, bore pits, maintenance ROWs, streambank repair areas would be removed. Beneficial impacts as a result of force main replacements would occur to vegetation, wildlife habitat, and aquatic species because the probability of a sewer main break above streams that would result in SSOs would be eliminated or lowered. Construction activities would likely temporarily displace wildlife and result in the removal of forested habitat. No impacts to threatened and endangered species are expected.	Potential for adverse impacts to vegetation and aquatic species and habitat as a result of continued erosion, deposition of sediments into streams in the area of aerial stream crossings, and the continued potential for SSO stemming from the continued use of aging sanitary sewer force mains.
Air Quality	Air pollutant emissions would be below *de minimis* levels for general conformity. Record of Non-Applicability is in Appendix B.	No impact.
Coastal Zone Management	Proposed Action is consistent with enforceable policies of the Virginia Coastal Zone Management Program.	No impact.
Cultural Resources	The loss of water storage tank 188 would result in adverse impacts to the historic viewshed of the Fort Belvoir Historic District and to the district itself. Impacts, however, would not be significant as adverse impacts would be minimized and compensated through mitigation measures as agreed upon in a Memorandum of Agreement between the Army and the	No impact.

Resource	Proposed Action	No Action Alternative
	Virginia Department of Historic Resources. Impacts to National Register of Historic Places-listed sites and unevaluated sites from the replacement of force main would be avoided by horizontal drilling underneath the site, rerouting the pipes, relining the existing pipe *in situ*, or by other means. Measures to avoid or mitigate any impact would be developed through Section 106 consultation with the Virginia Department of Historic Resources to protect archaeological resources.	
Infrastructure and Utilities	Long-term, beneficial impacts to Fort Belvoir's water and wastewater utility system as a result of improved reliability and capacity of water storage tanks, replacement of aging sanitary sewer mains, construction of permanent access for sewer main maintenance, protection of water and sewer lines from erosion, and proper preventative maintenance of aging infrastructure elements.	The existing water storage tanks would not be able to provide sufficient storage capacity to support the future needs and mission of Fort Belvoir. Rupture of aging force mains would release untreated wastewater to the environment and require costly emergency repair, cleanup, and could result in property damage and interruption of sewer service. No permanent access to manholes would hinder future maintenance activities of these sewer sections. Unrepaired aerial stream crossing could result in breakage or collapse of the water and/or sewer lines causing interruption in service, the need for costly emergency repair, release of untreated wastewater into the environment, and possible introduction of contaminants into the water distribution system. The reliability of Fort Belvoir's aging water

Resource	Proposed Action	No Action Alternative
		and wastewater infrastructure would continue to decline and future demands for service would not be met. Missed opportunities to repair and upgrade the existing system systematically could lead to emergency repairs, potential releases to the environment and larger more complex and costly system upgrades in the future.

Notes: ESC – erosion and sediment control, ROW – right of way, RPA – resource protection area, SSO – Sanitary Sewer Overflows

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8.0 ACRONYMS AND ABBREVIATIONS

µg	Micrograms
American Water	American Operations and Maintenance, Inc.
APE	Area of Potential Effects
AQCR	Air-quality Control Region
AQI	Air Quality Index
Army	Unite States Department of the Army
ASDC	Annual System Deficiency Corrections, Upgrades and Renewal & Replacement
BMPs	Best Management Practices
°C	Degrees Celsius
CAA	Clean Air Act
CATEX	Categorical Exclusion
CBPA	Chesapeake Bay Preservation Act
CCTV	Closed Circuit Television
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
dB	Decibel
DIP	Ductile Iron Pipe
DoD	Department of Defense
EA	Environmental Assessment
ENRD	Environmental and Natural Resources Division
EO	Executive Order
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
°F	Degrees Fahrenheit
FHWA	Federal Highway Administration
Fort Belvoir	United States Army Garrison Fort Belvoir
FNSI	Finding of No Significant Impact
FSDC	Future System Deficiency Corrections/Upgrades
FY	Fiscal Year
GHG	Greenhouse Gas

GIS	Geographic Information System
GPS	Global Positioning System
HDD	Horizontal Directional Drilling
HDPE	High Density Polyethylene
ISDC	Initial System Deficiency Correction
LS	Lift Station
mgd	Million Gallons Per Day
MS4	Municipal Separate Storm Sewer System
MWAQC	Metropolitan Washington Air Quality Committee
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NOA	Notice of Availability
NRHP	National Register of Historic Places
O_3	Ozone
Pb	Lead
PM	Particulate Matter
ppm	Parts Per Million
PRV	Pressure Reducing Valve
PVC	Polyvinyl Chloride
R&R	Removals and Replacement
REC	Record of Environmental Consideration
RMA	Resource Management Area
ROW	Right-of-Way
RPA	Resource Protection Area
SDR	Standard Dimension Ratio
SHPO	State Historic Preservation Office
SO_2	Sulfur Dioxide
SSO	Sanitary Sewer Overflow
UP	Utility Privatization
U.S.	United States

USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VAC	Virginia Administrative Code
Virginia DEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
WST	Water Storage Tank

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