

Alexandria, Virginia

# Chesapeake Bay Preservation Plan



August 2022

# Executive Summary

In 1992, the City of Alexandria (City) adopted the Chesapeake Bay Preservation Ordinance (CBPO) to manage land development while protecting water quality as required by the Chesapeake Bay Preservation Act (Bay Act) and then adopted the Water Quality Management Supplement to the City of Alexandria Master Plan (WQMS) in 2001. The CBPO contains specific regulatory criteria while the WQMS provides City officials and residents with an opportunity to think strategically about the future of the City's water resources. In response to a review of the original WQMS, updates have been made and incorporated into this "Chesapeake Bay Preservation Plan" as a revised chapter to the City's Master Plan.

Under the Bay Act's Chesapeake Bay Preservation Area Designation and Management Regulations, the City is required to establish

and maintain a comprehensive plan from which policy decisions are made about future land use and development that will protect water quality. This plan must include an information base, policy discussion, land use plan maps, and implementation measures based upon the following:

1. Location and extent of Chesapeake Bay Preservation Areas (CBPAs);
2. Physical constraints to development including soil limitations;
3. Character and location of commercial and recreational fisheries;
4. Existing and proposed land use;
5. Existing and potential water pollution sources;
6. Public and private waterfront access;
7. Shoreline and streambank erosion problems; and
8. Maps of above items.



To address these topics and to meet the requirements of the Bay Act Regulations, the City has developed and implemented several processes and programs to protect and enhance water quality and continues to investigate additional measures to manage water resources, protect and enhance preservation areas, and protect the health of those that visit, live, and work in the City.

This plan includes the following basic elements:

- › **Section 1 Introduction and Goals.** This section introduces the Plan’s purpose, regulatory requirements, and the City’s overall goals.
- › **Section 2 Alexandria’s Water Resources – Information Base.** This section addresses the eight CBPA-required areas listed above and describes the existing conditions and activities.
- › **Section 3 Potential Pollutant Sources.** This section details the existing and potential pollutant sources in the City that could affect water quality.
- › **Section 4 Water Quality Management Policies and Programs.** This section details the City’s ordinances, policies, and programs the City has implemented, or is implementing, to regulate development/redevelopment and protect water quality.
- › **Section 5 Summary of Compliance and Water Quality Protection.** This section discusses each of the eight CBPA Designation and Management Regulation areas as they relate to the City’s policies and current compliance activities.

The City has developed future land use, development and redevelopment, and land management policies that protect water quality, resource management areas, and resource protection areas. Additional details about resource protection areas and resource management areas are included in Section 2.1 and 4.2 of this document. Policies in the Plan are based on an analysis of the data collected to date.

Before any policies are implemented or updated, they are reviewed by staff for consistency and applicability with federal, state, and local laws and regulations. Transportation & Environmental Services (T&ES) will review this document, existing data, and current policies on an annual basis to ensure compliance with the Chesapeake Bay Act. As required, the City also prepares an annual Chesapeake Bay Act report and will continue to submit to the Virginia Department of Environmental Quality (DEQ). To track progress implementing Bay Act components and policies in the future, the City will continue to track RPA disturbances, minimization of encroachments from the RPA, and ensure compliance of development and redevelopment projects with Bay Act regulations and with the City’s water quality sections of the small area plans.

This Chesapeake Bay Preservation Plan highlights policies implemented to protect water resources and opportunities to improve the health of those water resources. The City continues to pursue innovative solutions, alternative funding sources, and public feedback to protect the Potomac River and our local waterways to promote a cleaner and healthier Chesapeake Bay.

**This Chesapeake Bay Preservation Plan highlights policies implemented to protect water resources and opportunities to improve the health of our water resources.**

# Table of Contents

1. Introduction .....	1
1.1 Purpose and Enabling Authority .....	2
1.2 Surface Water Quality .....	3
1.3 Reduction of Urban Pollution .....	5
2. Alexandria's Water Environment Information Base .....	6
2.1 Chesapeake Bay Preservation Areas .....	8
2.2 Physical Constraints to Development .....	9
2.3 Commercial and Recreational Fisheries .....	15
2.4 Shorelines, Stream Bank Erosion and Stream Buffers .....	15
2.5 Existing and Proposed Land Use .....	18
2.6 Existing and Potential Water Pollution Sources .....	19
2.7 Public and Private Access to Waterfront Areas and Waterways .....	19
3. Potential Pollutant Sources .....	23
3.1 Point Source Pollution .....	24
3.2 Nonpoint Source Pollution .....	28
3.3 Erosion .....	30
3.4 Air Pollution .....	30
3.5 Waterfront and Dock Activities .....	30
3.6 Areas of Special Concern .....	30
4. Water Quality Management Policies and Programs .....	33
4.1 City Master Plan .....	34
4.2 City Ordinances and Regulations .....	34
4.3 City Programs .....	41
4.4 State, Federal, and Regional Programs .....	44
5. Summary of Compliance and Water Quality Protection .....	46
5.1 Physical Constraints to Development .....	47
5.2 Location and Extent of Chesapeake Bay Preservation Areas .....	47
5.3 Character and Location of Commercial and Recreational Fisheries .....	48
5.4 Existing and Proposed Land Use .....	48
5.5 Existing and Potential Water Pollution Sources .....	48
5.6 Public and Private Access to Waterfront Areas .....	49
5.7 Shoreline and Streambank Erosion Problems .....	49
5.8 Mapping .....	49
5.9 Funding .....	50
5.10 City Coordination .....	50
References .....	52

**List of Figures**

Figure 2-1. Watersheds in Alexandria, February 2019 .....8  
Figure 2-2. Resource Protection Areas in the City.....9  
Figure 2-3. Soils of Alexandria ..... 11  
Figure 2-4. Marine clay soil areas in the City..... 12  
Figure 2-5. Areas with steep slopes in the City..... 13  
Figure 2-6. Eroded and hardening stream reaches in the City..... 17  
Figure 2-7. Small area plans ..... 19  
Figure 2-8. Alexandria land uses..... 20  
Figure 2-9. Alexandria waterfront access areas and marinas ..... 22  
Figure 3-1. Combined sewer outfalls in the City ..... 26

**List of Tables**

Table 2-1. Alexandria’s TMDLs.....7  
Table 3-1. VPDES permits in Alexandria..... 25  
Table 3-2. Pollution potential by land use designation ..... 29



# 1

## INTRODUCTION

The City of Alexandria (City) was founded as a waterfront community. Today, residents, businesses, and visitors are drawn to the Waterfront and other water resources. Forested stream valley parks located throughout the City provide recreational opportunities and habitat for wildlife. All the City's waterways are part of the larger Chesapeake Bay watershed.

The City has committed itself to the stewardship of its waters and other natural resources. The purpose of this Chesapeake Bay Preservation Plan is to recognize the interdependency between people and their environment and to guide the City as it seeks to protect and restore its own numerous local waterways as well as the natural habitats of the Chesapeake Bay and the Potomac River. This plan is a tool developed to:

- › restore water quality in impaired streams that support diverse aquatic habitats;
- › combat the effects of climate change;
- › protect streams from the effects of improper development and pollution; and
- › provide a wide range of opportunities for the public to interact with and become stewards of their natural environment.

Through these efforts, the City will continue to protect and restore local waterbodies with connections to the Chesapeake Bay and improve the overall quality of life for the residents and visitors. Since the original WQMS was developed over two decades ago, the City has made significant progress in improving its stormwater management programs, policies, and infrastructure, and provides this Chesapeake Bay Protection Plan as an update to replace the older Supplement and a roadmap to continue to protect water quality.

## 1.1 PURPOSE AND ENABLING AUTHORITY

The Chesapeake Bay is among the nation's largest and most productive estuaries, covering parts of six states and the District of Columbia. As

the population of the Chesapeake Bay watershed has grown dramatically (from 12.7 million in 1980 to 18.4 million in 2020, a 45% increase), so too have the impacts of pollutants on the health of the Bay. Pollutants such as sediments, fertilizers, pesticides, and motor oil generated by various land uses and human activities are carried along with the huge volumes of fresh water into the Bay's 64,000 square mile watershed.

**The purpose of this Plan is to recognize the interdependency between people and their environment.**

There are 84 localities in Tidewater Virginia subject to the Chesapeake Bay Preservation Act of 1988 (the Act) (Sections 10.1-2100, et seq., of the Code of Virginia, 1950). The City implemented its Chesapeake Bay Preservation Ordinance (CBPO) beginning in 1992. This ordinance requires developers to meet pollution reduction and minimization targets through performance criteria during the development and redevelopment processes. Under the Act, Virginia localities are subject to Virginia Code 9 VAC 25, Chapter 830: Chesapeake Bay Preservation Area Designation and Management Regulations. This chapter requires that City plans, subdivision ordinances, and zoning ordinances are in accordance with the provisions of the Act with the overall goal of identifying and protecting Resource Protection Areas (RPAs) and Resource Management Areas (RMAs). All land within the corporate limits of the City is designated as a CBPA.

The purpose of incorporating water quality protection into local comprehensive plans is to account for what is already being done to help protect water quality and to provide a framework for expanding these efforts in a way that helps the City to meet environmental, social, and economic goals.

This Chesapeake Bay Protection Plan presents the City's long-range vision for a cleaner water environment and sets forth policies and strategies to achieve its identified water quality protection goals. This plan is intended to meet the requirement of the Chesapeake Bay Preservation Area Designation and Management Regulations for a comprehensive plan.

In addition to the City's Master Plan, the Small Area Plans (SAPs) are integral components of the City's water quality protection efforts. A goal of these plans is to guide development in the City in a way that balances economic and community needs while protecting natural resources. The nineteen SAPs provide the analytical base for detailed land use recommendations affecting each of the City's neighborhoods and development areas. It is also a goal of the City that each SAP is analyzed for opportunities to protect and restore water quality during development and redevelopment. For this reason, the City chose to implement a jurisdiction-wide RMA under its CBPO (see discussion in Section 4.2). It is also the intent of the City that designated future land uses are compatible with an area's natural constraints described in Section 2.

## 1.2 SURFACE WATER QUALITY

Among the most important indicators of the health of a watershed is the quality of the water in local rivers, streams, and wetlands. Protecting the quality of surface water is a major challenge for many urban jurisdictions, including the City. In addition to dumping and other overtly illegal acts, pollution that collects on parking lots, roof tops, and driveways, is often flushed directly to local streams during storm events. This is particularly true for the City, which was largely developed before water quality regulations for stormwater runoff were adopted.

The City's Environmental Management Ordinance (Article XIII of the Zoning Ordinance)

(1992) provides for safeguarding of Chesapeake Bay RPAs and protects water quality by requiring stormwater quality best management practices (BMPs) for new development and redevelopment. The Erosion and Sediment Control (ESC) Ordinance (1981) provides the basis of the City's vigorous plan review and inspection program to address construction site runoff controls. The City's BMP inspection program continues to be aggressive in requiring proper functioning and maintenance of facilities. The City also provides education and outreach to schools, interested organizations, and the public about ways to protect the City's water resources.

Pollutant removal under the Municipal Separate Storm Sewer System (MS4) permit has a special condition to address the Environmental Protection Agency (EPA)-established 2010 Chesapeake Bay Total Maximum Daily Load (TMDL) for nitrogen, phosphorous, and sediment (9VAC25-890). This TMDL sets pollution reductions for the six Chesapeake Bay watershed states and the District of Columbia. The TMDL is required under the Clean Water Act (CWA) and responds to consent decrees in Virginia and the District of Columbia from the late 1990s. The TMDL will be implemented using an accountability framework that includes Watershed Implementation Plans (WIPs), two-year milestones, and tracking and assessment tools. The final Phase III WIP lays out the strategy for each Bay locality to meet the TMDL by 2025.

The Chesapeake Bay TMDL aims to reduce the flow of sediment and nutrients entering the Potomac River and the Chesapeake Bay. While essential to healthy plant and animal growth, an overabundance of nutrients results in algae blooms which block sunlight and consume oxygen when they decay. Phosphorus is the primary nutrient of concern for freshwater systems such as the Potomac River while nitrogen is the nutrient of concern for brackish water systems such as the Chesapeake Bay.





*Winkler Botanical Preserve*

Most recently, the City published the Phase 2 Chesapeake Bay TMDL Action Plan for 40% Compliance with Part II A “Chesapeake Bay TMDL Special Condition” of the MS4 Permit. The City’s Phase 1 Chesapeake Bay TMDL Action Plan documenting the City’s proposed strategies to achieve 44%, 39%, and 39% of the City’s total nitrogen, total phosphorus, and total suspended solids (sediment) goals, respectively, by June 30, 2018, was approved by the Virginia DEQ on January 12, 2016. This Phase 2 Action Plan has been developed to document the means and methods and a general level of effort that will be needed for the City to meet the 40% cumulative Chesapeake Bay TMDL reduction targets in the MS4 permit for phosphorus, nitrogen, and sediment. Consistent with the approach in the Phase 1 Action Plan, the City’s Phase 2 planned internal goals includes progress to achieve reductions prior to the required permit end dates

to lessen the burden during the third permit cycle (July 2023 to June 2028).

The City is using a multi-pronged approach, including the following methods and strategies:

- › Redevelopment
- › Regional Facilities and Retrofits
- › Retrofits on City Properties and City Rights-of-Way
- › Tree Planting
- › Urban Stream Restoration
- › Public-Private Partnerships (P3s)
- › Urban Nutrient Management
- › Land Use Change
- › Forest Buffers
- › Nutrient Trading
- › Bi-Lateral Trading

Reductions have been made for the Bay TMDL through the implementation of projects such as the Lake Cook and Ben Brenman Pond retrofits, Four Mile Run Wetland Restoration, Windmill Hill living shoreline, Eisenhower Pond 19 construction, and other retrofit projects. In combination with projects currently in various stages of planning and implementation such as Lucky Run, public-private partnerships, urban nutrient management, tree planting, street sweeping, etc., the City is currently exceeding the Phase 2 requirements, with 72% reductions to date.

The City's redevelopment policies and procedures have also helped to meet and exceed the Bay restoration goals. The retrofit and restoration projects undertaken by the City have received attention on the state level, with the Four Mile Run project winning the Virginia Governor's Environmental Excellence award, among other accolades and formal awards.

### **1.3 REDUCTION OF URBAN POLLUTION**

Uncontrolled urban stormwater runoff may contribute significantly to water quality problems. Urbanization introduces a myriad of new pollutants into the environment, and significantly alters the land's ability to assimilate these pollutants. As forests and meadows are converted to parking lots, driveways, roads, roof tops and sidewalks, the surface of the land becomes increasingly impervious. As a result, pollutants that collect on these surfaces from human activities are flushed directly into local streams without the cleansing benefit of infiltration into the soil or

filtration by vegetation. Urban pollution can be reduced through the application of four principles:

- › Minimize impervious surface area necessary to accommodate desired land uses;
- › Preserve and restore existing vegetation;
- › Provide public education to change human behavior that results in pollution; and
- › Control pollution that cannot be reduced through changes in human behavior by employing technology or by installing stormwater management pollution reduction facilities (also known as best management practices, or BMPs).

Though already highly urbanized, continued growth and economic prosperity, enforcement of environmental regulations, and sustainable development provide the principle means for improving water quality and habitat conditions in the City. Most future residential and commercial development is expected to come in the form of redevelopment. This is particularly significant because most of the City's residential and commercial areas were developed prior to the implementation of water quality regulations.

To arrive at achievable water quality goals, strategies, and action plans, it is necessary to have a detailed understanding of the City's natural environment and existing local, state, and federal regulations and programs intended to help protect water quality. This Plan summarizes what water resources the City has, what can potentially pollute these resources, and what policies and strategies the City is using to protect and improve water quality conditions.



# 2

## ALEXANDRIA'S WATER ENVIRONMENT INFORMATION BASE

Located on the tidal Potomac River, approximately six miles south of downtown Washington D.C., the City serves as part of the larger Chesapeake Bay watershed. Having experienced numerous waves of urbanization since its founding in 1749, the City contains very few natural resources that have not been affected by human activities. Remarkably, however, the City is home to a hardy, if limited, natural ecosystem. Pockets of wildlife can be found in backyards, open spaces, parks, stream valleys, and even street trees and utility line rights-of-ways. The City's efforts to promote conservation and environmental stewardship within its boundaries serves as an integral part of larger Chesapeake Bay preservation efforts.

To promote future development and redevelopment that protect the remaining natural resources of the City, improve habitat conditions where possible, and enhance the overall quality of life for City residents, it is first necessary to identify and understand the natural environment and the potential constraints to human activities that they represent.

Since the 1970s, the City's water quality protection efforts have included a vigorous stormwater detention program, the adoption of the CBPO in 1992, the implementation of many pollution prevention programs, and the development of an innovative pollution control and urban stormwater management retrofit program that has attracted national attention.

Beginning in July 2003, the City obtained a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Small Municipal Separate Storm Sewer Systems (MS4) Permit No. VAR040057 aimed at reducing the discharge of pollutants into the Bay and its tributaries. The City's current five-year MS4 permit was effective in 2018.

Both larger streams and a myriad of smaller tributaries, some of which are still largely natural

and some of which have been significantly altered or piped, drain the City's landscape. Significant named tributaries include Holmes Run, Backlick Run, Hooff's Run, Taylor Run, Timber Branch, Strawberry Run, and Lucky Run. Figure 2-1 shows the watersheds and the smaller waterbodies within the City.

In addition to the Chesapeake Bay TMDL, the City currently has several approved local TMDLs for bacteria (fecal coliforms and E. coli) as well as TMDLs for Polychlorinated Biphenyls (PCBs). Details regarding the BMPs, other interim milestone activities, and monitoring strategies the City will use to address their TMDLs can be found in the respective TMDL Action Plans. Table 2-1 shows the City's approved TMDLs.

**TABLE 2-1. ALEXANDRIA'S TMDLS**

LOCATION	TMDL POLLUTANT
Four Mile Run (non-tidal)	Fecal Coliform
Four Mile Run (tidal)	E. Coli
Hunting Creek, Holmes Run, Cameron Run	E. Coli
Lower Potomac and Four Mile Run	PCBs
Lower Potomac and Hooff's Creek and Hunting Creek	PCBs
Hooff's Creek and Hunting Creek	PCBs

The City's current MS4 permit contains special conditions for local TMDLs under Part II, which requires the City to update any previously approved local TMDL action plans for TMDLs approved by the U.S. EPA prior to July 1, 2013, no later than 18-months after the permit effective date.

Fecal coliform levels are the most important from a human health standpoint. These indicator organisms, while not necessarily harmful in themselves, are found in the intestinal tracts of warm-blooded animals, including humans, and therefore can be indicative of fecal contamination

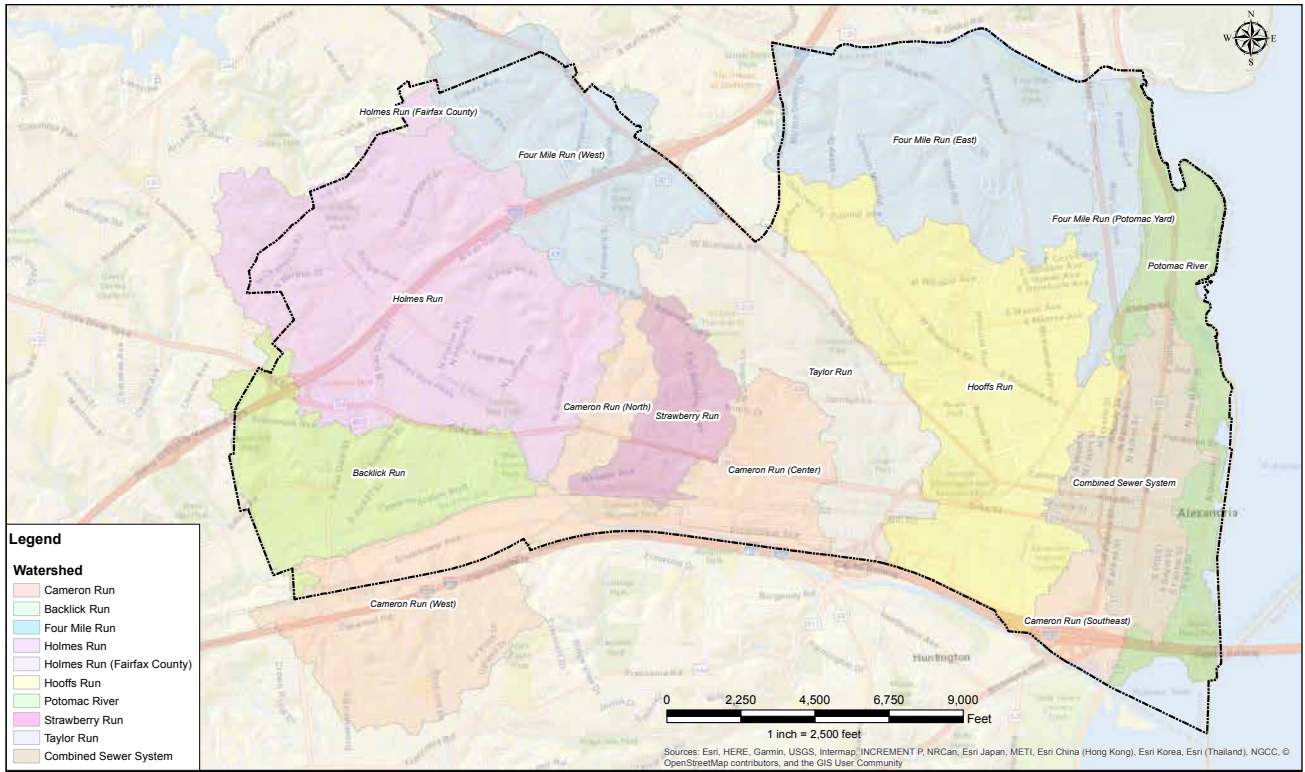


FIGURE 2-1. WATERSHEDS IN ALEXANDRIA, FEBRUARY 2019

and the possible presence of pathogenic organisms.

Potential contributors to the bacterial impairments, as documented in the TMDL reports, include wildlife (deer, raccoon, muskrat, beaver, and waterfowl), canine, human, and other. In April 2017, the Virginia General Assembly passed a new law requiring the remediation of the City’s combined sewer outfalls by July 1, 2025. In partnership with the Alexandria Sanitation Authority DBA Alexandria Renew Enterprises (AlexRenew), the City submitted a Long-Term Control Plan to DEQ in 2018 that calls for the construction of a system of underground tunnels to convey combined sewage to the wastewater treatment facility. In July 2018, the City transferred ownership of its CSO outfalls to AlexRenew. AlexRenew is responsible for the design and construction of the system of underground tunnels as part of its RiverRenew program.

## 2.1 CHESAPEAKE BAY PRESERVATION AREAS

Due to the presence of sensitive areas such as tidal wetlands, floodplains, and highly erodible soils, etc., the entire City footprint is designated as a CBPA, either RPA or RMA, as shown in Figure 2-2 and described in Section 4.2.1. Therefore, any land-disturbing activities within City limits over 2,500 square feet must follow regulations protecting the CBPA. Implementation of the Virginia Stormwater Management Program (VSMP), ESC Ordinance, Zoning Ordinance, and MS4 programs further protect these sensitive areas and ensure redevelopment is conducted such that natural resources are protected.

Figure 2-2 presents the City’s CBPA Map. It should be noted that it is the designation criteria identified in the CBPO which is binding, and when conflicts between the CBPA Map and the designation criteria arise, the designation criteria prevail.

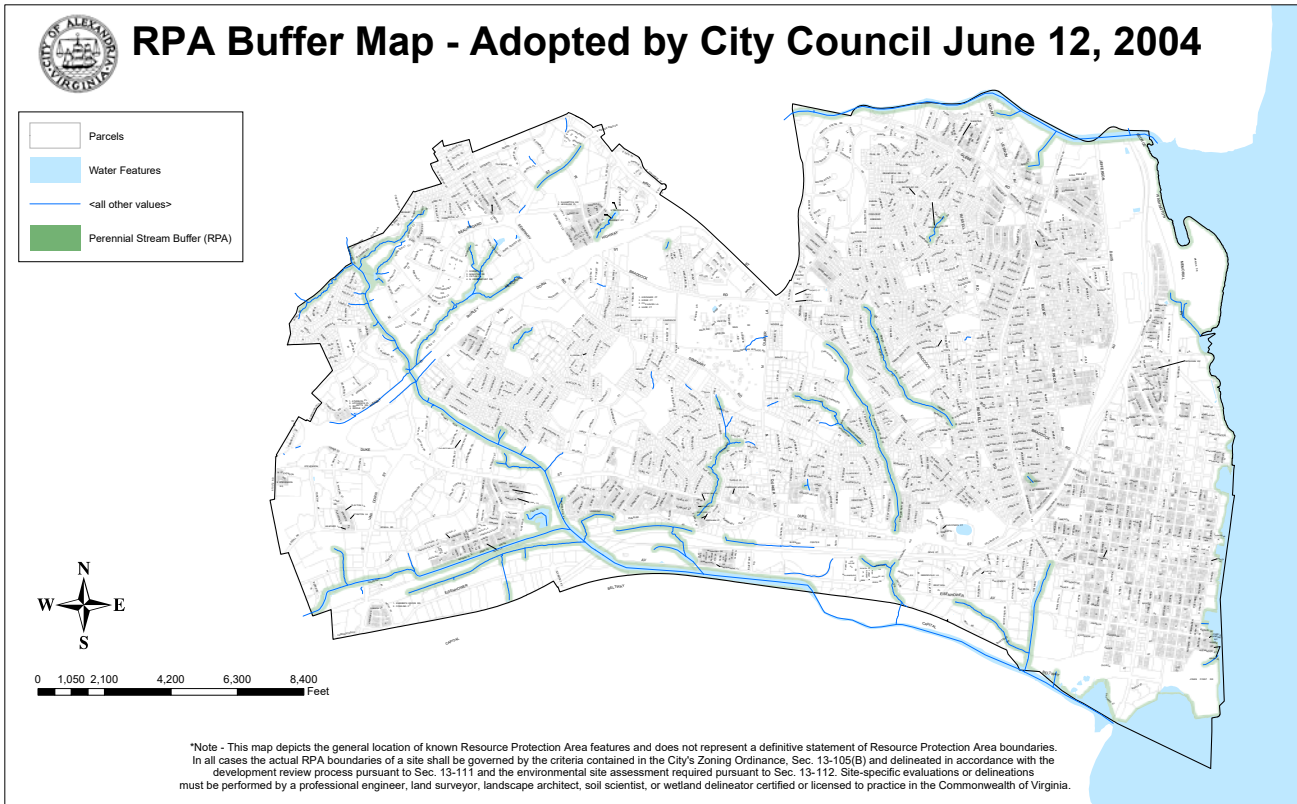


FIGURE 2-2. RESOURCE PROTECTION AREAS IN THE CITY

**2.2 PHYSICAL CONSTRAINTS TO DEVELOPMENT**

This section discusses the City's physical characteristics and constraints to development. Stream bank erosion, stream buffers and the Potomac River shoreline are also physical constraints and are discussed in section 2.4.

**2.2.1 GEOLOGY AND SOILS**

While topography is a manifestation of underlying characteristics, the characteristics of the geology and soil also have an important impact on development and water quality.

The City has an exceptionally diverse topography. Elevations range from almost sea level along the Potomac River shoreline and lower Four Mile Run and Cameron Run, to 280 feet above sea level near Alexandria Hospital. The City can be described as a plain that has been dissected by numerous streams that have cut narrow, shallow

valleys into the landscape. While most of the terrain is gently rolling, numerous tributaries have cut steeper valleys. In general, Four Mile Run and Cameron Run form two well defined valleys that frame the City while a series of hills divides the center of the City. Most of the steepest slopes in the City are associated with the smaller tributaries that have cut through the central plain. In general, the further west into the City, the higher and more rolling the terrain.

The City is situated almost entirely within the Coastal Plain of Virginia. The Coastal Plain consists of intermixed layers of sands, pebbles, mud, and silts that were deposited due to erosion from areas to the west when water levels were higher than they are currently. Differences in erosion rates between underlying rock formations have shaped modern drainage patterns and the contours of the landscape.

Because the underlying materials are relatively flat, soils in the City generally change in accordance with elevation and relation to streams and rivers. The soils include, from lowest to highest elevation: Ochlockonee (Oi), Huntington Loam (H), Keyport Silt Loam (K); Susquehanna Loam (So); Sassafras Gravelly Loam (Sf); and Leonardtown Silt Loam (L) and Loam (Lo).

Figure 2-3 provides a map of major soil groups. The only soils of genuine concern in the City are those which contain marine clay (or shrink-swell) soils, those which are located on steep slopes, and those which experience prolonged wetness or inundation due to flooding or low depth to groundwater. Areas with marine clays may be built upon (and to a large extent, have been built upon) if proper precautions are taken. Risks associated with marine clay include shrinking and swelling, which can crack building foundations, and landslides and slumping during periods of prolonged wetness. The limitations of marine clay layers that are only a few inches to a few feet thick may be overcome if building footings are extended deeper to the next soil layer. Thicker occurrences have been documented and may require additional precautions or preclude some types of development. The City will ensure that future development and redevelopment are appropriate for the underlying soils. Figure 2-4 shows areas that are underlain by marine clays.

Slopes greater than 15% require special consideration during the development or redevelopment processes due to the risk of erosion and slump. While most of the City is considered rolling terrain, there are significant areas where slopes are greater than 15%, as shown in Figure 2-5. Land use is further discussed in Section 3.2.1.

While topography is a manifestation of underlying characteristics, the characteristics of the geology and soil also have an important impact on development and water quality.

### **2.2.2 WETLANDS**

Wetlands serve as habitat for a wide range of plants and animals and are important as a means of buffering and protecting local streams from the adverse impacts of development. Wetlands are especially important areas for nutrient uptake by vegetation and for pollutants and other materials to be filtered and settled out before reaching local streams and rivers. While the City has for most of its history treated wetlands as areas to be reclaimed (lower King Street from Lee Street east was once open water) there remains significant wetland areas within the City.

Most of the City's wetlands are located adjacent to the Potomac River, Four Mile Run, Cameron Run, and other major tributaries. City wetlands are generally classified as palustrine (tidal wetlands along the Potomac River and the lower Four Mile Run and Cameron Run), riverine (adjacent to free-flowing tributaries), and lacustrine (open water, usually a pond or lake).

Wetlands must be identified for individual development sites according to all applicable federal, state, and City wetlands regulations, including the City's CBPO. Wetlands are protected under Section 404 of the CWA, which is administered by the U.S. Army Corps of Engineers (USACE).

In addition, per Article XIII of the Alexandria Zoning Ordinance, a non-tidal wetland that does not meet the criteria for designation as an RPA must be protected by a 50-foot vegetated buffer that includes protections akin to an RPA.

While remaining healthy wetlands should generally remain undisturbed, it is possible to use wetlands as open space and for educational purposes and other exempt activities such as trails and pathways. Opportunities to restore degraded wetlands or to create new wetlands should continue to be explored. If wetlands are impacted by development, the impact or loss should be mitigated through wetland creation or

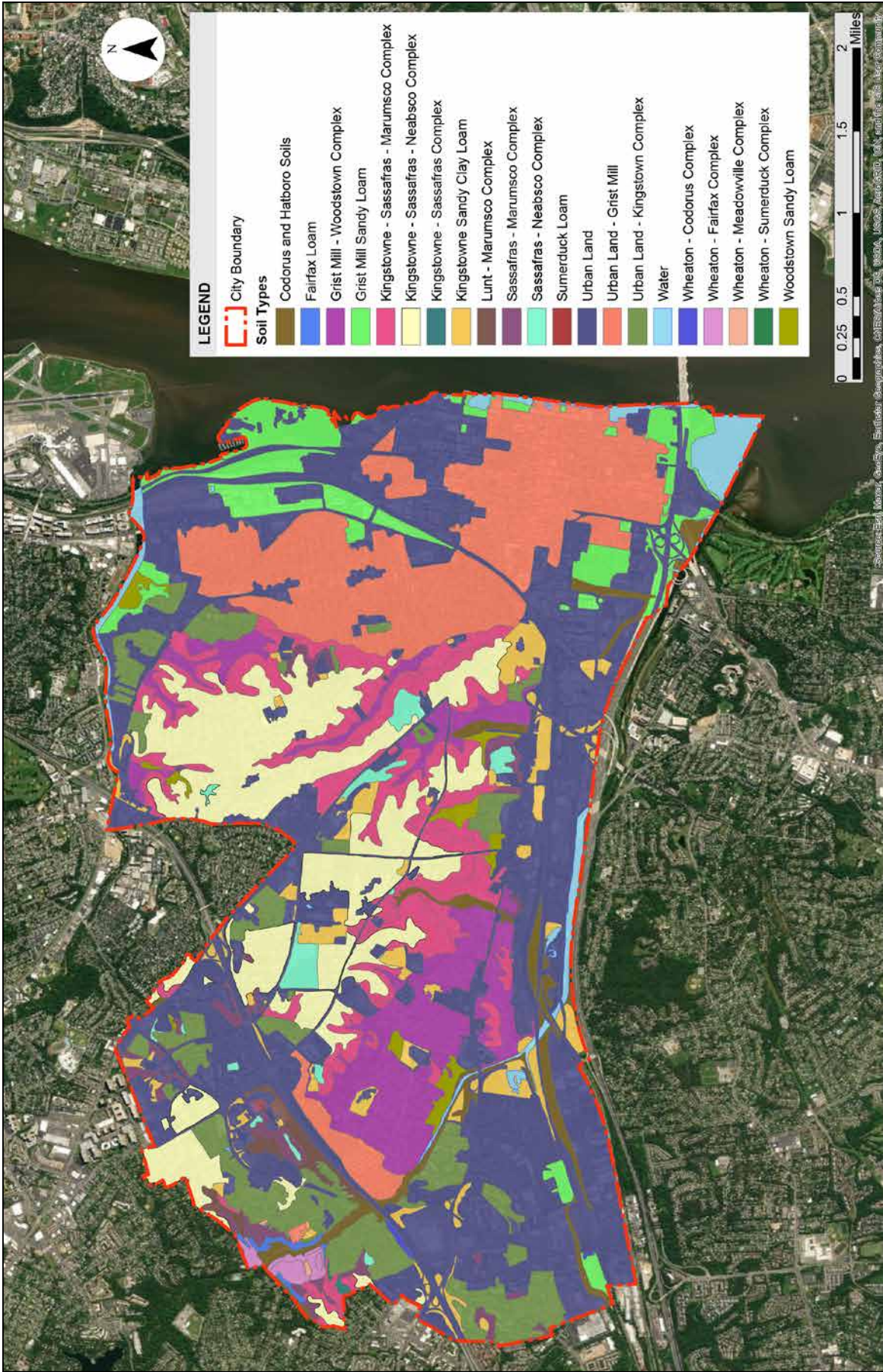


FIGURE 2-3. SOILS OF ALEXANDRIA





FIGURE 2-4. MARIANE CLAY SOIL AREAS IN THE CITY

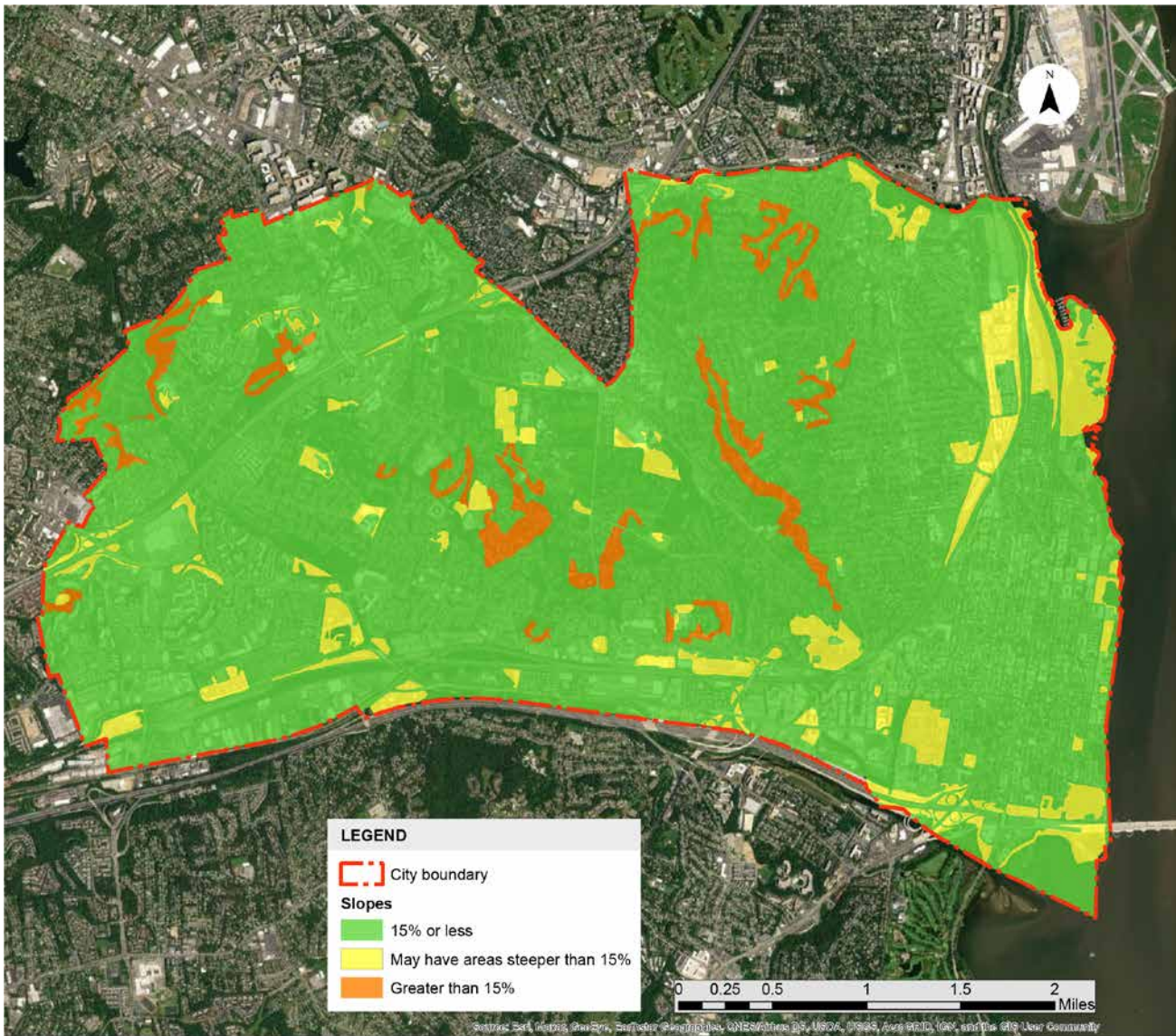


FIGURE 2-5. AREAS WITH STEEP SLOPES IN THE CITY

enhancement, improvements to riparian areas, or using creative BMPs to treat stormwater. The Four Mile Run restoration project is a tidal wetland restoration project carried out by the City.

### 2.2.3 GROUNDWATER

During its earlier years, the City relied heavily on groundwater for its supply of potable water, as evidenced by the multitude of wells, most of which are now closed. While the City no longer relies on groundwater for drinking water,

groundwater protection is still important. Many streams are fed by groundwater, especially during periods of extended dryness. Groundwater is extremely dynamic, and groundwater contamination can spread rapidly. Once contamination has occurred, mitigation is very expensive and time consuming.

The groundwater aquifer of the City consists primarily of the unconsolidated sediments of the Coastal Plain. Barring the introduction of

manmade contaminants, natural groundwater characteristics are fairly stable over time because they are largely dictated by the chemical and structural characteristics of the local aquifer.

Limiting factors associated with groundwater that should be considered during the development and redevelopment processes include the presence of groundwater recharge areas.

Large eastern and central areas of the City have also been identified by the U.S. Geological Survey (USGS) as having high potential for groundwater contamination due to a combination of natural and man-made factors. The remaining portions of the City are considered to have moderate potential for groundwater contamination. Protecting these areas from contamination requires the prevention or mitigation of common sources of groundwater pollution. While these sources of pollution are discussed in further detail in Section 3, they may include leaking underground storage tanks (USTs), failed septic fields, leaking sanitary sewer lines, and abandoned industrial/landfill sites. Of these sources, DEQ has sited USTs as the greatest threat to groundwater supplies.

#### **2.2.4 POTABLE WATER SUPPLY AND WATER SUPPLY PROTECTION**

The City relies on surface water withdrawals outside its boundaries for its municipal water supply. While there are currently a small number of operational wells within the City that are maintained for industrial purposes, all existing development is, and new development is required to be, connected to the municipal water system.

The City's supplier/distributor of potable water is the Virginia-American Water Company (VAWC). VAWC, in turn, purchases treated water from the Fairfax County Water Authority (FCWA). The FCWA maintains two water intakes, one on the Potomac River in Loudoun County (Corbalis Water Treatment Plant) and one on the Occoquan

Reservoir, which is the main source of the City's potable water.

The City's water supply is among the best protected in the Commonwealth. By cooperative agreement under the Occoquan Basin Nonpoint Pollution Management Program (established in 1978), the entire Occoquan Reservoir watershed has been subject to BMPs to control nonpoint source pollution since the early 1980s. In addition, large areas of the Occoquan Reservoir watershed have been downzoned to protect the watershed from the negative impacts of large areas of impervious surfaces.

VAWC's program for maintaining its drinking water lines includes regular analysis of water, comprehensive plan studies, and annual system-wide flushing. VAWC does not have a formal water conservation program, and instead, relies on public tools such as the "Wise Water Use" information on their website.

The City and VAWC joined 21 other communities to develop a comprehensive water supply plan that encompasses all of Northern Virginia. The plan, developed by the Northern Virginia Regional Commission, includes information on water sources, water use, water resource conditions, water management actions and drought and contingency plans in the event of a water deficit. The plan also includes water supply projections through 2040.

Initiated in 2018, One Water Alexandria is a partnership between the three water entities that serve the City: VAWC, the City, who owns the sanitary and storm sewer infrastructure; and AlexRenew, who owns the water resource recovery facility, interceptors, pump stations, and combined sewer outfalls. This partnership has spearheaded several initiatives that are discussed in later sections.

### **2.2.5 WILDLIFE AND NATURAL HABITATS**

A healthy and diverse habitat is the end goal of an effective watershed management plan. Much of the City's natural landscape has experienced radical change over time due to development. Despite the impacts, regrowth of vegetation, scattered parcels of open and undeveloped land, utility rights-of-ways, and stream valleys, in combination with suitable and sustainable forms of development, have resulted in a limited yet remarkably resilient wildlife habitat known to ecologists as "typical suburban." While many species have taken up residence in lawn trees or wooded back yards, the bulk of the City's wildlife habitat can be found along natural areas of the Potomac River and the City's stream valley parks.

Wildlife habitat in the City is diverse but can be roughly divided into tidal and nontidal. Nontidal habitats include free flowing streams and forests of the City's uplands while tidal habitats include the estuarine portions of Four Mile Run and Hunting Creek as well as their associated wetlands and marshes.

### **2.3 COMMERCIAL AND RECREATIONAL FISHERIES**

The City does not have any commercial or recreational fisheries and does not have future plans for these businesses.

### **2.4 SHORELINES, STREAM BANK EROSION AND STREAM BUFFERS**

The physical integrity of a stream, including its banks and areas buffering the stream, has a direct impact on stream habitat and water quality. Degraded physical integrity of a stream is typically a symptom of too much water volume for a stream's capacity. As impervious surface area increases, stormwater tends to enter local streams at higher flow rates, rather than infiltrate slowly into the soil at a significantly reduced volume and rate. Urban streams seek to find



new equilibrium by expanding their capacity, resulting in undercutting and widening of banks, deepening of channels, and gulying. The impact on water quality and habitat can be devastating. Soil sediments, which also contain nutrients, are washed downstream where they eventually settle and smother aquatic communities. In addition, aquatic habitats are destroyed because water levels in streams fluctuate from torrential during storm events, to a trickle during periods of extended dryness.

While the impacts on water and habitat quality can be devastating, flooding due to a stream's inability to handle increased stormwater volume and velocity can seriously impact the welfare of residents and businesses. Particularly due to the effects of climate change, storm volume and intensities continue to exponentially increase, bringing more devastation in its wake.

Most of the City's major waterways have been hardened and/or channelized over time to stabilize eroding stream banks and to increase capacity. As a result, several stream restoration projects have been investigated or initiated in Lucky Run, Strawberry Run, and Taylor Run.

Figure 2-6 shows the stream reaches in the City that are severely eroded or hardened.

Current City regulations require stormwater be detained and released slowly to mimic the land's ability to hold large volumes of water over time. As a result, the need for future channelization and hardening projects has been reduced, although by no means eliminated, and the opportunity to stabilize remaining natural stream segments by other means have arisen.

A natural, undisturbed, mature vegetated forest buffer is an effective means of protecting water quality and aquatic habitats from the impacts of land use development. Not only does a vegetative buffer protect streams from runoff and activities from adjacent land uses, but also the tree canopy serves to cool and moderate stream temperatures. The City's CBPO requires the preservation of a 100-foot buffer area landward and adjacent to all RPA features and tributary streams during development.

Starting in 2004, the City initiated the Stream Assessment Program. Phase I of the program involved the identification and mapping of perennial and intermittent streams, defining the intermittent/ephemeral stream interface and approximate limits of ephemeral streams. Phase II of the program was completed in 2008 and involved the assessment of fifty-seven stream reaches within the City's eight local watersheds. Information related to stream conditions was collected relating to habitat, infrastructure impacts, problem areas, stream characteristics, and geomorphic classification. The information from these studies will continue to be used to prioritize streams for restoration.

Phase III was completed in 2019 and included assessing, evaluating, and ranking five potential project sites using a decision matrix with a comprehensive list of criteria to prioritize the projects. As part of the Phase III assessment in Spring 2018, teams assessed bank erosion along

several streams around the City to determine potential nutrient and sediment loading to the Bay. Locations surveyed included banks at Holmes Run, Strawberry Run, Taylor Run, Timber Branch, Unnamed tributary near Walleston Court, and an outfall into Holmes Run. This assessment was conducted using the Bank Assessment for Non-Point Source Consequences of Sediment (BANCS) method, which provides an estimate of the rate of erosion and amount of bank material being eroded from streambanks and deposited into the water. Based on the results of the assessment, all locations analyzed exhibited states of accelerated bank erosion. The average sediment loading rate into the stream for all locations was 0.67 ton per year per foot. The two top ranking projects were segments along Strawberry Run and Taylor Run. Conceptual designs were developed for these two highest-ranking potential project sites. The City will continue to prioritize future projects for implementation.

### **Potomac River Shoreline**

The City's Potomac River shoreline stretches for 7.8 miles from Hunting Creek on the south to Four Mile Run on the north. As with the City's smaller streams, the physical integrity of the Potomac River shoreline is important to minimize erosion and to protect wildlife habitats. Most of the Potomac River shoreline from Daingerfield Island south is hardened with various combinations of rip rap and concrete, and wood and steel bulkheads. In some areas, hardening has allowed public access to the Potomac River, while in others it has been necessary to prevent harmful erosion. Overall, approximately 58% of the shoreline is artificially stabilized, of which 75% is rip rap, 20% is bulkhead, and 5% is channel gabion. Daingerfield Island, which is maintained by the National Park Service, represents the largest natural area along the waterfront.

Most of the bulkheads and hardened areas along the Potomac range from fair to good condition,

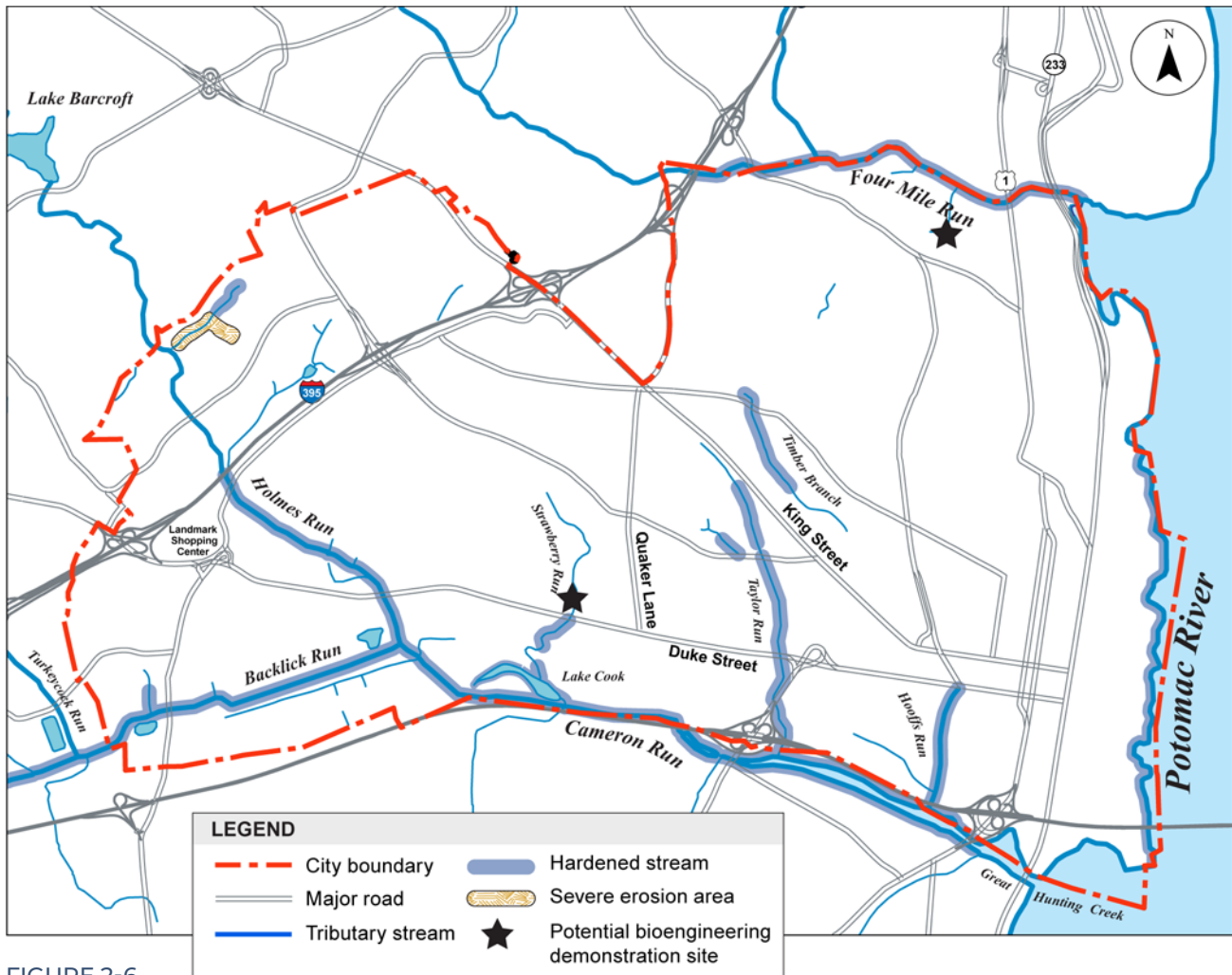


FIGURE 2-6. ERODED AND HARDENING STREAM REACHES IN THE CITY

although pockets of debilitated structures dot the shoreline. As development has continued along the waterfront, the remaining less stable bulkheads are being replaced or removed.

While the Daingerfield Island shoreline has been left in a largely natural condition, other pockets of “natural” shoreline can be found along the waterfront. Cobbles, washed from the City’s colonial streets and natural landforms, and banks with high clay content have prevented the development of significant areas of shoreline erosion.

Construction of the living shoreline at Windmill Hill Park to address the failing bulkhead was substantially complete in June 2018. This project introduced approximately 1,200 feet of living shoreline including stone sill, stone revetment, and a planted slope with tidal grasses, riparian buffer and native landscaping, that will encourage and support more diverse aquatic wildlife use at the park.



*Living shoreline at Windmill Hill Park*

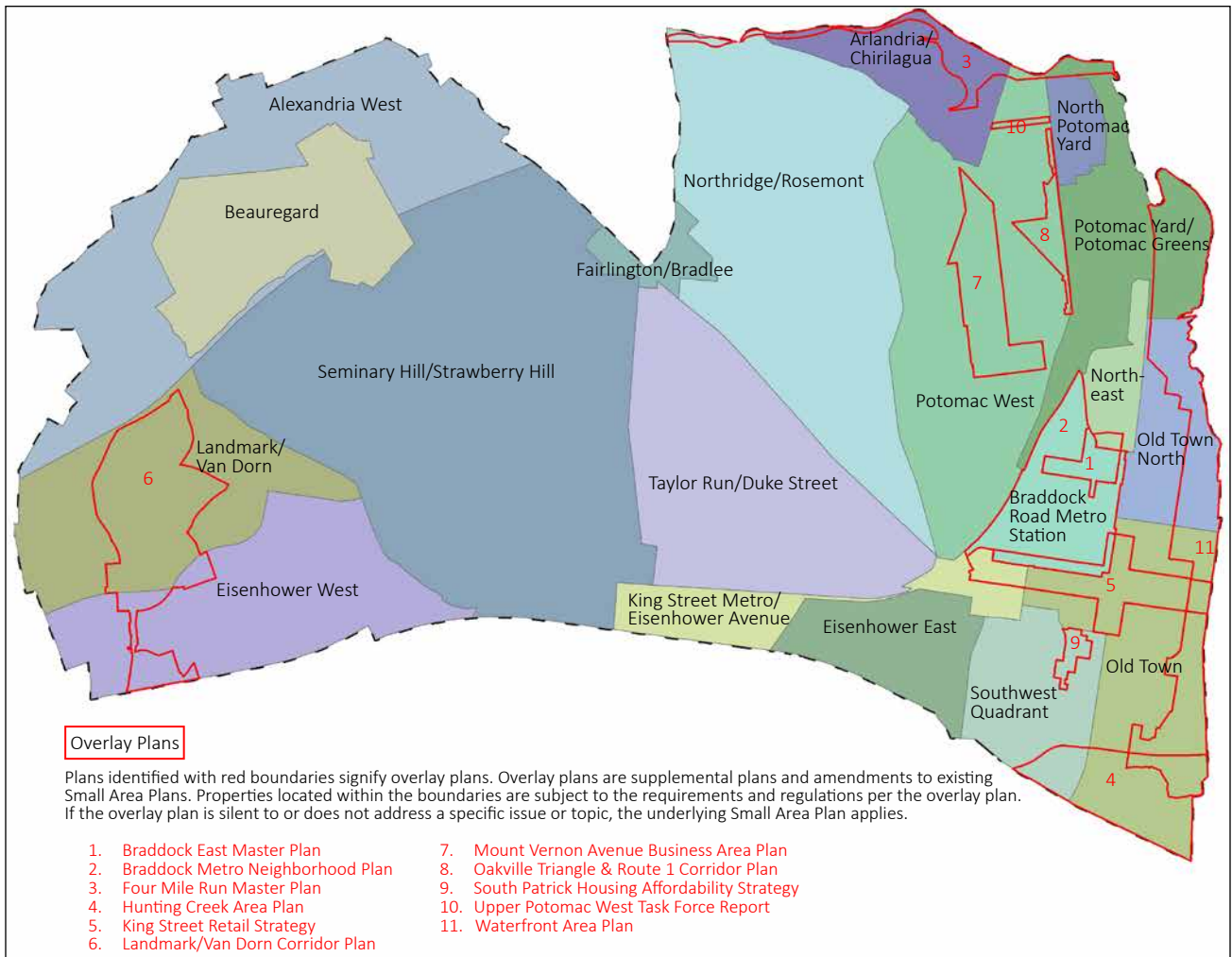
## 2.5 EXISTING AND PROPOSED LAND USE

The Alexandria Master Plan is made up of multiple Small Area Plans (SAPs) covering neighborhoods throughout the City, as well as topical chapters of citywide relevancy, such as Historic Preservation, Urban Design, Transportation, and Open Space. The Alexandria Master Plan was adopted by the City Council on June 13, 1992, and chapters are added or updated on an ongoing basis as needed through Master Plan Amendments. The City's Small Area Plans include neighborhood plans and master plans for the following areas: Alexandria West, Arlandria-Chirilagua, Beauregard, Braddock Road Metro Station, Eisenhower East, Eisenhower West, Fairlington/Bradlee, King Street Metro/Eisenhower Avenue, Landmark/Van Dorn, Northeast, North Potomac Yard, Northridge/Rosemont, Old Town, Old Town North, Potomac West, Potomac Yard/Potomac Greens, Seminary

Hill/Strawberry Hill, Southwest Quadrant, Taylor Run/Duke Street, and Waterfront.

Figure 2-7 illustrates the extent of SAP boundaries. Each of the SAPs include relevant information about stormwater management and improvement through redevelopment. As the SAPs are updated, current requirements and recommendations are added for the improvement of water quality and control of water quantity.

Land uses in the City are associated with different degrees of impervious surface area. This means that each land use will also affect water quality differently. Industrial/commercial land uses typically are the most impervious, while parks and open space land use is typically the least impervious. Residential land use falls in the middle. Currently, the City is approximately 58% residential, 13% coordinated development districts, 11% commercial, 6% transportation/utilities, 6% public open space, 3% recreational,



**FIGURE 2-7. SMALL AREA PLANS**

2% industrial, and less than 1% waterfront. Figure 2-8 shows the current land use. As the SAPs are updated, the land uses are evaluated, and the most optimal use is recommended for each plan area. Impervious area is recommended to be limited and open space and park land uses protected or increased through the redevelopment process.

## 2.6 EXISTING AND POTENTIAL WATER POLLUTION SOURCES

Section 3 of this Plan details the City's existing and potential pollutant sources. This section

contains a substantial amount of information and is therefore a stand-alone section.

## 2.7 PUBLIC AND PRIVATE ACCESS TO WATERFRONT AREAS AND WATERWAYS

The City aims to increase public and private access to waterfront areas, but recognizes that waterfront access and use can affect water quality and that sensitive shoreline features may constrain where access is appropriate. Greater access to the water can lead to more trash, accidental spills, and interactions with and harm



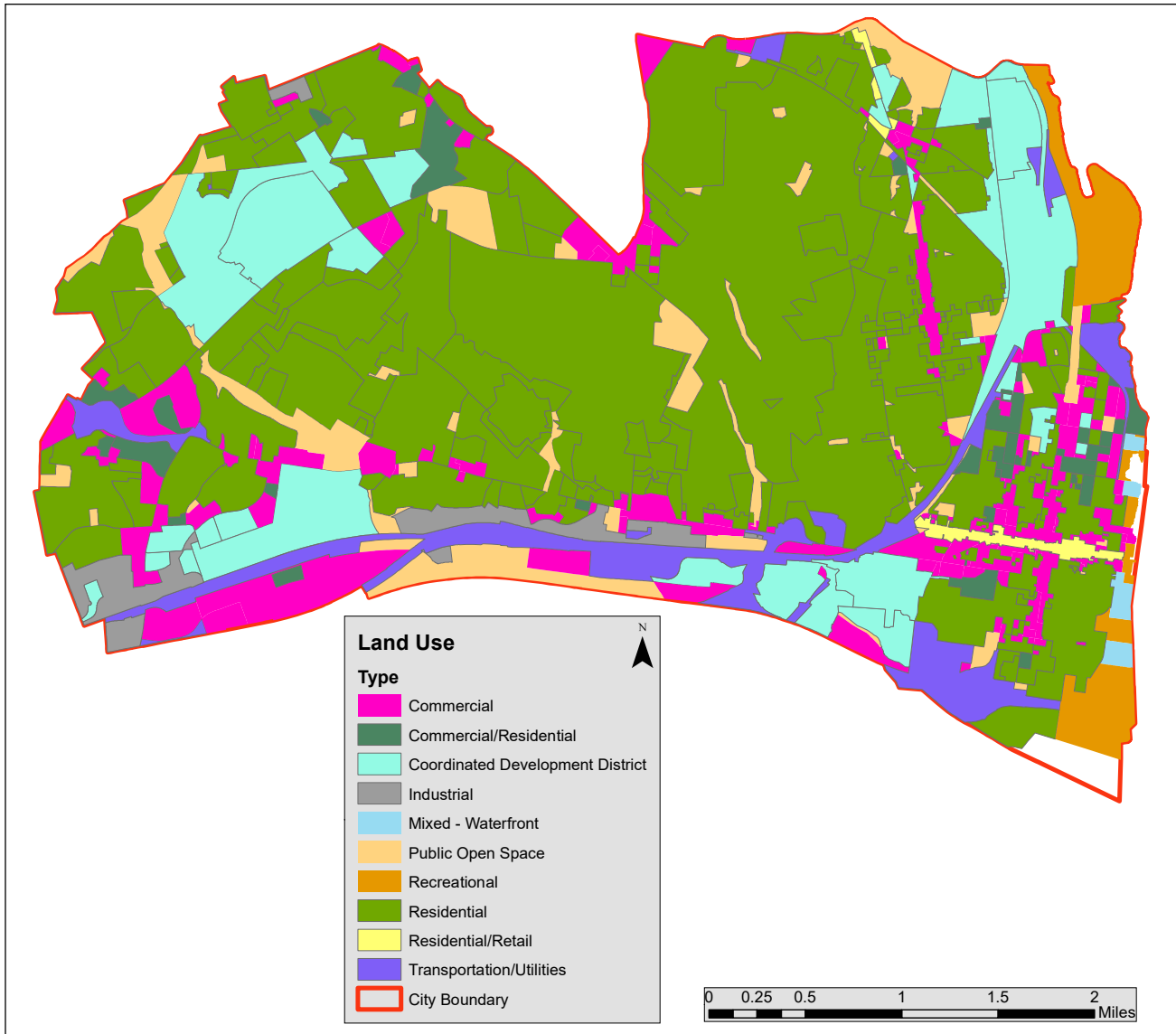


FIGURE 2-8. ALEXANDRIA LAND USES

to aquatic wildlife and plants. The City’s public access and design implementation plan for the waterfront was updated in the 2012 “Waterfront Small Area Plan.” The Plan provides a framework for revitalizing the City’s waterfront through several means, including: incorporating history as a foundation for planning and design, expanding and enhancing public open spaces, improving public access and connectivity, promoting the waterfront as an arts and cultural destination, ensuring compatible development.

The Plan calls for a redesign of Waterfront Park combined with the King Street Park, acquired by the City from the Old Dominion Boat Club which added approximately an acre of park at the heart of the waterfront. Overall, the Plan adds nearly six acres of new public spaces including new public piers, streets that are converted to pedestrian-oriented spaces, and more.

Redevelopment plans have also been approved and constructed for the Old Dominion Boat Club and waterfront properties located along

The Strand and the Robinson Terminal North property. Figure 2-9 shows public and private boat docking areas and marinas as well as public and private access points on the City's waterfront.

Additional policies regarding future land uses on the waterfront are contained in the Old Town Small Area Plan. These include provisions for open space and public access, encouragement of water-oriented activities and mixed-use

development, and architectural design. Siting of future waterfront access areas will be determined with consideration for the environment.

The Potomac River Generating Station, located in Old Town North and decommissioned in 2012 (PRGS), is also under plan for redevelopment which may further provide access to the waterfront in North Old Town.

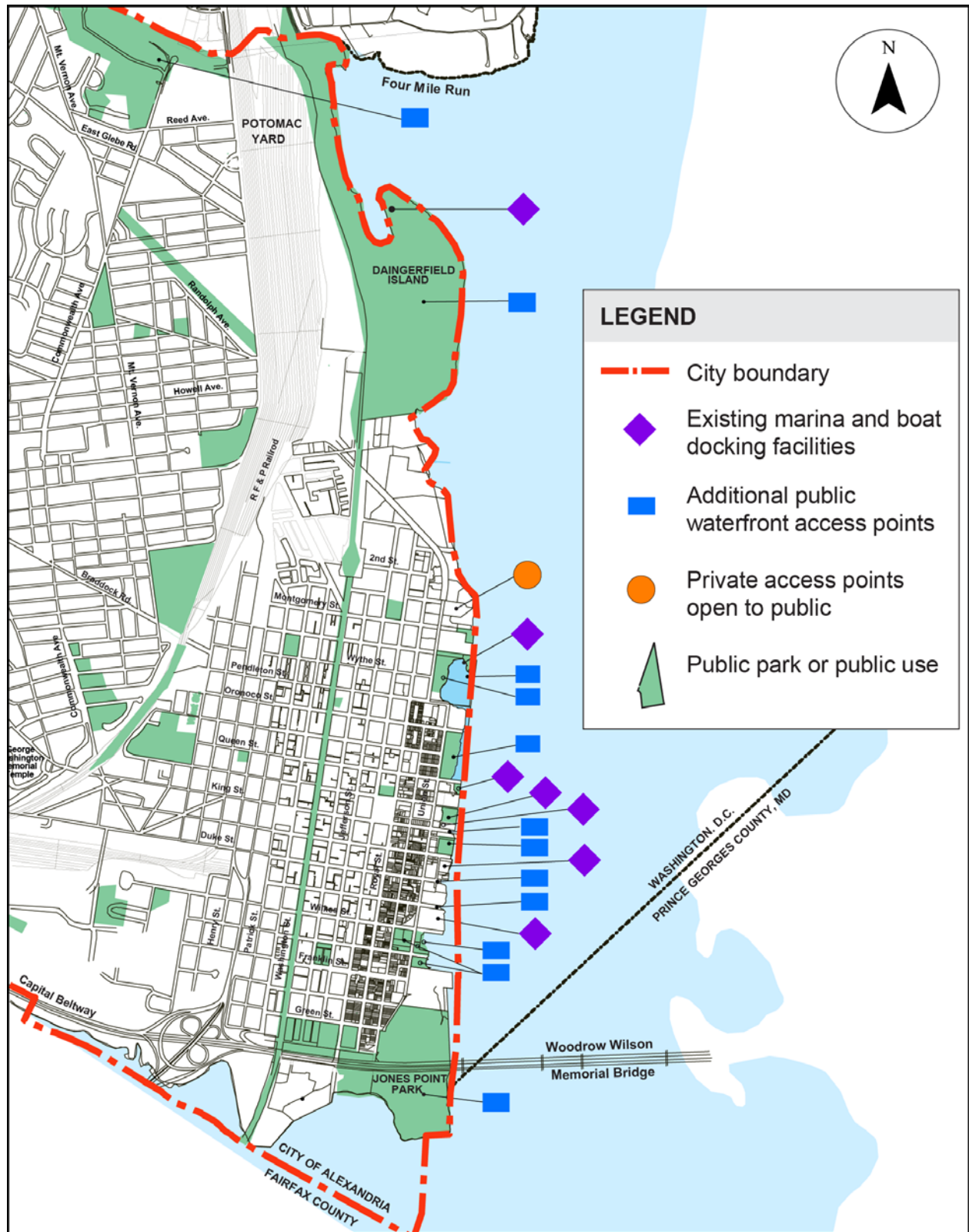


FIGURE 2-9. ALEXANDRIA WATERFRONT ACCESS AREAS AND MARINAS



# 3

## POTENTIAL POLLUTANT SOURCES

Understanding what and where pollution is generated is the first step towards preventing and controlling pollution before it damages water quality and the environment. This section outlines existing and potential sources of urban stormwater pollution faced by the City.

As a result of heavy industrialization, contaminated industrial sites exist within the City and are often converted to residential and commercial uses. The City also has large concentrations of commercial activity, resulting in large areas of impervious surfaces.

Like other urban localities, portions of the City are served by a combined sewer system (CSS). In most localities, stormwater and wastewater are carried separately, with the stormwater being channeled to a local stream and the wastewater being piped to a local wastewater treatment facility. A CSS combines both stormwater and wastewater in one system for treatment, as the City has in approximately 540 acres of Old Town. The disadvantage of this system is that during very wet weather, the system becomes overwhelmed and combined sewage above the capacity of the system discharges to the Potomac River. The RiverRenew project, being constructed by AlexRenew, will significantly reduce these discharges by collecting combined sewage into a tunnel and conveying it to their wastewater treatment facility for a high level of treatment, providing significant water quality benefits.

The most cost-effective approach to the problem of pollution is to prevent it at its source. Several tools are available to the City to aid in pollution prevention including public education and awareness, water conservation, and lawn care programs, and recycling efforts, to name a few. The cost to the City once environmental damage has been done includes not only short-term clean-up costs, but also long-term costs including decreased property values and diminished tax base.

The City also recognizes that the best way to protect local and regional water quality is through an integrated watershed management plan such as the MS4 Program Plan, which involves strategic use of structural and nonstructural BMPs to address all sources and types of pollutants to optimize water quality and resource protection.

The following sections describe the City's existing sources of pollution as well as potential sources of pollution that the City may face in the future. This inventory, along with various tools afforded by the state and the federal governments, is being used by the City to minimize and eliminate the impacts of pollution on the environment.

### **3.1 POINT SOURCE POLLUTION**

Point sources of pollution are those that can be tracked to a specific point or outfall. While pollution from point sources is often in large volume, point sources are the easiest to manage because they are confined and often there is a single entity responsible for clean-up. Point sources of pollution within the City include NPDES discharge points, CSOs, and ASTs/USTs. In each case, there is a specific entity responsible for maintenance, and, except for ASTs, are monitored by the City, state, and/or federal government.

#### **3.1.1 VPDES DISCHARGES**

Industries and municipalities, under the CWA NPDES program, are required to report wastewater discharges to state waters, and to the maximum extent practicable, mitigate the effects of the pollution on the environment. DEQ administers Virginia's program and is charged with ensuring that environmental regulations are enforced. DEQ issues VPDES permits to control point source discharges within the state.

According to state records, there are six general VPDES permits and one individual VPDES permit in the City. VPDES permits in Alexandria are listed below in Table 3-1. Discharges from these sources

are strictly controlled and currently meet state and federal environmental standards.

**TABLE 3-1. VPDES PERMITS IN ALEXANDRIA**

PERMIT TYPE	PERMIT HOLDER
Small MS4	City of Alexandria
Industrial Stormwater	Covanta Alexandria Arlington, LLC. – Covanta Alexandria Arlington, LLC.
	Eurovia Atlantic Coast, LLC. Db a Virginia Paving Company – Virginia Paving Company, Alexandria Plant
	United Parcel Service – United Parcel Service VAALE
Vehicle Wash Water	Enterprise Rent A Car – Enterprise 4213 Duke Street
Individual	Alexandria Sanitation Authority – AlexRenew Water Resource Recovery Facility

Under the MS4 permit, the City is required to monitor illicit discharges as a source of pollution. However, illicit discharges do not appear to be significant sources of pollution in the City based on years of monitoring data. Specific outfalls will be monitored annually for illicit discharges, and any potential sources will be identified and eliminated promptly. Illicit discharges are further discussed in Section 4.2.11.

### 3.1.2 WASTEWATER TREATMENT

For most of the City, wastewater is treated by Alexandria Renew Enterprises, commonly referred to as AlexRenew. Approximately one square mile in the northwestern part of the City has its wastewater conveyed to Arlington County and treated at the Arlington County Water Pollution Control Plant.

AlexRenew is a special purpose body created by the City and chartered by the state. AlexRenew operates an advanced water resource recovery facility located on South Payne Street. In addition to the City’s wastewater, AlexRenew treats wastewater from a part of Fairfax County under an agreement established when the Alexandria Sanitation Authority was originally

created. AlexRenew also owns and operates the four principal interceptor sewers and pumping stations in the City. One interceptor sewer, the Holmes Run Trunk Sewer is used jointly by the City and the County. AlexRenew also owns the City’s Combined Sewer Outfalls (CSOs) located within the City limits.

Treated effluent from the AlexRenew plant is regulated by an individual VPDES permit and is discharged to Hunting Creek, a tributary of the Potomac River. The treatment plant discharge is the largest of the City’s point sources. In 1987, the CWA was expanded to include not only point source pollution coming from industrial and wastewater treatment sources, but also to include discharges from storm sewer systems that drain urban areas.

### 3.1.3 COMBINED SEWER SYSTEM

The City’s combined sewer system (CSS) includes areas east of the railroad corridor (mostly Old Town) and comprises approximately 540 acres and four combined sewer overflow (CSO) outfalls. CSOs are located at the end of Pendleton Street, Royal Street, under Duke Street at Hooff’s Run, and at Hooff’s Run between Duke and Jamieson Streets, as shown in Figure 3-1.

The CSS collection system, with the exception of the four CSO outfalls, is owned, operated, and maintained by the City’s Department of Transportation and Environmental Services (T&ES).

RiverRenew is a program being implemented by AlexRenew with support from the City to address legislation passed in 2017 by the Virginia General Assembly. This legislation requires significant reductions in the total number of CSO discharges and volume of CSO discharges. The program calls for construction of a tunnel system and other improvements that would transport sewage and stormwater flows from all four combined sewer outfalls to AlexRenew’s Water Resources Recovery Facility. This program

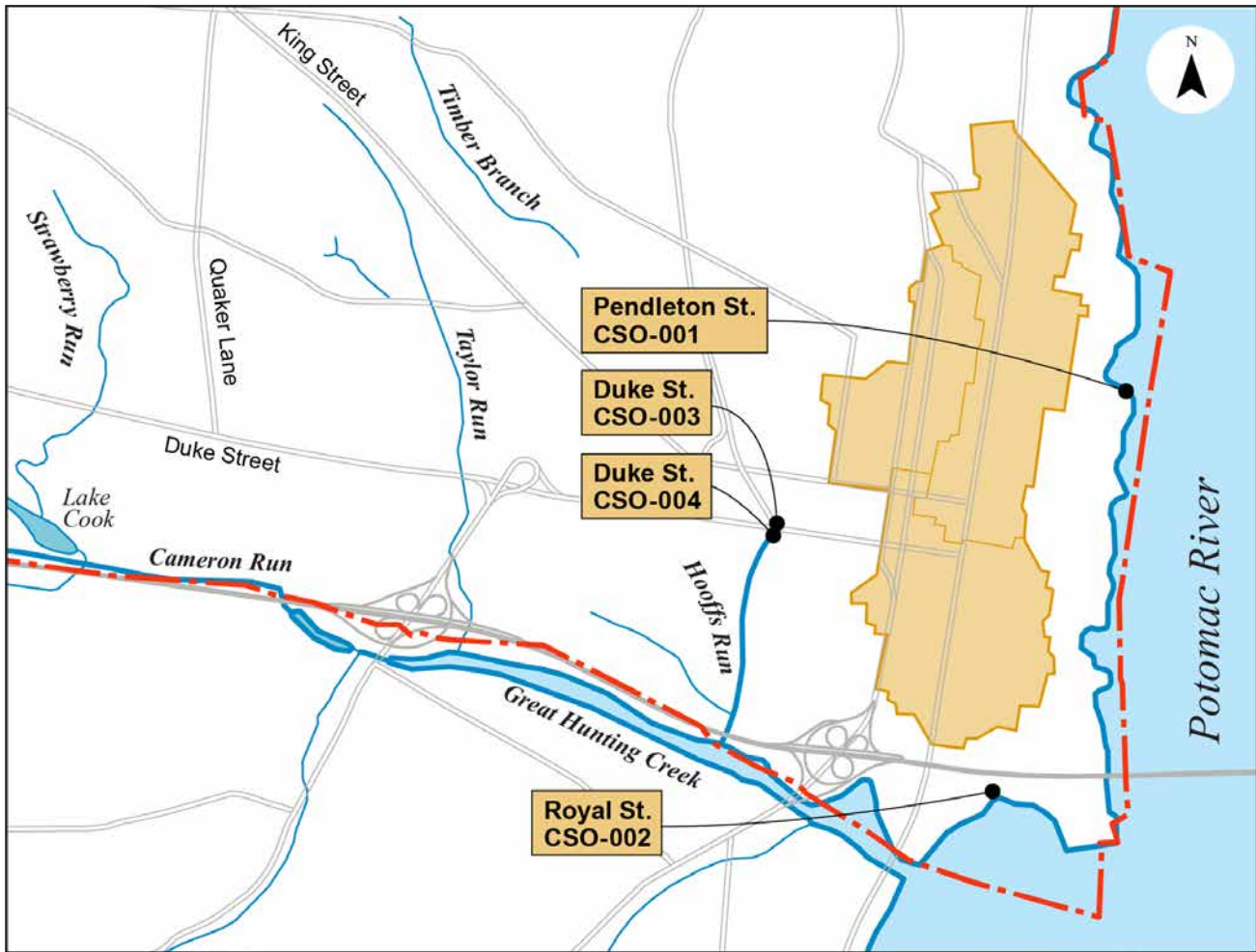


FIGURE 3-1. COMBINED SEWER OUTFALLS IN THE CITY

will prevent millions of gallons of sewage from reaching the City's streams and rivers. Combined sewer flows will be fully treated at the facility until it reaches capacity, at which point the excess flow will receive initial treatment and disinfection and the remaining flows will be stored until they can be treated. CSOs into local waterways will be significantly reduced and only occur a few times a year during extreme storm events when flows exceed the combined capacity of the entire system.

Prior to the adoption of this project, the City transferred ownership of its combined sewer outfalls to AlexRenew in the 2018 Outfall Transfer

Agreement. The City will retain responsibility for granting land-use permits to AlexRenew as the RiverRenew project goes forward, so it retains oversight of the construction. Updates on this program can be found at [riverrenew.com](http://riverrenew.com).

### 3.1.4 LEAKING SANITARY SEWER LINES

In many urban areas, particularly in well-established areas such as the City, pollution may result from leaking sanitary sewer lines, which allows stormwater infiltration and inflow (I&I) into the sanitary sewer system. Leaking sanitary sewer lines may cause elevated fecal coliform bacteria levels in local streams as well as a number of other health and odor problems.

The City's sanitary sewer system dates back to the early 1930s. The materials first used were terra cotta and cement. Today, the City's system is composed of these original materials along with PVC, concrete, and ductile iron pipe. The system contains over 240 miles of sanitary sewer and 6.2 miles of combined sewer. The system is maintained by the T&ES, Public Works Services Division, with the use of sewer jet cleaners and catch-basin cleaners (in the combined sewer system).

The sewer system is inspected using CCTV technology to determine when repair or replacement of sanitary sewers are required. The City currently runs a preventive maintenance program and surveys the entire system on a scheduled basis. The City has established the Asset Renewal Program to inspect approximately 10% of the sanitary sewer system and rehabilitate approximately 2% of the system annually.

This program is a continuation of a 20-year I&I remediation program to determine the degree and source of the stormwater I&I into the sanitary sewer system. Based on the results of the prior field work and engineering studies, a remediation plan was developed including such measures as relining old sewers, jointly sealing, rerouting connections and manhole repairs. Approximately one-quarter of the City's sewers have been rehabilitated to date and a total of approximately \$30 million has been spent. Details about the sanitary sewer system are included in the City's Sanitary Sewer Master Plan.

### **3.1.5 ABOVEGROUND AND UNDERGROUND STORAGE TANKS**

ASTs and USTs can contribute to water quality problems through spillage, leakage, and in the case of ASTs, toppling. DEQ is responsible for permitting and tracking both ASTs and USTs. The installation and removal of ASTs and USTs is regulated by local building and fire codes and requires that permits also be issued by Alexandria Code Enforcement.

ASTs are regulated by the federal government through the Clean Water Act. 40 CFR Part 112 requires owners of single tanks with a capacity greater than 660 gallons or multiple tanks with an aggregate capacity greater than 1,320 gallons to register and formulate a Spill Prevention Control and Countermeasure Plan (SPCCP). Virginia has adopted requirements for tank owners to present an Oil Discharge Contingency Plan (ODCP) before a storage tank may be registered. The purpose of an ODCP is to have a plan of action in the event of a catastrophic release of oil from the largest tank. The plan must also identify what the impact of such a discharge will be on the environmental receptors and what will be done to mitigate those impacts in the event of a spill.

However, individual tanks with a capacity of less than 660 gallons or multiple tanks with an aggregate capacity of less than 1,320 gallons are not currently regulated by the state or the federal government. Most home fuel oil tanks are typically only 200 to 660 gallons and are not regulated. This aggregate of tanks may pose a serious threat if small problems are not taken seriously. It is therefore the responsibility of the individual owner to ensure that leaks and spills do not occur. According to DEQ, approximately 90 percent of releases from individual tanks are a result of overfill or the tipping over of the tank. Overfill can occur if the driver/ filler is not paying attention or if the capacity of the tank is not known. To reduce the risk of an accidental spill, the homeowner or fuel oil company should inspect a tank before filling to ensure that it is sturdy and does not exhibit signs of corrosion. An owner should also have the capacity of the tank clearly marked on the tank and specifically indicate the filling cap location.

USTs pose a much greater risk to water resources, in part because spillage is often not detected until long after it begins. According to DEQ, USTs are the primary source of groundwater contamination in Virginia. In addition, many



streams are fed by groundwater and therefore a spill may also adversely impact surface water quality. In addition to gasoline, USTs are used for storing benzene, kerosene, diesel fuel, used motor oil, and fuel oil.

T&ES, the Fire Department, and the City's Code Administration work with the DEQ Water Division to prevent leakage and to ensure that any leakage into the environment is remedied. In many instances, the presence of contaminated groundwater due to leaking USTs does not present itself until vacant commercial and industrial properties are redeveloped. Sometimes these contaminants surface near residential areas in the storm sewer system or in natural streams, causing public health and safety problems and producing undesirable odors. These issues are addressed by T&ES and the Fire Department.

### **3.1.6 SEPTIC SYSTEMS**

Improperly maintained septic systems can fail, therefore posing a local health and water quality risk. All new development and redevelopment are required by City Code to connect to the City's sanitary sewer system. There are no known on-site septic systems in the City.

## **3.2 NONPOINT SOURCE POLLUTION**

Nonpoint source pollution is pollution that originates from small, diverse sources. Nonpoint source pollution may originate as atmospheric deposition, leaking automobiles, pet waste, and misapplied lawn fertilizers and pesticides as well as a host of other sources. When these pollutants get swept up into stormwater runoff, it is difficult to trace their origins.

Most commonly, nonpoint source pollution is a result of pollutants accumulating on impervious surfaces that are subsequently flushed into local waterways by stormwater runoff. Urban land use in general produces high annual nonpoint source pollutant loadings of nutrients, heavy metals, and oxygen depleting substances. Oil

**Nonpoint source pollution from urban areas can be reduced by minimizing the amount of impervious surface area from development, using open space, preserving indigenous vegetation, restoring denuded vegetative stream buffers, preventing pollution through public education, and by employing the use of structural stormwater management facilities.**

contamination, sediments, pesticides, metals, and other toxic substances found in urban runoff are often found at sufficient levels to kill and destroy aquatic life. Among the most destructive, yet inconspicuous pollutants are excess nutrients. Excess nutrients can result in a phenomenon known as eutrophication. Eutrophication results in algal blooms, which block sunlight and deplete dissolved oxygen content during decay. Eutrophication also destroys the recreational use of the water resource and results in strong odor and undesirable taste.

### **3.2.1 POLLUTANT POTENTIAL BY LAND USE**

As noted previously, the greater the level of impervious surface area, the greater the risk that water resources will be impacted by nonpoint source pollution. The City has an impervious surface area of approximately 42%, which is among the highest in Virginia. As a result, the City recognizes that the control of nonpoint source pollution must be a key component of water quality management efforts.

While it is true that nonpoint source pollution potential increases as impervious surface area increases, one must not conclude that residential areas made up of less impervious cover are not significant sources of nonpoint source pollution.

Indeed, industrial areas tend to be the most stringently regulated areas, while residential areas are often the worst offenders because of relatively inexperienced residents performing car repairs or applying fertilizers and pesticides.

In general, nonpoint source pollution from urban areas can be reduced by minimizing the amount of impervious surface area from development, preserving open space, preserving indigenous vegetation, restoring denuded vegetative stream buffers, preventing pollution through public education, and by employing the use of structural stormwater management facilities which operate by removing pollutants.

However, different land uses and activities are associated with different types of pollution (Table 3-2). In order to facilitate the efficient and effective targeting of nonpoint source management efforts, the City should be viewed in terms of four management areas.

Many resources are available that provide guidance on the prevention of nonpoint source pollution through sensitive site design and through public education. The City promotes nonpoint source pollution reduction through

its own public education programs and by encouraging the use of sensitive site design during the plan review process. Intensely Developed Areas (IDAs) can be designated as an overlay of CBPAs within jurisdictions subject to the Bay Act. IDAs serve as redevelopment areas in which development is concentrated as of the local program adoption date. At this time, the City does not have any IDAs.

### 3.2.2 WILDLIFE, NON-MIGRATORY WATERFOWL, AND PET WASTE

Non-migratory waterfowl, wildlife, and pet waste take on particular significance as sources of nonpoint pollution because they are primary sources of fecal coliform bacteria. Fecal coliform contamination causes many streams to be deemed unsafe for recreational uses. While some sources of fecal coliform pollution are preventable through public education (pet waste, for instance), other sources will require significantly more effort and planning to achieve significant reductions.

**TABLE 3-2. POLLUTION POTENTIAL BY LAND USE DESIGNATION**

LAND USE	IMPERVIOUS COVER	POLLUTANTS	BMPS
High Density Commercial and Mixed-Use Corridors	Moderate-High	Non-point source pollutants like trash, automobile oil, etc.	Structural
Industrial Uses	High	Chemicals, oils, wastewater, etc.	Structural
Public and Private Institutional and Recreational Uses	Low-Moderate	Trash, pet waste, sediment	Structural, impervious surface removal, green management
Residential Uses	Low-Moderate	Automobile and yard wastes	Structural, public education

### 3.3 EROSION

Soil erosion is one of the most pressing pollution problems faced by the City. Suspended sediments choke and muddy local waterways making them uninhabitable for aquatic life. In addition, nutrients and other pollutants attach themselves to sediment particles and contribute to eutrophic conditions in the Potomac River and the Chesapeake Bay.

Soil erosion is most often the result of streambank erosion, improperly managed land uses, and unregulated land development. The City's ESC Ordinance addresses soil erosion problems during the site development process.



### 3.4 AIR POLLUTION

Over time, air pollution becomes water pollution due to gravity and deposition. The federal Chesapeake Bay Program estimates that just over one third of the nitrogen reaching the Bay originates from air pollution. The difficulty in managing air pollution is that a majority comes from sources beyond the Bay region, mostly from the industrial states to the west. The federal Clean Air Act, last amended in 1990, is the primary regulation governing air quality. The Chesapeake Bay Watershed model also includes airshed modeling.

### 3.5 WATERFRONT AND DOCK ACTIVITIES

Because of their proximity to the water, waterfront and dock activities have a potential to degrade water quality if not properly managed. Dock related pollution may result from improper use of cleaning agents on boats, improper disposal of toilet waste, improper disposal of hazardous materials, leakage from engines, improper disposal of fish waste, improper use of mollusk repellent copper paints, etc. Waterfront activities may also contribute litter and trash to the water.

Waterfront activities within the City are varied and include docking and pedestrian activities along the Old Town waterfront and at the Washington Sailing Marina, commercial activities along Waterfront Plaza, and recreational activities at Founders Park and Oronoco Bay Park. The City's public access and design implementation plan for the waterfront is outlined in its 2012 Waterfront Small Area Plan.

Management of marinas and docking facilities for water quality purposes is a joint responsibility of DEQ, the Virginia Marine Resources Commission (VMRC), and the USACE. The VMRC has established Criteria for the Siting of Marinas or Community Facilities for Boat Mooring (VR 450-01-0047) which outlines proper BMPs to ensure a marina's compatibility with the environment.

### 3.6 AREAS OF SPECIAL CONCERN

Other areas of special concern are due to past industrial activities and contamination such as Potomac River Generating Station and the Alexandria Gas Works/Oronoco Site. Past sites that are were remediated and redeveloped in recent years include the Bogle Chemical

Company Site, Potomac Yard, Cameron Station, and Carlyle.

### **Alexandria Gas Works/Oronoco Site**

Since entering the site in Virginia's Voluntary Remediation Program (VRP) in 2000, the City has made significant gains remediating coal tar substances found beneath the former manufactured gas plant (MGP). The plant operated near the corner of North Lee and Oronoco Streets between 1851 and 1947 but has since been replaced by commercial office buildings.

Contamination was discovered shortly after the installation of a stormwater pipe below Oronoco Street which empties into the Potomac River at the end of Oronoco St. To date, the City has removed coal tar from the water table beneath the site, eliminated direct migration pathways to the Potomac River, contained and collected coal tar at the outfall, treated, affected groundwater and performed multiple rounds of soil, groundwater, sediment, water and air gas testing.

In 2013, the City installed a groundwater treatment system beneath Oronoco Street. The system removes coal tar from the groundwater before it discharges into the Potomac River just below the stormwater pipe outfall. After almost 4 years of continuous operation, the system has proven to be effective in removing coal tar substances. In addition to operating the groundwater treatment system, the City continues to collect coal tar from beneath the former MGP and to prevent residual product from emanating from impacted sediments off the outfall.

In 2016-2017, the City inspected and repaired the main storm sewer pipe along Oronoco Street in the area between North Union and the North Royal Streets. This work identified potential pathways for intrusion of contaminants into the pipe. In 2018, the City completed a major project to dredge and cap residual coal tar-impacted

sediments around the Oronoco Street outfall in the Potomac River.

The City is currently conducting a project aimed at increasing coal tar recovery close to the source area (i.e., Lee Street Square).

### **Potomac River Generating Station (PRGS)**

The coal-fired power plant began operations on the PRGS site in 1949 to provide power to Washington D.C. and to serve as a backup power source for the nearby Pentagon. In the early 2000s, however, residents living close to the station began complaining of black dust covering their balconies. These locals voiced their strong concerns about the site's impacts on health and the environment. Following years of litigation and under an agreement with the City, the PRGS was decommissioned in 2012. The site then went under years of remediation. While active remediation ended in 2019, onsite groundwater monitoring wells continue to be tested quarterly for petroleum contaminants. Power company GenOn leased the site for decades.

In November 2020, Hilco Redevelopment Partners announced the purchase of the PRGS Site in the Old Town North neighborhood in Alexandria, one of the redevelopment sites identified in the Old Town North Small Area Plan. The Plan envisions the site as a Mixed-Use/Innovation District incorporating innovation uses that serve as an economic anchor attracting creative entrepreneurial and commercial activities in a mixed-use environment. The site will include park space and likely provide public access to the waterfront.

### **Municipal Land Fill Sites**

Closed municipal landfill sites are areas of potential concern only if improperly disturbed. Four abandoned municipal landfill sites are located within the City boundaries. One site located on the west side of Hooff's Run near the Beltway has been remediated as a result of the Carlyle development project. Other landfills are

located on the east side of Hooff's Run at the AlexRenew Facility, in North Old Town (centered around Montgomery Street, First Street, Pitt Street, and Royal Street) and the northeast corner of the City bordered by Commonwealth Avenue, Four Mile Run and Route 1.

**Other Hazardous Contamination Sites**

As the City continues to develop and redevelop, it is likely that vestiges of the City's industrial past will continue to be discovered. T&ES has the primary responsibility for addressing problem sites through the development process.



# 4

## WATER QUALITY MANAGEMENT POLICIES AND PROGRAMS

The City has adopted a sophisticated array of ordinances, regulations, policies, and programs to address constraints to development, the preservation and management of water and natural resources, and the prevention and control of pollution. The City has worked diligently with state and federal agencies to bring its environmental and water quality protection programs into compliance with state and federal laws and regulations and has worked to implement its own programs to address locally identified environmental and water quality needs and concerns.

Responsibility for environmental protection in the City is a cooperative effort among agencies including T&ES; the Department of Planning and Zoning; the Department of Parks, Recreation and Cultural Activities; the Code Enforcement Administration; and the Fire Department. In addition, the City's Environmental Policy Commission provides citizen input and guidance into the development of the City's environmental policies, programs, and regulations. Many City residents and staff have gone above and beyond compliance with regulations or participation in City programs and have taken active roles in promoting environmental stewardship.

The following is an overview of existing plans, regulations, ordinances, and programs related to water quality protection and management in the City.

#### **4.1 CITY MASTER PLAN**

The Master Plan is the principal guiding document that identifies the City's priorities and provides a vision of how the City will grow both physically and as a community. The Master Plan contains background information, guidance, and policy in the areas of land use, housing, transportation, community facilities, economics and finance, and urban design. In addition to these general policies, the Master Plan consists of

specific SAPs that provide for the detailed on-the-ground implementation of goals and policies.

Existing and proposed land uses are reviewed and updated through the City's SAP process. These SAPs cover various geographical regions across the City that serve as an overlay to the planning and development process.

Goals and objectives relating to the protection of the environment and water quality are found throughout the City's Master Plan. This plan serves to wrap these goals and objectives into a cohesive water quality management and protection plan.

#### **4.2 CITY ORDINANCES AND REGULATIONS**

The City has adopted several ordinances and regulations to protect the environment and water quality from the impacts of development and human activity. In many instances, these ordinances and regulations implement state and/or federal requirements and mandates. For instance, the City's CBPO implements the state's Chesapeake Bay Preservation Act while the City's ESC Ordinance implements the state's Sediment and Erosion Control Law. The Floodplain Overlay District of the City's Zoning Ordinance is required by the Federal Emergency Management Agency (FEMA) for City residents to qualify for flood insurance. Other City ordinances relating to water quality and the environment include regulations affecting the preservation and maintenance of trees, shrubs, plants, and vegetation, regulations prohibiting the improper disposal of pet waste, used oil, automotive fluids, and other hazardous materials that may find their way to a local stream through a storm drain, and pertinent sections of the Zoning Ordinance relating to development approvals and procedures. Additionally, the City reviews soil and groundwater remediation plans through the site development and redevelopment process.

Collectively, these ordinances and regulations provide the means by which the City protects its water quality and, in some unfortunate situations, prosecute those who impact the City's natural resources.

#### **4.2.1 CHESAPEAKE BAY PRESERVATION ORDINANCE**

The City's CBPO (Section 13-100 of the City Code) is one of the City's most comprehensive water quality protection tools. This Ordinance implements the Virginia Chesapeake Bay Preservation Act (Chapter 25, Title 10.1 of the Code of Virginia) which was enacted in 1988 by the Virginia General Assembly in recognition that the Chesapeake Bay was on the verge of becoming an ecological disaster area in part because of uncontrolled nonpoint source pollution from urban and agricultural areas. Water quality conditions in the Chesapeake Bay were only the most visible manifestation of a larger problem. In addition to the Chesapeake Bay, local streams and watersheds were also suffering the effects of pollution and many could no longer support aquatic life.

The primary purpose of the CBPO is to prevent any increase in nonpoint source pollution from new development and to reduce nonpoint source pollution from redevelopment. In addition, the City has committed to:

- › Protect existing high quality state waters and restore all other state waters to a condition or quality that will permit all reasonable public uses, and will support the propagation and growth of all aquatic life which might reasonably be expected to inhabit them;
- › Safeguard the clean waters of the Commonwealth from pollution;
- › Prevent any increase in pollution;
- › Reduce existing pollution; and
- › Conserve water resources to provide for the health, safety, and welfare of the present and future citizens of the Commonwealth.

To accomplish these goals, the CBPO establishes a program to protect environmentally sensitive features which, when disturbed or developed incorrectly, lead to reductions in water quality in the Chesapeake Bay and local streams, lakes, and rivers. In accordance with the guidelines established by the Chesapeake Bay Preservation Area Designation and Management Regulations, the City mapped CBPAs and adopted a CBPA Overlay District in 1992. The mapping of these areas, which include RPAs and RMAs was based on a survey of existing natural resources documentation and field surveys.

#### **Resource Protection Areas**

RPAs are lands at or near the shoreline containing components that are especially sensitive because of (1) the intrinsic value of the ecological and biological processes they perform which benefit water quality, or (2) the potential for impacts that may cause significant degradation to the quality of state waters.

The RPA designation within the City includes:

1. Tidal wetlands;
2. Tidal shores;
3. Nontidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow;
4. A buffer area of 100 feet (measured from top of bank) located adjacent to and landward of the components listed in subsections (1) through (3) above and along both sides of any water body with perennial flow. The 100-foot buffer is primarily found along water bodies with perennial flow in the City.

The City has been very protective of RPAs with only two exceptions approved to date to allow for new encroachments of impervious area within the RPA. In both cases, extensive mitigation was required.



### Resource Management Areas

RMAs include land types that, if improperly developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the RPA. All lands in the City, not included in an RPA, constitute the RMA since all such land drains through natural or man-made channels to the Potomac River. It is important to note that City elected to designate RMA jurisdiction-wide to afford protection to these areas.

To meet the goals of the Act, and to comply with the City's Bay Act Ordinance, development within the RMA should proceed in a manner that achieves the following objectives: preventing an increase in nonpoint source pollution as a result of new development based on a City-wide average, decreasing nonpoint source pollution during redevelopment, minimizing land disturbance during development, maximizing the preservation of native vegetative cover, and minimizing impervious surfaces for the desired land use. In addition, the CPBO requires that a 100-foot vegetated buffer area must be preserved along all RPA features and tributary streams and in some cases, reestablished if one does not presently exist or is in poor condition.

The criteria are intended to establish rules that the City can use in granting, denying, or modifying requests to rezone, subdivide, or to use and develop land in the RMAs and RPAs. Implementation of the criteria is achieved through use of performance standards, structural pollution management facilities (BMPs) and various planning and zoning concepts.

Additionally, the City protects intermittent streams and wetlands with a 50-foot vegetated buffer.

### 4.2.2 EROSION AND SEDIMENT CONTROL ORDINANCE

The purpose of the City's ESC Ordinance (Section 5-4-1 et seq) is to prevent the degradation

of local soil and water resources from land-disturbing activities adequate controls of erosion and sedimentation are provided. The City's ESC Ordinance also requires the landowner to take necessary measures to preserve and protect trees and other vegetation during all phases of any land-disturbing activity. The ESC Ordinance implements the Virginia Erosion and Sediment Control Law (§§ 21-89.1 et seq., Code of Virginia (1950)) as well as the Chesapeake Bay Preservation Act.

Under the ESC Ordinance, landowners proposing a nonexempt regulated land disturbing activity of greater than 2,500 square feet (reduced from 10,000 square feet under the City's CBPO) must first submit an ESC plan to T&ES.

The following is an abbreviated list of the basic principles of the City's ESC Ordinance. The developer must refer to the City Code for a complete description of requirements.

- › Measures must be taken to stabilize denuded areas and soil stockpiles.
- › Permanent vegetative cover must be established on denuded areas not otherwise permanently stabilized.
- › Adjacent properties must be protected from sediment deposition.
- › Measures intended to trap sediment on-site must be constructed as a first step in grading and be made functional before upslope land disturbance takes place.
- › Stormwater runoff from drainage areas greater than three acres must be controlled by a sediment basin.
- › Cut and fill slopes must be designed and constructed in a manner than minimizes erosion.
- › Downstream properties and waterways must be protected from sediment deposition, erosion, and damage due to increases in the volume and velocity of stormwater runoff as a result of site disturbance.

- › Onsite waterways must be designed and constructed to withstand expected velocity and volume of flow.
- › Disturbance of natural waterways by construction vehicles and activities must be minimized.
- › Conservation practices for ESC must be equal to or exceed the specifications of those contained in the most recent edition of the Virginia Erosion and Sediment Control Handbook.

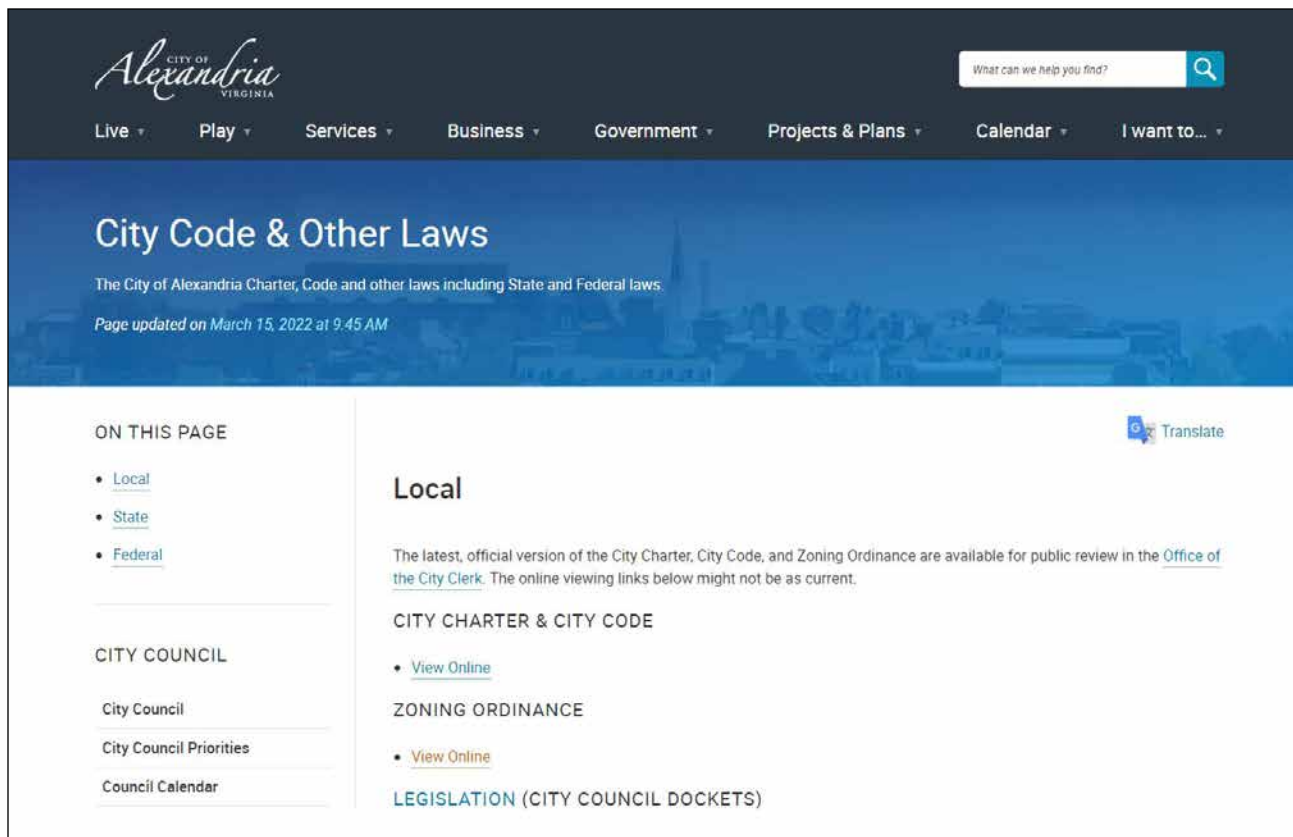
#### 4.2.3 VIRGINIA STORMWATER MANAGEMENT PROGRAM

The Virginia DEQ implements the VSMP under the Virginia Stormwater Management Act, 9 VAC 25: Chapter 870. The VSMP was established to manage the quality and quantity of runoff resulting from land-disturbing activities and includes items such as local ordinances, rules,

permits, requirements, annual standards and specifications, policies and guidelines, technical materials, and requirements for plan review, inspection, and enforcement. The City began administering the VSMP locally effective July 1, 2014. This includes “Chesapeake Bay Land-Disturbing Activities” of greater than or equal to 2,500 square feet and less than one acre, while land disturbing activities of 1 acre or greater except for detached single family homes within or outside a common plan of development or sale, are required to apply for coverage under the VPDES construction general permit.

#### 4.2.4 FLOOD CONTROL AND FLOODPLAIN OVERLAY DISTRICT

The purpose of the City’s Floodplain Overlay District (Section 6-300 of the City Code) is to prevent the loss of life and property, the creation of health and safety hazards, the disruption of



Alexandria’s City Code and Ordinance web page

commerce and governmental services, and unnecessary expenditure of public funds for flood protection as a result of improper development within the floodplain. The City uses FEMA's Flood Insurance Rate Maps (FIRMs) to show which areas are subject to flooding and what associated risks are present with the flood hazard.

The City's floodplain management regulations are in compliance with the floodplain management criteria set forth in regulations promulgated by the Federal Insurance Administration of the Federal Emergency Management Administration. The floodplain within the City is defined as the 100-year flood level. In general, buildings or structures and their extension and accessory buildings may be constructed or substantially improved only in accordance with specific requirements. Among these requirements is that new structures or additions must be appropriately floodproofed and any alteration (including development activities or the placement of fill) may not increase flood levels.

#### **4.2.5 REGULATION OF TREES, SHRUBS, PLANTS, AND VEGETATION**

To protect and maintain vegetation planted on private property per the site plan or subdivision processes, and to promote and protect trees and vegetation on public spaces, the City has adopted regulations governing the removal and maintenance of trees, shrubs, plants, and vegetation (Section 6-2-1 et seq). Implementation of these regulations is the responsibility of the Department of Parks, Recreation, and Cultural Activities and the City Arborist. In general, the regulations restrict the removal or destruction of trees on properties subject to site plans or approval of a subdivision plat. The Chesapeake Bay Preservation Act Regulations allow any locality within the Chesapeake Bay watershed to adopt an ordinance providing for the planting and replacement of trees during the development process. Tree canopy requirements are based on land use type, with more commercial/industrial

land uses requiring less tree canopy compared to residential land uses.

#### **4.2.6 REGULATION OF DOG WASTE AND DISPOSAL OF REFUSE/DEBRIS INTO STORM SEWERS**

Storm sewers serve as direct conduits from streets and parking lots to neighborhood and eventually the Potomac River and Chesapeake Bay. The Alexandria City Code (Section 5-6-31) prohibits the placement of any kind of material in catch basins or manholes of any public sewer, including but not limited to common pollutants such as trash, paint, antifreeze, and used oil. Specifically relating to the control of animal feces, which is a primary source of fecal coliform bacteria in City streams, Section 5-7-42(3) prohibits knowingly or willingly allowing an animal to defecate on public property unless the owner of the dog immediately removes the material and disposes it in a safe manner.

Section 5-7-46 of the City Code allows for levying fines for pet owners that do not pick up after their pets at public parks. Pet owners not cleaning up after their pet or disposing of pet waste bags in a storm drain may be subject to the City Code of Ordinances Title 11, Chapter 13 Environmental Offenses for illicit discharges to the storm drain system.

#### **4.2.7 PROHIBITION OF DUMPING HAZARDOUS WASTES INCLUDING USED OIL**

Hazardous wastes, including used motor oil, present an immediate risk not only to the environment, but to human health as well. In addition to Section 5-6-31 of the City Code (discussed above), the dumping of hazardous and flammable materials is regulated under the Virginia Statewide Fire Prevention Code. The Fire Prevention Code is incorporated by reference into the City Code under Section 4-2-12. In instances where used oil or other hazardous materials have been dumped, the City's Fire Department may

issue citations and impose a fine or in some cases imprisonment.

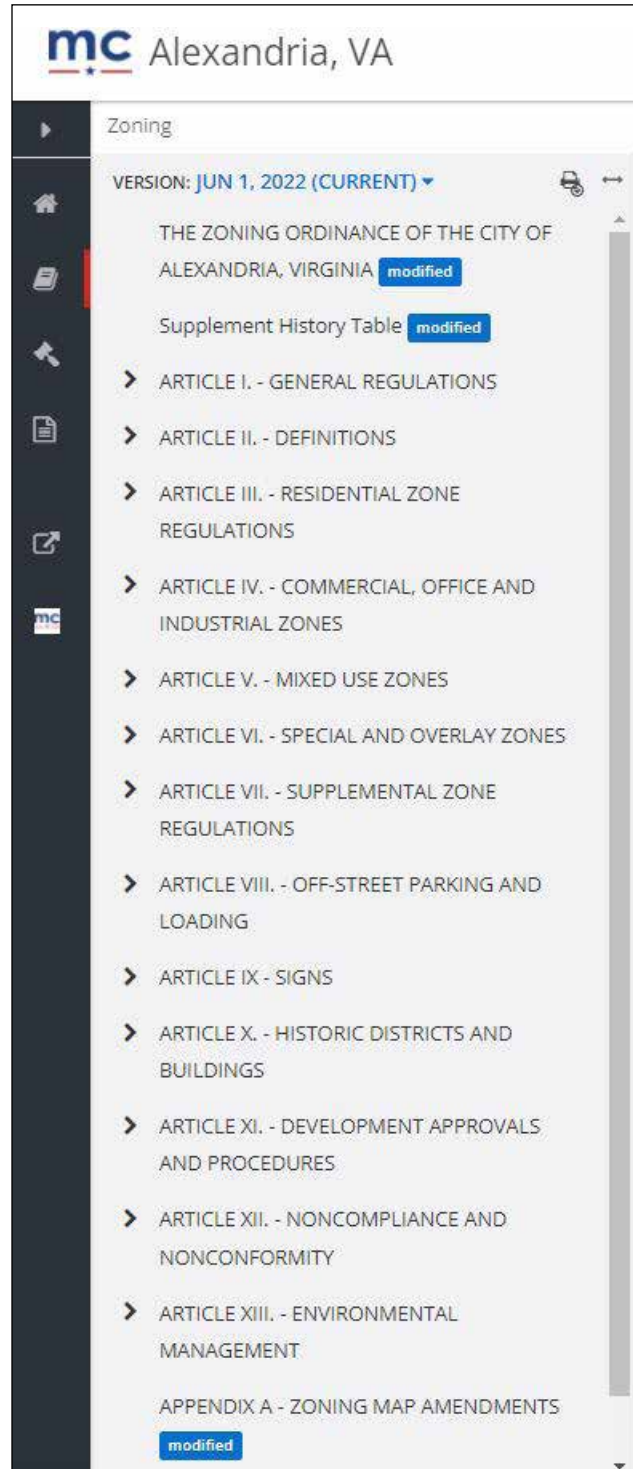
#### 4.2.8 PROHIBITION OF AUTOMOBILE MAINTENANCE ON CITY STREETS

Maintenance of automobiles is one of the primary sources of toxic and hazardous waste in urban streams and creeks. It is difficult to prevent some spillage of used oil, antifreeze, or other automobile fluid during major repairs or maintenance even with standard precautions in place. Frequently, individuals will choose to maintain vehicles on a City street because it represents a convenient way to dispose of used fluids or so that small “drips” do not mar the owner’s driveway or garage. Section 10-4-13 “Stopping for Purpose of Sale, Repairs, etc.” specifically prohibits any vehicular repair in any public street, public park, wildlife sanctuary, or public parking lot. The provision also prohibits any activity that results in the drainage of any fluid other than water from a motor vehicle.

#### 4.2.9 ZONING ORDINANCE DEVELOPMENT APPROVAL PROCEDURES

The City’s development approval procedures under its Zoning Ordinance (Section 11-100) provide for several actions that must be observed during the development process to minimize environmental impacts, ensure compliance with environmental regulations, and remedy environmental problems. Pertinent sections of the development approval procedures include but may not be limited to the following.

- › Preliminary site plans must show the general location of slopes; terraces; retaining walls; major trees and shrubs; natural and artificial watercourses, bodies of water, and wetlands; the limits of floodplain and designated RPA buffers; significant geological features; areas that can reasonably be expected to or which do contain soils or materials contaminated with but not limited to heavy metals, petroleum products, PCBs, pesticides, fly ash or other toxic or hazardous materials; USTs; areas located within 1,000 feet of a former sanitary landfill,



Alexandria's Zoning Ordinance web page

dump, or disposal area; and areas with the potential of generating combustible gasses.

- › Plans for collecting and depositing stormwater and the method used of treatment of natural and artificial watercourses, including a delineation of proposed limits of floodplains.
- › Plans to remediate, remove, or control any contaminated soils, materials, underground storage tanks, combustible cases, or old landfills, dumps, or disposal areas.
- › Plans for minimizing the impact on existing wetlands or for the creation of new wetlands.
- › The delineation of buildable areas allowed on each lot and based on front and back yard setback requirements and other relevant easements or limitations regarding lot coverage.

Responsibility for ensuring compliance with these procedures rests with the Department of Planning and Zoning, and T&ES.

Article XIII: Environmental Management of the Zoning Ordinance covers zoning regulations in accordance with the VSMP and Virginia Stormwater Management Act. These regulations specify development allowed in the CBPA boundaries and apply as an overlay district. This Article supersedes any zoning, land use, or land development regulation of the City Code that is inconsistent with its provisions.

#### **4.2.10 PROCEDURES FOR CONTROL OF CONTAMINATED LAND**

The City established a contaminated land control program aimed at cleaning up existing contaminated sites within the City. Also, as part of the City's Development Special Use Permit (DSUP), the City established standard contaminated land procedures to identify and remediate redeveloped or brownfield sites before redevelopment can occur. These DSUPs typically have specific conditions aimed at protecting public health and the environment. Contaminants of specific concern include levels

of volatile organic compounds (VOCs) that may be considered unsafe for conventional construction and levels of arsenic and/or creosote that warrant special precautionary measures or controls. Other contaminants may include petroleum hydrocarbons, heavy metals, and/or polychlorinated biphenyls (PCBs).

The City acknowledges that each situation is unique and requires individual attention through appropriate technical reviews depending on the type of contaminant, the degree and extent of contamination, and location.

#### **4.2.11 PROHIBITION ON ILLICIT DISCHARGES**

Chapter 13 of Title 11 of the City Code prohibits non-stormwater discharges to the storm sewer system. Nonstormwater discharges are any substances other than natural rainwater, such as paint, commercial carwashes, and other chemicals. T&ES works closely with the Fire Marshall's Office Environmental Investigations Unit to investigate and enforce illegal dumping and illicit discharge incidents. Illicit discharges are also prohibited by the Virginia Stormwater Management Program (VSMP) implemented by DEQ. VSMP includes the regulation of small MS4s such as the City as a point source of pollution. The City implements the provisions of the MS4 permit such as the six Minimum Control Measures (MCMs) and impervious area treatment requirements. One of the MCMs is Illicit Discharge Detection and Elimination (IDDE).

#### **4.2.12 STORMWATER UTILITY FEE ORDINANCE**

Chapter 6 of Title 5 of the City Code states that a stormwater utility fee is imposed on all parcels of land in the City based on their impervious surface area. The fee is a dedicated funding source for existing stormwater management services and new capital projects to reduce sediment and nutrient pollution into our local waterways, the Potomac River, and the Chesapeake Bay.

#### 4.2.13 ENVIRONMENTAL OFFENSES ORDINANCE

Chapter 13 of Title 11 of the City Code prohibits the illegal accumulation, storage, and/or disposal of waste in such a way that contaminates the environment.

#### 4.2.14 GREEN INFRASTRUCTURE

Memo to Industry 01-18 addresses the City's green infrastructure requirements for all development and redevelopment projects. The City requires 65% of all phosphorous reductions to be accomplished through green infrastructure. Green infrastructure facilities are constructed to filter and absorb stormwater where it falls. These include bioretention areas, vegetated roofs, and cisterns, among others.

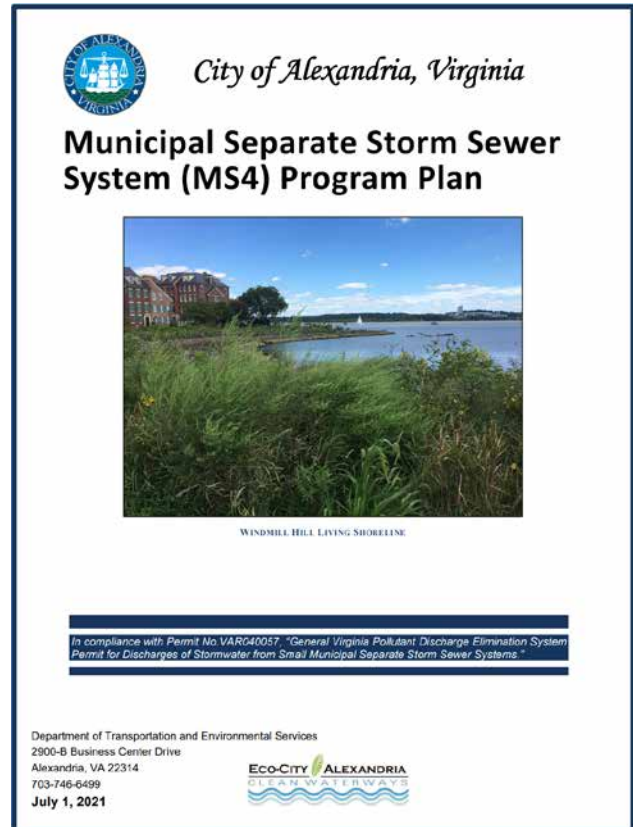
### 4.3 CITY PROGRAMS

In addition to regulations and ordinances, the City has implemented several programs that are aimed at reducing environmental and water pollution. These programs have been adopted to meet specific needs that have been identified by the City, and collectively, address a wide range of pollutants and provide significant benefits to the environment.

#### 4.3.1 MS4 PROGRAM

The Virginia Stormwater Management Program (VSMP) includes the regulation of small Municipal Separate Storm Sewer Systems (MS4s) such as the City as a point source of pollution. The City implements the provisions of the MS4 permit such as the six Minimum Control Measures (MCMs) and management of impervious areas. These programs are detailed in the City's MS4 Program plan, and some highlights include:

- › Under MCM #1: Public Education and Outreach, the City has developed many educational materials, presentations, signage, etc. to promote messages related to stormwater and pollution prevention. Every year, representatives



from the City and experts also partake in speaking engagements designed to educate the public.

- › Under the program for MCM #2: Public Involvement and Participation, the City has hosted stream cleanup events, Earth Days, Water Discovery Days, and Student Showcases. Along with MCM #1, this MCM encourages education through activity.
- › Through MCM #3: Illicit Discharge Detection and Elimination, City employees help implement the illicit discharge prohibition discussed in Section 4.2 by conducting regular screenings of outfalls and investigations into suspected illicit discharges.
- › MCM #4: Construction Site Stormwater Runoff Control allows the City to obtain required permits, perform ESC inspections, and receive

complaints from residents related to ongoing construction activities.

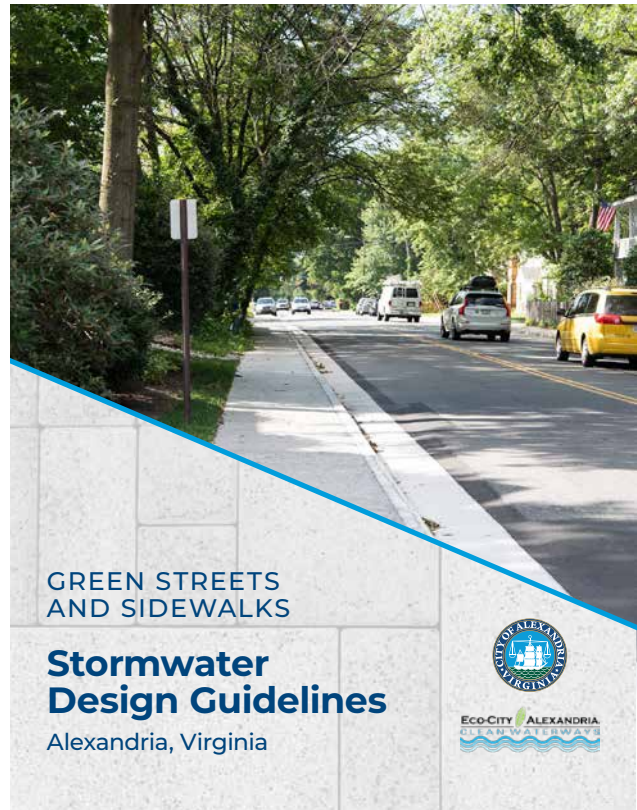
- › Under MCM #5: Post Construction Stormwater Management, the City inspects and maintains publicly owned BMP facilities to encourage containment and treatment of stormwater runoff. The City also reviews all development, redevelopment, and capital improvement projects (CIPs) to ensure compliance with all federal, state, and local laws and regulations.
- › Under MCM #6: Pollution Prevention and Good Housekeeping, City employees receive training on pollution prevention and good housekeeping practices to reduce pollution. This MCM also focuses on proper application of landscape nutrients, pesticides, and deicers. By implementing turf and landscape nutrient management plans on applicable municipal lands and ensuring that City staff apply nutrients in accordance with manufacturer's recommendations on all other municipal lands, the City will reduce the likelihood of potential contamination.

#### 4.3.2 GREEN STREETS AND SIDEWALKS

When planning new stormwater management infrastructure in the Right-of-Way, the City follows the Green Streets and Sidewalks Stormwater Management Guidelines. In contrast to conventional practices, green stormwater elements are designed to reduce the volume of stormwater, slow it down, and treat it near its source. The City's Green Streets goals follow several principles:

- › Protect and restore natural resources;
- › Promote health, equity, and human habitat;
- › Design for safety and mobility;
- › Design for life cycle;
- › Design for resilience; and
- › Optimize for performance.

Following these design principles allows the City to be innovative when implementing BMPs. This



type of low impact design is not only attractive and natural-looking but is also cutting edge and symbolic of the future of development.

#### 4.3.3 STREET SWEEPING/FLUSHING AND CATCH BASIN CLEANING PROGRAM

A significant portion of pollutants entering local streams come from runoff from street surfaces. The City has a long tradition of using street sweepers for aesthetic purposes and first established its program in the 1900s. More recently, street sweeping has been recognized for its water quality benefits. Although less effective at trapping fine particles (which often have nutrients attached), sweeping is very effective at removing litter, larger sediments, and sands. According to various sources, street sweepers can remove up to 50% of all street surface pollutants. Today, water quality is a primary reason for the continuance of the City's street sweeping program.

The City's mechanical and vacuum street sweepers, which are operated by T&ES, clean over 1,600 lane miles at a frequency of once a week to once a month, depending on need. Catch basins, which often trap litter and other large debris, are also cleaned as needed and prior to storm events, depending on the observed rate of accumulation.

#### **4.3.4 HOUSEHOLD HAZARDOUS WASTE AND USED OIL COLLECTION PROGRAMS**

To encourage City residents to dispose of hazardous waste and used oil in an environmentally sound manner, the Solid Waste Division runs the Household Hazardous Waste and Electronics Recycling Collection Center at Colvin Street. This facility is open several days a week, and instructions for what is accepted can be found on the City's website. By making it easy to dispose of these substances, it is more likely that residents will not be tempted to dump these substances into storm drains or wooded areas.

#### **4.3.5 LEAF COLLECTION PROGRAM**

Although leaf particles provide excellent food for aquatic species, an overabundance of leaf litter can represent a significant source of local nutrient pollution. The City has run a leaf vacuuming program to ensure that the City's streams are not overwhelmed and choked by large quantities of leaf debris.

Every November until January, the City begins its annual leaf vacuuming and leaf bag collection program for residents who receive City trash and recycling collection. After collection, the leaves are ground into mulch, which is an effective natural substitute for commercial fertilizers and is available free for self-hauling at the City's mulching site on Eisenhower Avenue.

#### **4.3.6 SANITARY SEWER LINE INSPECTION AND MAINTENANCE PROGRAM**

While performing routine maintenance and inspection of its sewer lines, the City also looks to detect illicit connections to sewer lines and

to locate areas of groundwater inflow (into the system) and sewage infiltration (into the surrounding soils). Inflow of surface water and groundwater during wet weather can overwhelm the system. At the same time, leakage from sanitary sewer lines into the environment can pollute local streams.

If blockages of the system are observed during routine maintenance, staff may perform CCTV of the lines to determine the extent of the blockage and the best course of remedial action required to remove the blockage. Assessing the condition of sanitary sewer lines can serve to detect an issue with blockage, deflection or root intrusion and prevent sanitary overflows or backups from occurring. Reconstruction and remediation of sanitary sewers such as relining old sewers, joint sealing, rerouting connections, and manhole repairs are performed as warranted as part of the inflow and infiltration program. In addition, planned rehabilitation of the sanitary sewer are identified through the Asset Renewal Program, which is a continuation of the City's 20-year program to identify and reduce stormwater I&I in the City's sanitary sewer system. As discussed in Section 3.1.4, about one-quarter of the City's sanitary sewers have been rehabilitated through the program.

#### **4.3.7 CLEAN WATER PARTNERS**

The City continues to participate in the Northern Virginia Regional Commission (NVRC) Clean Water Partners, a regional educational partnership among other local MS4 permittees. The Clean Water Partners use multiple platforms to distribute messages linked to specific stormwater problems associated with high-priority water quality issues such as proper pet waste disposal, not bagging lawn clippings, the benefits of planting native plants, and proper disposal of waste. The program's three high-priority water quality issues are specifically bacteria, nutrients, and chemical contaminants



which are consistent with the City's identified issues.

#### **4.3.8 FLOOD ACTION ALEXANDRIA**

The increasing frequency of more intense storm events has created more frequent flooding and drainage issues. The City identifies flooding and drainage projects through resident complaints, analyses, and field observations. These include small to medium 'Spot Improvement' CIPs to mitigate drainage issues. After identification and initial investigations, these projects often require work to identify CIP resources, perform onsite survey, complete design, secure right of entry (if applicable), and procure a construction contractor to perform the work. The City completed the initial Storm Sewer Capacity Analysis that identified problem areas and prioritized potential locations for large, multi-year CIPs to address capacity issues. The City also maintains a flood grant program and enhanced monitoring of storms through multiple rain gauges throughout the City.

#### **4.3.9 CLIMATE CHANGE**

The City of Alexandria developed the Energy and Climate Change Action Plan (eCAP) in 2011 to build on the work done in developing the Environmental Action Plan 2030 and further define the City's path to achieving significant greenhouse gas (GHG) emission reductions. The report lays out the potential local impacts of climate change (known in 2011), the steps the City had already undertaken to address climate change, and steps the City could take to mitigate and adapt to future climate change.

The City's Energy and Climate Change Action Plan is currently being updated to identify how the City responds to climate change impacts and environmental emergencies and align with the 2019 updated Environmental Action Plan 2040 (EAP2040) and build upon existing City energy, greenhouse gas reduction, and climate action

efforts. The EAP2040's targets include reducing community-wide greenhouse gas emissions by 50% by 2030 and 80 to 100% by 2050, contingent upon significant state and federal contributions.

#### **4.3.10 ENVIRONMENTAL ACTION PLAN 2040**

The Alexandria City Council unanimously adopted the updated Environmental Action Plan (EAP) 2040 in July 2019. The EAP is a comprehensive road map and affirms Alexandria's commitment to lead by example for a thriving, sustainable community. The Environmental Action Plan 2040 updated the 2009 EAP 2030 and includes emerging technology, evolving infrastructure needs, and new approaches to reducing the City and community's impact on the environment. The water quality goals of the EAP are to make Alexandria's waterbodies fishable and swimmable and to ensure safe and adequate infrastructure for drinking water supply, stormwater management, and wastewater treatment. These goals align with the goals and requirements of the CBPO.

The most significant impact of climate change will likely be the increased frequency and intensity of storms and an increase in sea level rise.

### **4.4 STATE, FEDERAL, AND REGIONAL PROGRAMS**

Many water quality management and environmental programs and regulations are implemented at the state, federal, and regional levels. The City works together with these agencies to reduce duplication of efforts and to pool collective resources.

DEQ monitors and enforces state regulations concerning USTs, industrial and wastewater treatment facility outfalls, the City's CBPA Program, wetland protection, and air quality. The City participates in the Northern Virginia Regional

Commission's Four Mile Run flood control program which requires new development and redevelopment to provide onsite detention. The program, with Alexandria's support, has recently been expanded to allow for watershed-wide water quality programs.

Regarding already contaminated sites, the City is working with property owners and DEQ under the Virginia Voluntary Remediation Program (VRP). The VRP provides a mechanism for willing owners of contaminated land to clean up their sites under minimal government oversight in exchange for state approval of the cleanup. Under the VRP, parties negotiate a Site

Characterization/Remedial Action Workplan with DEQ. Upon successful completion of the plan, the state issues a Certification of Satisfactory Completion which provides that DEQ cannot pursue further enforcement action against past, present, or future owners of the property for the contamination. This state "seal of approval" is likely to be important to potential purchasers, lenders, and developers.

Finally, City staff actively participate on the Metropolitan Washington Council of Government's Nonpoint Source Pollution Subcommittee.



# 5

## SUMMARY OF COMPLIANCE AND WATER QUALITY PROTECTION

This section discusses how the City's environmental and water quality protection ordinances described in Section 4 help in protecting its sensitive natural resources, avoiding improper land uses on areas with constraints to development, and reducing or eliminating existing and potential sources of pollution. This section is organized along the lines of meeting the DEQ Office of Watersheds and Local Government Assistance Programs' critical areas including:

1. Physical constraints to development;
2. Location and extent of CBPAs;
3. Character and location of commercial and recreational fisheries;
4. Existing and proposed land use;
5. Existing and potential water pollution sources;
6. Public and private waterfront access;
7. Shoreline and streambank erosion problems; and
8. Maps of above items.

In addition, this section addresses issues relating to the overall coordination of City environmental and water quality goals, policies, and outreach programs as well as alternative financing strategies.

Since most detailed land use planning is accomplished through the City's Small Area Plans (SAPs), it is the City's intent that this Chesapeake Bay Preservation Plan serve as an overlay to the planning and development process and should be referenced accordingly. To provide a stronger link between each SAP and this supplement, the City will incorporate into each SAP a discussion of the City's long-range water quality protection policies and strategies, SAP-specific CBPA maps, and an SAP-specific analysis of opportunities to protect and improve water quality and the natural environment through planned development and redevelopment opportunities.

## 5.1 PHYSICAL CONSTRAINTS TO DEVELOPMENT

Constraints to development within the City include topography, geology and soils, wetlands, RPA features and their surrounding 100-foot buffers, wildlife habitat corridors, and groundwater recharge areas, as discussed in Section 2. Many of these areas are well identified since the City has been substantially built out for many years. In addition, many sensitive areas have already been built upon, making constraints to development more of a reactive management issue except in the cases of large-scale redevelopment where large areas of land can be developed and restored at one time.

Physical constraints to development add another element of difficulty to the development and redevelopment process. Particularly, constraints such as underlying soil characteristics discussed in Section 2.5 should be strongly evaluated prior to the design, plan approval, permitting, and construction process. As the City makes plans for future redevelopment projects, policies and regulations such as the Zoning Ordinance, VSMP, and Green Streets and Sidewalks will be applied to ensure the compatibility of redevelopment with sensitive environmental features. These policies not only protect the structural integrity of the redevelopment areas being constructed and therefore the safety of those using the areas, but also protect the health of the environment and sensitive areas.

## 5.2 LOCATION AND EXTENT OF CHESAPEAKE BAY PRESERVATION AREAS

Due to the presence of sensitive areas such as tidal wetlands, floodplains, and highly erodible soils, etc., the entire City is designated as CBPA, either RPA or RMA, as described in Section 4.2.1. Accordingly, all proposed land-disturbing activities within City limits over 2,500 square

feet must follow regulations protecting the CBPA. In addition to the City's CBPA Ordinance, implementation of the VSMP, ESC Ordinance, Zoning Ordinance, and MS4 programs protect these sensitive areas and ensure redevelopment is conducted such that natural resources are protected.

### **5.3 CHARACTER AND LOCATION OF COMMERCIAL AND RECREATIONAL FISHERIES**

As stated in Section 2.3, there are currently no commercial or recreational fisheries within City limits. Any future development of this land use will prioritize the health of aquatic and shoreline resources.

### **5.4 EXISTING AND PROPOSED LAND USE**

Most development within the City, except for a few remaining parcels, will take place in the form of redevelopment. Section 2.5 describes the current land use and portion of the land designated as SAP. Section 3.2.1 describes the relationship between pollution, water quality, and land use. The City will continue to use the redevelopment process as an opportunity to improve the water quality of its local streams, the Potomac River, and the Chesapeake Bay. The City continues to achieve water quality improvement through the redevelopment process through the CBPO to reestablish, when possible and necessary, RPAs and buffers adjacent to water bodies, removing existing encroachments, and planting vegetation within the RPA buffer areas. When encroachments into the RPA are unavoidable, the City works to minimize the impacts through vegetative mitigation either on site or offsite. Article XIII of the Zoning Ordinance, as well as the VSMP in general regulate land use and are used by the City to redevelop sensitive areas.

Through the SAP process, the City will continue to evaluate existing and proposed land uses and their effects on water quality. As the SAPs are updated, additional measures will be added to further protect RPA features and buffers, improve water quality through the implementation of BMPs and add additional water quantity controls in flood-prone areas. In addition, the SAPs will take into account the effects of climate change and incorporate conditions to reduce climate change effects throughout the City.

### **5.5 EXISTING AND POTENTIAL WATER POLLUTION SOURCES**

As a highly developed and urbanized area, there are many point and non-point sources of pollution present within City limits, as discussed in Section 3. While it is impossible to fully eliminate all pollution sources, the City aims to minimize the potential for contamination of land and water by converting existing sources of pollution to potential sources of pollution via prevention and control measures. Particularly for vital resources such as the City's potable water supply discussed in Section 2.2.4, it is important to eliminate potential for contamination.

To improve water quality, the City continues to catalogue USTs and ASTs, work with AlexRenew to upgrade Water Reclamation Facilities and control the CSS, and protect its perennial and intermittent streams and the Chesapeake Bay through the continued and consistent application of the CBPO and ESC Ordinance.

The City's MS4 program also requires the annual inspection of a number of outfalls to proactively address potential illicit discharges to the City's waterways. In addition, the City will continue to respond to reports of illegal dumping and illicit discharges and has procedures for the cleanup and removal of pollutants.



## 5.6 PUBLIC AND PRIVATE ACCESS TO WATERFRONT AREAS

As discussed in Section 2.7, the City recognizes the value and importance of adequate public access to its waterfront. Conversely, the City recognizes that waterfront access and use can affect water quality and that sensitive shoreline features may constrain where access and development is appropriate. Constraints include floodplain areas, areas that experience siltation and debris accumulation, and unstable shorelines.

The 2012 Waterfront Small Area Plan and other joint planning efforts with the National Park Service serve as the basis for current efforts to increase public access to the Potomac River. The City's Waterfront Committee and Parks and Recreation Commission continue to make specific recommendations for the few remaining undeveloped or nonconforming waterfront parcels.

These planning efforts will take into consideration the need to properly manage and protect sensitive natural resources and to protect water quality while seeking to achieve increased

opportunities for public access to the waterfront such as siting of new docks and piers.

In addition, the City will continue to guide redevelopment projects to establish access to waterfront areas when feasible throughout the City.

## 5.7 SHORELINE AND STREAMBANK EROSION PROBLEMS

Most of the City's waterways have been hardened or channelized to stabilize eroding stream banks and to increase carrying capacity, as discussed in Section 2.4. While stream hardening will continue to be necessary, depending on the specific problem, several alternative options may exist. The City will address erosion problems associated with remaining natural, but physically degraded streams on a site-specific basis and recognizes the need for flexibility in the remediation process. Many of these stream corridors are also designated RPAs under the City's CBPO.

In addition to eroding streambanks, several bulkheads along the Potomac River shoreline have been identified as being in poor condition. In some cases, active undercutting and erosion are taking place. Dilapidated bulkheads must be addressed by the developer during any waterfront redevelopment project. Redevelopment projects overtime will likely address most of the City's dilapidated bulkheads. The Floodplain Management Program and Zoning Ordinance are two tools used to protect the shoreline from further erosion problems. The City's Waterfront Plan also addresses flooding and bank stabilization.

## 5.8 MAPPING

Maps of the topics discussed in Sections 5.1–5.7 are included throughout this Plan. These maps will be evaluated periodically for updates and will reflect the latest data.

## 5.9 FUNDING

While water quality and environmental management can result in cost savings by reducing the need for cleaning up pollution, the upfront costs can be prohibitive. There are, however, several means by which the City can raise the necessary revenue to implement state and federal mandates as well as locally identified stormwater management projects and programs. Funding for the programs, capital projects and activities discussed in this Plan will require a varying degree of continuing or new City funding. As is the case with all City funding, this funding is determined in the City's annual operating budget and capital improvement program development process (in competition with other City needs) and is subject to appropriation by City Council.

### 5.9.1 STORMWATER UTILITY FEE PROGRAM

The purpose of a stormwater utility (or stormwater tax/service charge) is to provide an equitable, dedicated funding source for capital and operating costs of the Stormwater Management Program pursuant to Section 15.2-2114 of the Code of Virginia.

The City adopted the Stormwater Utility Fee on May 4, 2017, with the Fiscal Year (FY) 2018 budget with first billing in May 2018 to provide a dedicated source to fund the City's Stormwater Management Program and was motivated by the need to fund state and federal stormwater quality mandates enforced through MS4 regulations. The fee funds the stormwater management program more equitably than through real estate taxes, as the fee is based on the amount of impervious surface on a property.

### 5.9.2 GRANT OPPORTUNITIES

There are several federal and state grant programs that can help defray the costs of planning and implementing stormwater management programs. Common sources include:

- › Stormwater Local Assistance Fund (SLAF) Grants
- › Chesapeake Bay Local Assistance Fund
- › Virginia Coastal Resources Management Fund
- › Virginia Water Quality Improvement Fund
- › Watershed Restoration Grants
- › Water Quality Management Planning Grants
- › Small Watershed Grant Program
- › Virginia Environmental Endowment
- › Chesapeake Bay Restoration Fund

The City continues to monitor these grants and apply for funding as applicable to supplement funding generated by the Stormwater Utility.

### 5.9.3 CHESAPEAKE BAY PRESERVATION ACT CIVIL PENALTIES

Section 13-126(B) of the City's Environmental Management Ordinance provides the detailed penalties and procedures associated with a violation of the City's Chesapeake Bay Act. Penalties range from \$5,000 to \$10,000 per day per violation and must be found appropriate by the Circuit Court.

## 5.10 CITY COORDINATION

Water quality management is primarily the responsibility of T&ES with support from the Department of Planning and Zoning, the Department of Parks, Recreation, and Cultural Activities and the Code Administration Bureau. To reach the public, many of the City's departments have taken on outreach programs to address specific, acute problems. While public outreach and coordination are largely voluntary components of the City's water quality protection efforts, federal CWA regulations (40 CFR Parts 122 and 123) and the NPDES MS4 permit require the City to demonstrate that it is taking actions to provide materials or develop outreach programs to inform individuals and households about steps that can be taken to reduce stormwater pollution under the MCMs.

The City has established a Stormwater Work Group with representation from the divisions of T&ES, including Development and Right-of-Way Services, Stormwater Management, Transportation Planning, and Public Works Services, as well as the Departments of Planning and Zoning, Public Implementation, and Recreation, Parks & Cultural Activities. Other departments or organizations will participate as needed. The Stormwater Work Group has facilitated the coordination of environmental issues with a focus on water quality management and public education and outreach programs. Responsibilities will include using the City's web site as a means of sharing environmental information with the public and among City agencies. This group will also facilitate the review of environmental impacts of significant projects in the City.

In addition, the City consolidated many of its environmental programs under T&ES and within that department created a Stormwater Management Division (SWM). The SWM is responsible for MS4 permit compliance, and processes any correspondence and reporting related to this permit. For instance, the SWM would receive and oversee any responses to water quality or construction complaints reported under MCMs 1 and 4. In addition, the SWM is responsible for watershed management, including stormwater quality management and implementation of the CBPO, reviewing soil and erosion plans, coordinating contaminated land issues, and administering the air and noise pollution programs. IEQ SWMD will also work closely with other sections within T&ES whose responsibilities include sanitary and storm sewers and stream maintenance, which have significant impacts on water quality. The City's Department



of Project Implementation (DPI) coordinates with T&ES on water quality and stormwater capital improvement projects.

Finally, T&ES will continue to work with regional and state partners responsible for water quality programs, regulations, and initiatives including the Northern Virginia Regional Commission, the Metropolitan Washington Council of Governments, the DEQ Office of Watersheds and Local Government Assistance Programs, other DEQ departments, and the Virginia Department of Conservation and Recreation.

The City reviews and updates the data and policies adopted pursuant to MS4 requirements annually and as needed so that the information referenced in the Chesapeake Bay Preservation Plan remains current. The City implements all required components of the Bay Act and will, as required by law, provide DEQ with an annual status report regarding that implementation.



# References

Chesapeake Bay Preservation Act. 62.1 V.A.C. § 2.5 (1988).

City of Alexandria, Virginia, 1992. *City of Alexandria Master Plan*. June 13, 1992.

- › Stormwater Utility Fee program  
(<https://www.alexandriava.gov/stormwater-management/stormwater-utility-fee>)
- › Environmental offenses ordinance (section 13-1-21.1)
- › Erosion and sediment control ordinance (number 4489)
- › Chesapeake bay preservation ordinance
- › The Zoning Ordinance of the City of Alexandria. Article XIII: Environmental Management
- › City of Alexandria, VA, Regulation of trees, shrubs, plants, vegetation. X VAC 9 (section 6-2-1 et seq)
- › Regulation of dog waste and disposal of refuse/debris into storm sewers (sections 5-7-42(3) and 5-6-31 and 5-7-4)
- › Prohibition of Dumping Hazardous Wastes Including Used Oil (sections 4-2-12 and 5-6-31)
- › Prohibition of Automobile Maintenance on City Streets

City of Alexandria, Virginia, Department of Planning and Zoning, 2012. *Waterfront Small Area Plan*. February 25, 2012.

City of Alexandria, Virginia, 2015. *Bacteria Total Maximum Daily Load (TMDL) Action Plan*. June 17, 2015.

City of Alexandria, Virginia, 2015. *Tidal Potomac Polychlorinated Biphenyls (PCB) Total Maximum Daily Load (TMDL) Action Plan*. June 28, 2015.

City of Alexandria, Virginia, 2019. *Phase 2 Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan for 40% Compliance*. September 24, 2019.

City of Alexandria, Virginia, 2021. *City of Alexandria Sanitary Sewer Master Plan*. Available at <https://www.alexandriava.gov/sewers/basic-page/sanitary-sewer-master-plan>.

City of Alexandria, Virginia, 2021. *City of Alexandria Green Street and Sidewalk Stormwater Design Guidelines*. Available at <https://www.alexandriava.gov/stormwater-management/green-street-and-sidewalk-stormwater-design-guidelines>.

City of Alexandria, Virginia, 2021. *Virginia Municipal Separate Storm Sewer System (MS4) Program Plan*. July 1, 2021. MS4 Permit available at <https://www.alexandriava.gov/stormwater-management/municipal-separate-storm-sewer-system-ms4-permit>.

U.S. Environmental Protection Agency, 2010. *Chesapeake Bay Total Maximum Daily Load*. Available at [www.epa.gov/chesapeake-bay-tmdl/chesapeake-bay-tmdl-document](http://www.epa.gov/chesapeake-bay-tmdl/chesapeake-bay-tmdl-document).

Virginia American Water (2022) 'Wise Water Use.' Available at <https://www.amwater.com/vaaw/water-information/wise-water-use>.

Virginia Department of Environmental Quality, 2018. *Virginia Pollutant Discharge Elimination System General Permit for Discharges from State and Federal Small Municipal Separate Storm Sewer Systems*. November 1, 2018.

Virginia Marine Resources Commission, 1988. *Criteria for the Siting of Marinas or Community Facilities for Boat Mooring*. VR 450-01-0047. September 19, 1988.

Virginia Stormwater Management Program (VSMP) Regulation. 9 V.A.C. § 25 870 (2014).



Eco-CITY  ALEXANDRIA  
CLEAN WATERWAYS  
