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Executive Summary

The Lower Occoquan Watershed Management Plan illustrates an approach for improving the water resources, natural habitat and overall health of the watershed. The plan was initiated by Fairfax County with participation from local residents and is part of the comprehensive, countywide watershed planning effort. The previous watershed plans were developed in the mid-1970s and intended to span a 25-year period. Since then the practice of stormwater/watershed management has rapidly evolved to include newer technologies and innovative techniques. Also within this time period, there have been many regulatory changes governing water quality at the local, state and federal levels. This plan is intended as a management tool to be used over the next 25 years and fulfills Fairfax County's commitment to the multijurisdictional effort of improving water quality in the Chesapeake Bay.

The Lower Occoquan Watershed Management Plan was developed to meet the following countywide watershed planning goals established by the County through intensive stakeholder and resident input:

- 1. Improve and maintain watershed functions in Fairfax County, including water quality, habitat and hydrology.
- 2. Protect human health, safety and property by reducing stormwater impacts.
- 3. Involve stakeholders in the protection, maintenance and restoration of County watersheds.

Background

The Lower Occoquan watershed is a collection of several small watersheds within Fairfax County that drain into the Bull Run/Occoquan River System. The largest streams in the area are Wolf Run, Sandy Run and Giles Run. There are numerous smaller tributaries that drain directly into the river. Fountainhead Regional Park, Mason Neck State Park and the Mason Neck National Wildlife Refuge are all located in the Lower Occoquan watershed. The watershed also includes the Laurel Hill redevelopment area (formerly the District of Columbia Department of Corrections facility).

All but the southern portion of the watershed is located within the Water Supply Protection Overlay District (WSPOD), established to protect the Occoquan Reservoir. Additionally, most of the northern portion is located within a Residential-Conservation (R-C) District, which limits development to large-lot residential areas, in order to protect streams and water quality. Therefore, the dominant land uses in the watershed are estate residential and open space. Minimal new development is expected, although redevelopment of existing areas will occur in the watershed. The *Lower Occoquan Watershed Management Plan* is a tool to be used to maintain the water quality in the watershed and target areas for improvement.

Watershed Management Areas

Lower Occoquan watershed is divided into 10 smaller watershed management areas (WMAs). A WMA is a small area, approximately 4 square miles, which drains to a specific stream or tributary. Each WMA is then divided into smaller subwatersheds, typically 100 to 300 acres. The purpose of these areas is to identify specific projects or opportunities to enhance the overall stream conditions, as well as to serve as the basic units for watershed modeling and other evaluations. Lower Occoquan's 10 watershed management areas listed in geographical order

from northwest to southeast are Old Mill Branch, Wolf Run, Ryans Dam, Sandy Run, Occoquan, Giles Run North, Mill Branch, Giles Run South, Kane Creek, and High Point.

Watershed Planning Process

In general, the watershed management planning process consists of the following steps:

- 1. Review and synthesize previous studies and compile data.
- 2. Involve public to gain input, provide education and build community support.
- 3. Evaluate current watershed conditions and project stormwater runoff from present and ultimate development conditions.
- 4. Develop candidate non-structural and structural watershed improvement projects.
- 5. Develop preliminary cost estimates, cost-benefit analysis and prioritization of capital projects.
- 6. Gain adoption of the final watershed management plan by the Board of Supervisors.

Several indicators were identified to detect changes in the watershed. The main categories of indicators are watershed impact indicators, watershed source indicators and programmatic indicators. These indicators were first used to assess the existing conditions and the future conditions without plan implementation in the watershed. Next they were used to identify management needs and problem areas during subwatershed ranking. Finally, the indicators were used to prioritize projects, along with cost and feasibility.

The subwatersheds were ranked by the following procedure:

- 1. Using the watershed impact overall composite scores to identify subwatersheds that were potential problem areas under existing and future conditions.
- 2. Applying individual source indicator scores to identify potential sources of impacts in downstream problem areas.
- 3. Using the programmatic indicator data inventory to identify subwatersheds where management is most needed.
- 4. Consulting available field data throughout the previous steps to confirm the results.

Summary of Existing Watershed Conditions

As a result of minimal development, large parks and open space, the overall stream habitat condition of the watershed is considered good to excellent. The Lower Occoquan watershed contains some of the highest stream quality in Fairfax County. The 2001 Fairfax County Stream Protection Strategy Baseline Study (SPS) gave ratings of "excellent" to "fair" for various streams in the watershed. The follow-up to this study, the 2005 Fairfax County Stream Physical Assessment (2005 SPA) also showed that the streams in the Lower Occoquan were generally above average for Fairfax County.

As one of many measures used to protect stream water quality, the County adopted the Chesapeake Bay Preservation Ordinance, which limits development on land that lies within a Resource Protection Area (RPA). RPAs are buffers adjacent to or near the shorelines of streams, rivers and other waterways that protect sensitive areas from the excessive influx of pollutants. The sensitive areas include tidal and non-tidal wetlands, tidal shorelines, floodplains and perennial streams (waters flowing year-round). More than 50 percent of the streams within the Lower Occoquan watershed lie within an RPA.

To meet the standards of the Clean Water Act, the County and Virginia Department of Environmental Quality regularly monitor water quality at various locations throughout the watershed. Lower Occoquan had relatively few locations considered "impaired," but these include portions of Wolf Run, Mill Branch, Belmont Bay, Occoquan River and Occoquan Bay. A complete summary of watershed conditions may be found in Appendix A

Project Selection

Several types of both structural and non-structural projects were selected for this watershed restoration plan. The structural projects include stream restorations, pipe daylighting, stormwater pond retrofits, outfall improvements, swale restorations and bioretention areas. The non-structural projects include rain barrels, cisterns, street sweeping, reforestations and buffer restorations.

Projects were proposed throughout the watershed that would help meet the County's goals and objectives. Projects to improve watershed functions were proposed in subwatersheds with the worst indicator scores. Additional projects were proposed throughout the watershed that would increase stewardship and maintain important watershed functions. Projects were selected by comparing the lowest scoring impact indicators to the types of proposed projects to ensure projects would provide the most benefit within each subwatershed. The proposed projects were then presented at the watershed advisory group (WAG) meetings for community input. This input was taken into consideration while finalizing project selection and during the score adjustment procedure.

Following preliminary project selection, field investigations were performed for the candidate project sites. The purpose of the field investigations was to document site conditions, check for feasibility and take photos. The information was then compiled in a database. The information was used for the prioritization and to support ranking modifications.

Cost estimates were generated for all project types except street sweeping, rain barrels and cisterns, because their costs can be widely variable. Smaller projects were grouped together into "suites," based on cost and location, to allow their costs and benefits to be compared more evenly to other projects.

Project Prioritization

The Lower Occoquan Watershed Management Plan implementation is divided into two priority phases. The first phase has a 0 – 10-year timeframe and includes the top-ranked 21 structural projects. The second phase has an 11 – 25-year timeframe and includes all other viable structural projects, a total of 62 projects. The structural projects were prioritized based on five factors: impact indicators, source indicators, priority subwatersheds, sequencing and implementability. These factors were used to create prioritization scores for each project so that they could then be ranked. Once the projects were quantitatively ranked, they were qualitatively reviewed. The qualitative review involved going through every project and considering factors that aren't quantitatively considered, such as comments provided by the WAG group, field observations and the ability for the project to meet the County's goals. A best professional judgment adjustment was added to the initial score to determine the final score.

Due to the higher quality conditions of this watershed group, there were considerably fewer projects in the "priority", or 10-year, group than compared to other watershed plans in the

County. Another reason that the Lower Occoquan Watershed Plan had fewer projects was that part of the watershed, the Laurel Hill property, is being redeveloped. The stormwater management plan developed for this property is separate from the Lower Occoquan WMP.

A simplified cost-benefit analysis was performed on the structural projects in the 0-10-year implementation plan based on a project's overall cost compared to its prioritization score (i.e., benefits). A best professional judgment adjustment based on the cost-benefit analysis was used to amend the rankings where necessary, which determined the final overall ranking of structural projects.

The 19 non-structural projects were ranked separately since they will be implemented concurrently with the capital improvement of the structural projects. The non-structural projects were ranked using a different more qualitative method than the structural project ranking scheme. A detailed description of the project selection and prioritization process can be found in Appendix B.

Project Fact Sheets

Project fact sheet were created for all structural projects that fall into the 10-year plan. These fact sheets include: basic information about location, existing conditions and proposed improvements. The project fact sheets also discuss the benefits and have itemized, planning-level cost estimates. They are illustrated with location maps. Projects that were grouped together, or put into a "suite," were combined on one fact sheet.

Public Involvement

A WAG was formed to help provide feedback from residents of the watershed. The group was assembled from a variety of organizations, including members of homeowners associations, George Mason University, and other public and private organizations. This group acted as proxy for their respective organizations and helped to disseminate information from the process. The group met with County staff and their consultants five times throughout the different stages of the process to provide feedback, which was an essential part of the planning and prioritization process.

Table ES-1-1 provides a list of all projects proposed within Lower Occoquan watershed. This includes the 0 - 10- (10-year) and 11 - 25-year (25-year) structural project groups as well as the non-structural projects.

Plan Costs and Benefits

The total cost of the 0-10-year plan (includes 21 structural projects only) is \$12 million. The benefits to the county are wide-ranging. The yearly total suspended sediment load will be reduced by 260 tons if the 0-10-year plan is implemented. Nitrogen will be reduced by an additional 420 pounds and phosphorus will be reduced by 170 pounds annually. This represents a 4% reduction in sediment loads, and 1% reductions in nitrogen and phosphorus. If the additional 62 structural projects in the 11-25 year plan are implemented (at a cost of \$50 million), the annual suspended sediment load will be reduced by an additional 790 tons. Nitrogen will be reduced by an additional 1250 pounds yearly and phosphorus by an additional 460 pounds yearly. If the entire 0-25 year plan (83 structural projects) is implemented, at a cost of \$62 million, the suspended sediment load will be reduced by 1050 tons annually, and

nitrogen and phosphorus will be reduced by 1670 and 630 pounds annually, respectively. This represents a 15.1% reduction in sediment, a 2.0% reduction in nitrogen, and a 4.2% reduction in phosphorus. Additionally, the 19 non-structural projects will have water quality benefits as well, although the costs and benefits of these projects are less easily quantified. These benefits will help attain the goals set by the County to improve water quality in the Lower Occoquan watershed.

The following provisions address the funding and implementation of projects and programs in Fairfax County watershed plans. These provisions as recommended by the Board were developed for the Popes Head Creek Watershed Management Plan in February 2006 and have been applied to the Lower Occoquan Watershed Management Plan:

- i. Projects and programs (both structural and non-structural) will first undergo appropriate review by County staff and the Board (please see iii below) prior to implementation. Board adoption of the Watershed Management Plan will not set into motion automatic implementation of projects, programs or initiatives that have not first been subject to sufficient scrutiny to ensure that the projects that are funded give the County the greatest environmental benefit for the cost.
- ii. Road projects not related to protection of streambeds or banks or water quality will not be funded out of the stormwater and watershed budget.
- iii. The Watershed Management Plan provides a conceptual master-list of structural capital projects and a list of potential non-structural projects for the watershed. Staff will, on a fiscal year basis, prepare and submit to the Board a detailed work plan to include a description of proposed projects and an explanation of their ranking, based on specific criteria. Criteria used to assemble this list will include, but are not limited to, cost-effectiveness as compared to alternative projects, a clear public benefit, a need to protect public or private lands from erosion or flooding, a need to meet a specific watershed or water quality goal, and ability to be implemented within the same fiscal year that funding is provided. Staff also intends to track the progress of implementation and report back to the Board periodically.
- iv. Each project on the annual list of structural projects will be evaluated using basic valueengineering cost effectiveness principles before implementation and the consideration of alternative structural and non-structural means for accomplishing the purposes of the project will be considered before implementation. This process will ensure the County's commitment to being a fiscally responsible public entity.
- v. Obstruction removal projects on private lands will be evaluated on a case-by-case basis for referral to the Zoning Administrator and/or County Attorney for action as public nuisances; and otherwise to determine appropriate cost-sharing by any parties responsible for the obstructions.

Stream restoration projects on private lands will be evaluated to determine means for costsharing by land owners directly responsible for degradation due to their land uses

Table ES-1-1: Project List - Executive Summary

Fable ES-1-1: Project List - Executive Summary Priority Structural Projects (10-Year Implementation Plan) ¹					
Project #	Project Type	WMA	Location		Cost
KC9209	Stream Restoration	Kane Creek	Behind 10809 Harley Rd.	\$	840,000
MB9104	Stormwater Pond Retrofit	Mill Branch- Giles Run South	10418 Old Colchester Rd. (Mason Neck West Park)	\$	240,000
MB9105	Stormwater Pond Retrofit	Mill Branch- Giles Run South	Across from 10555 Furnace Rd.	\$	280,000
MB9107	Stormwater Pond Retrofit	Mill Branch- Giles Run South	10119 Giles Run Rd.	\$	130,000
MB9109	Stormwater Pond Retrofit	Mill Branch- Giles Run South	8115 Mims St.	\$	290,000
MB9111	Stormwater Pond Retrofit	Mill Branch- Giles Run South	9816 Richmond Hwy.	\$	180,000
MB9114	Stormwater Pond Retrofit	Mill Branch- Giles Run South	9850 Furnace Rd. (I-95 Landfill)	\$	160,000
MB9122	Stormwater Pond Retrofit	Mill Branch- Giles Run North	Behind 8605 Cross Chase Court	\$	190,000
MB9202	Stream Restoration	Mill Branch- Giles Run South	10207 Old Colchester Rd.	\$	720,000
MB9506	BMP/LID	Mill Branch- Giles Run South	9850 Furnace Rd, Lorton (I-95 Landfill)	\$	110,000
MB9510	BMP/LID	Mill Branch- Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)	\$	220,000
SA9201	Stream Restoration	Sandy Run	Next to 8721 Birch Cliff Dr.	\$	780,000
SA9209	Stream Restoration	Sandy Run	Near 10746 Beechnut Ct.	\$	600,000
SA9211	Stream Restoration	Sandy Run	Behind 6901 Streamwood Pl.	\$	360,000
SA9213	Stream Restoration	Sandy Run	6650 Rutledge Dr.	\$	560,000
SA9701	Outfall Improvement	Sandy Run	Near 11223 Silverleaf Dr.	\$	150,000
WR9201	Stream Restoration	Wolf Run	Behind 12101 Henderson Rd.	\$	1,120,000
WR9208	Stream Restoration	Wolf Run	Near 12025 Seven Hills La.	\$	1,050,000
WR9209	Stream Restoration	Wolf Run	12060 Rose Hall Dr.	\$	1,420,000

¹ Only 10-yr structural projects will have associated project fact sheets at the end of section 5.

	Priority Structural Projects (10-Year Implementation Plan) ¹					
Project #	Project Type	WMA	Location		Cost	
WR9211	Stream Restoration	Wolf Run	Behind 11724 Amkin Dr.	\$	1,160,000	
WR9212	Stream Restoration	Wolf Run	7610 Maple Branch Rd.	\$	1,420,000	
Total Cost				\$	11,980,000	

	Long-Term Structural Projects (25-Year Implementation Plan) ¹				
Project #	Project Type	WMA	Location		
KC9203	Stream Restoration	Kane Creek	6407 High Point Rd. (Mason Neck State Park)		
KC9204	Stream Restoration	Kane Creek	6408 High Point Rd. (Mason Neck State Park)		
KC9205	Stream Restoration	Kane Creek	6409 High Point Rd. (Mason Neck State Park)		
KC9208	Stream Restoration	Kane Creek	Behind 10800 Harley Rd.		
KC9210	Stream Restoration	Kane Creek	Across from 10417 Gunston Rd.		
MB9106	Stormwater Pond Retrofit	Mill Branch- Giles Run South	10301 Richmond Hwy		
MB9108	Stormwater Pond Retrofit	Mill Branch- Giles Run South	10109 Giles Run Rd.		
MB9117	Stormwater Pond Retrofit	Mill Branch- Mill Branch	Behind 8940 Highgrove Ct.		
MB9119	Stormwater Pond Retrofit	Mill Branch- Giles Run North	Near 9300 Cardinal Forest La.		
MB9120	Stormwater Pond Retrofit	Mill Branch- Giles Run North	9001 Southpointe La. (Behind Cul-de-sac)		
MB9121	Stormwater Pond Retrofit	Mill Branch- Giles Run North	8850 Cross Chase Circle (William Halley Elementary School)		
MB9123	Stormwater Pond Retrofit	Mill Branch- Giles Run North	Behind 8628 Meadow Edge Terr.		
MB9124	Stormwater Pond Retrofit	Mill Branch- Giles Run North	Behind 9210 Cross Oaks Ct.		
MB9125	Stormwater Pond Retrofit	Mill Branch- Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)		
MB9205	Stream Restoration	Mill Branch- Mill Branch	9751 Ox Rd (Occoquan Regional Park, Site 1)		
MB9206	Stream Restoration	Mill Branch- Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 3)		
MB9207	Stream Restoration	Mill Branch- Mill Branch	Across street from 8932 Lorton Rd.		

¹ Only 10-yr structural projects will have associated project fact sheets at the end of section 5.

	Long-Term Structural Projects (25-Year Implementation Plan) ¹				
Project #	Project Type	WMA	Location		
MB9208	Stream Restoration	Mill Branch- Giles Run North	8301 Lorton Rd.		
MB9209	Stream Restoration	Mill Branch- Giles Run North	8300 Newby Bridge Dr.		
MB9210	Stream Restoration	Mill Branch- Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 1)		
MB9212	Stream Restoration	Mill Branch- Giles Run North	8921 Cross Chase Cir.		
MB9213	Stream Restoration	Mill Branch- Giles Run North	8601 Cross View		
MB9502	BMP/LID	Mill Branch- Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 5)		
MB9504	BMP/LID	Mill Branch- Giles Run South	10100 Gunston Rd. (Gunston Elementary School)		
MB9509	BMP/LID	Mill Branch- Giles Run North	8285 Glen Eagles La. (Christ Church United Methodist Inc.)		
MB9511	BMP/LID	Mill Branch- Giles Run North	8275 Glen Eagles La. (Crosspointe Swim and Racquet Club)		
OC9101	Stormwater Pond Retrofit	Occoquan	Behind 9340 Davis Dr.		
OC9102	Stormwater Pond Retrofit	Occoquan	Behind 9270 Davis Dr.		
OC9203	Stream Restoration Suite	Occoquan	Behind 9307 Denali Way		
OC9204	Stream Restoration	Occoquan	10450 Van Thompson Rd.		
OC9207	Stream Restoration Suite	Occoquan	Behind 9035 Palmer Dr.		
OC9208	Stream Restoration	Occoquan	Behind 9520 Elk Horn Rd.		
OM9201	Stream Restoration	Old Mill Branch	Near 12505 Old Yates Ford Rd. (Fountainhead Regional Park)		
OM9202	Stream Restoration	Old Mill Branch	Behind 8100 Flossie La.		
OM9203	Stream Restoration	Old Mill Branch	Behind 12606 Clifton Hunt La.		
OM9205	Stream Restoration	Old Mill Branch	Behind 12990 Wyckland Dr.		
OM9206	Stream Restoration	Old Mill Branch	Behind 12995 Wyckland Dr.		
OM9207	Stream Restoration	Old Mill Branch	Behind 7859 My Way Dr.		
RD9201	Stream Restoration	Ryans Dam	Near 8517 Wolf Run Shoals Rd.		

¹ Only 10-yr structural projects will have associated project fact sheets at the end of section 5.

Long-Term Structural Projects (25-Year Implementation Plan)¹				
Project #	Project Type	WMA	Location	
RD9202	Stream Restoration	Ryans Dam	Behind 11470 Robert Stephens Dr.	
SA9101	Stormwater Pond Retrofit	Sandy Run	Next to 9699 Thorn Bush Dr.	
SA9102	Stormwater Pond Retrofit	Sandy Run	8120 Ox Rd.	
SA9103	Stormwater Pond Retrofit	Sandy Run	Behind 7401 Wayfarer Rd.	
SA9105	Stormwater Pond Retrofit	Sandy Run	Behind 7200 Ox Rd.	
SA9205	Stream Restoration Suite	Sandy Run	Behind 10901 Henderson Rd.	
SA9206	Stream Restoration	Sandy Run	Across street from 11100 Devereux Station La.	
SA9207	Stream Restoration Suite	Sandy Run	Near 11212 Hunting Horse Dr.	
SA9208	Stream Restoration	Sandy Run	10608 Daysailer Dr.	
SA9212	Stream Restoration	Sandy Run	6572 Ox Rd.	
SA9214	Stream Restoration	Sandy Run	6635 Rutledge Dr.	
SA9702	Outfall Improvement	Sandy Run	Behind 11204 Silver Leaf Dr.	
WR9206	Stream Restoration	Wolf Run	Near 7900 Wolf Run Hills	
WR9210	Stream Restoration	Wolf Run	7501 Amkin Ct.	
WR9213	Stream Restoration	Wolf Run	Behind 7433 Clifton Rd.	
WR9214	Stream Restoration	Wolf Run	7121 Swift Run Trails Dr.	
WR9217	Stream Restoration	Wolf Run	12013 Corral Dr.	
WR9218	Stream Restoration	Wolf Run	11047 Lilting La.	
WR9219	Stream Restoration	Wolf Run	11418 Lilting La.	
WR9220	Stream Restoration	Wolf Run	11806 Yates Ford Rd.	
WR9221	Stream Restoration	Wolf Run	11721 Yates Ford Rd.	
WR9222	Stream Restoration	Wolf Run	11543 Lilting La.	
WR9223	Stream Restoration	Wolf Run	11543 Lilting La.	

¹ Only 10-yr structural projects will have associated project fact sheets at the end of section 5.

	Non-Structural Projects ¹				
Project #	Project Type	WMA	Location		
HP9801	Buffer Restoration	High Point	Near 10709 Gunston Rd. (Gunston Hall Plantation)		
MB9505	BMP/LID	Mill Branch- Giles Run South	10100 Gunston Rd. (Gunston Elementary School)		
MB9507	BMP/LID	Mill Branch- Giles Run North	8850 Cross Chase Circle (William Halley Elementary School)		
MB9512	BMP/LID	Mill Branch- Giles Run North	9350 Crosspointe Dr. (Silverbrook Elementary School)		
MB9801	Buffer Restoration	Mill Branch- Giles Run South	Behind 10463 Greene Dr.		
MB9802	Buffer Restoration	Mill Branch- Mill Branch	9751 Ox Rd. (Occoquan Regional Park, Site 2)		
MB9803	Street Sweeping Program	Mill Branch- Giles Run South	8386 Old Vicarage St.		
MB9804	Buffer Restoration	Mill Branch- Mill Branch	Next to 8936 Lorton Rd.		
MB9805	Street Sweeping Program	Mill Branch- Giles Run North	Near 8327 Bluebird Way		
MB9806	Buffer Restoration Suite	Mill Branch- Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 1)		
MB9807	Buffer Restoration Suite	Mill Branch- Giles Run North	8700 Laurel Crest Dr. (Laurel Hill Golf Club, Site 2)		
MB9808	Street Sweeping Program	Mill Branch- Giles Run North	Near 8709 Lorfax Dr.		
MB9809	Street Sweeping Program	Mill Branch- Giles Run North	Near 9413 Eagle Glen Ter.		
MB9810	Street Sweeping Program	Mill Branch- Giles Run North	Behind 9105 Oak Chase Ct.		
MB9811	Buffer Restoration	Mill Branch- Giles Run North	Next to 9527 Crosspointe Dr.		
MB9812	Street Sweeping Program	Mill Branch- Giles Run North	Near 8409 Crosslake Dr.		
SA9801	Buffer Restoration	Sandy Run	Next to 10711 Sandy Run Trail		
SA9802	Buffer Restoration	Sandy Run	10600 Hunting Shire La.		
SA9803	Other	Sandy Run	Behind 6909 Heathstone Ct.		

¹ Only 10-yr structural projects will have associated project fact sheets at the end of section 5.