Cabin John Creek

Watershed Assessment and Management Recommendations

Final Draft for Approval

Environmental Management Division

Department of Public Works

City of Rockville, Maryland

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Center for Watershed Protection

KCI Technologies, Inc.

CABIN JOHN CREEK

WATERSHED ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

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Prepared By:

Environmental Management Division
Department of Public Works
City of Rockville
111 Maryland Avenue
Rockville, Maryland 20850

Consultant Services by:

KCI Technologies, Inc.
936 Ridgebrook Road
Sparks, Maryland 21152

Center for Watershed Protection
8390 Main Street, 2nd Floor
Ellicott City, MD 21043

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The Cabin John Creek Watershed Management Plan was initiated by the City of Rockville Department of Public Works, Environmental Management Division. The Project Team consisted of the following City staff and consultants:

CITY OF ROCKVILLE STAFF

Heather Gewandter, Department of Public Works
Michael Critzer, Department of Recreation and Parks
Dianne Fasolina, Department of Recreation and Parks
Mark Kibiloski, Department of Recreation and Parks
John Scabis, P.E., Department of Public Works
Lise Soukup, P.E., Project Manager, Department of Public Works
Jim Woods, P.E., Department of Public Works

KCI TECHNOLOGIES, INC.

Susanna Brown
Ryan Burdette, P.E.
Manasa Damera
Nate Drescher
Bill Frost, P.E., Project Manager
Colin Hill
Jackie Krayenvenger, P.E.
Bill Medina
Mandy O'Shea
Mike Pieper
Andrea Poling

CENTER FOR WATERSHED PROTECTION

Kelly Collins
Greg Hoffmann, P.E.
Julie Schneider, Subcontract Manager
Lori Lilly

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1 EXECUTIVE SUMMARY

INTRODUCTION / BACKGROUND

The City of Rockville, as an active steward of the environment, is responsible for watershed management within the City limits. The City oversees stormwater and sediment control regulations for new and redevelopment, maintains and repairs public stormwater management facilities and storm drains, and designs and constructs Capital Improvement Program projects for stormwater management facilities and stream restoration. The City works with private owners and commercial operators to protect water quality from illicit discharges and offers education and outreach programs to promote sustainable practices. It also evaluates watershed policies, monitors stream and stormwater facility conditions, and administers the City's Stormwater Management Fund that supports staffing, consultants and contractor services, and other watershed program elements.

The City's watershed management program is regulated by Maryland Department of Environment under a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit. This permit is part of a national watershed protection program administered through U.S. Environmental Protection Agency under the Clean Water Act. The permit, renewable every five years, requires Rockville to implement effective programs that reduce water-borne pollutants from construction sites, municipal activities, and commercial and residential properties. The permit makes the City responsible for the quality of the runoff discharged from public storm drains into streams, and for the stream conditions themselves. Throughout the Chesapeake Bay, MS4 permits are moving towards numeric stream quality standards that will hold municipalities to even higher levels of watershed protection. The City's already-extensive efforts must expand to balance the existing effects of urban development with more effective watershed improvements.

As part of this comprehensive effort, the City's Department of Public Works (DPW) has completed an update to the 1996 Cabin John Creek Watershed Management Plan. The new assessment and recommendations will help the City prioritize CIP projects and programmatic activities over the next ten years.

Rockville is situated at the headwaters of Cabin John Creek. The stream starts near the City's center and flows south to enter Montgomery County at Route I-270 and Montrose Road, then to its confluence with the Potomac River near Glen Echo. The overall Cabin John Creek watershed at the Potomac River drains 25 square miles (16,022 acres); the portion within the City is 3.6 square miles (2,281 acres). It encompasses part of downtown Rockville, including City Hall, County buildings and the District Courthouse; most of the commercial area along Rockville Pike, the I-270 corridor near Tower Oaks, and residential communities, including Potomac Woods, North Farm, Hungerford, and New Mark Commons, and Woodmont Country Club. The new watershed study covers the portion of the Cabin John Creek watershed located within the City limits. It divides the watershed into the same seven sub-watersheds that were used in the 1996 study to allow comparisons of watershed and stream conditions over time.

The new study's findings and recommendations were evaluated by City staff from DPW's Environmental Management and Engineering Divisions, the Department of Recreation and Parks, and the Watershed Protection sub-committee of the Commission on the Environment. They were also presented in two public meetings.

FINDINGS / WATERSHED CONDITION

LAND USE ANALYSIS AND STORMWATER MANAGEMENT CAPACITY

The Cabin John watershed is significantly urbanized, but not by a single type of land use. About a third of the area consists of open space, which includes parks and golf course areas; another third is residential, and the last third is a mix of commercial and institutional uses and roadways. Overall, the watershed is about 32% impervious.

Studies have shown that impacts on aquatic life begin to occur at 10% impervious and significant degradation is found at around 25%. At 32% imperviousness, Rockville's Cabin John Creek watershed is characterized by fair to poor water quality, unstable channels, and limited diversity in aquatic life. Small changes in land use or watershed controls do not measurably affect water quality at this level of imperviousness, so restoration is needed on a widespread basis to produce significant improvements.

Tree canopy helps to counteract the impact of impervious areas. A study by the Maryland Department of Natural Resources found that tree canopy covers approximately 44% of the City, exceeding the American Forests goal of 40% in all three of the City's watersheds.

Half of the watershed's area drains to some form of stormwater management (SWM) system. These tend to be either small facilities on commercial sites or larger public SWM facilities that treat mixed residential and commercial areas. Many facilities were built under outdated standards that are not effective at reducing stream erosion or trapping pollutants. Based on recommendations from the 1996 Cabin John Creek Watershed Management Plan, the City has retrofitted, or modernized, the largest public SWM ponds in the watershed to provide at least partial water quality and channel protection controls. The City is now enforcing proper maintenance of private SWM systems, as well as reducing a maintenance backlog on public facilities, so they will perform as originally designed.

WATER QUALITY IMPAIRMENTS

The State of Maryland has listed Cabin John Creek and its tributaries, collectively, as an impaired water body. Pollutants of concern include nutrients (nitrogen and phosphorus), sediment, fecal bacteria, and adverse impacts to biologic communities. Subsequent State analysis identified high storm flow rates and sediment loads, but not nutrients, as the primary stressors on the stream biological communities.

The State's designation triggers a Clean Water Act requirement to undertake a Total Maximum Daily Load (TMDL) assessment. A TMDL is an investigation into the causes and corrective actions needed to restored the impaired water body to health. To date, a TMDL was performed for fecal coliform bacteria (2007). Another one for sediment (total suspended solids) is pending. These TMDLs will require the City and Montgomery County to develop implementation plans that reduce these pollutants.

STREAM ASSESSMENT

Aquatic habitat assessment, water quality sampling, and stream channels measurements were performed. Almost all of the streams in the watershed are identified as having poor quality habitat, and none have highly rated habitat. The poor physical conditions are related to active erosion and sedimentation, channelization and disturbed riparian (i.e., near-stream) buffer impacts where streams abutted residential lots.

The channel assessment shows active head cuts (an incised eroded channel working back upstream to a storm drain outfall) in smaller headwater streams. Larger streams exhibit deeply incised stream channels and eroded banks, with large sediment loads moving with every storm. Although most development occurred in this watershed 20-50 years ago, many of the streams are still actively eroding.

This is typical of urbanized watersheds due to geomorphic shaping processes. Streams are very dynamic. They constantly change channel shape, capacity, and depth in response to storm flow patterns. After imperviousness is created by development, urban stream channels expand over decades to accommodate the higher storm flows. The lack of effective stormwater controls in older areas further contributes to the channel instability.

RECOMMENDATIONS

Although urbanized streams generally cannot be restored to the aquatic diversity and stability found in forested low-impervious areas, they can be made healthier. In Rockville, watershed management goals are more ambitious than simply meeting State permit requirements. They are intended to achieve cleaner water, more stable habitat, and less adverse man-made impacts. Healthier streams cause less damage to adjacent properties and City infrastructure, support a wider diversity and number of fish and aquatic insects, and deliver cleaner water to the Potomac River and the Chesapeake Bay. They also enhance the beauty and use of the stream valleys for all City residents.

This plan recommends watershed improvements in three categories: stormwater management retrofits, stream restoration, and operational programs.

Stormwater Management

Water quality-based stormwater controls help improve all sizes of streams, and these benefits continue downstream to the Chesapeake Bay. For this reason, water quality improvements are the highest priority for the recommended stormwater projects. Water quantity-based stormwater management to reduce downstream channel erosion is less effective in an already developed watershed, so it is a secondary goal. Unless most or all of the contributing drainage area is controlled, adding quantity controls has little correlation with stream stability.

The recommended projects, shown in Table A and Figure A, each involve retrofits or improvements to existing City-owned stormwater management dry ponds or wet ponds. No suitable locations were found to create new facilities.

Three concepts recommend engineering modifications to update outdated stormwater management designs and/or replace aging pipes; these are recommended as future CIP projects. The other three concepts recommend major maintenance on existing ponds constructed or expanded as a result of the 1996 Cabin John Creek Watershed Management Plan. These wet ponds need extensive sediment removal (i.e., dredging) to restore their original volume and maintain their pollutant removal effectiveness, but are already optimally designed for maximum water quality benefits.

TABLE A: RECOMMENDED STORMWATER MANAGEMENT PROJECTS

Sub-watershed	Current Site ID	Name and SWM Type	Final Recommendation	Priority
Bogley Branch	R-02	Potomac Woods Wetland Marsh Pond	Program for major maintenance. Remove accumulated sediment, dredge pond to restore original storage volume, adjust forebay berm, and replant wetland areas.	High
Bogley Branch	R-08	Locks Pond Court Wet Pond	Program for major maintenance. Remove accumulated sediment, dredge pond to restore original storage volume.	High

TABLE A: RECOMMENDED STORMWATER MANAGEMENT PROJECTS

Sub-watershed	Current Site ID	Name and SWM Type	Final Recommendation	Priority
Upper Cabin John	R-23	Hungerford-Stoneridge Wetland Marsh Pond	Program for major maintenance. Remove accumulated sediment, dredge pond to restore original storage volume, adjust forebay berm, and replant wetland areas. Forebay dredging (high priority) may be done separately from main pool dredging.	High-Medium (may be done in two stages)
Seven Locks Tributary	R-12a	Montgomery County Detention Center Wet Pond	CIP retrofit and repair project. Replace corrugated metal pipe control structure, replace low flow pipes, stabilize inflow channels, provide accessible forebays, and adjust controls to provide for 1" water quality volume and channel protection volume or to current standards.	Medium
Bogley Branch	R-03	Arlive Ct. Dry Pond	CIP retrofit project. Convert dry pond to sand filter to provide water quality treatment.	Low
Lower Cabin John	R-19b	North Farm Dry Pond	CIP retrofit project. Convert dry pond to sand filter to provide water quality treatment.	Low

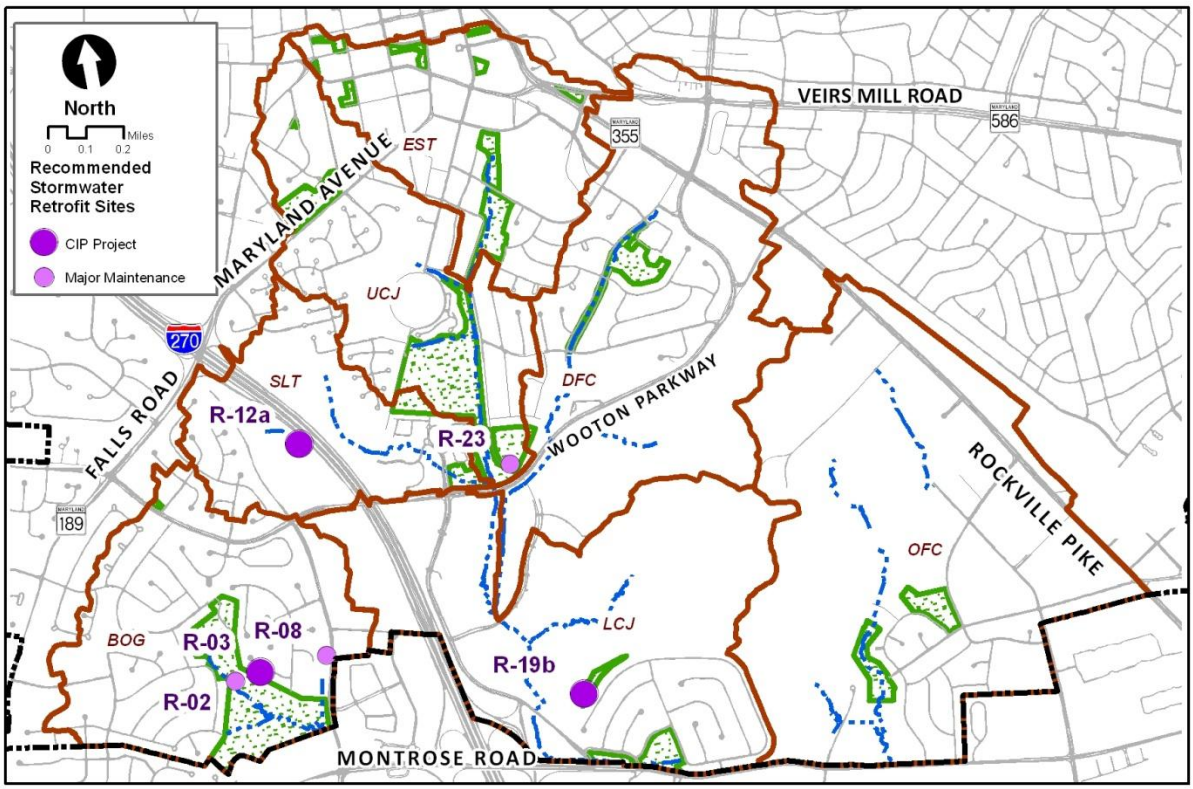

FIGURE A: RECOMMENDED STORMWATER MANAGEMENT PROJECTS

STREAM RESTORATION

Rockville's stream restoration measures focus on reducing bank erosion and sediment loadings from within the channel itself. They use rocks, bank shaping, and native plantings to create stable channels

and good aquatic habitat. These projects are designed to safely convey both small and large storm flows and accommodate debris loads from uncontrolled drainage areas.

Restoration concepts were developed for streams on City land where moderate to severe erosion or storm drain outfall damage was observed during the initial stream assessment. These concepts generally fall into two types of projects: traditional stream restoration for larger streams to armor or protect eroded banks, and a new technique for stabilizing smaller streams and storm drain outfall channels called regenerative stream conveyance (RSC). This method creates a filter of stone, sand, and woodchips in the channel that stops widening/downcutting and may also offer some water quality benefits.

Based on current conditions, seven CIP stream restoration projects are recommended. Four other stream segments will be monitored for worsening conditions between now and the next Cabin John Creek assessment. Table B and Figure B show the stream reaches involved in these recommendations.

TABLE B: RECOMMENDED STREAM RESTORATION PROJECTS

Sub-watershed	Current Site ID	Location	Final Recommendation	Priority
Old Farm Creek	R-80S	Old Farm Creek in Montrose Park at Rollins Ave.	CIP project – storm drain outfall repair, spot stream restoration and removal of debris	High
Upper Cabin John	R-68S	Stream at Dogwood Park – from Waddington Lane to Cabin John Pkwy.	CIP project – outfall RSC or stream restoration	High
Elwood Smith Tributary	R-66S	Outfall below Mt. Vernon Place to pedestrian bridge at Elwood Smith Recreation Center	CIP project - storm drain outfall repair; CMP culvert replacement	High
Bogley Branch	R-62S	Potomac Woods Park at Derbyshire Road	CIP project – outfall RSC or stream stabilization	Medium
Dawson Farm Creek	R-70S	Cabin John Creek mainstem – east branch	CIP project – stream restoration; sediment/debris removal from culverts under Wootton Pkwy.	Medium
Lower Cabin John	R-72S	Cabin John Creek mainstem – west branch	CIP project – stream restoration	Medium
Lower Cabin John	R-73S	Outfall channel from Tower Oaks Blvd. to mainstem south of Preserve Pkwy.	CIP project – removal of old dry pond dam/barrel and outfall RSC or stream stabilization	Medium

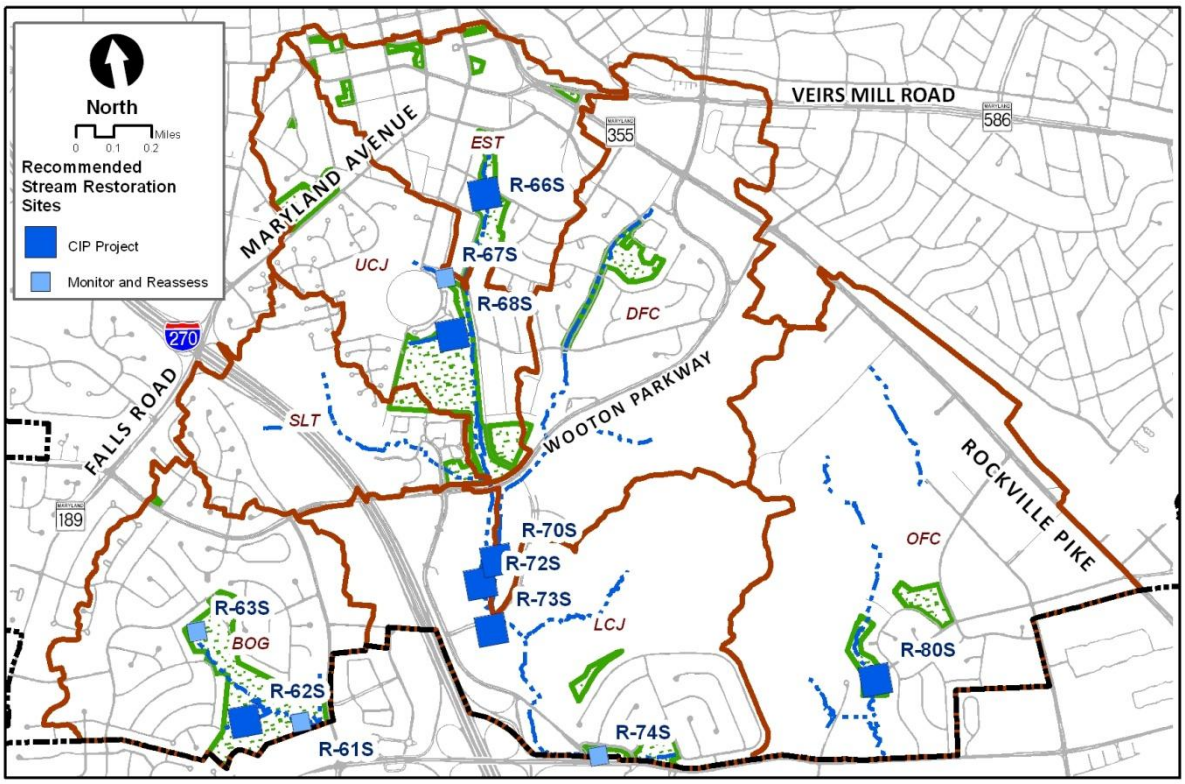

FIGURE B: RECOMMENDED STREAM RESTORATION PROJECTS

OPERATIONAL PROGRAMS

Two upland reconnaissance surveys were conducted during the study: the Neighborhood Source Assessment (NSA), which evaluated typical residential community behaviors affecting water quality, and Hotspot Site Investigation (HSI, which identified illicit discharges or other housekeeping concerns on commercial/institutional sites. Based on these assessments and other findings from the watershed assessment field work, several measures are highly recommended for implementation across the watershed. The operational program recommendations are organized into the following categories: ongoing monitoring and assessment; enforcement; outreach; maintenance; and incentives.

Ongoing Monitoring and Assessment

- Develop a water quality monitoring protocol to track pollutants targeted by TMDLs (nutrients, sediment or suspended solids, bacteria, etc.). This should include a city-wide plan identifying what parameters, where, when and how often. In addition, this protocol should identify the best way to monitor the success of SWM retrofits and stream restorations by identifying before and after monitoring techniques.
- Implement monitoring protocol. More monitoring data is needed to accurately identify pollution sources as well as to effectively evaluate programmatic success. The City should use monitoring results to make adjustments in program or project implementation as needed.
- Assess the feasibility of increasing frequency of street sweeping or storm drain inlet cleaning. (Debris, leaves, yard clippings, organic material, or trash was observed in common areas and street gutters in 26 of the 32 NSAs.) Further investigation is needed to identify the most cost-effective measures, best street sweeper equipment for water quality improvements, and ideal

frequency for residential and for non-residential streets. Also evaluate if source controls at storm drain inlets is more economical than trash/grit control at storm drain outfalls.

Enforcement

- Continue to conduct immediate investigation and enforcement for potential illicit discharges, using the Water Quality Ordinance.
- Increase compliance inspection and enforcement along Rockville Pike to reduce poor dumpster and trash management practices, using the Property Code regulations.
- Work with Woodmont Country Club and the Montgomery County Seven Locks Maintenance Yard to improve the water quality of runoff leaving their sites through better housekeeping practices and site management.

Outreach

- Conduct a lawn care education effort to reduce fertilizer use, and encourage proper disposal of yard debris, grass clippings and pet waste. (Sixteen of 32 NSAs had over 20 percent of the lawns showing high maintenance practices and some of the NSAs were observed with 100 percent of the lawns with high maintenance.)
- Expand the City's Rainscapes program to promote increased implementation of conservation landscaping in order to increase onsite runoff retention. Consider adding rain gardens or soil amendments to the Rainscapes program.
- Promote Rainscapes rebate program for tree planting in residential lots. This can be a lower priority because all but five of the NSAs had more than 20 percent of the lot devoted to landscaping as opposed to turf cover. All but four of the NSAs had more than 30 percent of the lot covered by tree canopy
- Promote the City's volunteer storm drain marking program. Stenciling was observed in only one of the NSAs.

Maintenance

- Develop an inspection and maintenance program to keep major culverts clear of sediment and vegetation.
- Continue to develop and refine a SWM maintenance program. Take into consideration SWM design, placement (what areas are draining to the facility) and age.

Incentives

- Consider expanding Rainscapes rebate program to encourage voluntary implementation of Environmental Site Design (ESD) practices on institutional and commercial properties to reduce runoff and improve water quality.

RECOMMENDATION COSTS

The preliminary cost of the recommended stormwater management and stream restoration projects is estimated at $5,015,000. This includes design and construction capital costs, and major maintenance work for pond dredging. Costs for recommended non-structural program changes cannot be fully quantified at this time. Some costs will be for contractor/consultant services or rebate programs, and some are for increased staffing to improve enforcement, maintenance or outreach services. Although they will add additional costs, these may be implemented City-wide since it is expected that similar issues exist in the City's other watersheds.