

Lake Monticello

Lake Health and Storm Water Management Implementation Plan

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**Respectfully Submitted to the
Lake Monticello Association Board of Directors**

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Introduction

The Lake Monticello community enjoys a number of amenities which provide opportunities for recreation, entertainment, and generally enhance the value of homes and building lots within the community. Perhaps the most important among these amenities is Lake Monticello itself.

Approximately 350 acres in size and over two miles long, the lake provides a centerpiece for living at Lake Monticello. Maintenance of the lake is accomplished both in terms of lake chemistry and its physical infrastructure. For many years, a group of lake-resident volunteers has measured and monitored the lake as the Lake Preservation Committee (LPC).

In addition to the lake and its integral structures, the issues of stream and storm water flow in the community and into the lake is analyzed and reported on (to the LMOA Board of Directors, BoD) by the recently appointed Storm Water Management Committee (SWMC).

Based on the findings of these two committees and an earlier engineering study aimed at assessing the state of community infrastructure, steps have been taken to quantify overall lake health and storm water management needs. Combining the earlier study and more recent findings from a Lake Management consulting firm, a plan of action has been developed to address findings which indicate a need for action on the part of LMOA to preserve and enhance lake health and its utility as a recreational resource.

This document specifies a series of efforts resulting from needs identified by LPC, SWMC, early engineering studies, and a comprehensive evaluation by the Williamsburg Environmental Group (WEG) in combination with the Virginia Lake Management Company (VLMC).

This implementation plan is a snapshot of current thinking, planning, and budget limitations. It is expected to evolve over time as the results of rehabilitative and preventative measures are realized, and new needs arise. Detailed planning has been done for early years with a focus on current year efforts. A long range projection is included which includes all measures selected to implement the various studies recommendations and internal analyses.

Background

This multiyear implementation plan for improving the watershed infrastructure of Lake Monticello and protecting and preserving the lake itself was developed based on two engineering studies:

- (1) *Lake Monticello Infrastructure Master Plan*, prepared by the Cox Company, Charlottesville, Virginia dated March 1996
- (2) *Lake Monticello Lake Management Plan* prepared by the Williamsburg Environmental Group (WEG), Williamsburg, Virginia in cooperation with the Virginia Lake Management Company, Virginia Beach, Virginia dated October 2004.

The Cox Report was conducted to define the measures needed to upgrade the roads around the community. As part of the roads plan, they identified the areas where culvert and ditch upgrades were needed to handle the storm water runoff. In addition, the Hurt and Proffitt Company performed detailed engineering design covering Lake Monticello roads and related drainage infrastructure based on the “Cox Report” findings in 1999. The two reports were used to develop the master plan for LMOA roadway maintenance and repair in addition to drainage facilities accomplished in conjunction with road maintenance.

As the community has developed, there is less permeable surface which can soak up storm water flow. As a result much more water is flowing along our streets and across lots, resulting in erosion and pollution of the lake with silt, nutrients, and debris. For example, paving of a 20 ft. wide x 50 ft. long driveway results in 1000 sq. ft. of impervious surface. When 1-inch of rain falls, 624 gallons of water will run off that driveway onto the surrounding yard area or into a ditch. If we have 3000 of these driveways, the total water flow that cannot soak into the ground as it falls is 1.8 million gallons. Considering all the homes, streets, parking lots, buildings, and driveways, it is clear that a huge amount of storm water must be handled by our ditch, culvert and stream infrastructure. The roads program currently underway includes culvert upgrades but does not include much needed ditch work. The Cox Engineering Company estimated that \$1 million of ditch upgrades, based on 2004 dollars, was needed to effectively handle the storm water flow.

WEG conducted a thorough study of our water shed and lake water quality and concluded that current water quality is good. That conclusion is based on the fact that the nutrient content of our water falls within the eutrophic range of the water quality spectrum. This range is an ideal middle ground between the oligotrophic/mesotrophic range, where nutrient levels are extremely low and the lake water is crystal clear (not good for supporting fish and other wildlife) and the hypereutrophic range, where the lake water is choked with algae (not good for swimming and boating).

The report also concludes that, with continued development within the community and in the surrounding areas, particularly along Rt. 53, the quality of our lake water will be degraded by significant increases in storm water flow, with attendant increased nutrient, silt and debris. Based on watershed models, WEG concluded that silt will increase by 15-20% and nutrient (phosphorus) will increase by 50 -60%. In addition, they concluded that many current stream beds are severely or moderately eroded and that, with increased development in the watershed, this situation will get worse. Stream erosion increases silt load to the lake (estimated at 340 tons/year) and results in loss of trees in the watershed. From their study, they recommended \$3.6 million worth of work, including installation of BMPs (Best Management Practices - structures to control water flow),

restoration of many streams, and public education to help reduce pollution from home sites. WEG also assessed the lake weed (hydrilla) situation and health of the fish population and concluded that more aggressive measures of weed control were needed to keep the weed level under control for boating and swimming.

In 2003, with the roads and drainage project well underway, Mr. Ron Ritter was appointed as Lake Health Project Manager by the LMOA BoD in an effort by the Board to focus attention on what had earlier been identified as the Board's top priority: preserving and improving lake health

The Implementation Plan

The goals of this implementation plan are:

- (1) Maintain dam and spillway structures and downstream areas.
- (2) Upgrade and maintain the storm water infrastructure of the community.
- (3) Protect and preserve lake water quality as LM and surrounding communities develop.
- (4) Protect and preserve lake quality for recreation (swimming, boating, fishing).
- (5) Improve community awareness of lake and lake quality issues.

The most important item in this goals list is maintenance of the dam since without it we would not have a lake. The Tufton pond dam is included in this portion of the plan and future budget requests. Recent work has focused on meeting state requirements by clearing the channels below the main dam and below the spillway.

Water runoff has been observed at the downstream side of a culvert built at the base of the dam for emergency use. The source of the leak in the main dam has been identified and work is underway to define a plan for repairing the leak permanently, consistent with state requirements. Also, rip-rap is being added to the dam face to stop erosion. Expenses included in the 15 year plan include money to retire a low level release valve located on the upstream (lake) side of the dam culvert. In addition, this plan includes provision for replacement of the badly deteriorated trash rack on the Tifton pond spillway, and it addresses annual maintenance costs, including such things as tree clearing, channel maintenance, and spillway maintenance.

Storm water management, which includes ditch and culvert improvements, stream restoration and construction of facilities to impede or otherwise control water flow (so-called "BMPs" or Best Management Practices which have been proven to provide results), will require the bulk of the funds necessary to execute this plan. For roadside ditch and culvert improvements, it has been recommended to hire a part time storm water civil engineer (or engage a consulting engineer if a part time engineer cannot be found) to provide the individual assessment and supervision of the work needed along our roadways and around the many homesites with drainage issues. This plan calls for prioritizing the work so that the worst areas are corrected first. In this regard the work will probably not be done on a section-by-section basis, as the roads are being done. Depending on funds available each year, specific work for that year will be identified and a contractor engaged to improve those areas.

To help stop the impact of water flow throughout the community, particularly from outside the community, WEG identified 18 sites where BMPs would be highly beneficial for slowing the flow of silt and nutrient. Those sites have been reviewed and, because of many of these recommendations involved privately owned properties, have been modified. From this review, 12 sites were identified and prioritized.

Further, to optimize the effectiveness of the funds available for this work, we are focusing on Jersey barrier structures similar to the water control structure constructed in the stream running across Jefferson Drive into Jackson cove. Selected BMPs will attenuate the flow of silt, nutrient and debris into Monroe, Jackson and Van Buren coves, key receptors for storm water from the watershed. With full implementation, we expect the projected future increase in silt flow will be stopped and the current silt load will be reduced by 10%. For 2005, the first major BMP will focus on the stream from Jefferson Center/Rt.53 to Jackson cove. The BMP will be an extended detention type which is expected to reduce silt by 60% and nutrient by about 35%.

Stream restoration presents a greater challenge for implementation since many streams are on private property. Of the 22 sites identified by WEG as priority areas for restoration in their 10 year plan, 6 are within common areas accessible for performing work. There are another 4 or 5 others identified that are accessible. The Project Team is discussing alternate ways to help homeowners with restoration of streams on their property, from providing techniques for restoration to potentially assisting with cost. The planned expenditures here will focus on the streams which can be accessed and that have been identified as needing work.

The first stream restoration project, to be completed by the end of 2005, has been planned for the stream flowing from Jefferson Center/ Route 53 to Jackson cove, a major silt and nutrient source. About 1000 ft. of this stream runs along Hole #12 of the golf course and will be improved to eliminate erosion and help control flow.

The WEG report includes many other recommendations for maintaining the quality of our lake. They recommended aggressive weed control, starting with a major chemical treatment (\$148,000), carp stocking (\$13,280) and installation of a carp screen at the spillway outlet (\$50,000), followed by annual maintenance with grass carp and spot chemical control. We are planning for the annual chemical spot treatment and carp maintenance stocking only, pending our experience with the severity of weed infestation in 2005. Aggressive carp stocking over the past 4 years may be responsible for the general lack of severe weed growth in 2004. If severe weed growth is experienced this year, this reduced plan will be reassessed. The carp screen is part of this 15 year plan since it has been recommended by all consultants. Carp are riverine fish and seek running water and so they may be leaving the lake thru the spillway during high flow conditions.

Another major expense item is BMP maintenance. When a BMP is installed, it is with the goal of collecting much of the silt and debris that flows down a stream into the lake. As a result, the BMP needs to be cleaned on a regular basis to maintain efficiency. WEG figured the cost of maintenance at 7.5% of the cost of the BMP. The plan here calls for slightly less than this figure. The exact cost will be determined by experience. This 15 year plan includes funding for maintenance dredging of current BMPs as well; ie. Tufton pond, the Acres storm water pond, and the ponds on the golf course. All of these structures are controlling storm water flow and collecting silt, debris and nutrient and, therefore, must be maintained.

Other expenses in the plan include money for public education, a key to lake health. Homeowner management of their landscape has a major impact on the lake. That includes all homeowners within the watershed. For

example, LPC data show that lake water nitrogen levels double in the summer months, directly attributable to fertilizer use. This increase could cause extensive algae growth. A committee has been formed to develop, publish, and advertise best practices for homeowner management to minimize impact on the lake.

A small amount of money has been included for dredging which, in this plan, means “biodredging”. This new technology offers the promise of biologically reacting the organic material in lake bottom sediment, thus eliminating it as a source of hydrogen sulfide, a toxic chemical, and substantially reducing the volume, thus restoring the water depth.

This technology will be tested in the pond on Hole #7 of the golf course. Some lake front homeowners are also considering a trial in their small coves. If the claims are proved, this technology will be useful for substantially reducing the dredging requirements for the main lake and would help improve the overall water quality in severely silted areas.

Many of the WEG recommendations for other non-structural expenditures will be implemented through use of volunteers. For example, litter control, bathymetric measurements for siltation monitoring, and measurement of weed infestation.

The plan, and projected budget, assume that lake residents support a dues increase requested in the 2005 budget proposal. If this dues increase is not supported, a substantial revision will have to be made.

The following exhibits show a summary and detailed listing of WEG recommendations and associated costs. Also included are a number of cost trade-offs which demonstrate where the most “bang per buck” can be obtained.

The final exhibits provide the detailed element planning for 2005 and also the elements (with associated funding) for a comprehensive lake management implementation over the 15-year planning period.

<u>WEG RECOMMENDATIONS</u>	
10 Year Program	
BMP Construction	\$1,148,000
Stream Restoration	1,515,625
Non Structural Practices	619,775
Weed Control	<u>352,080</u>
<u>Total</u>	\$3,634,480
10 Year Program	
Annual cost assuming 3% Inflation	\$414,000