Bacterial Implementation Plan Development for the James River and Tributaries – City of Richmond

Technical Report

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Virginia Department of Environmental Quality
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New River-Highlands
RC&D

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Steering Committee Members

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City of Richmond

Virginia Chapter of Alliance for Chesapeake Bay

Reedy Creek Coalition

Richmond Chapter of the Sierra Club

Virginia Department of Environmental Quality (VADEQ)

Virginia Department of Conservation and Recreation (VADCR)

Local citizens and stakeholders in the James River - Richmond watershed

EXECUTIVE SUMMARY

The James River and tributaries around Richmond have been listed as impaired on Virginia's *303(d) Total Maximum Daily Load Priority List and Report* since 1996 due to violations of the State's water quality standards for fecal coliform bacteria. This means that the waterways do not support primary contact recreation including swimming, wading, and fishing due to an increased risk of illness or infection when coming in direct contact with the water. The fecal coliform bacteria standards at the time of the first impairment listings specified that in-stream fecal coliform levels must not exceed a single sample maximum of 1,000-cfu/100 mL or a geometric mean of 200-cfu/100 mL. A total maximum daily load (TMDL) study was developed for the James River and selected tributaries in 2010 and for Tuckahoe Creek and tributaries in 2004, as required by the Clean Water Act (CWA, §303d). These studies established the bacterial reductions necessary to meet water quality standards for bacteria to fully support the recreation/primary contact designated use.

Virginia's Water Quality Monitoring, Information, and Restoration Act (WQMIRA, §62.1-44.19:4) requires implementation plans (IPs) be developed for waterbodies with approved TMDL studies in order to provide a specific methodology by which the pollutant reductions may be met. To fulfill this goal, a framework was established to achieve bacteria water quality standards for the impaired James River and tributaries around the Richmond area utilizing the completed TMDL studies as guidance.

Review of TMDL Development

Modeling conducted in support of the James River - Richmond TMDL considered fecal bacteria loads in runoff resulting from wildlife (*e.g.,* deer, raccoon, muskrat, beaver, turkey, goose, mallard, and wood duck), livestock (*e.g.,* beef, dairy and horse), residential (*e.g.,* failing septic systems, straight pipes, dogs and cats) sources, and urban (*e.g., CSOs, runoff)* sources. Direct loads to the stream (including direct deposition from cattle and wildlife), uncontrolled discharges (failing septic systems and straight pipes), and permitted sources were also modeled. The *E. coli* geometric mean standard (126 cfu/100 mL) with an implicit Margin of Safety (MOS) was used as the water quality endpoint.

Bacteria concentration data collected in Reedy Creek during and after TMDL development were higher overall values than the data used to calibrate the model originally. Therefore, it was necessary to recalibrate and reallocate the Reedy Creek model during IP development to account for needed bacteria reductions not captured in the TMDL study.

The Tuckahoe Creek TMDL was determined using the load-duration approach where the average annual flow condition is multiplied by the single sample standard for *E. coli* (235 cfu/100mL) with the proper unit conversions. The percent reductions were determined by distributing the allowable annual bacteria load to each source using the Bacterial Source Tracking (BST) data. Tuckahoe Creek drains into the James River and is therefore within the James River and Tributaries – Richmond study area.

The final load reduction scenarios for meeting the water quality standard for bacteria in the James River - Richmond TMDL showed all failing septic systems and straight pipes should be identified and corrected, and reductions in bacteria from residential, urban, and agricultural runoff is needed (Table ES.1). Alternative E refers to the preferred implementation of the City of Richmond's Phase III Combined Sewer Overflow (CSO) Long Term Control Plan (Greeley and Hanson, 2006 and Appendix C, Figure C.1).

Table ES. 1 Final bacteria load reduction scenarios to meet the WQS for the James River – Richmond watershed and Tuckahoe Creek.

Impairment	Wildlife Direct*	Wildlife Land Based*	Livestock Direct	Agricultural Land Based	Human Direct	Human and Pet Land Based	City of Richmond CSO Program Project Plan
Almond Creek	0%	0%	91%	0%	100%	85%	Alternative E and a 52% reduction
Bernards Creek	0%	38%	99%	93%	100%	96%	NA
Falling Creek	0%	0%	0%	0%	100%	13%	NA
Gillie Creek	0%	0%	0%	0%	100%	94%	Alternative E and a 95% reduction
Goode Creek	0%	0%	0%	0%	100%	96%	NA
No Name Creek	0%	0%	0%	0%	100%	94.5%	NA
Powhite Creek	0%	0%	40%	0%	100%	86%	NA
Reedy Creek**	0%	97%	0%	0%	100%	99.5%	NA
James River (riverine)	0%	63%	96%	99%	100%	99%	Alternative E
James River (tidal)	0%	0%	0%	0%	100%	0%	Alternative E

Stream	Wildlife *	Livestock	Human	Pet
Tuckahoe	88.91%	99%	99%	99%

*Direct and land-based wildlife bacteria reductions will not be explicitly addressed by this implementation plan (see Section 1.2.2)
**The final scenario for Reedy Creek after the remodeling effort
*** The Tuckahoe Creek bacteria TMDL scenario was determined differently, using the load-duration approach and BST data

Public Participation

The actions described in this document have been constructed based on recommendations from local citizens, local government representatives, Virginia Departments of Conservation and Recreation (VADCR), Environmental Quality (VADEQ), and Health (VDH), the Monacan Soil and Water Conservation District (SWCD), City of Richmond (COR), county governments, citizen organizations, and MapTech, Inc. Every citizen and interested party in the watershed is encouraged to become involved in implementing the plan to help restore the health of the James River and tributaries.

Public meetings were conducted to distribute information and gain feedback from the community. Active participation was solicited in smaller forums called working groups. These groups were comprised of stakeholders with similar concerns (*e.g.,* agricultural, residential, and government/urban). Representatives from each working group participated in the Steering Committee, where input from the working groups was reviewed and decisions about the IP were made. Throughout the public participation process, a major emphasis was placed on discussing best management practices (BMPs), BMP specifications, locations of control measures, and education.

Opinions were voiced throughout the public participation meetings regarding what should be included in the implementation plan. Most members of the working groups agreed that the cornerstone of the implementation plan should be cultivating public involvement and education, as well as, encouraging partnerships between the citizens and government agencies in order to reduce fecal bacteria in James River – Richmond watershed.

Assessment of Implementation BMPs

The quantity or extent of pollution control measures, or BMPs, recommended for implementation was determined through spatial analyses of land use, stream-networks, and topography, along with regionally appropriate data archived in the VADCR Agricultural BMP Database. Input from state and local agency representatives and community members was used to verify the analyses. The collective BMPs required to meet the TMDL reduction goals for all impairments within the James River- Richmond watershed for a 20-year implementation period were identified and are shown in Table ES.2. The BMPs required to achieve reductions to meet bacteria water quality standards for individual impaired waterbodies are shown in Section 6.1.

Table ES. 2 Stage I and Stage II implementation goals.

All BMP Needs	Unit	Cost per unit*	# Units	Total Cost**
STAGE I (1st 10 years) ***Subtotal $14,556,600***				
Agricultural BMPs:				
Livestock Exclusions (LE-1T and LE-2T)	System	$25,000	148	$3,700,000
Stream Protection (WP-2T)	System	$8,000	1	$8,000
Prescribed Grazing Plan and Implementation (NRCS 528)	Acre	$77	2,783	$214,291
Conservation Tillage – Cropland (SL-15A)	Acre	$100	252	$25,200
Reforestation of Erodible Cropland (FR-1)	Acre	$154	306	$47,124
Reforestation of Erodible Pasture (FR-1)	Acre	$154	549	$84,546
Riparian Buffers – Cropland	Acre	$360	200	$72,000
Residential Waste Treatment BMPs:				
Septic Systems Pump-outs (RB-1)	System	$450	5,543	$2,494,350
Septic System Repair (RB-3)	System	$3,500	206	$721,000
Septic System Installation/Replacement (RB-4)	System	$8,000	482	$3,856,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	118	$2,360,000
Sewer Connection	System	$6,000	100	$600,000
Pet Waste Pick-Up Program:				
Baggy, Sign and Waste Basket Station	Station	$170	56	$9,520
Bag Refills	Each	$0.10	3,066,000	$306,600
Mailings	Each	$0.36	161,024	$57,969
STAGE II (2nd 10 years) ***Subtotal $869,204,599***				
Agricultural BMPs:				
Streamside Fence Maintenance	Feet	$3.50	12,810	$44,835
Waste Storage Facility (WP-4) – Beef	System	$10,000	42	$420,000
Waste Storage – Horse	System	$3,000	176	$528,000
Pet Waste Pick-Up BMPs:				
Pet Waste Composters	Composter	$50	188	$9,400
Mailings	Each	$0.36	161,024	$57,969
Bag Refills	Each	$0.10	3,066,000	$306,600
Residential/Urban BMPs:				
Sewer Connection	System	$6,000	69	$414,000
Wet Ponds Level 1 Design - Pervious	Acre-Treated	$14,000	1,500	$21,000,000
Rain Gardens Level 1 Design - Pervious	Acre-Treated	$19,000	1,500	$28,500,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	13,305	$252,795,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	13,305	$79,830,000
Wet Ponds Level 1 Design - Impervious	Acre-Treated	$69,000	251	$17,319,000
Rain Gardens Level 1 Design - Impervious	Acre-Treated	$94,000	251	$23,594,000
Bioretention Facilities Level 1 Design - Impervious	Acre-Treated	$94,000	253	$23,782,000
Infiltration Trench Level 1 Design - Impervious	Acre-Treated	$31,000	251	$7,781,000
CSO SW Volume Reduction BMPs:				
Retro-fitted Vegetated Roofs Level 2 Design	Sq. Ft.	$30	630,061	$18,901,830
Rainwater Harvesting - Rain Barrels	Each (50gal)	$150	21,660	$3,248,925
Rainwater Harvesting - Cisterns	Each (500gal)	$1,000	241	$241,000
Permeable Pavement Level 2 Design	Sq. Ft.	$24	5,052,960	$121,271,040
Increased Storage within the CSO System	Gallons		27,300,000	$269,160,000
Grand Total				**$883,761,199**

*Values are based on stakeholder estimates and input.
**Additional engineering study and analysis during the traditional adaptive management process may reduce the design criteria and costs needed.

Cost/Benefit Analysis

The costs of the above control measures were determined based on the cost of control measures previously installed through the Virginia Cost-Share Program in the James River watershed, discussions with local agency representatives and working groups, and literature review.

The primary benefit of implementation is the reduction of *E. coli* bacteria in these streams. With the completion of this implementation plan, the risk of illness or infection contracted through recreating in these streams should decrease significantly. Streambank protection, provided through exclusion of livestock from streams, will also lead to improved aquatic habitat. The practices recommended in this document will provide economic benefits to landowners in addition to the anticipated environmental benefits.

Measurable Goals and Milestones for Attaining Water Quality Standards

Potential funding sources available during implementation were identified during plan development. Sources may include, but are not limited to:

- Federal Clean Water Act Section 319 Incremental Funds
- Virginia Agricultural Best Management Practices Cost-Share Program
- Virginia Agricultural Best Management Practices Tax Credit Program
- USDA Environmental Quality Incentives Program (EQIP)
- Virginia Revolving Loan Programs
- USDA Wildlife Habitat Incentive Program (WHIP)
- Virginia Water Quality Improvement Fund

Implementation is scheduled to occur in two main stages. The first stage involves implementation of the most cost-effective control measures. Stage II describes the remainder of the control measures required to achieve the targeted pollutant load reductions and fully achieve the reductions called for in the TMDL studies.

Identification of critical areas to be targeted first for residential BMP installation was accomplished through analysis of bacteria loads from human and dog sources. Targeting may increase the effectiveness of BMPs by reducing more bacteria per dollar invested.

In addition to future DEQ assessments of impaired waters, success may also be evaluated by the number of BMPs implemented in the watershed. The use of adaptive management strategies will provide flexibility for BMP implementation. In order to gauge watershed progress, the Alliance for the Chesapeake Bay will provide a forum on the Chesapeake Network which will allow stakeholders to communicate regarding ongoing watershed implementation.

Stakeholders and Their Role in Implementation

Implementation progress success will be determined by water quality monitoring conducted by VADEQ through the agency's monitoring program.

The Soil and Water Conservation Districts (SWCDs) will be in charge of initiating contact with farmers and homeowners in the impaired watersheds to encourage the installation of agricultural BMPs. The SWCD staff will conduct outreach activities in the watersheds to garner the participation and community support necessary to obtain implementation milestones, and to make the community aware of the water quality impairments present in the James River - Richmond watershed and how they may affect local residents.

VDH is responsible for septic system regulation. VDH's actions are driven by homeowners self-diagnosing they have a septic problem or by complaints. In relation to these TMDLs, VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and straight pipes.

In the Commonwealth of Virginia, water quality problems are managed via legislation, incentive programs, education, and legal actions. The agencies regulating activities that impact water quality in Virginia include: VADEQ, VADCR, Virginia Department of Agriculture and Consumer Services (VDACS), and VDH.

Achieving the goals of this IP (*i.e.*, improving water quality and removing these waters from the Section 303(d) list) is dependent on stakeholder participation – not only the local citizens who need agricultural control measures or residential waste treatment facilities, but also all citizens living in the watershed. It must be acknowledged first that there is a water quality problem, and changes must be made as needed in operations, programs, and legislation to address these pollutants. Local citizens can become involved by picking up after their pets, properly maintaining their septic systems, becoming water quality monitoring volunteers and volunteering to distribute information and educate others at public events.

An Implementation Plan describes a scenario of Best Management Practices which are aimed at achieving the pollutant reductions outlined in a TMDL study. The BMPs chosen in this IP are not the only types which stakeholders can choose to implement, rather they are merely options among many. DEQ does not intend for the IP to be a prescriptive document, rather, it is a tool that watershed stakeholders may use to reach watershed bacteria reduction goals. While the development of an IP is required by Virginia state law, all of the BMPs outlined in the IP document are voluntary practices. The implementation of BMPs will not be done by any one locality, city, non-profit organization, or government agency. Rather, all stakeholders including citizens, will be responsible for implementing BMPs in the watershed in order to reach the bacteria reduction goals outlined in the TMDL. Again, this document outlines one scenario by which those goals can be achieved.

1. INTRODUCTION

1.1 Background

The detrimental effects of bacteria in food and water supplies have been documented repeatedly. Throughout the United States, the Centers for Disease Control estimates that at least 73,000 cases of illnesses and 61 deaths per year are caused by *E. coli* 0157:H7 bacteria (CDC, 2001). Other fecal coliform (FC) pathogens (*e.g., E. coli* 0111) are responsible for similar illnesses. In addition, the presence of other bacterial and viral pathogens is indicated by the presence of fecal bacteria. Whether the source of contamination is human, livestock, or pet waste, the threat of these pathogens appears more prevalent as these populations increase. As stakeholders, we must assess the risk we are willing to accept and then implement measures to safeguard the public from these risks.

The Clean Water Act (CWA) that became law in 1972 requires that all U.S. streams, rivers, and lakes meet their state's water quality standards. The CWA also requires that states conduct monitoring to identify polluted waters or those that do not meet standards. Through this required program, the state of Virginia has found that many stream segments do not meet state water quality standards for protection of the six beneficial uses: recreation/swimming, aquatic life, wildlife, fish consumption, shellfish consumption, and public water supply (drinking).

When streams fail to meet standards, Section 303(d) of the CWA and the U.S. Environmental Protection Agency's (EPA) Water Quality Management and Planning Regulation (40 CFR Part 130) both require that states develop a Total Maximum Daily Load (TMDL) for each pollutant. A TMDL is a "pollution budget" for a stream. That is, it sets limits on the amount of pollution that a stream can receive and still maintain water quality standards. In order to develop a TMDL, background concentrations, point source loadings, and non-point source loadings are considered. A TMDL accounts for seasonal variations and must include a margin of safety. Through the TMDL process, states establish water-quality based controls to reduce pollution and meet water quality standards.

Once a TMDL is developed and approved by the State Water Control Board (SWCB) and EPA, measures must be taken to reduce pollution levels in the stream. Virginia's 1997 Water Quality

Monitoring, Information and Restoration Act (WQMIRA) states in section 62.1-44.19:7 that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters". The TMDL Implementation Plan (IP) describes control measures, which can include the use of better treatment technology and the installation of best management practices (BMPs), to be implemented in a staged process.

The James River that flows through the City of Richmond and tributaries have been listed as impaired on VADEQ's *303(d) Total Maximum Daily Load Priority List and Reports* due to violations of the State's water quality standards for fecal bacteria (Figure 1.1).

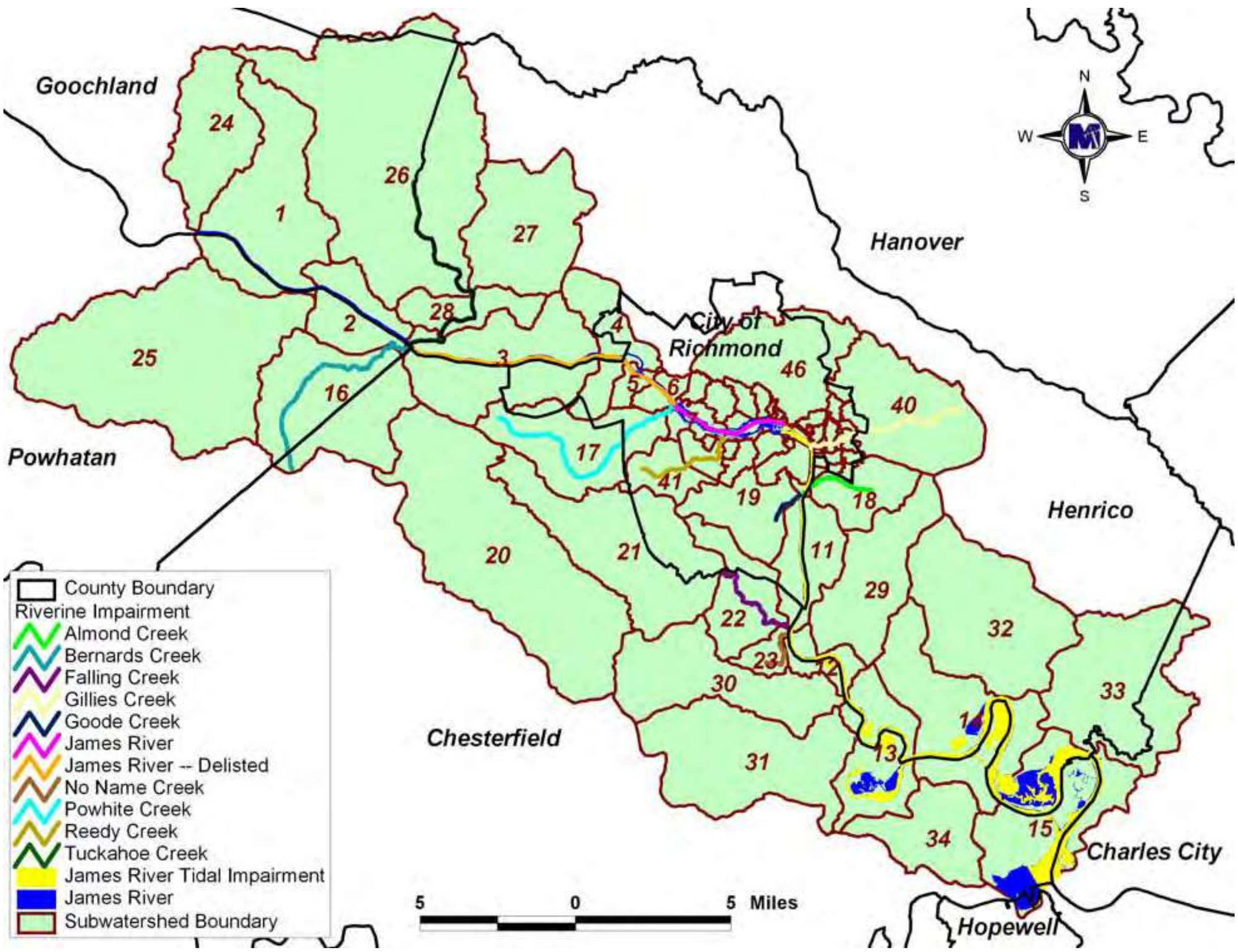

Figure 1.1 Location of the impairments within the James River - Richmond IP project area.

The James River (riverine) (VAP-H39R-08) begins at Boulevard Bridge and continues downstream to the Mayos Bridge (2.99 miles). This impaired segment was initially listed on VADEQ's *1996 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 1996). The segment remained impaired on all subsequent 303(d) lists (1998, 2002, 2004, 2006 and 2008).

The James River (tidal) (VAP-G01E-01) begins at the fall line at Mayos Bridge and continues downstream to the Appomattox River confluence (10.84 square miles). This impaired segment was initially listed on VADEQ's *1996 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 1996). The segment remained impaired on all subsequent 303(d) lists (1998, 2002, 2004, 2006 and 2008).

Almond Creek (VAP-G01R-02) begins at its headwaters and continues downstream to the James River confluence and includes unnamed tributaries (2.26 miles). This impaired segment was initially listed on VADEQ's *1998 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 1998). The segment remained impaired on all subsequent 303(d) lists (1998, 2002, 2004, 2006 and 2008).

Bernards Creek (VAP-H39R-10) begins at its headwaters and continues downstream to the James River confluence (6.97 miles). This impaired segment was initially listed on VADEQ's *2004 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 2004). The segment remained impaired on all subsequent 303(d) lists (2006 and 2008).

Falling Creek (VAP-G01R-03) begins at the Falling Creek Reservoir Dam and continues downstream to the James River confluence (3.81 miles). This impaired segment was initially listed on VADEQ's *2002 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 2002). The segment remained impaired on all subsequent 303(d) lists (2004, 2006 and 2008).

Gillie Creek (VAP-G01R-06) begins at its headwaters and continues downstream to the James River confluence (5.79 miles). This impaired segment was initially listed on VADEQ's *2004 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 2004). The segment remained impaired on all subsequent 303(d) lists (2006 and 2008).

Goode Creek (VAP-G01R-01) begins at its confluence with Broad Rock Creek and continues downstream to the James River confluence (1.23 miles). This impaired segment was initially listed on VADEQ's *2002 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 2002). The segment remained impaired on all subsequent 303(d) lists (2004, 2006 and 2008).

No Name Creek (VAP-G01R-08) begins at its headwaters and continues downstream to the James River confluence including tributaries (1.83 miles). This impaired segment was initially listed on VADEQ's *2004 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 2004). The segment remained impaired on all subsequent 303(d) lists (2006 and 2008).

Powhite Creek (VAP-H39R-05) begins at its headwaters and continues downstream to the James River confluence (8.12 miles). This impaired segment was initially listed on VADEQ's *2002 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 2002). The segment remained impaired on all subsequent 303(d) lists (2004, 2006 and 2008).

Reedy Creek (VAP-H39R-06) begins at its headwaters and continues downstream to the James River confluence (3.68 miles). This impaired segment was initially listed on VADEQ's *1998 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 1998). The segment remained impaired on all subsequent 303(d) lists (2002, 2004, 2006 and 2008).

Tuckahoe Creek (VAP-H39R-02) begins at confluence with Little Tuckahoe Creek and continues downstream to the James River confluence at Tuckahoe Island (8.7 miles). Major tributaries are also listed as impaired: Anderson, Broad, Georges and Readers Branches, Little Tuckahoe Creek, and Deep Run (total of 30.2 miles). The grouping was initially listed on VADEQ's *1998 303(d) Total Maximum Daily Load Priority List and Report* (VADEQ, 1998). The segments remained impaired on all subsequent 303(d) lists (2002, 2004, 2006 and 2008), but are now listed separately.

In developing this IP, elements from both state and federal guidance were incorporated and the recommended guidelines from Virginia's *Guidance Manual for Total Maximum Daily Load Implementation Plans* were followed. Specific state and federal requirements of an IP are described in chapter 2 of this document.

Once developed, the Virginia Department of Environmental Quality (VADEQ) will take TMDL implementation plans to the SWCB for approval as the plan for implementing the pollutant allocations and reductions contained in the TMDLs. Also, VADEQ will request SWCB authorization to incorporate the TMDL implementation plan into the appropriate Water Quality Management Plan (WQMP) in accordance with the CWA's Section 303(e). In response to a Memorandum of Understanding (MOU) between EPA and VADEQ, VADEQ also submitted a draft Continuous Planning Process to EPA in which VADEQ commits to regularly updating the WQMPs. Thus, the WQMPs will be, among other things, the repository for all TMDLs and TMDL implementation plans developed within a river basin.

1.2 *Applicable Water Quality Standards*

According to 9 VAC 25-260-5 of Virginia's State Water Control Board *Water Quality Standards*, the term "water quality standards" means "…provisions of state or federal law which consist of a designated use or uses for the waters of the Commonwealth and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the State Water Control Law and the federal Clean Water Act."

As stated in Virginia state law 9 VAC 25-260-10 (Designation of uses),

> *A. All state waters, including wetlands, are designated for the following uses: recreational uses, e.g., swimming and boating; the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources, e.g., fish and shellfish.*
>
> ♦
>
> *D. At a minimum, uses are deemed attainable if they can be achieved by the imposition of effluent limits required under §§301(b) and 306 of the Clean Water Act and cost-effective and reasonable best management practices for nonpoint source control.*

Virginia adopted its current *E. coli* and *enterococci* standard in January 2003 and was updated in June 2008. *E. coli* and *enterococci* are both bacteriological organisms that can be found in the intestinal tract of warm-blooded animals; there is a strong correlation between these and the incidence of gastrointestinal illness. Like fecal coliform bacteria, these organisms indicate the presence of fecal contamination. *E. coli* is used as an indicator organism for other pathogenic bacteria, viruses and parasites that may be present in the water. It is difficult to analyze for pathogenic bacteria, viruses and other parasites, however quantifying *E. coli* is considered reliable and cost-effective. EPA believes that *E. coli* is a much better indicator of possible health risk to humans from water borne bacteria than fecal coliform bacteria of which *E. coli* is a subset. EPA recommends that *E. coli* should be used as the indicator organism for assessing fresh water contact recreation.

The criteria which were used in developing the bacteria TMDL in this study are outlined in Section 9 VAC 25-260-170 (Bacteria; other recreational waters) and read as follows:

> *A. The following bacteria criteria (colony forming units (cfu)/100mL) shall apply to protect primary contact recreational uses in surface waters, except waters identified in subsection B of this section:*
>
> *E. coli bacteria shall not exceed a monthly geometric mean of 126 cfu/100mL in freshwater. Enterococci bacteria shall not exceed a monthly geometric mean of 35 cfu/100mL in transition and saltwater.*
>
> 1. *See 9VAC25-260-140 C for boundary delineations for freshwater, transition and saltwater.*
> 2. *Geometric means shall be calculated using all data collected during any calendar month with a minimum of four weekly samples.*
> 3. *If there [are] insufficient data to calculate monthly geometric means in freshwater, no more than 10% of the total samples in the assessment period shall exceed 235 E. coli cfu/100mL.*
> 4. *If there [are] insufficient data to calculate monthly geometric means in transition and saltwater, no more than 10% of the total samples in the assessment period shall exceed enterococci 104 cfu/100mL.*
> 5. *For beach advisories or closures, a single sample maximum of 235 E. coli cfu/100mL in freshwater and a single sample maximum of 104 enterococci cfu/100mL in saltwater and transition zones shall apply.*

Sufficient bacteria standard violations were recorded at VADEQ water quality monitoring stations to indicate that the recreational use designations are not being supported in the streams listed in Section 1.1.

1.2.1 Designated Uses

All waters in the Commonwealth have been designated as "primary contact" for the swimming use regardless of size, depth, location, water quality or actual use. The *E. coli* bacteria standard is described in 9 VAC 25-260-170 and in Section 1.2 of this report. This standard is to be met during all stream flow levels and was established to protect bathers from ingestion of potentially harmful bacteria and associated pathogens. However, many headwater streams are small and shallow during base flow conditions when surface runoff has minimal influence on stream flow. Even in pools, these shallow streams do not allow full body immersion during periods of base flow. In larger streams, lack of public access often precludes the swimming use.

Recognizing that all waters in the Commonwealth are not used extensively for swimming, Virginia has approved a process for re-designation of the swimming use for secondary contact in cases of: 1) natural contamination by wildlife, 2) small stream size, and 3) lack of accessibility to children, as well as due to widespread socio-economic impacts resulting from the cost of improving a stream to a "swimmable" status.

The re-designation of the current swimming use in a stream will require the completion of a Use Attainability Analysis (UAA) and the approval of a designated use removal or use modification by the SWCB. A UAA is a structured scientific assessment of the factors affecting the attainment of the use, which may include physical, chemical, biological, and economic factors as described in the Federal Regulations. The stakeholders in the watershed, Virginia, and EPA will have an opportunity to comment on these special studies, should they be developed.

1.2.2 Wildlife Contributions

In some streams for which TMDLs have been developed, water quality modeling indicates that even after removal of all of the sources of *E. coli* (other than wildlife), the stream will not attain standards. TMDL allocation reductions of this magnitude are not realistic and do not meet EPA's guidance for reasonable assurance. Based on the water quality modeling, many of these streams will not be able to attain standards without some reduction in wildlife bacteria loads. Virginia and EPA are not proposing the reduction of wildlife to allow for the attainment of water quality standards. This is obviously an impractical action. While managing over-populations of wildlife remains an option to local stakeholders, the reduction of wildlife or changing a natural background condition is not the intended goal of a TMDL.

Virginia has a 'general management plan' for deer and geese, but these plans are on a statewide resolution level. On a case by case basis, Virginia Department of Game and Inland Fisheries

(VDGIF) will help with the management of geese in urban settings. This will generally occur after local government and citizen management efforts have failed to discourage Canada Geese from an area.

The following actions can control waterfowl impacts: adding shoreline vegetation and no-mow zones, using proprietary products for managing/discouraging waterfowl/goose populations, using trained canines to intimidate geese - border collies are the most common species used, addling eggs - shaking the eggs of nesting geese to make the eggs nonviable while still allowing the female goose to perform her breeding duties, and introducing predators such as snapping turtles.

Henrico County and Chesterfield County qualify for wildlife management urban archery deer season extension. The City of Richmond has the extended urban archery deer season currently in place.

In such a case, after demonstrating that the source of *E. coli* contamination is natural and uncontrollable by effluent limitations and BMPs, the state may decide to re-designate the stream's use for secondary contact recreation or to adopt site specific criteria based on natural background levels of *E. coli*. The state must demonstrate that the source of *E. coli* contamination is natural and uncontrollable by effluent limitations and BMPs through a UAA as described above. All site-specific criteria or designated use changes must be adopted as amendments to the water quality standards regulations. Watershed stakeholders and EPA will be able to provide comment during this process.

1.3 *Project Methodology*

The overall goal of this project was to begin the process of restoring water quality in the James River - Richmond impaired stream segments.

In fulfilling the state's requirement for the development of a TMDL IP, a framework has been established for reducing *E. coli* levels and achieving the water quality goals for the James River - Richmond impaired segments for which TMDL allocations were developed. With successful completion of the IP, Virginia will be well on the way to restoring the impaired waters and enhancing the value of this important resource. Additionally, development of an approved IP will improve the localities' chances for obtaining monetary assistance during implementation.

2. STATE AND FEDERAL REQUIREMENTS FOR IMPLEMENTATION PLANS

There are a number of state and federal requirements and recommendations for TMDL IPs. The goal of this chapter is to clearly define what they are and explicitly state if the "elements" are a required component of an approvable IP or are merely a recommended topic that should be covered in a thorough IP. This chapter has three sections that discuss a) the requirements outlined that must be met in order to produce an IP that is acceptable and approvable by the Commonwealth, b) the EPA recommended elements of IPs, and c) the required components of an IP in accordance with Section 319 guidance.

2.1 *State Requirements*

The TMDL IP is a requirement of Virginia's 1997 Water Quality Monitoring, Information, and Restoration Act (§62.1-44.19:4 through 19:8 of the Code of Virginia), or WQMIRA. WQMIRA directs the SWCB to "develop and implement a plan to achieve fully supporting status for impaired waters." In order for IPs to be approved by the Commonwealth, they must meet the requirements as outlined by WQMIRA. WQMIRA requires that IPs include the following:

- date of expected achievement of water quality objectives,
- measurable goals,
- necessary corrective actions, and
- associated costs, benefits, and environmental impact of addressing the impairment.

Virginia also has a guidance manual for the development of IPs on their website (antiquated link removed).

2.2 *Federal Recommendations*

Section 303(d) of the CWA and current EPA regulations do not require the development of implementation strategies. The EPA does, however, outline the minimum elements of an approvable IP in its 1999 *Guidance for Water Quality-Based Decisions: The TMDL Process.*

The listed elements include:

- a description of the implementation actions and management measures,
- a time line for implementing these measures,
- legal or regulatory controls,
- the time required to attain water quality standards, and
- a monitoring plan and milestones for attaining water quality standards.

It is strongly suggested that the EPA recommendations be addressed in the IP, in addition to the required components as described by WQMIRA.

2.3 *Requirements for Section 319 Fund Eligibility*

The EPA develops guidelines that describe the process and criteria used to award CWA Section 319 nonpoint source grants to States. The guidance is subject to revision and the most recent version should be considered for IP development. The "Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003" identifies the following nine elements that must be included in the IP to meet the 319 requirements:

1. Identify the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in the watershed-based plan;
2. Estimate the load reductions expected to achieve water quality standards;
3. Describe the NPS management measures that will need to be implemented to achieve the identified load reductions;
4. Estimate the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement the watershed-based plan.
5. Provide an information/education component that will be used to enhance public understanding of the project and encourage the public's participation in selecting, designing, and implementing NPS management measures;
6. Provide a schedule for implementing the NPS management measures identified in the watershed-based plan;
7. Describe interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented;
8. Identify a set of criteria for determining if loading reductions are being achieved and if progress is being made towards attaining water quality standards; if not, identify the criteria for determining if the watershed-based plan needs to be revised; and
9. Establish a monitoring component to evaluate the effectiveness of the implementation efforts.

3. REVIEW OF TMDL DEVELOPMENT

MapTech, Inc. developed *E. coli* bacteria TMDLs for the James River - Richmond watershed, which were completed in 2010. Tuckahoe Creek was a separate *E. coli* bacteria TMDL completed by DEQ in 2004. The TMDLs are posted on DEQ's website (antiquated link removed). Water quality monitoring and the *E. coli* load reductions called for in the TMDL studies were reviewed to determine the water quality goals and associated pollutant reductions that would need to be addressed through the development of the implementation plan.

3.1 Water Quality Modeling

In order to understand the implications of the load allocations determined during TMDL development, it is important to understand the modeling methods used in the analysis. The United States Geological Survey (USGS) Hydrologic Simulation Program - Fortran (HSPF) water quality model was used as the modeling framework to simulate hydrology and existing conditions and perform *E. coli* bacteria TMDL allocations in the James River - Richmond watershed. Seasonal variations in hydrology, climatic conditions, and watershed activities can be explicitly accounted for. The model can provide output every day over the simulation time period, therefore the *E. coli* geometric mean standard (126 cfu/100mL) was used to calculate the TMDLs and percent reductions needed by source.

The project watershed was divided into subwatersheds to facilitate the hydrology and bacterial modeling. Figures 3.1 and 3.2 below show the subwatershed numbering scheme and the impairments within the project area.

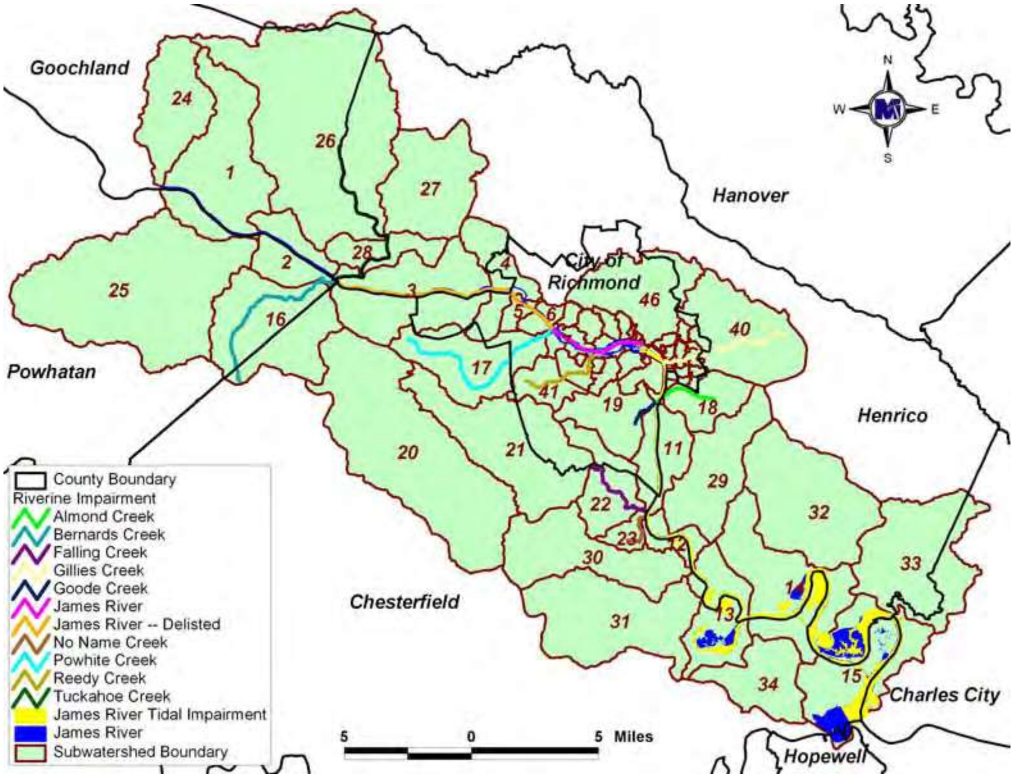

Figure 3.1 Subwatersheds used for modeling in the James River – Richmond TMDL project area.

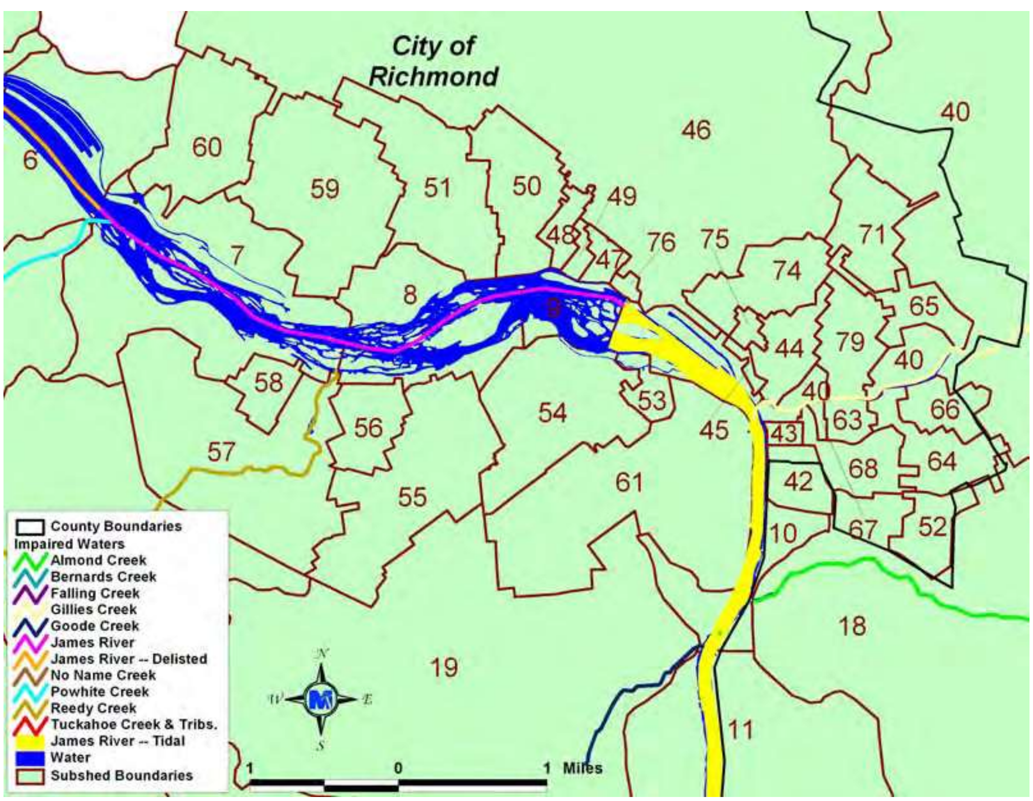

Figure 3.2 Subwatersheds used for modeling in the James River – Richmond TMDL project area zoomed into the Richmond area.

The Tuckahoe Creek TMDL was determined differently by using the load-duration approach where the average annual flow condition is multiplied by the single sample standard for *E. coli* (235 cfu/100mL) with the proper unit conversions. The percent reductions were determined by distributing the allowable annual bacteria load to each source using the Bacterial Source Tracking (BST) data.

3.1.1 *E. coli* Sources

Potential sources of *E. coli* considered in the TMDL development included both point source and nonpoint source contributions. VPDES permitted point sources for fecal bacteria control are shown in Table 3.1.

Table 3.1 VPDES permitted point sources for fecal bacteria control in James River - Richmond watershed and Tuckahoe Creek.

Permit	Receiving Stream(s)	Facility Name
VA0003077	James River (tidal)	DuPont Teijin Films
VA0024163	James River (not impaired)	Mary Mother of the Church Abbey WWTP
VA0024996	James River (tidal)	Falling Creek WWTP
VA0026557	James River (tidal)	Philip Morris USA Incorporated - Park 500
VA0027910	Trib to Little River to James River (not impaired)	Manakin Farms Inc Lagoon
VA0028622	James River (tidal)	Harbour East Village WWTP
VA0060194	Proctors Creek	Proctors Creek WWTP
VA0063177	James River (riverine and tidal), Gillie Creek, and Almond Creek	Richmond WWTP
VA0063649	Trib to Tuckahoe Creek	Richmond Country Club WWTP
VA0063690	James River (tidal)	Henrico County WWTP
VA0066494	UT to Proctors Creek	Youngs Mobile Home Park
VA0090727	Dutoy Creek	Dutoy Creek WWTP

At the time that this TMDL was created, permitted point discharges that may contain pathogens associated with fecal matter were required to maintain *E. coli* concentrations below 126 cfu/100 mL.

Both urban and rural nonpoint sources of *E. coli* bacteria were considered in water quality modeling. Sources included residential sewage treatment systems, land application of waste, livestock, wildlife, and domestic pets. Loads were represented either as land-based loads (where they were deposited on land and available for wash off during a rainfall event) or as direct loads (where they were directly deposited to the stream). Land-based nonpoint sources are represented as an accumulation of pollutants on land, where some portion is available for transport in runoff. The amount of accumulation and availability for transport vary with land use type and season. The model allows a maximum accumulation to be specified. The maximum accumulation was adjusted seasonally to account for changes in die-off rates, which are dependent on temperature and moisture conditions. Some nonpoint sources, rather than being land-based, are represented as being deposited directly to the stream (*e.g.,* animal defecation in stream, straight pipes). These sources are modeled similarly to point sources, as they do not require a runoff event for delivery to the stream.

This Implementation Plan is unique in that the Richmond City area contributes to a combined sewer system. During dry weather, runoff water and sewer waste are both sent to the Richmond WWTP and treated. During some rainfall events, the stormwater and sewage mixture that flows into the WWTP exceeds the treatment capacity causing both untreated sewage and stormwater to overflow into the James River (riverine), James River (tidal), Gillie Creek, and Almond Creek. The CSO locations are shown in Figure 3.3.

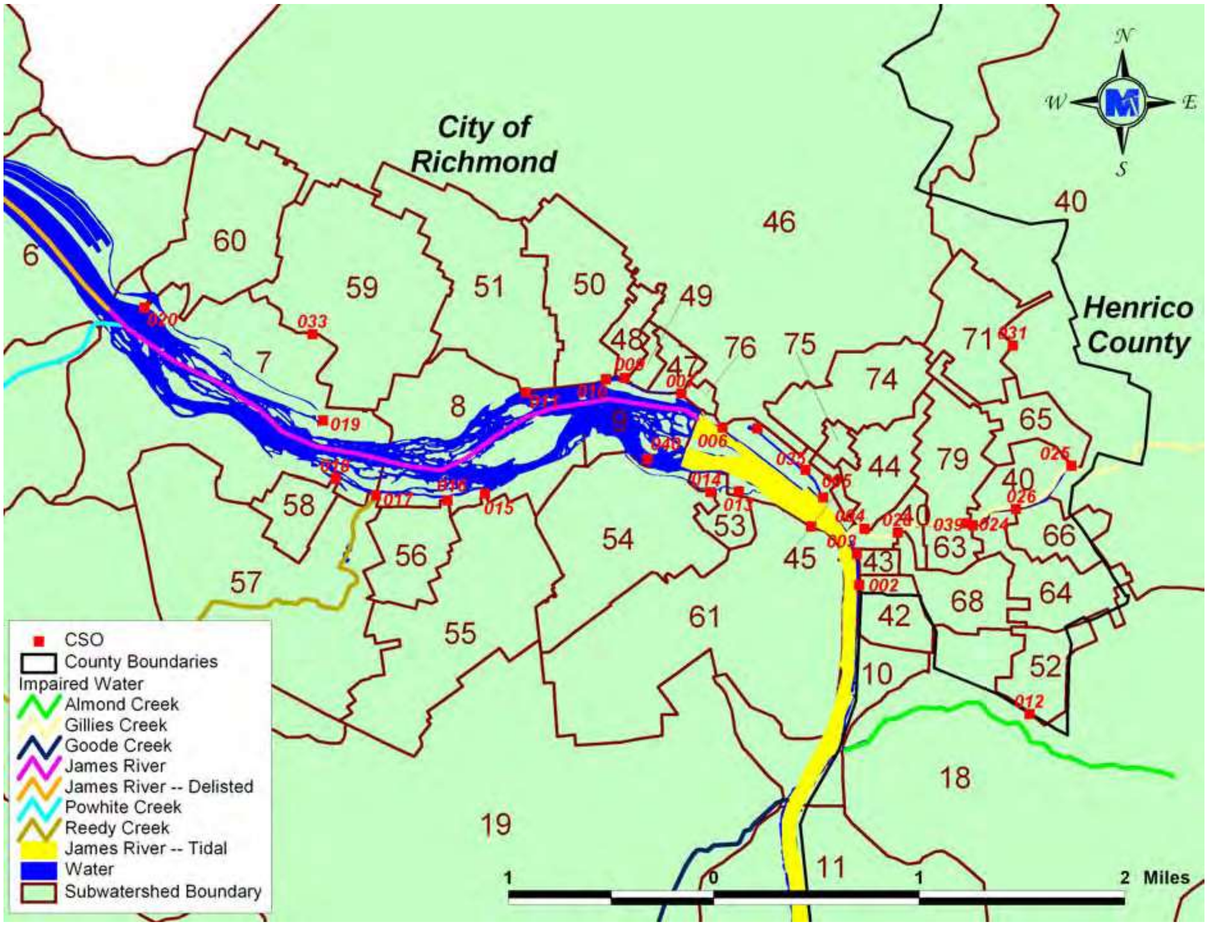

Figure 3.3 CSO locations within the James River – Richmond project area.

3.1.2 Remodeling of Reedy Creek

Bacteria concentration data collected in Reedy Creek during and after TMDL development were overall higher values than the data used to calibrate the model originally. This situation led to the need to recalibrate the Reedy Creek model. Below are graphs (Figures 3.4 – 3.7) and tables (Table 3.2 and 3.3) showing the recently collected data and the recalibration results.

Table 3.2 Most recent *E. coli* data for Reedy Creek.

Station	Start Date	End Date	#	Min	Max	Mean	Median	Standard Deviation	Violation %*
1	6/28/2003	6/4/2005	21	5	11,460	1,053	75	2,682	24%
2-RDD000.19	7/2/2003	6/12/2007	32	20	2,100	313	87	554	28%
2	6/28/2003	6/4/2005	21	5	9,540	840	180	2,109	33%
RC1	2/20/2010	10/16/2010	9	82	2,420	1,186	579	1,040	78%
2-RDD000.99	1/10/2006	12/5/2006	12	27	7,200	1,018	115	2,097	42%
3	6/28/2003	6/4/2005	21	5	13,340	1,461	240	3,076	52%
2-RDD001.57	1/10/2006	12/16/2008	25	5	9,000	2,008	1,960	2,138	88%
4	6/28/2003	3/19/2005	18	5	13,980	950	45	3,268	22%
RC3	2/20/2010	10/16/2010	9	166	2,420	1,478	1,300	857	89%
2-RDD002.61	1/10/2006	12/5/2006	11	13	9,000	1,074	170	2,658	45%
6	6/28/2003	6/4/2005	21	5	14,000	1,230	90	3,230	33%
RC4	2/20/2010	10/16/2010	9	48	2,420	510	199	771	44%
7	6/28/2003	6/4/2005	21	5	4,400	506	60	1,035	33%
2-RDD003.61	1/10/2006	12/5/2006	11	28	6,900	943	170	2,022	45%
8	6/28/2003	6/4/2005	21	25	7,760	1,245	400	2,124	57%

*Based on the SS standard (235 cfu/100mL *E. coli*)

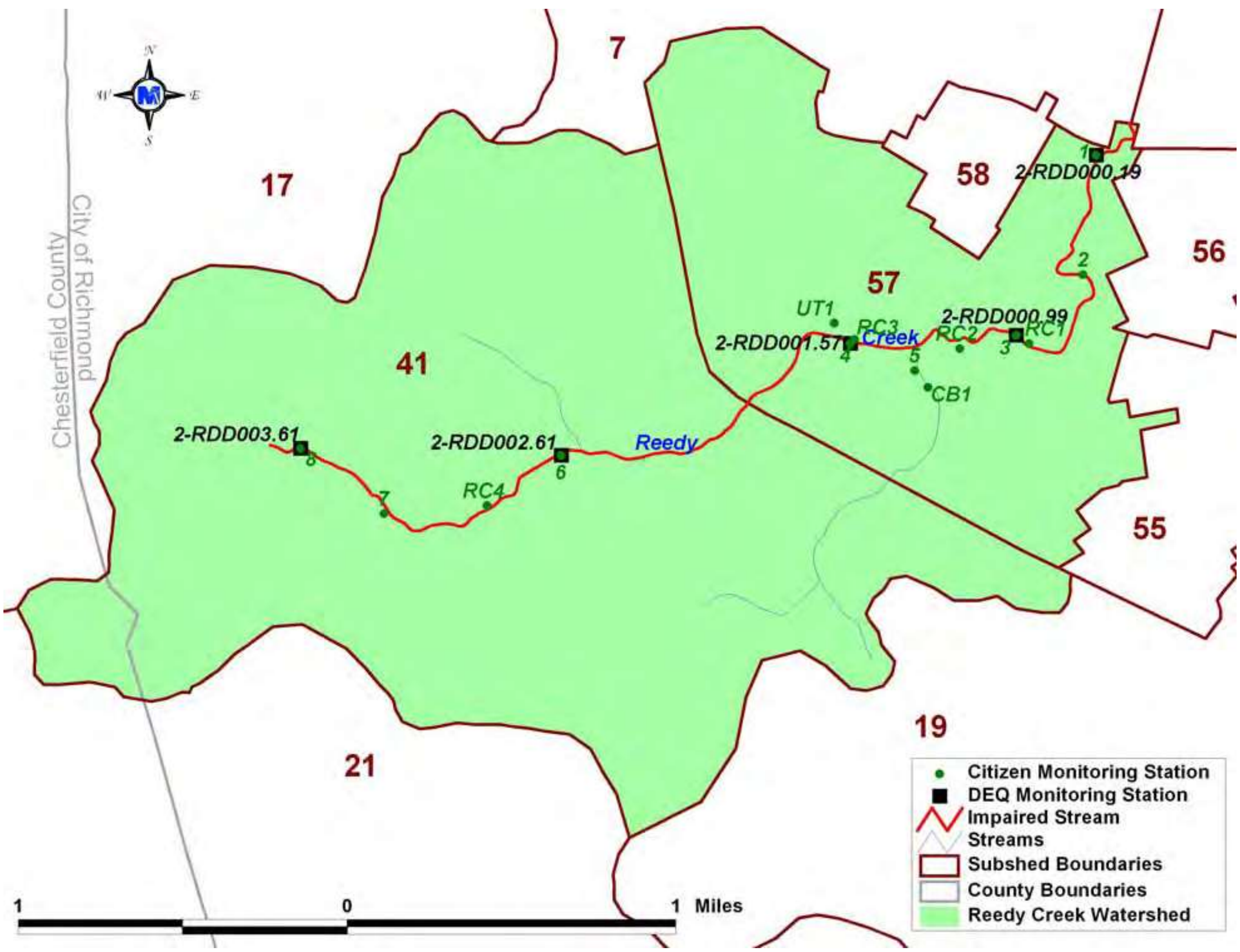

Figure 3.4 All monitoring stations in Reedy Creek.

Table 3.3 Comparison of modeled and observed *E. coli* recalibration results for Reedy Creek.

Stream	Subwatershed	Modeled *E. coli* 1/1/06 - 12/31/08			Monitored *E. coli* 1/1/06 - 12/31/08		
		n	Geometric Mean (cfu/100ml)	Violation %*	*n*	Geometric Mean (cfu/100ml)	Violation %*
Reedy Creek	41	1,095	2,146	72	25	1,004	88
Reedy Creek	57	1,095	175	36	28	135	36

*Based on the SS standard (235 cfu/100mL)

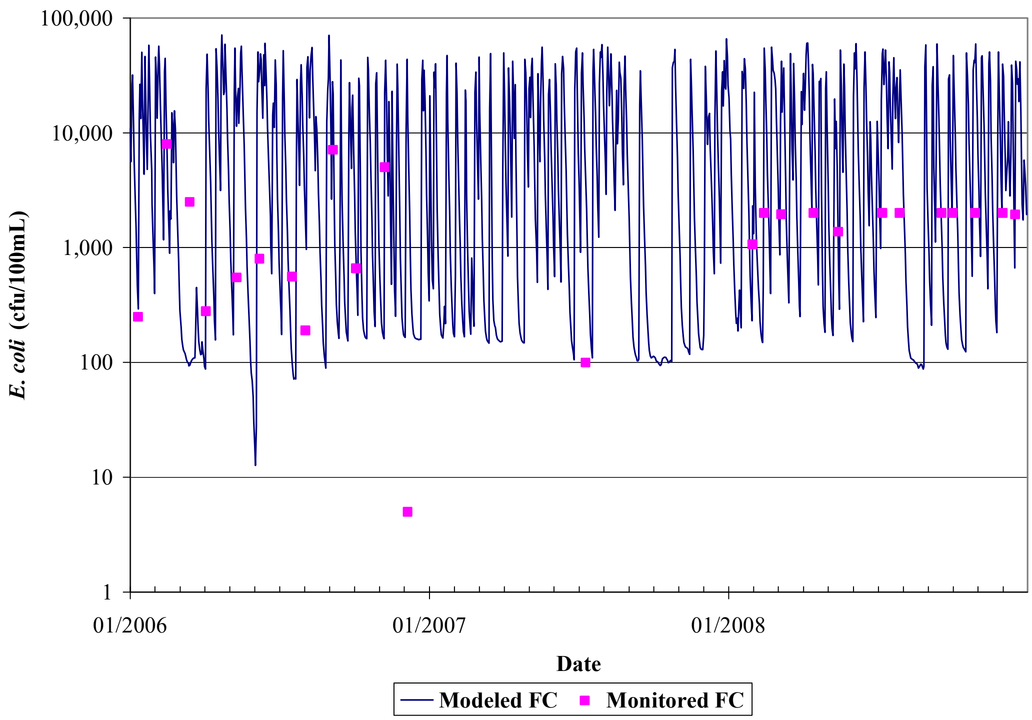

Figure 3.5 Reedy Creek recalibration at 2-RDD001.57 (subwatershed 41) from 1/1/2006 to 12/31/2008.

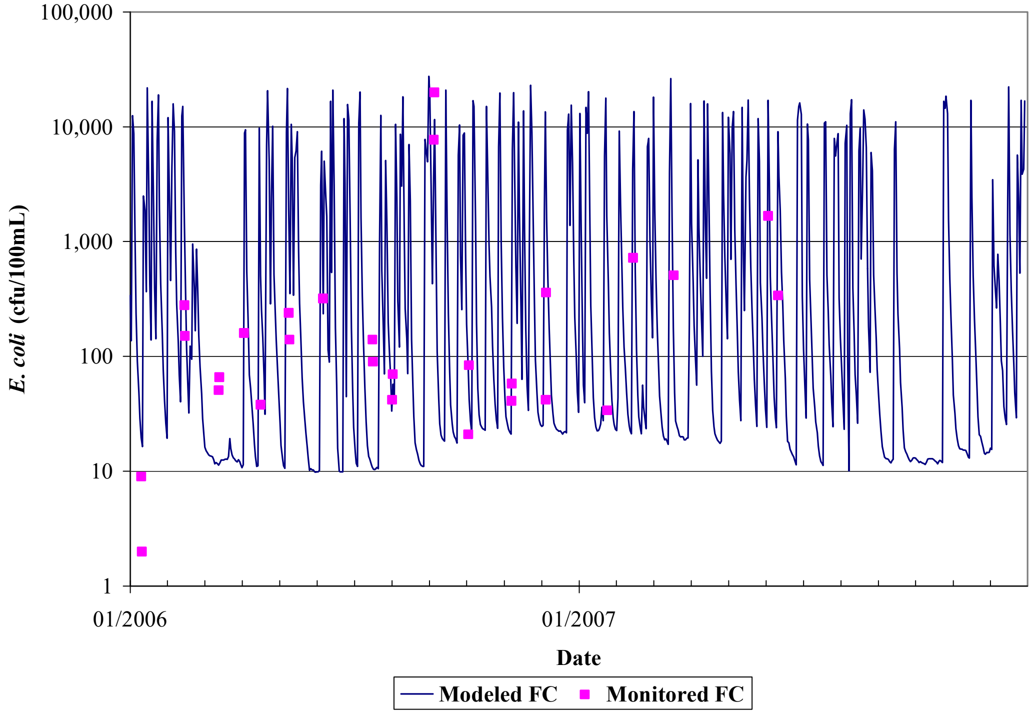

Figure 3.6 Reedy Creek recalibration at 2-RDD000.19 (subwatershed 57) from 1/1/2006 to 12/31/2008.

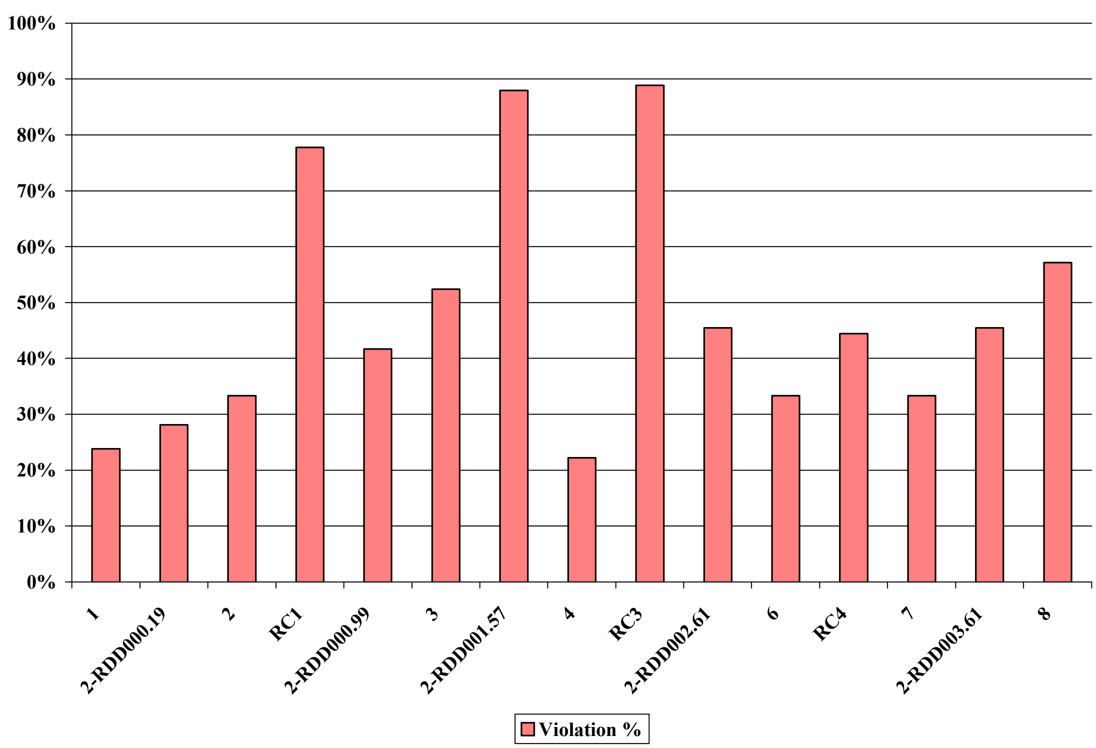

Figure 3.7 Reedy Creek % violation data from downstream (left) to upstream (right).

There are hot spots in the Reedy Creek data at stations RC3/2-RDD001.57 (End of 44th Street) and at RC1/2-RDD000.99 (100 yards downstream of Roanoke Ave). During implementation, engaging homeowners in between station 2-RDD002.61 (downstream of Erich Road) and station 2-RDD001.57 regarding BMPs they can install to reduce bacteria from their property should be a priority.

Using the recalibrated Reedy Creek model, additional allocation scenarios were run. Several model runs were made investigating scenarios that would meet the 30-day geometric mean goal of 126 cfu/100mL. Scenario #6 in Table 3.4 will be used to quantify the BMPs for Reedy Creek in this Implementation Plan. There were no reductions to livestock or agricultural bacteria loads as it was determined during the TMDL that there are no livestock or agricultural land uses in the watershed.

Table 3.4 Reallocation of Reedy Creek using the recalibrated model.

	Percent Reductions to Existing Bacteria Loads						
		Wildlife Land Based		**Agricultural Land Based**	**Human Direct**	**Human and Pet Land Based**	**VADEQ *E. coli* Standard percent violations**
Scenario	**Wildlife Direct**	**Barren, Commercial, Forest, OpenSpace, Wetland**	**Livestock Direct**	**Cropland, Pasture, LAX**	**Straight Pipes**	**LMIR**	**>126 GM**
1	0	0	0	0	0	0	100.00
2	0	0	0	0	100	0	89.58
3	0	0	0	0	100	99	33.33
4	99	0	0	0	100	99	33.33
5	99	99	0	0	100	99	8.33
6 – final for IP	**0**	**97**	**0**	**0**	**100**	**99.5**	**0.00**

3.1.3 *E. coli* Model Allocations

Several model runs were made investigating scenarios that would meet the 30-day geometric mean goal of 126 cfu/100mL. All upstream impairments were allocated before the allocation of downstream impairments was completed. The final bacteria reduction scenarios are shown in Table 3.5 including the final scenario for Reedy Creek after the remodeling effort. All final allocation scenarios call for a 100% reduction of direct human sources (straight pipes, non-permitted sewer overflows, leaking sewers). Alternative E refers to the preferred implementation of the City of Richmond's Phase III Combined Sewer Overflow (CSO) Long Term Control Plan (Greeley and Hanson, 2006 and Appendix C, Figure C.1).

Table 3.5 Final bacteria load reduction scenarios to meet the WQS for the James River – Richmond watershed and Tuckahoe Creek.

Impairment	Wildlife Direct*	Wildlife Land Based*	Livestock Direct	Agricultural Land Based	Human Direct	Human and Pet Land Based	City of Richmond CSO Program Project Plan
Almond Creek	0%	0%	91%	0%	100%	85%	Alternative E and a 52% reduction
Bernards Creek	0%	38%	99%	93%	100%	96%	NA
Falling Creek	0%	0%	0%	0%	100%	13%	NA
Gillie Creek	0%	0%	0%	0%	100%	94%	Alternative E and a 95% reduction
Goode Creek	0%	0%	0%	0%	100%	96%	NA
No Name Creek	0%	0%	0%	0%	100%	94.5%	NA
Powhite Creek	0%	0%	40%	0%	100%	86%	NA
Reedy Creek**	0%	97%	0%	0%	100%	99.5%	NA
James River (riverine)	0%	63%	96%	99%	100%	99%	Alternative E
James River (tidal)	0%	0%	0%	0%	100%	0%	Alternative E
Stream	**Wildlife ***		**Livestock**		**Human**	**Pet**	
Tuckahoe Creek***	88.91%		99%		99%	99%	

*Direct and land-based wildlife bacteria reductions will not be explicitly addressed by this implementation plan (see Section 1.2.2)
**The final scenario for Reedy Creek after the remodeling effort
*** The Tuckahoe Creek bacteria TMDL scenario was determined differently, using the load-duration approach and BST data

3.2 *Implications of the TMDL on Implementation Plan Development*

The major implication in the development of these TMDLs is that extreme reductions are required to achieve the water quality standard. All uncontrolled discharges, failing septic systems, leaking sewer lines, and non-permitted overflows must be identified and corrected; livestock must be excluded from streams, a majority of the urban/residential nonpoint bacteria sources must be reduced, and two streams require reductions to CSOs. However, there are subtler implications as well. Implicit in the requirement for 100% correction of uncontrolled discharges is the need to maintain all functional septic systems and sewer lines. There is also the need to maintain currently installed livestock exclusion fencing. This implementation plan is one option in which the bacteria reductions stated in the TMDL could be achieved.

Wildlife bacteria reductions will not be explicitly addressed by this implementation plan. All planning efforts will be directed at controlling anthropogenic sources. See Section 1.2.2 in this report for a discussion of regulatory issues regarding wildlife.

4. PUBLIC PARTICIPATION

Public participation was an integral part of the TMDL Implementation Plan development. Multiple meetings were held including public meetings, agricultural, residential, and urban working groups, and steering committee meetings. Table 4.1 shows all the meeting dates, types, locations and attendance. Appendix A contains all of the meeting minutes from working groups and the steering committee.

Achieving the goals of this IP (*i.e.*, improving water quality and removing these waters from the Section 303(d) list) is dependent on stakeholder participation – not only the local citizens who need agricultural control measures or residential waste treatment facilities, but also all stakeholders within watershed. It must be acknowledged first that there is a water quality problem, and changes must be made as needed in operations, programs, and legislation to address these pollutants. Local citizens can become involved by picking up after their pets, properly maintaining their septic systems, becoming water quality monitoring volunteers and volunteering to distribute information and educate others.

Table 4.1 Meetings held during the James River - Richmond TMDL IP development.

Date	Meeting Type	Location	Attendance
11/16/2010	First Public	Piedmont Regional Office, DEQ 4949A Cox Rd, Glen Allen, VA 23060	21
11/16/2010	First Ag Working Group	Piedmont Regional Office, DEQ	5
11/16/2010	First Res Working Group	Piedmont Regional Office, DEQ	7
11/16/2010	First Govt Working Group	Piedmont Regional Office, DEQ	10
12/13/2010	Second Ag Working Group	Richmond Waste Water Treatment Plant 1400 Brander St., Richmond, 23224	10
12/13/2010	Second Res Working Group	Richmond Waste Water Treatment Plant	13
12/9/2010	Second Govt Working Group	Piedmont Regional Office, DEQ	19
1/12/2010	First Steering Committee	Westover Hills Library 1408 Westover Hills Boulevard Richmond, VA 23225	18
1/24/2011	Third Ag Working Group	Westover Hills Library	10
1/24/2011	Third Res Working Group	Westover Hills Library	15
1/26/2011	Third Govt Working Group	Henrico Co. Administration Building	23
3/9/2011	Second Steering Committee	Piedmont Regional Office, DEQ	18
4/11/2011	Third Steering Committee	Westover Hills Library	17
5/18/2011	Final Public	DEQ Central Office	20

5. ASSESSMENT OF IMPLEMENTATION BMPS

An important element of the TMDL IP is the encouragement of voluntary compliance with implementation actions by local, state, and federal government agencies, business owners, and private citizens. In order to encourage voluntary implementation, information was obtained on the types of actions and program options that can achieve the IP goals in a practical and cost-effective manner.

5.1 *Identification of Control Measures*

Potential control measures or best management practices (BMPs), their associated costs and efficiencies were identified through review of the TMDL, input from Working Groups, and literature review. Control measures were assessed based on cost, water quality impacts, and stakeholder interest. Measures that can be promoted through existing programs were identified, as well as those that are not currently supported by existing programs. Some control measures were indicated or implied by the TMDL allocations, while others were selected through a process of stakeholder review and analysis of effectiveness in these watersheds.

The bacteria removal efficiencies used in this study to quantify BMPs are listed in Table 5.1. The control measures listed in Table 5.1 are divided into categories based on the method of load reduction. "Direct Reductions" are those that reduce the load of pollutant from a specific source to the stream itself or to the land. "Buffer" practices control pollutants through both land conversion and treatment of runoff from upland areas. "Runoff Treatment" measures are those that either capture and treat runoff (*e.g.*, retention ponds) or call for changes in land management, which alters the runoff potential of the land (*e.g.*, improved pasture management).

The BMP bacteria removal efficiencies shown in Table 5.1 are based on the experiments performed as noted in the applicable reference. It is understood that BMP performance varies based on storm events, climates, collection methods, laboratory methods and protocols, and various other factors, which leads to uncertainty in the results. When available the range of percent bacteria removed is shown with the values used in the modeling efforts of this project shown in parenthesis.

Table 5.1 Potential control measure efficiencies in removing bacteria.

Control Measure	Bacteria Removal Efficiency Value or Range Cited	Efficiency Used in IP Model	Reference	Unit	Cost per Unit
Direct Reduction Efficiency					
Streamside Fencing	100%	100%	1	System	$25,000
Corrected Straight-pipe	100%	100%	1	System	$8,000
Repaired Septic System	100%	100%	1	System	$3,500
Pet Waste Pick-Up Program	25%	25%	3	Station	$170
Pet Waste Composters	99%	99%	1	Composter	$50
Waste Storage Facilities	85%	85%	16	System	$10,000
Buffer Efficiency*					
Vegetated Buffer	94% - 99.9%	99%	12	Acre	$360
Runoff Treatment Efficiency					
Improved Pasture Management	50%	50%	4	Acre	$77
Loafing Lot Management.	60.8% - 64.3%	60%	15	System	$10,000
Manure Incorporation	90%	90%	2	Acre	$80
Wet Ponds	-6% - 99%	70%	6	Acre-Treated	$41,000
Rain Garden	70%	70%	5	Acre-Treated	$19,000
Bioretention Basins	90%	90%	4	Acre-Treated	$19,000
Submerged Gravel Wetland	78%	78%	7	Sq. Ft.	$5
Sand Filter	36% - 83%/65%	60%	8,9	Cu. Ft.	$600
Shallow Marsh	55% - 97%	78%	10	Acre	$60,500
Extended Detention Pond	48%	48%	13	Acre-Ft.	30,000
Infiltration Trench	90%	90%	14	Acre-Treated	$31,000
Conservation Tillage	61%	61%	2,17	Acre	$100
Street Sweeping	0.6% - 2%	2%	11	Mile	$35

*Buffer efficiencies shown here apply to runoff generated outside of the buffer area, but within a distance equal to twice the buffer width. Additional reductions result from the conversion of land from its existing condition to the buffer area.

1 Removal efficiency is defined by the practice.

2 Commonwealth of Virginia. 2005. Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the James River, Lynnhaven, and Poquoson Coastal Basins. Antiquated link removed. (Number of sampling events is not provided by the source.)

3 Swann, C. 1999. A survey of residential nutrient behaviors in the Chesapeake Bay. Widener Burrows, Inc. Chesapeake Bay Research Consortium. Center for Watershed Protection. Ellicott City, MD. 112pp. Antiquated link removed.

4 Hunt, W.F., J.T. Smith, and J.M. Hathaway. 2007. Nutrient, Metal, and bacteria removal by an urban bioretention area in Charlotte, NC. Journal of Environmental Engineering. (Number of sampling events is not provided by the source.)

5 Hunt, William F, Jonathan T Smith, and Jon Hathaway. City of Charlotte Pilot BMP Monitoring Program , Mal Marshall Bioretention Final Monitoring Report. City of Charlotte, 2007. (33 sampling events)

6 Center for Watershed Protection. 2007. National Pollutant Removal Performance Database Version 3. Antiquated link removed. (11 sampling events)

7 Vegetated Rock Filter Treats Stormwater Pollutants in Florida. Watershed Protection Techniques. Center for Watershed Protection. Spring 1996. Vol. 2(2):372-374. (150 sampling events)

8 Developments in Sand Filter Technology to Improve Stormwater Runoff Quality. Watershed Protection Techniques. Center for Watershed Protection. Summer 1994. Vol. 1(2): 47-54. (Number of sampling events is not provided by the source.)

9 Barrett, M. E., 2003. Performance, Cost, and Maintenance Requirements of Austin Sand Filters. DOI: 10.1061/(ASCE)0733-9496(2003)129:3(234). (Number of sampling events is not provided by the source.)

10 Center for Watershed Protection. 2007. National Pollutant Removal Performance Database Version 3. Antiquated link removed. (3 Sampling Events)

11 Zarriello, Phillip J., Robert F. Breault, and Peter K. Weiskel. Potential Effects of Structural Controls and Street Sweeping on Stormwater Loads to the Lower Charles River , Massachusetts. Northborough, Massachusetts, 2002. (Number of sampling events is not provided by the source.)

12 Tate, K. W., Atwill, E. R., Bartolome, J. W. & Nader, G. 2006 Significant Escherichia coli attenuation by vegetative buffers on annual grasslands. J. Environ. Qual. 35, 795–805. (27 sampling events on 48 plots)

13 Borden, R. C., J.L. Dorn, J.B. Stillman and S.K. Liehr. 1996. Draft Report. Evaluation of Ponds and Wetlands For Protection of Public Water Supplies. Water Resources Research Institute of the University of North Carolina. Department of Civil Engineering. North Carolina State University. Raleigh, North Carolina. (Number of sampling events is not provided by the source.)

14 Schueler, T.R., 1992. A Current Assessment of Urban Best Management Practices. Metropolitan Washington Council of Governments. (Number of sampling events is not provided by the source.)

15 Barnett, J. R., R. C. Warner, and C. T. Agouridis. "The effectiveness of a combination weep berm-grass filter riparian control system for reducing fecal bacteria and nutrients from grazed pastures." Web. (4 simulations conducted over 3 plots.)

16 Based on measurements of bacteria density as excreted and after storage.

17 Bacteria removal efficiency estimated based on sediment and nutrient removal efficiency.

It is recognized that there are BMPs not listed in Table 5.1 above that would have a positive impact on the water quality of the James River and tributaries. It is difficult to model the bacteria load reductions and the changes to hydrology that result from the installation of some BMPs. It is uncertain how to quantify bacteria removal and runoff retention of a BMP if bacteria removal efficiencies or hydrologic changes are unknown. For example, it is unknown how planting a tree will reduce the bacteria in a nearby stream; however, based on common knowledge, urban tree planting can enhance the environment by increasing shade, increasing transpiration, contributing to the beautification of a city, and benefiting air quality. Also some education practices were difficult to quantify, but would be beneficial additions to a Pet Waste Pick-up Program (explained more in Section 5.3.3). Therefore, based on Working Group members' suggestions, the BMPs in Table 5.2 should be promoted in the watershed as "Green Practices" that will benefit the surrounding environment.

The 'Difficulty of Installation/ Implementation' column was determined by working group members and best professional judgment using knowledge of costs, ease of installation, amount of maintenance needed, and engineering/design requirements.

Table 5.2 BMPs to promote in the James River – Richmond watershed.

Practice	Difficulty of Installation/ Implementation	Direct Waste or Land Use Treated
Agricultural BMPs:		
Dragging Pastures to Break up Cow Patties	Easy	Pasture
Pasture and Hayland Planting (NRCS 512)	Easy ($30 - $330 per acre)	Pasture and Hayland
Pet Waste BMPs:		
Education to Vet Clinics, SPCAs, Pounds, Shelters, and Hunt Clubs	Easy	Dog waste
Public Service Announcements	Medium	Dog waste
TV Commercials	Difficult ($)	Dog waste
Newspaper Articles	Easy	Dog waste
Residential/Urban BMPs:		
Urban Trees	Easy	Residential/Commercial
Upland Reforestation	Easy	Residential/Commercial
Bayscape	Medium	Residential/Commercial
French Drain	Medium	Residential
Dry Well	Medium	Residential
Level Spreader	Medium	Commercial
Dry Swale	Medium	Commercial
Wet Swale	Medium	Commercial
Filtering Practices	Medium	Residential/Commercial
Grass Channels	Easy	Residential/Commercial
Constructed Wetlands	Difficult	Residential/Commercial
Any Low Impact Development (LID) Practices	Medium /Difficult	Residential/Commercial in Non-CSO watersheds
Other Innovative Projects	Easy/ Medium	Any

5.2 Currently Installed BMPs

In an implementation plan it is important to acknowledge, and take into account, any BMPs and programs already in place that treat or prevent the pollutant of interest from reaching surface waters. In the James River – Richmond watershed, BMPs currently installed that treat or prevent bacteria from traveling to surface waters include: streamside fencing BMPs, failing septic repairs, pet waste pick-up stations, and riparian buffers. There are also many Low Impact Development (LID) control measures already installed within the watershed. This section will highlight each of these accomplishments. These BMPs will be taken into account in the "Quantification of Control Measures" section.

Agricultural BMPs

It is recognized that the Soil and Water Conservation Districts (SWCD) and Natural Resources Conservation Service (NRCS) have been working in these watersheds to establish agricultural Best Management Practices (BMPs) that are both cost-effective and beneficial to the farmer and the environment. The information in Table 5.3 was derived from the Department of Conservation and Recreation (DCR) Ag BMP database (antiquated link removed; see DCR website). Of all the BMPs in the database, those shown in Table 5.3 are the most efficient at prevention/removal of bacteria from agricultural land runoff. All of the Buffer Land and Streamside Fencing BMPs were installed in Norwood Creek (JM81) and Genito Creek/Dover Creek (JM82) drainage areas within the James River (riverine) watershed.

Table 5.3 Currently installed Agricultural BMPs within the James River – Richmond watershed study area that prevent/remove bacteria.

BMP name	DCR BMP Code	Units	# Units Installed	Average Acres Benefited	Average System Cost
Continuous No-till System	SL-15A	Acres	1,871.50	21.5	$2,106.17
CREP Riparian Forest Buffer	CP-22	Acres	33.5	6.7	$477.10
Grazing Land Protection	SL-6	Lin. Feet	17,397	36.5	$8,854.83
Permanent Veg. Cover on Cropland	SL-1	Acres	39.4	6.6	$1,144.03
Protective Cover for Specialty Crops	SL-8	Acres	2.9	2.9	$101.50
Reforest. of Erodible Crop/Pasture	FR-1	System	1	8	$2,400.00
Riparian Forest Buffer	CRFR-3	Acres	20.4	4.1	$3,434.04
Stream Protection	WP-2	Lin. Feet	600	2.4	$5,103.78

VDH Failing Septic System Corrections

Chesterfield, Powhatan and Henrico County Health Departments have documented their efforts in repairing and replacing failing septic systems. The values in Table 5.4 summarize the repairs/replacements in all three counties by subwatershed.

Table 5.4 The number of failing septic systems corrected in Chesterfield, Powhatan, and Henrico Counties shown by subwatershed.

Subwatershed	Impairment Drainage Area	# Failing Septic Systems Corrected
1	JR riverine	1
2	JR riverine	1
3	JR riverine	42
4	JR riverine	3
11	JR tidal	20
12	JR tidal	11
13	JR tidal	17
14	JR tidal	49
15	JR tidal	1
16	Bernards Creek	22
17	Powhite Creek	105
18	Almond Creek	30
20	Falling Creek	225
21	Falling Creek	99
22	Falling Creek	9
23	No Name Creek	12
25	JR riverine	62
26	Tuckahoe Creek	31
27	Tuckahoe Creek	16
28	Tuckahoe Creek	17
29	JR tidal	71
30	JR tidal	48
31	JR tidal	135
32	JR tidal	155
33	JR tidal	15
34	JR tidal	32
40	Gillie Creek	41
46	JR tidal	2

Existing Pet Waste Pick-Up Stations

The City of Richmond started a Dog Waste Pick-Up Program in the fall of 2010 (Appendix D). There are currently a total of 28 dog waste baggy stations installed in the City including 4 in Chimborazo Park, 15 in James River Park, 4 in Forest Hill Park and 1 station each at Meadow & Park, Morris & Floyd, Sheppard & Maplewood, Lake & Walker, and Broad & 36th Streets.

Ruff House Dog Park (at Rockwood Park on Hull Street Rd) is maintained currently by DoodyCalls. DoodyCalls is a company that will remove dog waste from residential yards, parks and commercial properties and will service pet-waste stations. They donated 800 pet waste bags for the two pet stations at Ruff House Dog Park (antiquated link removed; see DoodyCalls website).

Friends of Chesterfield's Riverfront: Chesterfield County Riparian Plantings

Friends of Chesterfield's Riverfront is a local, non-profit organization formed in 1997 as a result of the adoption of the Riverfront Plan by Chesterfield County. It is represented by community leaders and citizens interested in promoting and enhancing the Appomattox and James Rivers (antiquated link removed; see Chesterfield Riverfront website). The following list shows the riparian buffers planted within the James River – Richmond watershed study area to date. All of these buffers are within the Falling Creek impairment drainage area (in subwatersheds 20 and 21).

Falling Creek at Meadowbrook Apartments, March 2010:

Linear feet – 500
Buffer Width – 60 feet
Total square footage – 30,000
Cost - funded by a grant from the National Fish and Wildlife Foundation (Total cost: $10,092.49)

West Branch at the Palmore Tract, March 2010:

Linear feet – 1100 overall
Buffer width – 50 feet, south side of creek; 15 feet, north side of creek
Total Square Footage – 35,750
Cost - funded by a grant from the National Fish and Wildlife Foundation (Total cost: $10,092.49)

Pocoshock Creek at Twilight Lane, November 2005:

Linear Feet – 700
Buffer Width – 100 feet
Total Square Footage – 70,000
Total Cost: $6800

Henrico County Stream Buffer Projects

Henrico County has documented stream buffer projects completed and planned within the municipality. Those mentioned here will provide the most water quality benefit regarding lowering bacteria levels in streams and are within the James River watershed.

Jamestown Apartments Stream Restoration Project – 1400 feet of restoration with a 50 foot buffer on both sides of the stream on Unnamed Tributary to Cabin Branch.

Some projects that are planned but not yet installed include the Skipwith Elementary School Stream Restoration Project and the Nelson Property Stream Restoration Project. It is recommended that all stream buffer projects include at least a 35 foot stream buffer on both sides planted with hardy, native plants.

Street Sweeping

Pollutants that potentially can enter surface water through storm sewers, including sediment, debris, trash, road salt, chemicals, and trace metals can be minimized by street sweeping. Recent estimates are that the new vacuum assisted dry sweepers may achieve 50-88% overall reduction in the annual sediment loading from a residential street, depending on sweeping frequency (Bannerman, 1999). A benefit of high-efficiency street sweeping is that they capture pollutants before they are made soluble by rainwater (antiquated link removed). Street sweepers also make road surfaces less slippery in light rains, improve aesthetics by removing litter, and prevent clogging of inlets from leaves and debris. Street sweeping has the potential of removing bacteria that is attached to sediment, that has traveled to road ways via runoff, and from dog waste from urban pets and wildlife. Effective sweeping schedules (3 times per year: spring, summer, fall) and routine sweeper maintenance are suggested to optimize the efficiency of the practice at removing possible pollutants.

Currently the City of Richmond sweeps 22,000 lane miles per year.

Henrico County currently plans to sweep an average of 7,305 lane miles per year. Approximately 1/3 of this area is in the James River watershed (the other 2/3 drains to the Chickahominy River).

Green Urban BMPs and Stormwater BMPs

Greening Virginia's Capital

Virginia's Capitol Square is making some changes to how stormwater runoff is managed on the Capitol grounds, adjacent streets and nearby alleys. The DCR has partnered with the Department of General Services (DGS) and the City of Richmond to implement this project funded by the National Fish and Wildlife Foundation (antiquated link removed; see Green VA Capital website.

In September 2010, the 5th Street Green Alley was completed in the City of Richmond (in subwatershed 48). This 7,000 square feet section of pervious pavement drains approximately 1 acre of urban land allowing runoff to infiltrate into the underlying soil (Figure 5.1). Pervious pavement can reduce runoff from storms, eliminate puddles, lower local flooding, reduce ice hazards, and reduce urban heat. This site was chosen as the pilot project because of the numerous design and construction challenges it presented - a steep slope, several entrances, cobblestone with asphalt ramps, and underground utilities. If the construction was successful at this location, then installation of pervious pavement in other alleys would be easily achievable.

Figure 5.1 Pervious pavement installed in the 5th Street Alley in Richmond, VA.

The second alley to undergo resurfacing using pervious pavement will be the 12th Street alley between E. Main and E. Cary and 12th and 13th streets (antiquated link removed). It is scheduled for completion in July/August 2011. This project will drain approximately one acre of urban land. This is within subwatershed 46, which drains to CSO#006 and eventually the tidal James River.

The third alley undergoing construction of pervious pavement will be alley bounded by Tilden St. and Cleveland St. and Monument Ave. and W. Franklin Street. It is scheduled for completion in the summer of 2011. This project area is 0.27 acres and will drain 1.85 acre of urban land. This is within subwatershed 46, which drains to CSO#006 and eventually the tidal James River.

Other BMP plans include a rain garden installed on the bus loop, rain gardens installed along portions of 9th and 10th streets, a rain garden installed at the Bell Tower, pervious pavement installed to replace the steps leading down the hill from the Washington Equestrian Statue, and a pervious sidewalk installed by the front of the Edgar Allen Poe statue. The project overall can capture 15,000 gallons of rainwater.

Richmond's Vegetated Roof Accomplishments

The Effluent Filtration Building in Richmond's Wastewater Treatment Plant complex currently has a Vegetated Roof (Figure 5.2). This site is 5,420 square feet. A future Vegetated Roof is planned for the UV building and will be 1,737 square feet. This project will be completed in 2012. The buildings are in subwatershed 61, which drains to the tidal James River.

Figure 5.2 Vegetated Roof installed on the Richmond Wastewater Treatment Plant in Richmond, VA.

Virginia Commonwealth University (VCU) Green BMP Plans

VCU is currently planning to construct a Vegetated Roof on the Pollack Building (325 N. Harrison St.). This is within subwatershed 46 in the Shockoe Basin drainage area. The building is an estimated 24,780 square feet in area; all of this area may not be covered with vegetation. Other future green BMPs are a bayscape near the Trani Center for Life Sciences Building (1000 W. Cary St., an estimated area of 23,920 square feet) with future plans for zero-stormwater discharge from this facility. A rain garden outside the Grace E. Harris Hall (1015 Floyd Ave., an estimated area of 31,570 square feet) is also planned for the university. These buildings are both within subwatershed 51 that drains to CSO #011, and eventually into the riverine James River.

The university also has planned to install a 12,000 gallon cistern at the Cary Street Gym (subwatershed 51), a 2,500-square-foot bioretention area at East and Snead Halls (subwatershed 50), prefabricated retention basins at the Jefferson Street Parking Deck and Cary and Belvidere Student Housing (subwatershed 50), and oversized manholes and storm sewer lines to slow peak stormwater runoff at the Trani Center for Life Sciences and Gladding Residence Center III (23,920 gallons). All information can be found at (antiquated link removed; see VCU website).

The Science Museum of Virginia Green BMPs

The museum, housed in Richmond's former railroad depot, sits on 38 acres, 14.5 acres are concrete and buildings, including train sheds, the IMAX theater, planetarium, and a block-long parking lot.

Bayscape landscaping was put in place in 2009. An area between the museum's driveway and the parking lot in front of the Children's Museum (6,223 sq. ft.) was planted with native vegetation that can absorb stormwater runoff from the semi-circular driveway in front of the museum. By September 2010, the museum plans to transform the roof of the IMAX theater into a Vegetated Roof (~0.1 acre) with plants and vegetation around the dome to filter rain water and provide cooling insulation. The asphalt under 44 parking spaces in the center of the lot in front of the Children's Museum will be replaced with pervious pavers (~1 acre). Tree wells will be added to the landscaping around the main driveway. Bioretention basins will serve as a buffer between the parking lot and the sidewalk along W. Broad Street (~1 acre). A cistern will collect rainwater from the train shed canopies and that water will be used to irrigate an urban farming project behind the museum. The museum is also planning exhibits on rain barrels, how rainfall impacts the James River, what chemicals and pesticides do to the water and fish population, the cooling benefits of Vegetated Roofs, and other related LID practices (antiquated link removed). The museum is in subwatershed 46, which drains to CSO#006 and eventually the tidal James River.

Mosley Architect Building

The Mosley Architect Building features a green roof, porous concrete in the parking lot, low-flow toilets and waterless urinals, and other LID practices (antiquated link removed).
They used green building techniques to renovate a contaminated garage as long as a football field into its headquarters. The building is in subwatershed 46, which drains to CSO#006 and eventually the tidal James River.

Ruby Harvey Memorial Rain Garden

Planted in March 2010, the Ruby Harvey Memorial Rain Garden at the Second Presbyterian Church is in memory of a 4-year-old girl who attended preschool there. The garden put Second

Presbyterian in the forefront of local efforts to make construction and renovation friendly to the environment. The garden earned a "Clean River Award" in 2010 from Richmond as best small project for stormwater management. The garden absorbs water that drains from two downspouts of the 165-year-old church where it faces North Fifth Street. The rainwater flows into the 75-square-foot plot that curves along the opposite side of a brick wall from the renovated playground. (antiquated link removed). This rain garden is in subwatershed 46, which drains to CSO#006 and eventually the tidal James River.

SunTrust Building

The 11,800-square-foot Vegetated Roof was installed at SunTrust Bank's Mid-Atlantic Headquarters in August 2005 as Richmond's first public and Virginia's largest Vegetated Roof. The SunTrust Vegetated Roof was planted with a mixture of 7 varieties of succulent plants, including sedums, that will mature into a quilt-like carpet, flowering at different times and changing colors with the season.

Though initial upfront costs for Vegetated Roof construction are generally higher than typical roofs, these are offset by the valuable economic benefits gained, including increased roof longevity and building energy efficiency. The cost for a Vegetated Roof in Virginia ranges between approximately \$15-\$30/ft^2, as compared to typical roof construction at \$5-\$15/ft^2. The total cost of the SunTrust Vegetated Roof proved to be very economical at a cost of \$15.7/ft^2 (antiquated link removed; see Green Roofs website). This building is in subwatershed 46, which drains to CSO#006 and eventually the tidal James River.

VACO Building

The Virginia Association of Counties (VACO) building was renovated and now boasts a Vegetated Roof and low-flow plumbing fixtures. The building roof area is a total of 4,250 square feet; the Vegetated Roof is 3,000 square feet. The VACO building was given a gold certification by the Leadership in Energy and Environmental Design (antiquated link removed; see Virginia Association of Counties website). This building is in subwatershed 46, which drains to CSO#006 and eventually the tidal James River.

Stuart Court Building

The fire lane of the Stuart Court Building (1600 Monument Ave) was retro-fitted with reinforced grass. Grasspave2 porous pavement is a structure which provides incredible load bearing strength while protecting vegetation root systems from deadly compaction. High void spaces within the entire cross-section enable excellent root development, and storage capacity for rainfall from storm events. For example, a 13 inch cross-section (one inch Grasspave2 with sand and a 12 inch base course) can store 2.6 inches of water. Stormwater is slowed in movement through and across Grasspave2 surfaces, which deposits suspended sediment and increases time to discharge. This project covers 2,600 square feet and was completed in 2006 (antiquated link removed; see Invisible Structures website). This building is in subwatershed 46, which drains to CSO#006 and eventually the tidal James River.

Rocketts Landing Condo

Rocketts Landing is a new community along the James River and minutes from downtown Richmond. Vegetated roofs were selected not only for their aesthetic value, but also for their energy savings and overall life cycle cost. The vegetated roof with raised planting beds provides an additional outdoor living space in excess of 900 square feet per unit. The entire size is 3,840 square feet and was completed in 2007. The contractor was recently awarded the James River Green Building Council's Leadership Award (antiquated link removed; see Green Roofs website). This building is in subwatershed 42, which drains to CSO#002 and eventually the tidal James River.

Private Residence

A private residence in subwatershed 4 has a vegetated roof with 5,400 square feet. There are over 13,000 sedum plants. This area drains to the James River de-listed segment.

Henricopolis SWCD

Henricopolis SWCD has distributed 210 rain barrels from 2008-10. It is not known whether all were installed, are functioning, or are maintained properly. In 2011, they are planning four workshops on rain barrels where they will distribute 120 rain barrels. These may be in use in the James River watershed or the Chickahominy watershed.

Tredegar Iron Works Museum

The Tredegar Iron Works Museum has a bayscape draining approximately 2/3 of an acre. This facility is in subwatershed 50, which drains to CSO#010 and eventually the riverine James River.

Henrico County Green BMPs

Henrico County currently has many low impact development/green BMPs installed. Many of these retain, filter, and/or evapotranspire stormwater, which benefits the water quality of nearby streams. These BMPs include: 50/10 Basins, 50/10 – Underground, Baysaver, Bioretention Basins/Trenches, Extended Detention Basins, Filterra, Grassed Swales, Infiltration Basins/Trenches, Oil / Water Separators, Pond wetland, Retention Basins (wet ponds), Sand Filter, Stormtreat, Stormwater 360, Vegetated Filter Strip, and Vortech Units. All together these BMPs treat runoff from 1,991 acres of impervious area and from 2,750 acre of pervious land within the county. These BMPs are located within subwatersheds 3, 4, 11, 14, 18, 26, 27, 28, 29, 32, 40, 42, and 46. Of these subwatersheds, 42 and 46 are within CSO drainage areas, where these BMPs help mitigate stormwater that would otherwise contribute to overflows or be treated by the Richmond WWTP.

Chesterfield County Green BMPs

Chesterfield County has distributed 632 rain barrels through a workshop series since 2008.

5.3 *Quantification of Control Measures*

5.3.1 Agricultural BMPs

The allocations determined during the TMDL development dictate some of the control measures that should be employed during implementation. In order to meet the reductions in direct deposition from livestock, some form of stream exclusion is necessary. Fencing is the most obvious choice; however, the type of fencing, distance from the stream bank, and most appropriate management strategy for the fenced pasture are less obvious.

While it is recognized that farmers will want to minimize the cost of fencing and the amount of pasture lost, any fencing installed through the use of cost-share programs should follow established NRCS specifications and be located 35-ft from the stream bank, at a minimum, as is specified in existing Virginia cost-share programs.

An alternative water source will typically be required where pasture is fenced off from streams. The main criterion is that the system be dependable. Water systems alone (*i.e.,* with no streamside fencing) have been shown to reduce the amount of time cattle spend in the stream by as much as 50 to 80%. This is not a large enough reduction to meet the TMDL. It is recommended that all fencing, even that which is installed solely at the landowner's expense, be placed at least 35-ft from the stream. The inclusion of a buffer helps to reduce bacteria, as well as sediment and nutrient, loads in runoff. The incorporation of effective buffers could reduce the need for more costly control measures.

From an environmental perspective, the best management scenario would be to exclude livestock from the stream bank 100% of the time and establish permanent vegetation in the buffer area. This prevents livestock from eroding the stream bank, provides a buffer for capturing pollutants in runoff from the pasture, and establishes (with the growth of streamside vegetation) one of the foundations for healthy aquatic life. From a livestock-production perspective, the best management scenario is one that provides the greatest profit to the farmer. Obviously, taking land (even a small amount) out of production is contrary to that goal. However, a clean water source has been shown to improve milk production and weight gain. Clean water will also improve the health of animals (*e.g.,* cattle and horses) by decreasing the incidence of waterborne illnesses and exposure to swampy areas near streams. Additionally, intensive pasture management, which becomes possible with an alternative water source, has been shown to improve overall farm profitability and environmental impact. From a part-time farmer's perspective, the best management scenario is one that requires minimal input of time. This would seem to preclude intensive pasture management; however, those farmers who have adopted an intensive pasture-management system typically report that the additional management of the established system amounts to "opening a gate and getting out of the way" every couple of days. Additionally, the efficient use of the pasture often means that fewer supplemental feedings are necessary. Among both part-time and full-time farmers there are individuals who are hesitant to allow streamside vegetation to grow unrestricted because of aesthetic preferences or because they have spent a lifetime preventing this growth. However, given the reductions needed in pollutant (*i.e.*, fecal bacteria) delivery to the stream, a vegetated buffer will be needed. For planning purposes, it was assumed that a vegetated buffer would be established in conjunction with stream fencing.

5.3.1.1 *Livestock Exclusion BMPs*

To estimate fencing requirements, the stream network was overlaid with land use. Stream segments that flowed through or adjacent to land use areas that had a potential for supporting cattle (pasture) were identified. If the stream segment flowed through the pasture area, it was assumed that fencing was required on both sides of the stream, while if a stream segment flowed adjacent to the pasture area, it was assumed that fencing was required on only one side of the stream. Not every land-use area identified as pasture has livestock on it at any given point in time. However, it was originally assumed that all pasture areas have the potential for livestock access. This IP focuses on fencing along perennial streams. Maps of all potential streamside fencing required for the James River - Richmond watershed are shown in Figures 5.3 through 5.6. The maps are labeled “worst case fencing” because they do not account for currently installed fencing or any updates garnered from the working group meetings. An estimate of 201,527 feet of streamside fence required to exclude cattle from the streams was originally estimated for the watershed areas that required direct livestock reductions in the TMDL.

Only Bernards Creek, Powhite Creek, Almond Creek, Tuckahoe Creek, and the James River (riverine) impairments required reductions to agricultural bacteria sources in their respective TMDLs. Of these streams, Powhite Creek and Almond Creek required agricultural reductions only to direct livestock bacteria loads. All streamside fencing BMPs will be in Stage I of the IP as eliminating direct livestock bacteria loads is one of the most cost-effective BMPs. Chesterfield County, the local SWCD, and an independent survey of Powhite Creek watershed indicated there are no livestock present in the watershed; therefore, the fencing needs were given a “0” in Table 5.5.

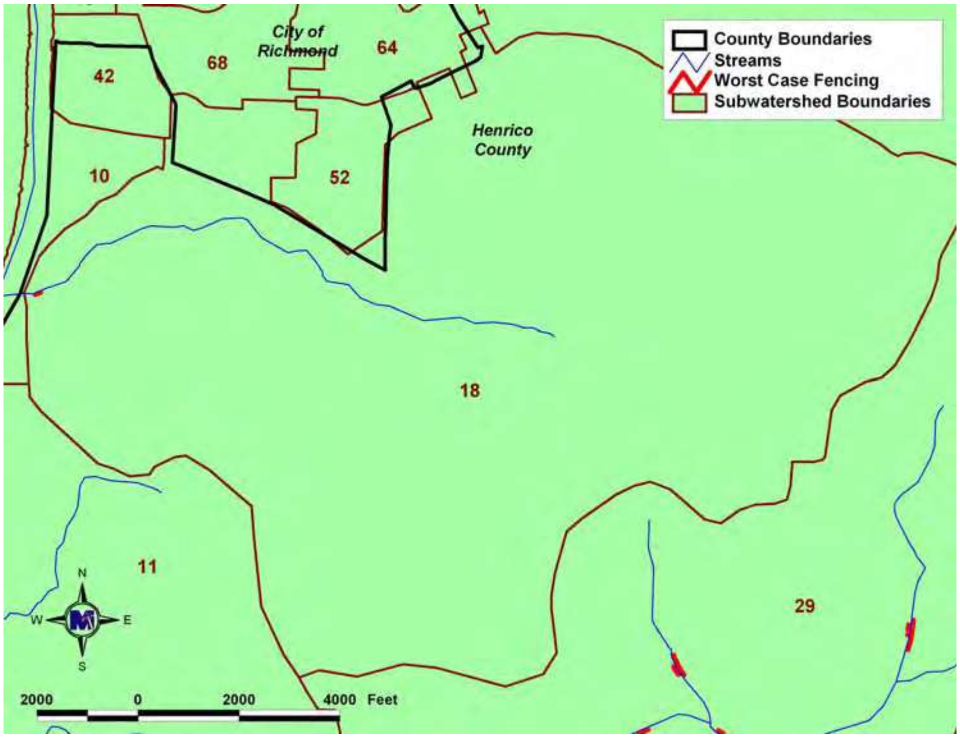

Figure 5.3 Original estimation of streamside fence needed in the Almond Creek subwatersheds (18,52).

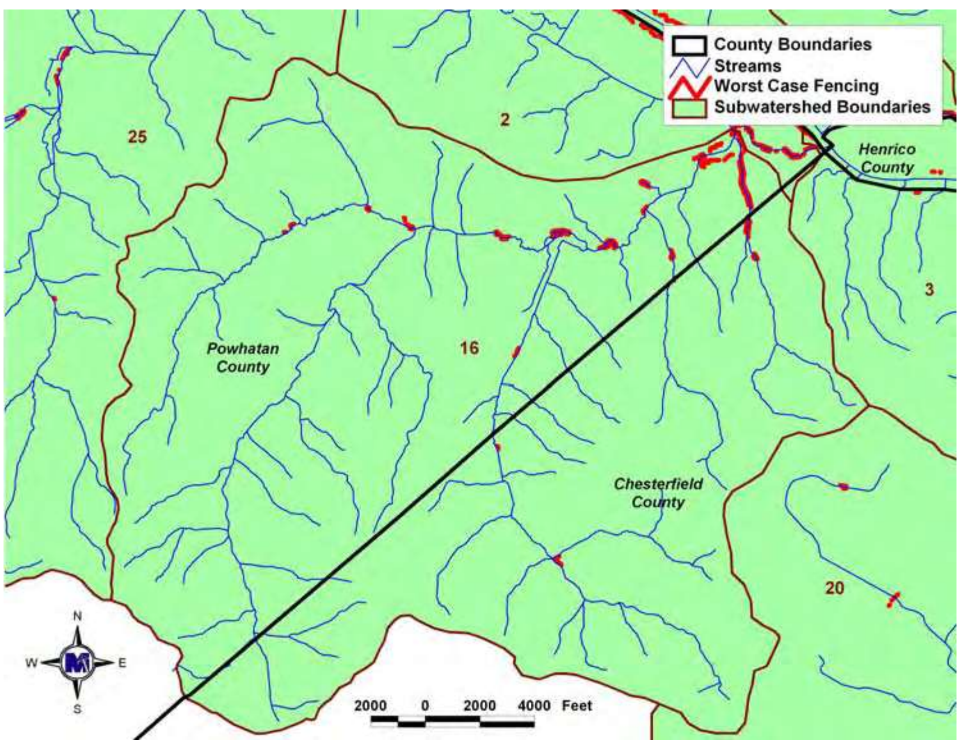

Figure 5.4 Original estimation of streamside fence needed in the Bernards Creek subwatershed (16).

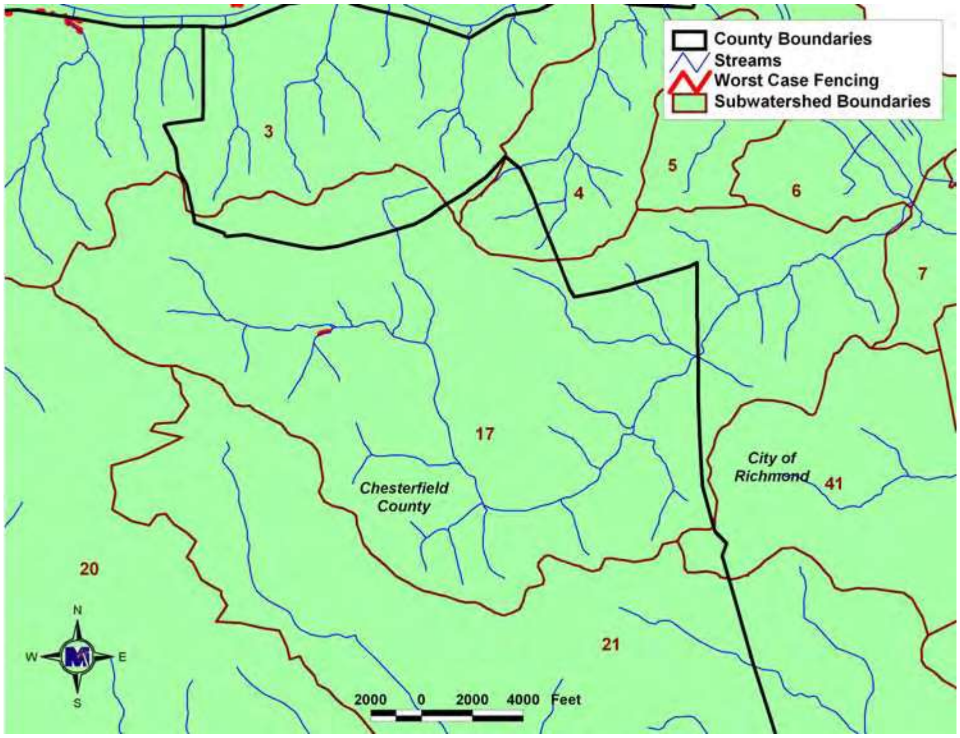

Figure 5.5 Original estimation of streamside fence needed in the Powhite Creek subwatershed (17).

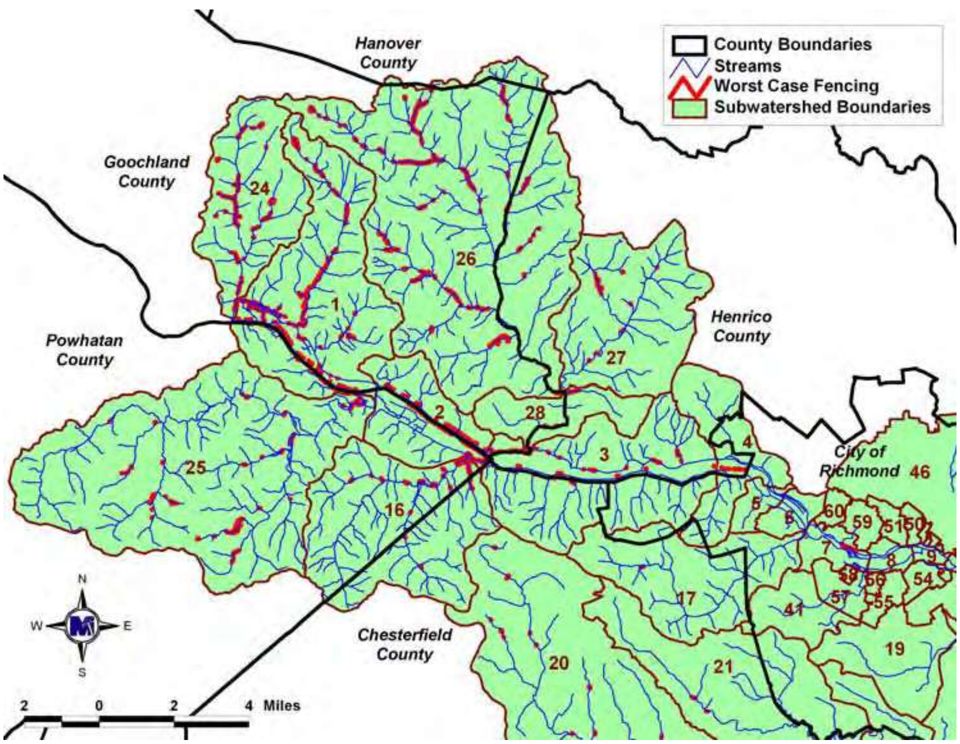

Figure 5.6 Original estimation of streamside fence needed in the James River (riverine) subwatersheds (1-9, 16, 17, 24-28, 41, 47-51, 55-60, 76).

The VADCR Agricultural BMP Database was utilized to determine typical characteristics (*e.g.,* streamside fencing length per practice) of full livestock exclusion systems leading to the quantification of the number of systems. The database was queried for information on Grazing Land Protection Systems (SL-6) and Streambank Protection Systems (WP-2T) installed in the watershed. There are 14 SL-6 systems and 1 WP-2 system installed in the study area. The average streamside fencing length for an SL-6 system was 1,243 feet and a WP-2T system was 600 feet in the James River - Richmond watershed. The average total cost for an SL-6 system was $8,855 and a WP-2T system was $5,104 in the James River - Richmond watershed.

New livestock exclusion systems are now available in TMDL IP watersheds:

- The Livestock Exclusion with Riparian Buffer (SL-6 and LE-1T) systems include streamside fencing, interior fencing, alternative watering system, and require a 35-ft buffer from the stream. The SL-6 practice offers a cost-share up to 75%, whereas the LE-1T practice offers a maximum of 85% and can only be installed in a TMDL IP watershed.
- The Livestock Exclusion with Reduced Set-Back (LE-2T) system is similar to the LE-1T, except that it only requires a 10-ft buffer and offers a maximum of 50% cost-share, and can only be installed in a TMDL IP watershed.
- The Stream Protection (WP-2T) system includes streamside fencing, hardened access/crossing options, requires a 35-ft buffer, and offers a 75% cost-share, and can only be installed in a TMDL IP watershed. In cases where a watering system already exists, a WP-2T system is a more appropriate choice.

The streamside fencing estimates were updated to exclude the fencing already installed in the watershed. In Table 5.5 'Cost-Share Fence Installed' was subtracted from 'Estimated Fence Length Needed' to calculate 'Total Fence Length Needed'. To establish the total number of full livestock exclusion systems necessary to achieve full implementation, systems were calculated by dividing the streamside fencing by the average streamside fencing length per system (1,243 ft). The breakdown of the number of exclusions systems that are expected to be SL-6/LE-1T to LE-2T was estimated as 90% to 10% with 1 WP-2T needed on a horse farm in the Bernards Creek watershed. Table 5.5 shows the livestock exclusion estimates for the James River – Richmond project area.

Table 5.5 Streamside Fencing Systems needed to exclude livestock in Almond, Bernards, Powhite, Tuckahoe and the James River (riverine) watersheds.

Stream Name	Estimated Fence Length Needed (ft)	Cost-Share Fence Installed (ft)**	Total Fence Length Needed (ft)	Fence Maintenance (ft)	LE-1T or SL-6 Systems Needed	LE-2T Systems Needed	WP-2T Systems Needed
Almond Creek	73	0	73	6	1	0	0
Bernards Creek	14,770	0	14,770	1,034	11	1	1
James River (riverine)*	118,004	17,997	100,007	7,000	73	8	0
Powhite Creek	550	0	0***	0	0	0	0
Tuckahoe Creek	68,130	0	68,130	4,770	50	5	0
Project Totals	**201,527**	**17,997**	**182,980**	**12,810**	**135**	**14**	**1**

*The values shown for James River (riverine) watershed do not include values for Bernards, Powhite and Tuckahoe
**Includes values from Section 5.2
***Chesterfield County, the SWCD, and an independent survey of Powhite watershed agree there are no livestock.

As is typical in agricultural components of IPs (recommended by DCR), 7% (12,809 feet) of all fencing length installed would need to be replaced during the length of the project.

5.3.1.2 *Land-Based BMPs*

In addition to direct livestock bacteria reductions, agricultural land-based bacteria reductions are also needed in the Bernards Creek, Tuckahoe Creek, and the James River (riverine) watersheds. One BMP identified was improved pasture management or Prescribed Grazing Plan and Implementation (NRCS 528). This BMP is considered an enhancement of a Livestock Exclusion system. Along with the infrastructure provided by a grazing land management system, Prescribed Grazing Plan and Implementation (NRCS 528) can include the following to be beneficial to reducing erosion and bacteria attached to sediment:

- Maintenance of an adequate forage height (suggested 3-inch minimum grass height) during growing season.
- Application of lime and fertilizer according to soil test results.
- Mowing of pastures to control woody vegetation.
- Distribution of manure through managed rotational grazing.

- Reseeding due to severe drought if necessary.

All agricultural land-based BMPs in Table 5.6 should be implemented to meet the target bacteria load in each impaired stream. The stage of the IP that each BMP will be placed in is noted in Table 5.6. Note that the James River (riverine) impairment watershed consists of an upstream area that is rural (Figure 5.6). The land-based BMP estimates were updated to exclude those already installed in the watershed.

Vegetated buffers were also included in the implementation strategy to filter runoff from cropland. These buffers will act as filters, trapping bacteria and sediment before it runs into the stream. When considering the effectiveness of a vegetated buffer in trapping pollutants, it is important to consider the area that will be draining to the buffer. For modeling purposes, it was assumed that a typical buffer would be capable of receiving and treating runoff from an area four times its width.

Table 5.6 Agricultural land-based BMPs for Bernards Creek, Tuckahoe Creek, and James River (riverine) watersheds.

Control Measure	Unit	Bernards Creek	James River (riverine)	Tuckahoe Creek	Stage of Project
Prescribed Grazing Plan and Implementation (NRCS 528)	Acres	400	2,342	41	Stage I
Waste Storage Facility (WP-4) – Beef	System	0	28	14	Stage II
Conservation Tillage – Crop (SL-15A)	Acre	45	88	119	Stage I
Waste Storage - Horse	System	16	104	56	Stage II
Reforestation of Erodible Cropland (FR-1)	Acre	42	112	152	Stage I
Reforestation of Erodible Pasture (FR-1)	Acre	79	462	8	Stage I
Riparian Buffers - Cropland	Acres	5	83	112	Stage I

5.3.2 Residential Waste Treatment BMPs

The allocations determined during the TMDL development dictate some of the control measures that should be employed during implementation. The 100% reduction in bacteria loads from straight pipes, failing septic systems, sewer leaks, and non-permitted sewer overflows is a preexisting legal requirement as well as a result of the TMDL. This reduction indicates that all illicit discharges (*i.e.*, straight pipes and cross-connections) in the watersheds should be corrected, and that all onsite sewage treatment systems (*e.g.,* septic systems and alternative waste treatment systems) and sewer infrastructure should be maintained in proper working condition. The local VDH is the regulatory agency in charge of septic system and alternative system maintenance (Section 7.6.5). Stream walks, watershed tours, home-to-home surveys, and public education are possible ways to improve the current method of straight pipe and failing septic system identification.

Correction of sewer overflows and leaks is an ongoing effort of the entities charged with the maintenance and operation of these systems. The options identified for correcting illicit discharges and failing septic systems included: repair of an existing septic system, installation of a septic system, installation of an alternative waste treatment system, and sewer hook-up.

All straight pipes and failing septic systems should be identified and corrected during implementation since a 100% load reduction from these sources was deemed necessary to meet the TMDL goals. Table 5.7 shows the number of failing septic systems and straight pipes estimated for each subwatershed from the TMDL. Also the number of failing septic systems corrected is shown with the resulting number of failing septic systems still in each watershed. These corrections are documented in Section 5.2.

Table 5.7 Estimated residential waste treatment systems in the James River - Richmond impairment drainage areas.

Impairment	Number of Homes (TMDL)	Houses with Standard Septic Systems (TMDL)	Potential Straight Pipes (TMDL)	Potential Failing Septic Systems (TMDL)	Failing Septic System Corrections (IP)*	Potential Failing Septic Systems (IP)
Almond Creek	3,262	296	2	36	30	6
Bernards Creek	2,266	1,201	3	43	22	21
Falling Creek	45,811	5,705	7	152	333	0
Gillie Creek	17,768	562	21	81	41	40
Goode Creek	7,758	74	2	4	0	4
James River (riverine)	26,353	5,251	53	505	109	396
James River (tidal)	52,927	9,593	60	469	556	68
No Name Creek	869	101	1	6	12	0

Powhite Creek	11,053	1,288	4	44	105	0
Reedy Creek	9,311	117	4	5	0	5
Tuckahoe Creek	36,455	2,482	60	274	64	210
Project Total	**213,833**	**26,670**	**217**	**1,619**	**1,272**	**750**

*Includes the corrections noted in Section 5.2

It was initially estimated that at least 5% of the failing septic systems would need new alternative treatment systems installed. Of the remaining failing septic systems, 70% would be corrected with conventional septic systems and 30% would be septic system repairs. Subwatersheds within Henrico County were updated so that 90% of the failing septic systems would require alternative treatment systems due to feedback from the Henrico VDH. It was also decided that all of the straight pipe corrections would be with standard septic systems. In July 2009, VDH began regulating the operation and maintenance of alternative onsite sewage systems.

Sewer connection estimates were calculated by Chesterfield County staff. County officials analyzed the number of residential homes with potential failing septic systems in older neighborhoods within 100 feet of existing sanitary sewer. Some of the mapping and analyses are shown in Appendix B. The values for sewer connections in Table 5.8 are only estimated for Chesterfield County areas. While homes with failing septic system that connect to public sewer in other jurisdictions would help with water quality improvement efforts, the analysis to pinpoint areas and numbers of potential homes was only performed by Chesterfield County. Other localities either chose not to provide this information or lacked the personnel needed to perform this analysis.

The numbers of septic tank pump-outs in the Plan were estimated as half of the total number of homes in Powhatan and Goochland Counties with septic systems. The other municipalities were not included in the IP because septic tank pump-outs are required within the Chesapeake Bay TMDL area, which includes Henrico, Chesterfield, and the City of Richmond.

All septic systems repairs, new septic systems, septic pump-outs, and alternative systems BMPs were placed in Stage I of the plans. The estimated sewer connections were placed in Stage I and Stage II according to the analysis done by the Chesterfield County officials.

Table 5.8 Estimated residential waste treatment system BMPs needed in the James River - Richmond impaired drainage areas.

Impairment	Estimated Septic Systems Repairs Needed	Estimated New Septic Systems Needed	Estimated Alternative Systems Needed	Estimated Sewer Connections Needed	Septic System Pump-Outs Needed*
Almond Creek	1	2	5	0	0
Bernards Creek	2	5	1	16	601
Falling Creek	0	0	0	7	0
Gillie Creek	7	18	36	0	0
Goode Creek	2	4	0	0	0
James River (riverine)	124	291	20	14	3579
James River (tidal)	0	0	0	128	0
No Name Creek	0	0	0	1	0
Powhite Creek	0	0	0	4	0
Reedy Creek	3	6	0	0	0
Tuckahoe Creek	64	150	56	0	1363
Project Total	**203**	**476**	**118**	**170**	**5,543**

*Only for homes on septic within Goochland and Powhatan Counties subwatersheds

5.3.3 Pet Waste Pick-up Program

All TMDL reduction scenarios (Table 3.5) required high reductions to residential land-based bacteria loads. Other than wildlife loads, the residential land use accumulates bacteria loads from human sources from failing septic systems (addressed in Section 5.3.2) and from domestic pets (dogs). Therefore, a pet waste pick-up program, or Community Pet Waste Education Program, is recommended to address dog waste in the project watershed. The Community Pet Waste Education Program was placed throughout Stage I and Stage II as it would be an on-going program. Instead of indicating that each impaired watershed should have a separate Community Pet Waste Education Program, it makes sense to create one that will cover the whole watershed.

There are several dog parks in the project watershed: Barker Field Dog Park (in Byrd Park in Richmond), Church Hill Dog Park (in Chimborazo Park in Richmond), Phideaux Field (at Forest Hill Presbyterian Church in Richmond), Ruff House Dog Park (in Rockwood Park in Chesterfield County) (antiquated link removed). Ruff House Dog Park already has maintained pet waste pick-up stations, as do other parks in the watershed (see

Section 5.2). The other parks should be inventoried for pet waste stations to ensure that users of the parks have the necessary amenities to clean up after their dogs.

Parks with the potential need for pet waste pick-up stations within the project watershed include those in Table 5.9. Pet waste stations should be installed in these parks to encourage people to clean up after their pet. The education program may also include a combination of educational materials distributed to pet owners, signage describing water quality concerns related to pet waste, and disposal bags and receptacles in areas of high pet traffic. Consideration should also be given to distributing pet waste information at camp grounds, picnic areas, school recreation spaces, community centers, "pocket parks" within the city, and tourist attractions. All future parks established within the watershed should have pet waste needs managed appropriately.

Education to Vet Clinics, SPCAs, Pounds, Shelters, and Hunt Clubs could be accomplished by giving these establishments educational materials that they could distribute to clients and post in their lobby/common area, as well as educating the caretakers of these establishments in the proper practices in pet waste cleanup for their kennels. Establishments that wash off dog kennels could install septic systems with retro-fit filters to prevent hair clogs (estimated cost of $4,500).

Municipalities could enact an ordinance to require proper disposal of pet waste and could gain income if it includes fines to people who do not pick up after their pet in common areas. The City of Richmond's code states: "Pet waste shall be disposed of as solid waste or sanitary sewage in a timely manner, to prevent the discharge thereof to the municipal separate storm sewer or waters of the state". The City of Richmond's pet waste disposal requirements in the city code can be found at: antiquated link removed; see Richmond VA municode website. The city of Richmond's pet waste pick-up program is shown in Appendix D.

Powhatan County has a restriction on the number of dogs allowed on a residentially zoned property. A maximum of four dogs are allowed before a Conditional Use Permit for a private kennel is required. Conditions are placed on a permit requiring the owner to dispose of pet waste on a regular basis. Commercial kennels in Powhatan include: County Line Kennels, Stay and Play, and Acres of Fun. Educational materials could be distributed to these establishments.

Articles in newspapers, Facebook, Twitter, radio spots, TV commercials, and public service announcements were all ideas put forth during working group meetings.

Chesterfield County has a restriction on the number of dogs per residence and citizens must apply for a Special Exception to keep more than 3 dogs. The Virginia Health Department will respond to pet waste complaints with a letter to the offender of the health risks and options on how to properly dispose of the pet waste.

This website could be used as a template or information source to create a website for the James River – Richmond IP area: antiquated link removed; see Harrisonburg VA website. More information is shown in Appendix E, which has a guide to setting up a pick-up program.

Discussions to initiate a comprehensive media campaign for pet-waste education of the surrounding watersheds have been proposed by the Alliance for the Chesapeake Bay and the Middle James Roundtable.

An additional Pet Waste Composter program is also proposed to help eliminate pet waste in homeowner's private yards and kennels. The program includes the distribution of pet waste composters to households with pets. The pet waste composter idea was not as readily accepted by the working groups, so these were placed in Stage II of the plan.

Table 5.9 Parks with potential need for pet waste pick-up stations.

Park Name	Type	Municipality
Battery Dantzler Park	Passive Park	Chesterfield County
Chester Linear Park	Passive Park	Chesterfield County
Clarendon Park	Passive Park	Chesterfield County
Cogbill Park	Passive Park	Chesterfield County
Dutch Gap Conservation Area	Passive Park	Chesterfield County
Falling Creek Ironworks	Passive Park	Chesterfield County
Falling Creek Linear Park	Passive Park	Chesterfield County
Falling Creek Wayside Park	Passive Park	Chesterfield County
Fernbrook Park	Passive Park	Chesterfield County
Fort Stevens	Passive Park	Chesterfield County
Fort Wead	Passive Park	Chesterfield County
Henricus Historical Park	Passive Park	Chesterfield County
Robious Landing Park	Passive Park	Chesterfield County
Trampling Run Park	Passive Park	Chesterfield County
Warebottom Church Historical Park	Passive Park	Chesterfield County
Bandy Field	Multi-Use Park	City of Richmond
Beaufont Oaks	Passive Park	City of Richmond
Belle Isle	Multi-Use Park	City of Richmond
Brown's Island Park	Multi-Use Park	City of Richmond
Byrd Park	Multi-Use Park	City of Richmond
Canal Walk Plaza	Multi-Use Park	City of Richmond
Cannon Creek Nature Area/ North Section	Passive Park	City of Richmond
Cannonball Triangle Park	Passive Park	City of Richmond
Canoe Run Park	Multi-Use Park	City of Richmond
Chelsea Village	Multi-Use Park	City of Richmond
Crooked Branch Ravine Park	Passive Park	City of Richmond
Gillie Creek Park	Multi-Use Park	City of Richmond
Glenway Field	Passive Park	City of Richmond
Great Shiplock Park	Multi-Use Park	City of Richmond
Highland Park Plaza	Multi-Use Park	City of Richmond
Jefferson Park	Multi-Use Park	City of Richmond
Kanawha Plaza Park	Passive Park	City of Richmond
Lewis G Larus Park	Passive Park	City of Richmond
Libbie Hill Park	Passive Park	City of Richmond
Little John Park	Multi-Use Park	City of Richmond
Manchester Park	Passive Park	City of Richmond
Maymont Park	Multi-Use Park	City of Richmond
Monroe Park	Passive Park	City of Richmond
Oregon Hill Linear Park	Passive Park	City of Richmond
Pocosham Park	Multi-Use Park	City of Richmond
Pollard Park	Multi-Use Park	City of Richmond
Powhite Park	Multi-Use Park	City of Richmond
Taylor's Hill Park	Passive Park	City of Richmond
Wayside Spring Park	Passive Park	City of Richmond
Deep Bottom Park	Passive Park	Henrico County
Deep Run Park	Passive Park	Henrico County
Hidden Creek Park	Passive Park	Henrico County
Highland Gardens Park	Passive Park	Henrico County
Osborne Park	Passive Park	Henrico County
Roslyn Hills Park	Passive Park	Henrico County
Short Pump Park	Multi-Use Park	Henrico County
Westham Park	Passive Park	Henrico County

5.3.4 Residential/Urban BMPs

Dog waste is the predominate source of bacteria in a residential/urban landscape once all failing septic systems, straight pipes, sewer leaks, and non-permitted sewer overflows are corrected. However, the documented bacteria removal efficiency of a pet waste pick-up program is not enough reduction to meet the TMDL bacteria goals for most of the impaired stream segments. Therefore, other BMPs were needed that treat runoff and remove bacteria from runoff waters. Stakeholders acknowledge the inherent difficulties involved in implementation of Residential / Urban BMPs in limited urban acreages.

The quantification of residential/urban BMPs to reduce bacteria in stormwater runoff was limited by the bacterial removal efficiency information available (Table 5.1) and by using the acreages of Commercial, Low/Medium Intensity Residential, and Open Space land uses as the maximum extent that each BMP could be installed in the watersheds. Due to these constraints, four residential/urban BMPs were quantified: Wet Ponds, Rain Gardens, Bioretention Facilities, and Infiltration Trenches.

After all agricultural BMPs, residential waste treatment BMPs, and a pet waste pick-up program were entered in the bacteria load model, the remaining bacteria reductions were obtained by adding more acres-treated by these residential/urban BMPs. All residential/urban BMPs in Table 5.10 should be implemented to meet the target bacteria load in each impaired stream. Similar values in Table 5.10 between watersheds are only a coincidence as, each BMP-scenario was determined for each impaired watershed individually.

Table 5.10 Residential/Urban BMPs (acres-treated) recommended to treat bacteria in runoff.

Stream	Wet Ponds	Rain Gardens	Bioretention Facilities	Infiltration Trench	Total acres-treated
Bernards Creek	59	59	59	59	236
Tuckahoe Creek	0	0	6,434	6,434	12,868
Powhite Creek	0	0	0	0	0
Reedy Creek	615	615	617	615	2,462
James River (riverine)	0	0	5,370	5,370	10,740
Gillie Creek	618	618	618	618	2,472
Almond Creek	0	0	0	0	0
Goode Creek	400	400	401	401	1,602
Falling Creek	0	0	0	0	0
No Name Creek	59	59	59	59	236
James River (tidal)	0	0	0	0	0

All of these BMPs were placed in Stage II of the plans. All of these BMPs are recommended to be installed at the Level 1 Design according to the Pollutant Removal Performance Database version 3, Appendix E (antiquated link removed).

Powhite Creek, Almond Creek, Falling Creek, and James River (tidal) watersheds did not require these BMPs to meet the overall bacteria reduction goals. However, these BMPs will benefit water quality and aesthetics if they are implemented, and stakeholders are encouraged to implement these BMPs if interested. In Almond Creek specifically, the installation of these BMPs may help reduce overflows from CSO#012 by slowing and preventing runoff from entering the CSO system.

5.3.5 Urban Stormwater Volume Reduction BMPs for CSO areas

The bacterial TMDL indicates that additional controls may be required in Gillie Creek and Almond Creek to lower bacteria loads from CSOs. The City of Richmond (COR) is developing a plan to evaluate controls needed to meet the WLAs in the bacterial TMDL, which may include conducting a Use Attainability Analysis (UAA) for the paved channel portion of Gillie Creek (the lower 1.7 miles). The City of Richmond's Long Term Control Plan (LTCP) is the guiding document for all CSO management (Appendix C). In addition to the benefits of the LTCP, this IP also examined new innovative technologies to reduce overflow volumes.

Urban Low Impact Development (LID) practices, which reduce runoff before it enters the combined sewer system, offer a potential supplement to traditional CSO mitigation measures. LID BMPs can be used to reduce stormwater volumes in urban landscapes and the associated combined-sewer overflows occurrences. There are several LID practices, applicable within the project area, which may be employed to reduce stormwater peak flows and volumes within urban landscapes, and thus reduce the likelihood and degree of CSOs. The practices analyzed here are: vegetated roofs, roof runoff detention systems, and permeable pavement. The designs and descriptions are consistent with The Virginia Stormwater BMP Clearinghouse (antiquated link removed; see Virginia Cooperative Extension website). All of the LID BMP recommendations were placed in Stage II of the plan because any additional CSO improvements made by the COR would occur after the completion of their current LTCP. Any interested private landowner, business, or industry is encouraged to pursue the installation of green LID practices at any time.

The quality of public surface waters is the responsibility of people utilizing the water, including landowners, stakeholders, and municipalities within the watershed. For the implementation of LID BMPs to be effective all parties should work together to promote and educate landowners regarding the benefits, costs, operation/maintenance, and design specifications of these practices.

Vegetated Roofs

Extensive Vegetated Roofs Level 2 Design, defined as having 2-6 inches of soil, can be installed on large flat rooftops like those of commercial and industrial buildings of adequate structural integrity. Extensive vegetated roofs have the potential to retain up to one inch of rainfall. A vegetated roof allows for the complete retention of smaller storms, as well as detention and attenuation of flows, in excess of its capacity. The modeling assumptions for the analyses below were (Casey Trees Endowment Fund and Limno-Tech, Inc., 2005):

- Considered all buildings (private and publicly owned) greater than 10,000 ft^2
- The buildings were structurally sound and capable of supporting the vegetated roof materials
- 80% of building footprint was available for vegetated roof application

- 3-4 inch deep extensive vegetated roof
- capability of retaining 1 inch of rainfall
- Used evapotranspiration rates to calculate "recharge" of storage capacity

Rainwater Harvesting - Roof Runoff Detention Systems

Roof runoff detention systems, such as rain barrels used for residences, capture rainwater from rooftops and keep it from flowing into the storm sewer system. The water can then be applied to lawns and gardens or allowed to slowly drain, ideally infiltrating into a pervious surface over time. Allowing the runoff detention system to slowly drain, guarantees that all the capacity is available for the next storm event. Each runoff detention system on its own represents a small reduction of stormwater volume to the combined-sewers, but collectively, on the scale of a neighborhood, can be substantial. Cisterns can also be installed which can hold larger volumes of water. The water can then be used for gray water activities such as toilet flushing. All the modeling assumptions for the analyses below were:

- Considered all buildings with 800 – 3,600 ft^2 footprint
- Storage and reuse with a cistern or other vessel (rainwater harvesting) (SW Design Spec 6)
- 50 gallon capacity for every 250 ft^2 of roof space for rain barrels
- 500 gallon capacity for cisterns
- 10% of capacity would be collected by cisterns
- detention system drains completely each day with a 90% efficiency in runoff captured

Permeable Pavement

Permeable (or porous or pervious) Pavement Level 2 Design, is an alternative to asphalt or concrete surfaces, which allows rainwater to infiltrate, thus reducing stormwater runoff. Pervious pavement can reduce runoff from storms, eliminate puddles, lower local flooding, reduce ice hazards, and reduce urban heat. There are various types of permeable pavement, including porous concrete, grid pavers, and reinforced turf grids. Permeable pavement is best suited in low-traffic areas, such as walkways and parking lots. The modeling assumptions for the analyses below were:

- Considered all parking lots
- Assumed 1 inch of rainfall infiltration, available each day

Bioretention Facilities

Bioretention Facilities Level 2 Design, are excavated areas backfilled with a sand/soil mixture, planted with native vegetation, and used to detain, filter, and infiltrate water. They can be located in median strips, parking lot islands, unused odd areas, and easements usually less than 2 acres in area. Implementation of bioretention basins could reduce runoff volume flowing into combined-sewers by detaining, evapotranspiring, and infiltrating water. A bioretention facility with an underdrain system is commonly referred to as a *Bioretention Filter*. A bioretention facility without an underdrain system or with a storage sump in the bottom is commonly referred to as a *Bioretention Basin*. Small-scale or Micro-Bioretention used on an individual residential lot is commonly referred to as a *Rain Garden*.

Analyses

The City of Richmond has made significant progress in eliminating and minimizing CSO outfalls. The City is involved in the ongoing process of continuing to reduce both the number of outfalls and frequency of overflow events, through sewer separation, interceptor replacement, green urban infrastructure installation, and increased underground storage. However, the TMDL determined that Almond Creek and Gillie Creek required reductions to CSO bacteria loads beyond the Alternative E plan of the City's LTCP (Appendix C).

A GIS analysis was performed to quantify the potential of decentralized approaches to stormwater management as alternatives to increased storage within the sewer system. This analysis focused on adding up the various types of impervious surfaces, within the combined sewer areas.

Table 5.11 shows the percent of the total annual rainfall that would be captured if the various LID practices were implemented on 100% of the available area within the combined sewer areas of the impairments' drainage area. The areas used to calculate the percentages are shown in Table 5.12, which includes the available acreage and percentage of total area on which each LID practice could be applied within the combined sewer areas of each impairment's drainage area.

Table 5.11 Rainfall removal expected with maximum LID practices installed in combined sewer areas as a percentage of all rainfall within the impairment drainage area.

100% Implementation: Annual Rainfall Retention/Detention from CSO areas					
Impairment	**Porous Pavement**	**Rain Barrels**	**Vegetated Roofs**	**Bioretention**	**Total**
Almond Creek*	5.3%	7.8%	0.2%	3.5%	17%
Gillie Creek*	6.6%	5.7%	0.8%	4.4%	17%
James River (riverine)*	1.6%	0.7%	0.2%	1.1%	3.6%
James River (tidal)*	4.4%	0.8%	0.9%	2.9%	9.0%

*acres in Table 5.11

It should be noted here that stormwater removal has the potential to increase bacteria concentrations in surface waters by decreasing dilution. These LID practices prevent runoff from areas with few bacteria sources, limiting the dilution effect from this relatively low bacteria-containing water. However, implementing LID practices in the non-CSO areas is recommended in some instances. For example, residential yards may contain high levels of bacteria from pets, and should roof runoff passes through this area quickly to a stream or storm drain, bacteria transport from the yard is highly likely. The varying degree to which these LID practices benefit the non-CSO areas makes their benefit to bacteria load reduction difficult to quantify. These BMPs should be promoted in the non-CSO watersheds, but are not quantified here.

By assuming that all water collected in rain barrels (50 gallons each) is applied to a pervious surface, infiltrating or evapotranspiring 90% of the water, effectively removing it from the system, the results in Table 5.13 are the maximum benefit to CSOs. Rain barrels may reduce the number of CSO events and overall gallons discharged directly to streams. A cistern analysis would yield similar results, although fewer cisterns would be needed as they typically hold 500 gallons or more. A cistern can collect runoff for use in gray water activities in the home (i.e.

toilets), whereas rain barrels are typically utilized to collect runoff for use on lawns and gardens in summer months.

Installing the maximum acres of vegetated roofs in the CSO areas will result in estimated reductions to CSOs shown in Table 5.14. Table 5.15 shows the maximum estimated benefit to CSOs if the maximum acreage of porous pavement is installed. The estimated maximum benefit of bioretention areas are shown in Table 5.16. All values show potential reduction in total gallons of CSO discharge to each stream for the entire TMDL modeling time period (1974 – 1978). These years were chosen by the City of Richmond as being representative of Richmond historical rainfall and were used to calculate the TMDLs for the James River and tributaries. Almond Creek and Gillie Creek show an estimated 12% and 13% reduction in overflow volumes, respectively, if maximum LID installation is completed. All reductions (Tables 5.13 to 5.16) were estimated beyond the reductions obtained when the City of Richmond's Alternative E plan (Appendix C) is implemented. Only Almond Creek and Gillie Creek required reductions to CSO bacteria loads beyond the LTCP Alternative E plan in their final TMDL scenarios.

Table 5.12 Area and percentage of drainage area available for LID stormwater practice implementation in the combined sewer areas only, by impairment watershed (cumulative).

Impairment	Drainage Area (DA) Within the CSO subwatersheds	Potential Roof Runoff Detention areas Buildings 800 - 3,600 ft2		Potential Vegetated Roof areas Buildings > 10,000 ft2		Potential Permeable Pavement areas Sidewalks, Parking Lots, etc.		Total acres that have potential for these SW BMPs All areas	
	(acres)**	Acres*	% of total DA	Acres*	% of total DA	Acres*	% of total DA	Acres*	% of total DA
Almond Creek	124	20	16%	0.46	0.3%	9	7.3%	29.46	24%
Gillie Creek	1,188	141	12%	14	0.9%	107	9.0%	262	22%
James River (riverine)	3,720	209	0.2%	121	0.1%	389	0.3%	719	19%
James River (tidal)	14,308	1,111	0.4%	733	0.2%	2,099	0.7%	3,943	28%

*Acres within combined sewer area which is available for LID stormwater practice implementation (cumulative)

**The cumulative drainage area within the CSO areas

Table 5.13 The number of days with CSOs and total gallons of CSOs with and without the maximum installation of rain barrels within the modeling time period (1974 – 1978).

		With Alternative E	With Alternative E	Estimated Maximum # Rain Barrels	With Alternative E and Maximum Rain Barrels	With Alternative E and Maximum Rain Barrels	% Reduction	% Reduction
Impairment	**CSOs Analyzed**	**Total gal**	**# CSO days**	**Number**	**Total gal**	**# CSO days**	**Total gal**	**# CSO days**
Almond Creek	12	1.29E+09	268	3,561	1.25E+09	217	2.9%	19%
Gillie Creek	4,24,26,25,31,39	8.19E+09	297	20,505	7.22E+09	271	11.9%	9%
James River (riverine)	7,10,11,15,16,18,19,20,33,40	2.46E+10	369	48,580	2.19E+10	305	10.8%	17%
James River (tidal)	5,6,14,34,35	1.33E+11	295	123,774	1.19E+11	145	10.4%	51%

Table 5.14 The number of days with CSOs and total gallons of CSOs with and without the maximum installation of vegetated roofs within the modeling time period (1974 – 1978).

		With Alternative E	With Alternative E	With Alternative E and Maximum Vegetated Roof	With Alternative E and Maximum Vegetated Roof	% Reduction	% Reduction
Impairment	**CSOs Analyzed**	**Total gal**	**# CSO days**	**Total gal**	**# CSO days**	**Total gal**	**# CSO days**
Almond Creek	12	1.29E+09	268	1.29E+09	268	0.04%	0%
Gillie Creek	4,24,26,25,31,39	8.19E+09	297	8.18E+09	292	0.2%	2%
James River (riverine)	7,10,11,15,16,18,19,20,33,40	2.46E+10	369	2.45E+10	348	0.5%	6%
James River (tidal)	5,6,14,34,35	1.33E+11	295	1.32E+11	249	0.2%	16%

Table 5.15 The number of days with CSOs and total gallons of CSOs with and without the maximum installation of permeable pavement within the modeling time period (1974 – 1978).

		With Alternative E	With Alternative E	With Alternative E and Maximum Porous Pavement	With Alternative E and Maximum Porous Pavement	% Reduction	% Reduction
Impairment	CSOs Analyzed	Total gal	# CSO days	Total gal	# CSO days	Total gal	# CSO days
Almond Creek	12	1.29E+09	268	1.27E+09	248	1.3%	7%
Gillie Creek	4,24,26,25,31,39	8.19E+09	297	7.98E+09	269	2.6%	9%
James River (riverine)	7,10,11,15,16,18,19,20,33,40	2.46E+10	369	2.38E+10	330	3.3%	11%
James River (tidal)	5,6,14,34,35	1.33E+11	295	1.31E+11	234	1.2%	21%

Table 5.16 The number of days with CSOs and total gallons of CSOs with and without the maximum installation of bioretention within the modeling time period (1974 – 1978).

		With Alternative E	With Alternative E	With Alternative E and Maximum Bioretention	With Alternative E and Maximum Bioretention	% Reduction	% Reduction
Impairment	CSOs Analyzed	Total gal	# CSO days	Total gal	# CSO days	Total gal	# CSO days
Almond	12	1.29E+09	268	1.28E+09	251	0.8%	6%
Gillie	4,24,26,25,31,39	8.19E+09	297	8.07E+09	270	1.5%	9%
James River (riverine)	7,10,11,15,16,18,19,20,33,40	2.46E+10	369	2.41E+10	333	2.0%	10%
James River (tidal)	5,6,14,34,35	1.33E+11	295	1.32E+11	236	0.7%	20%

5.4 *Technical Assistance and Education*

Stakeholders agree that technical assistance and education is key to getting people involved in implementation. There must be a proactive approach to contact farmers and residents to articulate exactly what the TMDL means to them and what practices will help meet the goal of improved water quality. The working groups recommended several education/outreach techniques, which could utilized during implementation. Outreach at County Fairs has been successful in other watersheds in the past. There are also opportunities for joint events with the Virginia Cooperative Extension Service. It may also be possible to involve the local Ruritan and Rotary clubs. A program should be established to educate septic and alternative waste system installers on the maintenance requirements expected of the homeowner. Many waste system installers are not aware of the maintenance required. In addition a Pet Waste Education program needs to be developed to educate pet owners about the importance of picking up after their dogs to protect water quality.

The following tasks associated with agricultural and residential programs were identified:

Agricultural Programs

1. Make contact with landowners in the watershed to make them aware of implementation goals, cost-share assistance, and voluntary options that are beneficial.
2. Provide technical assistance for agricultural programs (*e.g.,* survey, design, layout, and approval of installation).
3. Develop educational materials & programs.
4. Organize educational programs (*e.g.,* County Fair, presentations at joint VCE events or club events).
5. Distribute educational materials (*e.g.,* informational articles in FSA or Farm Bureau newsletters, local media).
6. Handle and track cost-share.
7. Assess and track progress toward BMP implementation goals.
8. Coordinate use of existing agricultural programs and suggest modifications where necessary.

Residential Programs

1. Identify straight-pipes and failing septic systems (*e.g.*, contact landowners in older homes, septic pump-out program).
2. Handle and track cost-share.
3. Develop educational materials & programs.

4. Organize educational programs (*e.g.*, demonstration septic pump-outs, nutrient management, pet waste control).
5. Distribute educational materials (*e.g.*, informational pamphlets on TMDL IP and on-site sewage disposal systems).
6. Assess progress toward implementation goals.

Staffing needs were quantified using full time equivalents (FTE), with one FTE being equal to one full-time staff member. It was determined that one agricultural FTE would be needed to provide technical assistance in the watersheds for the first ten years of implementation (Stage I). One residential/urban FTE and one urban FTE would be needed to provide technical assistance in the watersheds for the second ten years of implementation (Stage II). It is assumed that the staffing needs to implement the agricultural and residential waste treatment components of the plan will be carried out by existing personnel from the SWCDs and individual health departments. Discussions to initiate a comprehensive media campaign for pet-waste education of the surrounding watersheds have been proposed by the Alliance for the Chesapeake Bay and the Middle James Roundtable. The technical assistance for the urban stormwater BMP design and installation during Stage II would come from the municipality in which each BMP will be installed. Therefore, no technical assistance costs were added to the plan.

5.5 *Cost Analysis*

5.5.1 Agricultural BMPs

Streamside fencing through or adjacent to pasture with potential livestock access was translated and quantified into full livestock exclusion systems as described in Section 5.3.1.1. The cost of an LE-1T/SL-6 and a LE-2T system was estimated at $25,000 and the cost of a WP-2T system was estimated at $8,000.

The total cost of livestock exclusion systems includes not only the costs associated with fence installation, repair, and maintenance; but also the cost of taking land (*e.g.,* 35-ft buffer area) out of production. The cost of fence maintenance was identified as a deterrent to participation. Financial assistance possibilities for maintaining fences include an annual 25% tax credit for fence maintenance and conservation easements where the landowner is paid a percentage of the land value to leave it undisturbed. Additionally, the Streambank Protection (WP-2T) cost-share practice will be available as part of the implementation project and provides an upfront incentive payment to maintain stream fencing. The cost per foot for streamside fence maintenance is estimated at $3.50/ft.

The remaining costs outlined in Table 5.17 were determined through literature review, analysis of the Virginia Agricultural BMP Database, and discussion with stakeholders.

Table 5.17 Agricultural BMP costs for full implementation.

Agricultural BMPs	Unit	Cost per Unit	Total Units	Total Cost
Livestock Exclusion with Riparian Buffer (LE-1T, SL-6)	System	$25,000	135	$3,375,000
Livestock Exclusion with Reduced Set-Back (LE-2T)	System	$25,000	14	$350,000
Stream Protection (WP-2T)	System	$8,000	1	$8,000
Prescribed Grazing Plan and Implementation (NRCS 528)	Acre	$77	2,783	$214,291
Conservation Tillage – Cropland (SL-15A)	Acre	$100	252	$25,200
Reforestation of Erodible Cropland (FR-1)	Acre	$154	306	$47,124
Reforestation of Erodible Pasture (FR-1)	Acre	$154	549	$84,546
Riparian Buffers – Cropland	Acre	$360	200	$72,000
Streamside Fence Maintenance	Feet	$3.50	12,810	$44,835
Waste Storage Facility (WP-4) – Beef	System	$10,000	42	$420,000
Waste Storage – Horse	System	$3,000	176	$528,000
Total				**$5,168,996**

5.5.2 Residential Waste Treatment BMPs

The costs outlined in Table 5.18 were determined through past IP projects and discussion with stakeholders.

Table 5.18 Residential Waste Treatment BMPs costs for full implementation.

Residential Waste Treatment BMPs	Unit	Cost per Unit	Total Units	Total cost
Septic Systems Pump-outs (RB-1)	System	$450	5,543	$2,494,350
Septic System Repair (RB-3)	System	$3,500	203	$710,500
Septic System Installation/Replacement (RB-4)	System	$8,000	476	$3,808,000
Alternative Waste Treatment System Installation (RB-5)	System	$20,000	118	$2,360,000
Sewer Connection	System	$6,000	170	$1,020,000
Total				**$10,392,850**

5.5.3 Pet Waste Pick-up Program

The costs outlined in Table 5.19 were determined through online cost references. There were many more ideas from the Working Groups and the Steering Committee that were not included in this table, as the total costs were not known. As these aspects of the educational component of the pet waste pick-up program unfold, it is anticipated that the total cost of the program will be greater than the total shown in Table 5.19.

Table 5.19 Pet Waste Pick-up Program initial costs for full implementation.

Pet Waste Pick-up Program	Unit	Cost per Unit	Total Units	Total cost
Baggy, Sign and Waste Basket Station	Station	$170	56	$9,520
Bag Refills	Each	$0.10	6,132,000	$613,200
Mailings	Each	$0.36	322,048	$115,937
Pet Waste Composters	Each	$50	188	$9,400
Total				**$748,057**

5.5.4 Residential/Urban BMPs

The costs outlined in Table 5.20 were determined from the Pollutant Removal Performance Database version 3, Appendix E (antiquated link removed). Most of the residential/urban BMPs should be installed to treat/filter/infiltrate runoff from pervious area. These BMPs for Bernards Creek, Tuckahoe Creek, James River (riverine), Gillie Creek, Goode Creek, and No Name Creek are all recommended to treat previous runoff water. Reedy Creek watershed was the only one in which some of these BMPs are recommended to treat some runoff from impervious areas. similar values in Table 5.20 between BMPs are only a coincidence as, each BMP-scenario was determined for each impaired watershed individually.

Table 5.20 Residential/Urban BMP costs for full implementation.

Residential/Urban BMPs	Unit	Cost per Unit	Total Units	Total Cost
Wet Ponds Level 1 Design - Pervious	Acre-Treated	$14,000	1,500	$21,000,000
Rain Gardens Level 1 Design - Pervious	Acre-Treated	$19,000	1,500	$28,500,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	13,305	$252,795,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	13,305	$79,830,000
Wet Ponds Level 1 Design – Impervious	Acre-Treated	$69,000	251	$17,319,000
Rain Gardens Level 1 Design – Impervious	Acre-Treated	$94,000	251	$23,594,000
Bioretention Facilities Level 1 Design - Impervious	Acre-Treated	$94,000	253	$23,782,000
Infiltration Trench Level 1 Design - Impervious	Acre-Treated	$31,000	251	$7,781,000
Total				**$455,015,000**

5.5.5 Urban Stormwater Volume Reduction BMPs for CSO areas

Low Impact Development (LID) BMP costs were determined from literature review and information about projects within the watershed. In Table 5.21 the ‘Increased Storage within the CSO System’ BMP cost was based on the City of Richmond’s estimate of the total stormwater volume storage needed to meet the Gillie Creek TMDL (29.2MG) and cost ($300M), minus storage gained by estimated maximum amount of LID practices (3.5MG). The City of Richmond’s estimate of the total stormwater volume storage needed to meet the Almond Creek TMDL (2MG) and the cost ($12.6M), minus storage gained by estimated maximum amount of LID practices (0.4MG) was used. The final cost was extrapolated from a table sent with the TMDL comments.

Table 5.21 Costs for Urban Stormwater Volume Reduction BMPs for Almond Creek and Gillie Creek CSO areas for full implementation.

Urban Stormwater Volume Reduction BMPs for CSO areas	Unit	Cost per Unit	Total Units	Total Cost
Retro-fitted Vegetated Roofs Level 2 Design	Sq. Ft.	$30	630,061	$18,901,830
Rainwater Harvesting - Rain Barrels	Each (50gal)	$150	21,660	$3,248,925
Rainwater Harvesting – Cisterns*	Each (500gal)	$1,000	241	$241,000
Permeable Pavement Level 2 Design	Sq. Ft.	$24	5,052,960	$121,271,040
Increased Storage within the CSO System	Gallons		27,300,000	$269,160,000
Total				**$412,822,795**

* Determined as 10% of the total rainwater harvesting potential volume in each watershed

The James River (riverine) and James River (tidal) impairments did not require reductions to CSO bacteria loads in their respective TMDLs. However, stakeholders were interested in seeing the quantifications of the Urban Stormwater Volume Reduction BMPs in these areas. Table 5.22 was created to show the maximum potential that these BMPs could be installed within these CSO watersheds. The Reedy Creek portion refers to subwatershed #57 that drains to CSO#040 to James River (riverine). The estimated number of units and costs were include in Table 5.22 as a supplement for stakeholders to utilize, but were not included in the final IP BMP scenarios shown in Chapter 6.

Table 5.22 The LID BMPs already installed in the James River watershed and the maximum potential for future LID BMPs.

Potential BMPs	Unit	# Units Installed*	Cost per unit	Potential # Units	Potential Cost
****Reedy Creek CSO SW Volume Reduction BMPs:**					
Retro-fitted Vegetated Roofs Level 2 Design	Sq. Ft.	0	$30	278,784	$8,363,520
Rainwater Harvesting - Rain Barrels	Each (50 gal)	0	$150	11,166	$1,674,900
Rainwater Harvesting - Cisterns	Each (500 gal)	0	$1,000	124	$124,000
Permeable Pavement Level 2 Design	Sq. Ft.	0	$24	3,136,320	$75,271,680
Reedy Creek Potential Costs					*$85,434,100*
****James River (riverine) CSO SW Volume Reduction BMPs:**					
Retro-fitted Vegetated Roofs Level 2 Design	Sq. Ft.	0	$30	4,216,608	$126,498,240
Bioretention Facilities Level 2 Design	Sq. Ft.	2,500	$10,000	0	$0
Rainwater Harvesting - Rain Barrels	Each (50 gal)	0	$150	32,557	$4,883,550
Rainwater Harvesting - Cisterns	Each (500 gal)	1	$1,000	338	$338,000
Permeable Pavement Level 2 Design	Sq. Ft.	0	$24	16,944,840	$406,676,160
Rain Gardens/Bayscapes	Sq. Ft.	84,530	$0.44	0	$0
Increased Storage within the CSO System	gallons	23,920		0	$0
JR riverine Potential Costs					*$538,395,950*
****James River (tidal) CSO SW Volume Reduction BMPs:**					
Retro-fitted Vegetated Roofs Level 2 Design	Sq. Ft.	58,277	$30	20,780,827	$623,424,810
Bioretention Facilities Level 2 Design	Sq. Ft.	43,560	$10,000	0	$0
Rainwater Harvesting - Rain Barrels	Each (50 gal)	0	$150	111,397	$16,709,550
Rainwater Harvesting - Cisterns	Each (500 gal)	1	$1,000	1,237	$1,236,860
Permeable Pavement Level 2 Design	Sq. Ft.	177,306	$24	69,257,334	$1,662,176,016
Rain Gardens/Bayscapes	Sq. Ft.	8,223	$0.44	0	$0
Rain Water Harvesting	gallons	15,000		0	$0
JR tidal Potential Costs					*$2,303,547,236*

*Totals from BMPs described in Section 5.2
** The estimated number of units and costs were included in Table 5.22 as a supplement for stakeholders to utilize, but were not included in the final IP BMP scenarios shown in Chapter 6.

5.5.6 Technical Assistance

It will require at least $50,000 to support the salary, benefits, travel, training, and incidentals for one technical FTE. However, it is assumed that the staffing needs to implement the agricultural and residential waste treatment components of the plan will be carried out by existing personnel from the SWCDs and individual health departments. Discussions to initiate a comprehensive media campaign for pet-waste education of the surrounding watersheds have been proposed by the Alliance for the Chesapeake Bay and the Middle James Roundtable. The technical assistance for the urban stormwater BMP design and installation during Stage II would come from the municipality in which each BMP will be installed, or the contractor hired by private landowners. Therefore, no technical assistance costs were added to the plan.

5.6 *Benefit Analysis*

The primary benefit of implementation is cleaner waters in Virginia. Specifically, *E. coli* contamination in James River - Richmond will be reduced to meet water quality standards. Table 5.23 indicates the cost efficiencies of the various practices being proposed in this IP. This table shows the BMP in the analysis, the impairment values used, and the amount of bacteria reduced per $1000.

It is hard to gage the impact that reducing *E. coli* contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, because of the reductions required, the incidence of infection from *E. coli* sources through contact with surface waters should be reduced considerably. Reductions in bacteria and other pathogens through the implementation of the BMPs in this plan will ensure that recreation within the James River can continue safely. Also many of the BMPs recommended in this plan will help reduce erosion or filter sediments and nutrients from runoff water, which will help meet load reductions needed in the Chesapeake Bay TMDL.

Table 5.23 shows the cost efficiencies of BMPs by amount of bacteria removed per $1000. One impairment watershed did not need all BMPs within the plan so the watershed area used in the analysis is indicated in the second column. The Targeting Section 6.3 shows how these values can be used to target the BMPs in order of their efficiency of removing bacteria per their cost of installation.

Table 5.23 Cost efficiencies of control measures in units removed per $1,000.

BMPs	Impairment Values Used	Bacteria (cfu) Reduced per $1000
Agricultural:		
Livestock Exclusion Systems	JRriverine + Tuckahoe	7.38E+10
Prescribed Grazing Plan and Implementation (NRCS 528)	JRriverine + Tuckahoe	3.45E+12
Conservation Tillage – Cropland (SL-15A)	JRriverine + Tuckahoe	4.15E+12
Reforestation of Erodible Cropland (FR-1)	JRriverine + Tuckahoe	4.37E+12
Reforestation of Erodible Pasture (FR-1)	JRriverine + Tuckahoe	3.41E+12
Riparian Buffers – Cropland	JRriverine + Tuckahoe	3.62E+12
Waste Storage Facility (WP-4) – Beef	JRriverine + Tuckahoe	1.58E+12
Waste Storage – Horse	JRriverine + Tuckahoe	5.21E+11
Residential:		
Correction of Failing Septics	JRriverine + Tuckahoe	6.53E+10
Correction of Straight Pipes	JRriverine + Tuckahoe	2.27E+11
Pet Waste Pick-up Program	All	8.02E+12
Pet Waste Composters	JRriverine + Tuckahoe	1.19E+12
Wet Ponds Level 1 Design	Reedy	3.42E+10
Rain Gardens Level 1 Design	Reedy	2.32E+10
Bioretention Facilities Level 1 Design	JRriverine + Tuckahoe	1.61E+10
Infiltration Trench Level 1 Design	JRriverine + Tuckahoe	3.04E+10
CSO SW Volume Reduction BMPs:	Gillie + Almond	4.47E+08

An important objective of the implementation plan is to foster continued economic vitality and strength. This objective is based on the recognition that healthy waters improve economic opportunities for Virginians and a healthy economic base provides the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document will provide economic benefits to the community, as well as the expected environmental benefits. Specifically, alternative (clean) water sources, exclusion of cattle from streams, improved pasture management/prescribed grazing plan and implementation, and private sewage system maintenance will each provide economic benefits to land owners. Additionally, money spent by landowners and state agencies in the process of implementing this plan will stimulate the local economy.

5.6.1 Agricultural BMPs

A clean water source has been shown to improve weight gain and milk production in cattle. Fresh clean water is the primary nutrient for livestock with healthy cattle consuming, on a daily basis, close to 10% of their body weight during winter and 15% of their body weight in summer. Beef producers in several Virginia counties have reported weight gains in cattle after providing alternative water sources. Studies also show increased milk and butterfat production from dairy cattle ingesting water from a clean source (Zeckoski et al, 2007). Many livestock illnesses can be spread through contaminated water supplies. For instance, coccidia can be delivered through feed, water and haircoat contamination with manure (VCE, 2000). In addition, horses drinking from marshy areas or areas where wildlife or cattle carrying Leptospirosis have access tend to have an increased incidence of moonblindness associated with Leptospirosis infections (VCE, 1998b). A clean water source can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills.

In addition to reducing the likelihood of animals contracting waterborne illnesses by providing a clean water supply, streamside fencing excludes livestock from wet, swampy environments as are often found next to streams where cattle have regular access. Keeping cattle in clean, dry areas has been shown to reduce the occurrence of mastitis and foot rot. The VCE (1998a) reports that mastitis costs producers $100 per cow in reduced quantity and quality of milk produced. On a larger scale, mastitis costs the U.S. dairy industry about $1.7 billion to 2 billion annually or 11% of total U.S. milk production. While the spread of mastitis through a dairy herd can be reduced through proper sanitation of milking equipment, mastitis-causing bacteria can be harbored and spread in the environment where cattle have access to wet and dirty areas. Installation of streamside fencing and well managed loafing areas will reduce the amount of time that cattle have access to these areas.

Taking the opportunity to install an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 to 40 % and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70 to 80 % of the cost of growing or maintaining an animal, and pastures providing feed at a cost of 0.01 to 0.02 cents/lb of total digestible nutrients (TDN) compared to 0.04 to 0.06 cents/lb TDN for hay, increasing the amount of time that cattle are fed on pasture is clearly a financial benefit to producers (VCE, 1996). Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. In addition to reducing costs to producers, intensive pasture management can boost profits by allowing higher stocking rates and increasing the amount of gain per acre. Another benefit is that cattle are closely confined allowing for quicker examination and handling. In general, many of the agricultural BMPs recommended in this document will provide both environmental benefits and economic benefits to the farmer.

5.6.2 Residential BMPs

The residential programs will play an important role in improving water quality, since human waste can carry with it human viruses in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry. In terms of economic benefits to homeowners, an improved understanding of on-site sewage treatment systems, including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance, will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. The average septic system will last 20 to 25 years if properly maintained. Proper maintenance includes: knowing the location of the system components and protecting them (*e.g.,* not driving or parking on top of them), not planting trees where roots could damage the system, keeping hazardous chemicals out of the system, and pumping out the septic tank every 3 to 5 years. The cost of proper maintenance, as outlined here, is relatively inexpensive ($450) in comparison to repairing or replacing an entire system ($8000). Additionally, the repair/replacement and pump-out programs will benefit owners of private sewage (*e.g.,* septic) systems, particularly low-income homeowners, by sharing the cost of required maintenance.

In addition to the benefits to individual landowners, the economy of the local community will be stimulated through expenditures made during implementation, and the infusion of dollars from funding sources outside the impaired areas. Building contractors and material suppliers who deal with septic system pump-outs, private sewage system repair and installation, fencing, and other BMP components can expect to see an increase in business during implementation. Additionally, income from maintenance of these systems should continue long after implementation is complete. As will be discussed in greater detail in Chapter 8, a portion of the funding for implementation can be expected to come from state and federal sources. This portion of funding represents money that is new to the area and will stimulate the local economy. In general, implementation will provide not only environmental benefits to the community, but economic benefits as well, which, in turn, will allow for individual landowners to participate in implementation.

5.6.3 LID BMPs

The installation of Low Impact Development (LID) Best Management Practices (BMPs) can benefit water quality by filtering runoff, removing solids, oil, nutrients, bacteria, and other pollutants. Some LID BMPs increase infiltration, so runoff water has time to percolate through the soil matrix arriving at streams slower or even deep infiltrating to the ground water table. Other LID BMPs trap runoff water allowing plants to utilize this water and transpiring it into the air and/or allowing it to evaporate into the air. All LID BMPs are designed to make impervious surfaces act more like pervious ones, allowing stormwater to do what it most naturally does in a landscape.

Besides benefiting water quality as this project has emphasized, LID BMPs can also decrease urban heat island effects, benefit air quality, increase human health and moods, decrease the strain on the WWTP (lower incoming water volumes), decrease storm peak stream flows, increase shade, increase transpiration, and contribute to the beautification of a city.

6. MEASURABLE GOALS AND MILESTONES FOR ATTAINING WATER QUALITY STANDARDS

Given the scope of work involved with implementing these BMPs, full implementation and de-listing from the Virginia Section 305(b)/303(d) list is expected within 25 years. Described in this section are identification of milestones, a timeline for implementation, and targeting of control measures. The overall goal of the TMDL/IP program is that the impaired streams within this project meet the water quality standards.

6.1 *Milestones Identification*

The end goal of implementation is restored water quality of the impaired waters and subsequent de-listing of the waters from the Commonwealth of Virginia's Section 305(b)/303(d) list within 25 years. Progress toward this goal will be assessed during implementation through tracking of control measure installations and continued water quality monitoring. Agricultural control measures will be tracked through the Virginia Agricultural Cost-Share Program by DCR and the Soil and Water Conservation Districts (SWCDs). Residential waste treatment BMPs will be tracked by the local VDH. Urban/LID BMPs could be tracked through an online forum.

Following the idea of a staged implementation approach, resources and finances should be concentrated on the most cost-efficient control measures first. Concentrating on implementing livestock exclusion fencing, improving pasture management, residential waste treatment BMPs, and a community pet waste pick-up program within the ten years (Stage I) may provide the highest return on water quality improvement with the least cost to landowners. Stage II focuses on implementing residential and urban BMPs.

Implementation is anticipated to begin in September 2011, after which three milestones will be sought over the next 20 years (Table 6.1). The first milestone will be 10 years after implementation begins, whereby the most cost-efficient control measures will be installed, with significant reductions in bacteria anticipated. During and after Stage I implementation, the Steering Committee should evaluate water quality improvements and determine how to proceed to complete implementation. Stage II shows what is recommended for complete implementation. Based on completing Stage I and II, the final Stage III would be achieving the bacteria reductions required by the TMDL and this is anticipated by 2036.

Each impairment has a unique watershed, with a specific set of BMPs recommended to meet the water quality goals (Table 6.2 – 6.12). Each set of BMPs were determined using the bacteria loads from the TMDL HSPF model and the specific load reductions required. First the BMPs for the James River (riverine) watershed were determined, then the BMPs recommended for Tuckahoe Creek were calculated by area-weighting, finally these were subtracted from the whole so the final values shown for both watersheds were not double counted.

It was assumed that the benefits from the City of Richmond's LTCP Alternative E would be completed by the end of Stage II in the BMP scenarios below. The City of Richmond's (COR) Long Term Control Plan is the guiding document for all CSO management (Appendix C). In addition to the benefits of the LTCP, this IP also examined new innovative technologies to reduce overflow volumes. Urban LID practices, which reduce runoff volumes before entering the combined sewer system, offer a potential supplement to traditional CSO mitigation measures. All of the LID BMP recommendations were placed in Stage II of the plan.

Any combination of LID innovations and traditional CSO mitigation practices suggested for the Almond and Gillie watersheds that meet the TMDL/IP bacteria target load in both watersheds will greatly help to attain water quality standards. Regardless of the combination of LID and traditional CSO practices ultimately put in place, the IP recommends that the Residential Waste Treatment BMPs, Pet Waste Pick-Up Program, and Residential/Urban BMPs be utilized to their fullest extent.

An IP describes a scenario of BMPs which are aimed at achieving the pollutant reductions outlined in a TMDL study. The BMPs chosen in this IP are not the only types which stakeholders can choose to implement, rather they are merely options among many. DEQ does not intend for the IP to be a prescriptive document, rather, it is a tool that watershed stakeholders may use to reach watershed bacteria reduction goals. While the development of an IP is required by Virginia state law, all of the BMPs outlined in this IP document are voluntary practices. The implementation of BMPs will not be done by any one locality, city, non-profit organization, or government agency. Rather, all stakeholders including citizens, will be responsible for implementing BMPs in the watershed in order to reach the bacteria reduction goals outlined in the TMDL.

Table 6.1 All Stage I and Stage II implementation goals for the James River – Richmond impairments.

All BMP Needs	Unit	Cost per unit*	# Units	Total Cost**
STAGE I (1st 10 years) ***Subtotal $14,556,600***				
Agricultural BMPs:				
Livestock Exclusions (LE-1T and LE-2T)	System	$25,000	148	$3,700,000
Stream Protection (WP-2T)	System	$8,000	1	$8,000
Prescribed Grazing Plan and Implementation (NRCS 528)	Acre	$77	2,783	$214,291
Conservation Tillage – Cropland (SL-15A)	Acre	$100	252	$25,200
Reforestation of Erodible Cropland (FR-1)	Acre	$154	306	$47,124
Reforestation of Erodible Pasture (FR-1)	Acre	$154	549	$84,546
Riparian Buffers – Cropland	Acre	$360	200	$72,000
Residential Waste Treatment BMPs:				
Septic Systems Pump-outs (RB-1)	System	$450	5,543	$2,494,350
Septic System Repair (RB-3)	System	$3,500	206	$721,000
Septic System Installation/Replacement (RB-4)	System	$8,000	482	$3,856,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	118	$2,360,000
Sewer Connection	System	$6,000	100	$600,000
Pet Waste Pick-Up Program:				
Baggy, Sign and Waste Basket Station	Station	$170	56	$9,520
Bag Refills	Each	$0.10	3,066,000	$306,600
Mailings	Each	$0.36	161,024	$57,969
STAGE II (2nd 10 years) ***Subtotal $869,204,599***				
Agricultural BMPs:				
Streamside Fence Maintenance	Feet	$3.50	12,810	$44,835
Waste Storage Facility (WP-4) – Beef	System	$10,000	42	$420,000
Waste Storage – Horse	System	$3,000	176	$528,000
Pet Waste Pick-Up BMPs:				
Pet Waste Composters	Composter	$50	188	$9,400
Mailings	Each	$0.36	161,024	$57,969
Bag Refills	Each	$0.10	3,066,000	$306,600
Residential/Urban BMPs:				
Sewer Connection	System	$6,000	69	$414,000
Wet Ponds Level 1 Design - Pervious	Acre-Treated	$14,000	1,500	$21,000,000
Rain Gardens Level 1 Design - Pervious	Acre-Treated	$19,000	1,500	$28,500,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	13,305	$252,795,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	13,305	$79,830,000
Wet Ponds Level 1 Design - Impervious	Acre-Treated	$69,000	251	$17,319,000
Rain Gardens Level 1 Design - Impervious	Acre-Treated	$94,000	251	$23,594,000
Bioretention Facilities Level 1 Design - Impervious	Acre-Treated	$94,000	253	$23,782,000
Infiltration Trench Level 1 Design - Impervious	Acre-Treated	$31,000	251	$7,781,000
CSO SW Volume Reduction BMPs:				
Retro-fitted Vegetated Roofs Level 2 Design	Sq. Ft.	$30	630,061	$18,901,830
Rainwater Harvesting - Rain Barrels	Each (50gal)	$150	21,660	$3,248,925
Rainwater Harvesting - Cisterns	Each (500gal)	$1,000	241	$241,000
Permeable Pavement Level 2 Design	Sq. Ft.	$24	5,052,960	$121,271,040
Increased Storage within the CSO System	Gallons		27,300,000	$269,160,000
Grand Total				**$883,761,199**

*Values are based on stakeholder estimates and input.
**Additional engineering study and analysis during the traditional adaptive management process may reduce the design criteria and costs needed.

Table 6.2 Stage I and Stage II implementation goals for Bernards Creek.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) *Subtotal $762,000*				
Agricultural BMPs:				
Livestock Exclusions (LE-1T and LE-2T)	System	$25,000	12	$300,000
Stream Protection (WP-2T)	System	$8,000	1	$8,000
Prescribed Grazing Plan and Implementation (NRCS 528)	Acre	$77	400	$30,800
Conservation Tillage – Cropland (SL-15A)	Acre	$100	45	$4,500
Reforestation of Erodible Cropland (FR-1)	Acre	$154	42	$6,468
Reforestation of Erodible Pasture (FR-1)	Acre	$154	79	$12,166
Riparian Buffers – Cropland	Acre	$360	5	$1,800
Residential Waste Treatment BMPs:				
Septic Systems Pump-outs (RB-1)	System	$450	601	$270,450
Septic System Repair (RB-3)	System	$3,500	2	$7,000
Septic System Installation/Replacement (RB-4)	System	$8,000	5	$40,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	1	$20,000
Sewer Connection	System	$6,000	10	$60,000
Pet Waste Pick-Up Program:				
Mailings	Each	$0.36	2,266	$816
STAGE II (2nd 10 years) *Subtotal $3,510,435*				
Agricultural BMPs:				
Streamside Fence Maintenance	Feet	$3.50	1,034	$3,619
Waste Storage Facility (WP-4) – Beef	System	$10,000	0	$0
Waste Storage – Horse	System	$3,000	16	$48,000
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	2,266	$816
Residential/Urban BMPs:				
Sewer Connection	System	$6,000	6	$36,000
Wet Ponds Level 1 Design - Pervious	Acre-Treated	$14,000	59	$826,000
Rain Gardens Level 1 Design - Pervious	Acre-Treated	$19,000	59	$1,121,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	59	$1,121,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	59	$354,000
Grand Total				**$4,272,435**

Table 6.3 Stage I and Stage II implementation goals for Tuckahoe Creek.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) ***Subtotal $4,663,691***				
Agricultural BMPs:				
Livestock Exclusions (LE-1T and LE-2T)	System	$25,000	55	$1,375,000
Prescribed Grazing Plan and Implementation (NRCS 528)	Acre	$77	41	$3,157
Conservation Tillage – Cropland (SL-15A)	Acre	$100	119	$11,900
Reforestation of Erodible Cropland (FR-1)	Acre	$154	152	$23,408
Reforestation of Erodible Pasture (FR-1)	Acre	$154	8	$1,232
Riparian Buffers – Cropland	Acre	$360	112	$40,320
Residential Waste Treatment BMPs:				
Septic Systems Pump-outs (RB-1)	System	$450	1,363	$613,350
Septic System Repair (RB-3)	System	$3,500	64	$224,000
Septic System Installation/Replacement (RB-4)	System	$8,000	150	$1,200,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	56	$1,120,000
Pet Waste Pick-Up Program:				
Baggy, Sign and Waste Basket Station	Station	$170	10	$1,700
Bag Refills	Each	$0.10	365,000	$36,500
Mailings	Each	$0.36	36,455	$13,124
STAGE II (2nd 10 years) ***Subtotal $161,224,319***				
Agricultural BMPs:				
Streamside Fence Maintenance	Feet	$3.50	4,770	$16,695
Waste Storage Facility (WP-4) – Beef	System	$10,000	14	$140,000
Waste Storage – Horse	System	$3,000	56	$168,000
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	36,455	$13,124
Bag Refills	Each	$0.10	365,000	$36,500
Residential/Urban BMPs:				
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	6,434	$122,246,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	6,434	$38,604,000
Grand Total				**$165,888,010**

Table 6.4 Stage I and Stage II implementation goals for Powhite Creek.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) ***Subtotal $23,619***				
Residential Waste Treatment BMPs:				
Sewer Connection	System	$6,000	2	$12,000
Pet Waste Pick-Up Program:				
Baggy, Sign and Waste Basket Station	Station	$170	2	$340
Bag Refills	Each	$0.10	73,000	$7,300
Mailings	Each	$0.36	11,053	$3,979
STAGE II (2nd 10 years) ***Subtotal $23,279***				
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	11,053	$3,979
Bag Refills	Each	$0.10	73,000	$7,300
Residential/Urban BMPs:				
Sewer Connection	System	$6,000	2	$12,000
Grand Total				**$46,898**

Table 6.5 Stage I and Stage II implementation goals for Reedy Creek.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) ***Subtotal $84,772***				
Agricultural BMPs:				
Residential Waste Treatment BMPs:				
Septic System Repair (RB-3)	System	$3,500	3	$10,500
Septic System Installation/Replacement (RB-4)	System	$8,000	6	$48,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	0	$0
Sewer Connection	System	$6,000	0	$0
Pet Waste Pick-Up Program:				
Baggy, Sign and Waste Basket Station	Station	$170	6	$1,020
Bag Refills	Each	$0.10	219,000	$21,900
Mailings	Each	$0.36	9,311	$3,352
STAGE II (2nd 10 years) ***Subtotal $93,622,652***				
Pet Waste Pick-Up BMPs:				
Pet Waste Composters	Composter	$50	188	$9,400
Mailings	Each	$0.36	9,311	$3,352
Bag Refills	Each	$0.10	219,000	$21,900
Residential/Urban BMPs:				
Wet Ponds Level 1 Design - Pervious	Acre-Treated	$14,000	364	$5,096,000
Rain Gardens Level 1 Design - Pervious	Acre-Treated	$19,000	364	$6,916,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	364	$6,916,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	364	$2,184,000
Wet Ponds Level 1 Design - Impervious	Acre-Treated	$69,000	251	$17,319,000
Rain Gardens Level 1 Design - Impervious	Acre-Treated	$94,000	251	$23,594,000
Bioretention Facilities Level 1 Design - Impervious	Acre-Treated	$94,000	253	$23,782,000
Infiltration Trench Level 1 Design - Impervious	Acre-Treated	$31,000	251	$7,781,000
Grand Total				**$93,707,424**

Table 6.6 Stage I and Stage II implementation goals for James River riverine.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) ***Subtotal $7,264,647***				
Agricultural BMPs:				
Livestock Exclusions (LE-1T and LE-2T)	System	$25,000	81	$2,025,000
Prescribed Grazing Plan and Implementation (NRCS 528)	Acre	$77	2,342	$180,334
Conservation Tillage – Cropland (SL-15A)	Acre	$100	88	$8,800
Reforestation of Erodible Cropland (FR-1)	Acre	$154	112	$17,248
Reforestation of Erodible Pasture (FR-1)	Acre	$154	462	$71,148
Riparian Buffers – Cropland	Acre	$360	83	$29,880
Residential Waste Treatment BMPs:				
Septic Systems Pump-outs (RB-1)	System	$450	3,579	$1,610,550
Septic System Repair (RB-3)	System	$3,500	124	$434,000
Septic System Installation/Replacement (RB-4)	System	$8,000	291	$2,328,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	20	$400,000
Sewer Connection	System	$6,000	8	$48,000
Pet Waste Pick-Up Program:				
Bag Refills	Each	$0.10	1,022,000	$102,200
Mailings	Each	$0.36	26,353	$9,487
STAGE II (2nd 10 years) ***Subtotal $135,014,187***				
Agricultural BMPs:				
Streamside Fence Maintenance	Feet	$3.50	7,000	$24,500
Waste Storage Facility (WP-4) – Beef	System	$10,000	28	$280,000
Waste Storage – Horse	System	$3,000	104	$312,000
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	26,353	$9,487
Bag Refills	Each	$0.10	1,022,000	$102,200
Residential/Urban BMPs:				
Sewer Connection	System	$6,000	6	$36,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	5,370	$102,030,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	5,370	$32,220,000
Grand Total				**$142,278,834**

Table 6.7 Stage I and Stage II implementation goals for Gillie Creek.

All BMP Needs	Unit	Cost per unit*	# Units	Total Cost**
STAGE I (1st 10 years) *Subtotal $963,656*				
Residential Waste Treatment BMPs:				
Septic System Repair (RB-3)	System	$3,500	7	$24,500
Septic System Installation/Replacement (RB-4)	System	$8,000	18	$144,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	36	$720,000
Pet Waste Pick-Up Program:				
Baggy, Sign and Waste Basket Station	Station	$170	18	$3,060
Bag Refills	Each	$0.10	657,000	$65,700
Mailings	Each	$0.36	17,768	$6,396
STAGE II (2nd 10 years) *Subtotal $426,046,551*				
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	17,768	$6,396
Bag Refills	Each	$0.10	657,000	$65,700
Residential/Urban BMPs:				
Wet Ponds Level 1 Design - Pervious	Acre-Treated	$14,000	618	$8,652,000
Rain Gardens Level 1 Design - Pervious	Acre-Treated	$19,000	618	$11,742,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	618	$11,742,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	618	$3,708,000
CSO SW Volume Reduction BMPs:				
Retro-fitted Vegetated Roofs Level 2 Design	Sq. Ft.	$30	609,840	$18,295,200
Rainwater Harvesting - Rain Barrels	Each (50gal)	$150	18,455	$2,768,175
Rainwater Harvesting - Cisterns	Each (500gal)	$1,000	205	$205,000
Permeable Pavement Level 2 Design	Sq. Ft.	$24	4,660,920	$111,862,080
Increased Storage within the CSO System***	Gallons		25,700,000	$257,000,000
Grand Total				**$427,010,208**

*Values are based on stakeholder estimates and input.
**Additional engineering study and analysis during the traditional adaptive management process may reduce the design criteria and costs needed.
***based on COR estimate of total need to meet the TMDL (29.2MG) and cost ($300M), minus storage gained by estimated maximum amount of LID practices (3.5MG; see Table7); cost was extrapolated from a table sent with TMDL comments

Table 6.8 Stage I and Stage II implementation goals for Almond Creek.

All BMP Needs	Unit	Cost per unit*	# Units	Total Cost**
STAGE I (1st 10 years) ***Subtotal $145,717***				
Agricultural BMPs:				
Livestock Exclusions (LE-1T and LE-2T)	System	$25,000	1	$25,000
Residential Waste Treatment BMPs:				
Septic System Repair (RB-3)	System	$3,500	1	$3,500
Septic System Installation/Replacement (RB-4)	System	$8,000	2	$16,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	5	$100,000
Pet Waste Pick-Up Program:				
Mailings	Each	$0.36	3,380	$1,217
STAGE II (2nd 10 years) ***Subtotal $22,693,578***				
Agricultural BMPs:				
Streamside Fence Maintenance	Feet	$3.50	6	$21
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	3,380	$1,217
CSO SW Volume Reduction BMPs:				
Retro-fitted Vegetated Roofs Level 2 Design	Sq. Ft.	$30	20,221	$606,630
Rainwater Harvesting - Rain Barrels	Each (50gal)	$150	3,205	$480,750
Rainwater Harvesting - Cisterns	Each (500gal)	$1,000	36	$36,000
Permeable Pavement Level 2 Design	Sq. Ft.	$24	392,040	$9,408,960
Increased Storage within the CSO System***	Gallons		1,600,000	$12,160,000
Grand Total				**$22,839,295**

*Values are based on stakeholder estimates and input.
**Additional engineering study and analysis during the traditional adaptive management process may reduce the design criteria and costs needed.
***based on COR estimate of total need to meet the TMDL (2MG) and cost ($12.6M), minus storage gained by estimated maximum amount of LID practices (0.4MG; see Table7); cost was extrapolated from a table sent with TMDL comments

Table 6.9 Stage I and Stage II implementation goals for Goode Creek.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) ***Subtotal $41,793***				
Residential Waste Treatment BMPs:				
Septic System Repair (RB-3)	System	$3,500	2	$7,000
Septic System Installation/Replacement (RB-4)	System	$8,000	4	$32,000
Pet Waste Pick-Up Program:				
Mailings	Each	$0.36	7,758	$2,793
STAGE II (2nd 10 years) ***Subtotal $23,227,793***				
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	7,758	$2,793
Residential/Urban BMPs:				
Wet Ponds Level 1 Design - Pervious	Acre-Treated	$14,000	400	$5,600,000
Rain Gardens Level 1 Design - Pervious	Acre-Treated	$19,000	400	$7,600,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	401	$7,619,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	401	$2,406,000
Grand Total				**$23,269,586**

Table 6.10 Stage I and Stage II implementation goals for Falling Creek.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) *Subtotal $116,892*				
Residential Waste Treatment BMPs:				
Sewer Connection	System	$6,000	4	$24,000
Pet Waste Pick-Up Program:				
Baggy, Sign and Waste Basket Station	Station	$170	20	$3,400
Bag Refills	Each	$0.10	730,000	$73,000
Mailings	Each	$0.36	45,811	$16,492
STAGE II (2nd 10 years) *Subtotal $107,492*				
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	45,811	$16,492
Bag Refills	Each	$0.10	730,000	$73,000
Residential Waste Treatment BMPs:				
Sewer Connection	System	$6,000	3	$18,000
Grand Total				**$224,384**

Table 6.11 Stage I and Stage II implementation goals for No Name Creek.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) *Subtotal $58,813*				
Residential Waste Treatment BMPs:				
Septic Systems Pump-outs (RB-1)	System	$450	0	$0
Septic System Repair (RB-3)	System	$3,500	3	$10,500
Septic System Installation/Replacement (RB-4)	System	$8,000	6	$48,000
Alt. Waste Treatment System Installation (RB-5)	System	$20,000	0	$0
Sewer Connection	System	$6,000	0	$0
Pet Waste Pick-Up Program:				
Mailings	Each	$0.36	869	$313
STAGE II (2nd 10 years) *Subtotal $3,422,313*				
Pet Waste Pick-Up BMPs:				
Mailings	Each	$0.36	869	$313
Residential/Urban BMPs:				
Sewer Connection	System	$6,000	0	$0
Wet Ponds Level 1 Design - Pervious	Acre-Treated	$14,000	59	$826,000
Rain Gardens Level 1 Design - Pervious	Acre-Treated	$19,000	59	$1,121,000
Bioretention Facilities Level 1 Design - Pervious	Acre-Treated	$19,000	59	$1,121,000
Infiltration Trench Level 1 Design - Pervious	Acre-Treated	$6,000	59	$354,000
Grand Total				**$3,481,126**

Table 6.12 Stage I and Stage II implementation goals for James River tidal.

All BMP Needs	Unit	Cost per unit	# Units	Total Cost
STAGE I (1st 10 years) ***Subtotal $456,000***				
Sewer Connection	System	$6,000	76	$456,000
STAGE II (2nd 10 years) ***Subtotal $312,000***				
Residential/Urban BMPs:				
Sewer Connection	System	$6,000	52	$312,000
Grand Total				**$768,000**

6.2 Timeline

Table 6.13 below shows the approximate breakdown of BMP installation during Stages, the estimated percent violations of the geometric mean standard at each outlet, and the percent of the total cost. It is anticipated that the Steering Committee will reconvene after each 5 years to evaluated BMP installation progress and water quality monitoring results.

The TMDL model (HSPF) was used to estimate the water quality (geometric mean) of the impaired streams at each outlet (mouth) in order to show the Steering Committee estimated water quality results nearest the listing DEQ monitoring stations.

The Tuckahoe Creek TMDL was not calculated using this model (a load-duration approach was used, see Section 3.1), but this model was used to estimate the water quality during the IP timeline in order to give the Steering Committee estimates and goals to work toward. It is estimated that Tuckahoe Creek will meet the WQS after all BMPs are installed during Stage I, however, the James River (riverine) impairment will need all these BMPs installed in order to meet the WQS. This is due to the connectivity of the system, with Tuckahoe Creek flowing into the James River before the impaired segment begins.

The progress toward meeting the WQS differs for each impairment, as is expected from the modeling results and in reality. This depends on the severity of the impairment at existing conditions (how badly impaired it is at the start of implementation), the types of BMPs needed, the placement of BMPs into the stages, and so on. The impairments that required implementation of Residential/Urban BMPs and the CSO SW Volume Reduction BMPs show small percentages of cost for Stage I because their overall costs are very high and these high dollar BMPs were placed in Stage II.

Table 6.13 Timeline for implementation in the James River - Richmond watershed.

Implementation Milestones	Existing	Stage I Year 5	Stage I Year 10	Stage II Year 15	Stage II Year 20	Stage III Year 25
		Cumulative Progress Toward BMP Installation				
Agricultural BMPs	0	50%	100%	100%	100%	100%
Residential Waste Treatment BMPs	0	50%	100%	100%	100%	100%
Pet Waste Pick-Up Program	0	25%	50%	75%	100%	100%
Residential/Urban BMPs	0	0%	0%	50%	100%	100%
COR's LTCP Alt E	0	0%	0%	0%	100%	100%
CSO SW Volume Reduction BMPs	0	0%	0%	50%	100%	100%
		Estimated WQ and %Cost each 5 years				
Bernards – Est. GM % vio	52%	38%	17%	15%	13%	0%
Bernards - Cost (% of Total)	0%	17%	33%	67%	100%	100%
Tuckahoe - Est. GM % vio	20%	12%	0%	0%	0%	0%
Tuckahoe - Cost (% of Total)	0%	2%	5%	52%	100%	100%
Powhite - Est. GM % vio	37%	33%	20%	13%	2%	0%
Powhite - Cost (% of Total)	0%	25%	50%	75%	100%	100%
Reedy - Est. GM % vio	78%	62%	43%	23%	0%	0%
Reedy - Cost (% of Total)	0%	0.05%	0.1%	50%	100%	100%
JR riverine - Est. GM % vio	40%	35%	25%	20%	10%	0%
JR riverine - Cost (% of Total)	0%	4%	8%	54%	100%	100%
Gillie - Est. GM % vio	95%	78%	55%	33%	3%	0%
Gillie - Cost (% of Total)	0%	0.1%	0.2%	50%	100%	100%
Almond - Est. GM % vio	60%	45%	10%	7%	0%	0%
Almond - Cost (% of Total)	0%	0.3%	1%	50%	100%	100%
Goode - Est. GM % vio	98%	75%	52%	23%	2%	0%
Goode - Cost (% of Total)	0%	0.2%	0.4%	50%	100%	100%
Falling - Est. GM % vio	47%	22%	7%	2%	0%	0%
Falling - Cost (% of Total)	0%	26%	52%	76%	100%	100%
No Name - Est. GM % vio	100%	98%	40%	22%	3%	0%
No Name - Cost (% of Total)	0%	2%	4%	52%	100%	100%
JR tidal - Est. GM % vio	38%	27%	15%	8%	0%	0%
JR tidal - Cost (% of Total)	0%	30%	59%	80%	100%	100%

Est. GM % vio = Estimated Geometric Mean Standard (126 cfu/100mL) violation percentage; Estimated timeline based on 100% grant funding. The schedule for the implementing the Phase III CSO controls is based on the Special Order by Consent.

6.3 *Targeting*

Implicit in the process of a staged implementation is targeting of BMPs. Targeting ensures optimum utilization of resources. The James River - Richmond watershed was divided into subwatersheds (Figure 5.1). These subwatersheds were ranked based on different criteria for stakeholders to use as a guide on where to start implementation or education first.

One method of targeting involves considering the cost-efficiency of specific practices. Table 5.23 indicates the cost-efficiencies of the practices proposed in this IP. Practices with high cost-efficiencies, relative to other practices, will provide the greatest benefit per dollar invested. Using this table as a guide, as well as knowledge regarding the source of bacteria removed, the Agricultural BMPs should be promoted with this list of prioritization in mind: Livestock Exclusion Systems, Reforestation of Erodible Cropland (FR-1), Conservation Tillage (SL-15A), Riparian Buffers – Cropland, Prescribed Grazing Plan and Implementation (NRCS 528), Reforestation of Erodible Pasture (FR-1), Waste Storage Facility (WP-4) – Beef, and Waste Storage – Horse.

Using Table 5.23 as a guide, as well as knowledge regarding the source of bacteria removed, Residential/Urban BMPs should be promoted with this list of prioritization in mind: Correction of Straight Pipes, Correction of Failing Septic Systems, Pet Waste Pick-up Program, Pet Waste Composters, Wet Ponds Level 1 Design, Infiltration Trench Level 1 Design, Rain Gardens Level 1 Design, Bioretention Facilities Level 1 Design, and CSO Stormwater Volume Reduction BMPs.

The spatial targeting of residential waste treatment BMP needs was derived from ranking the number of failing septic systems and number of straight pipes in each subwatershed, while taking into account if an impaired stream segment was present in the subwatershed. County personnel could initiate contact with residents regarding residential waste treatment needs by area in the order of priority in Table 6.14. All other subwatersheds did not contain a failing septic system or straight pipe in the TMDL estimates. Targeting may increase the effectiveness of BMPs by reducing more bacteria per dollar invested.

Table 6.14 Spatial targeting results for Residential Waste Treatment System Needs.

Sub	Stream	Res. Waste Treatment Targeting Ranking	Sub	Stream	Res. Waste Treatment Targeting Ranking
26	Tuckahoe Creek	1st	20	Falling Creek	26th
25	JR riverine	2nd	31	JR tidal	27th
1	JR riverine	3rd	34	JR tidal	28th
24	JR riverine	4th	57	Reedy Creek	29th
29	JR tidal	5th	11	JR tidal	30th
40	Gillie Creek	6th	12	JR tidal	31st
32	JR tidal	7th	23	No Name Creek	32nd
28	Tuckahoe Creek	8th	10	JR tidal	33rd
33	JR tidal	9th	71	Gillie Creek	34th
6	JR riverine	10th	8	JR riverine	35th
2	JR riverine	11th	9	JR riverine	36th
16	Bernards Creek	12th	21	Falling Creek	37th
5	JR riverine	13th	30	JR tidal	38th
27	Tuckahoe Creek	14th	42	JR tidal	39th
22	Falling Creek	15th	44	Gillie Creek	40th
4	JR riverine	16th	52	Almond Creek	41st
3	JR riverine	17th	59	JR riverine	42nd
18	Almond Creek	18th	60	JR riverine	43rd
17	Powhite Creek	19th	61	JR tidal	44th
19	Goode Creek	20th	63	Gillie Creek	45th
13	JR tidal	21st	64	Gillie Creek	46th
41	Reedy Creek	22nd	65	Gillie Creek	47th
15	JR tidal	23rd	66	Gillie Creek	48th
14	JR tidal	24th	68	Gillie Creek	49th
7	JR riverine	25th	79	Gillie Creek	50th

Another targeting analysis was done using the number of dogs per acre and the number of parks, while taking into account if an impaired stream segment was present in the subwatershed. Parks, open spaces, subdivisions, and common areas could be canvassed for dog waste station needs by the subwatershed priority order in Table 6.15. The James River tidal subwatersheds were placed in lowest priority as this watershed did not require dog waste reductions in the TMDL. Mailings to homeowners, flyer/brochure distribution, and education to businesses could also follow this priority order. Targeting may increase the effectiveness of BMPs by reducing more bacteria per dollar invested.

Table 6.15 Spatial targeting results for Dog Waste Pick-up BMPs.

Sub	Stream	Dog Waste Pick-Up Program Targeting Ranking	Sub	Stream	Dog Waste Pick-Up Program Targeting Ranking
7	JR riverine	1st	79	Gillie Creek	35th
41	Reedy Creek	2nd	65	Gillie Creek	36th
9	JR riverine	3rd	68	Gillie Creek	37th
8	JR riverine	4th	67	Gillie Creek	38th
40	Gillie Creek	5th	23	No Name Creek	39th
27	Tuckahoe	6th	28	Tuckahoe	40th
57	Reedy Creek	7th	16	Bernards Creek	41st
22	Falling Creek	8th	25	JR riverine	42nd
3	JR riverine	9th	1	JR riverine	43rd
20	Falling Creek	10th	24	JR riverine	44th
50	JR riverine	11th	2	JR riverine	45th
6	JR riverine	12th	10	JR tidal	46th
44	Gillie Creek	13th	11	JR tidal	47th
4	JR riverine	14th	12	JR tidal	48th
17	Powhite Creek	15th	13	JR tidal	49th
19	Goode Creek	16th	14	JR tidal	50th
51	JR riverine	17th	15	JR tidal	51st
26	Tuckahoe	18th	29	JR tidal	52nd
5	JR riverine	19th	30	JR tidal	53rd
49	JR riverine	20th	31	JR tidal	54th
76	JR riverine	21st	32	JR tidal	55th
55	JR riverine	22nd	33	JR tidal	56th
58	JR riverine	23rd	34	JR tidal	57th
59	JR riverine	24th	42	JR tidal	58th
63	Gillie Creek	25th	43	JR tidal	59th
21	Falling Creek	26th	45	JR tidal	60th
48	JR riverine	27th	46	JR tidal	61st
56	JR riverine	28th	52	JR tidal	62nd
47	JR riverine	29th	53	JR tidal	63rd
64	Gillie Creek	30th	54	JR tidal	64th
60	JR riverine	31st	61	JR tidal	65th
18	Almond Creek	32nd	74	JR tidal	66th
66	Gillie Creek	33rd	75	JR tidal	67th
71	Gillie Creek	34th			

7. STAKEHOLDERS AND THEIR ROLE IN IMPLEMENTATION

Achieving the goals of this effort (*i.e.,* improving water quality and removing these waters from the impaired waters list) is dependent upon stakeholder participation. Both the local stakeholders charged with implementation of control measures and the stakeholders charged with overseeing our nation's human health are key elements of a successful IP. The first step is to acknowledge that a water quality problem exists and realize that changes must be made in operations, programs, and legislation to address these pollutants. The following sections in this chapter describe the responsibilities and expectations for the various components of implementation.

7.1 *Integration with Other Watershed Plans*

Each watershed in the state is under the jurisdiction of a multitude of individual, yet related, water quality programs and activities, many of which have specific geographic boundaries and goals. These include but are not limited to TMDLs, Roundtables, Water Quality Management Plans, erosion and sediment control regulations, stormwater management, Source Water Protection Program, and local comprehensive plans. Coordination of the implementation project with these existing programs could result in additional resources and increased participation. Also there are many volunteer organizations within the study area that are currently promoting many BMPs that will benefit water quality. A few are mentioned here.

Chesapeake Bay TMDL

This project watershed is within the Chesapeake Bay Watershed Implementation Plan drainage area. Most BMPs that address bacteria reduction will also help reduce nutrients and sediment from entering the waterways (antiquated link removed; see VA DEQ website). With overlapping BMP implementation goals, coordination between lead agencies and the documentation of work completed is important.

Alliance for the Chesapeake Bay (ACB)

The Alliance is unique in its focus on collaboration to address issues that affect the Bay and its streams and rivers. They engage, educate, partner and inspire through work with other organizations, communities, businesses and individuals. Their strength is in developing innovative solutions that can be implemented to protect the Bay. They believe long-term strategies and actions to protect and enhance the Bay can be achieved through collaboration and common goals (antiquated link removed; see the Alliance for the Bay website).

James River Association

The James Riverkeeper Program was launched in 2001 when JRA joined the Waterkeeper Alliance. The Waterkeeper Alliance is a growing international organization with over 153 local "Riverkeeper", "Baykeeper", and "Coastkeeper" programs, all dedicated to protecting local waters from pollution. The idea for this program stemmed from a concept dating back to old England, and was started in America in 1983 with the Hudson Riverkeeper. JRA's Riverkeeper monitors the length of the James River and its more than 15,000 miles of tributaries. They are on the water in a jon boat, kayak, canoe or doing river reconnaissance on foot and by vehicle 2 to 3 days each week (antiquated link removed; see the James River Association website).

The Middle James Roundtable

The Middle James Roundtable is a collaborative effort among various stakeholders in the Middle James watershed to improve water quality and the overall health of our communities. Roundtable stakeholders include elected officials, local government staff, the agricultural community, planning district commissions, business and industry, water and sewer utilities, commercial fishermen, soil and water conservation districts, developers, interested citizens, environmental groups, tourism and recreational groups, state and federal agency staff and public service authorities. Roundtable activities are dictated by the participants and can involve activities such as hosting forums to discuss local watershed issues and land use, educating citizens about water quality, grant writing, coordinating workshops, social marketing campaigns, collecting and analyzing water quality data and planning and implementation of watershed goals. The Middle James Roundtable consists of a steering committee, which meets quarterly. An executive committee, elected from current steering committee members by steering committee members, meets monthly. The Roundtable also holds a yearly meeting that focuses on local water quality issues (antiquated link removed; see the Middle James River Roundtable website).

Sierra Club

Sierra Club members promote a safe and healthy community in which to live, smart energy solutions to combat global warming, and an enduring legacy for America's wild places. Since 1892, the Sierra Club has been working to protect communities and wild areas. It is the largest and one of the most influential grassroots environmental organizations in the United States (antiquated link removed; see the Virginia Sierra Club website).

Reedy Creek Coalition

The Reedy Creek Coalition is an all-volunteer organization (under the umbrella of the Richmond Recreation & Parks Foundation) committed to restoring the health and beauty of Reedy Creek through education, training, and collaboration with all residents and users of the Reedy Creek Watershed and its natural resources. Volunteers have removed trash, removed invasive species, conducted citizen water sampling, conducted free homeowner audits to evaluate property for its impact on the watershed to offer tips on reducing stormwater and pollution runoff, conducted educational outreach activities, and held informational workshops on the benefits of residential rain barrels. All activities can be found at antiquated link removed; see the Reedy Creek Coalition website.

Enrichmond

The Enrichmond Foundation is an "umbrella" non-profit organization for volunteer groups and special initiatives in the City of Richmond whose primary interest is to maintain, restore, preserve, or improve Richmond's public recreational resources (antiquated link removed; see the EnRichmond website). In January 2011, volunteers planted 30 trees in William Byrd Park. Partners of the Enrichmond Foundation include many "Friend" groups for the public parks within Richmond.

7.2 City of Richmond's Stormwater Management Program

The City of Richmond Department of Public Utilities has a Stormwater Management Program in place to encourage private homeowners, businesses, industry and landowners within the City to design and install LID BMPs to reduce stormwater volumes and increase runoff water quality from their properties. Single-family residents are encouraged to install rain gardens, on-site rainwater storage devises, vegetated filter strips, and pervious pavement. Non-residential and multi-family property owners are encouraged to install any of the following practices: grassed channels, permeable pavement, infiltration practices, bioretention practices, dry swales, wet swales, filtering practices, constructed wetlands, wet ponds, extended detention ponds, rooftop disconnection, vegetated filters, rainwater harvesting, and vegetated roofs. A reduction of up to 50% off a stormwater bill is given for practices and combinations of practices that reduce the stormwater volumes flowing from impervious areas (antiquated link removed; see the Richmond government website).

7.3 Model Green Infrastructure Programs

DC RiverSmart Homes Program

The Washington D.C. RiverSmart Homes Program offers incentive to homeowners who reduce the stormwater runoff from their properties (antiquated link removed; see the DC Department of Energy & Environment website). Homeowners receive up to $1,200 to adopt one or more of the following landscape enhancements: Shade Trees, Rain Barrels, Pervious Pavers, Rain Gardens, and BayScaping.

Montgomery County, Maryland Rainscapes Program

The Montgomery County, Maryland Rainscapes Program promotes and implements projects on residential, institutional, and commercial properties to reduce stormwater pollution. The County offers technical and financial assistance (in the form of rebates) to encourage property owners to implement eligible RainScapes techniques on their property. Some practices include: Rain Gardens, Conservation Landscaping, Tree Canopy, Permeable Pavers, Green Roofs, Rain Barrels and cisterns, and Dry Wells (antiquated link removed; see the Montgomery County MD website).

Portland, Oregon's Green Infrastructure

Portland Oregon has documented the need for LID practices to promote the health of citizens and their river system. Their goals include the installation of the following: EcoRoofs, Green Streets, Trees, Invasive Removal and Revegatation, Culvert Removal, Land Purchase, and Planting in Natural Areas (antiquated link removed; see the Portland Oregon website).

7.4 Monitoring

Improvements in water quality will be determined in the James River - Richmond watershed through monitoring conducted by the VADEQ's ambient monitoring program. The monitoring data include bacteria, physical parameters (dissolved oxygen, temperature, pH, and conductivity), nutrients and suspended and dissolved solids. The VADEQ uses the data to determine overall water quality status. The water quality status will help gauge the success of implementation aimed at reducing the amount of bacteria in the streams of the James River - Richmond watershed.

The VADEQ monitoring stations in the James River - Richmond watershed are described in Table 7.1 and shown in Figure 7.1. Stations are monitored every other month within the monitoring period listed in Table 7.1.

Up-to-date monitoring results are available to residents on the DEQ website or by contacting their local DEQ regional office. On the website, query information by selecting the watershed from the drop-down menu. Volunteer monitoring may be on-going in the Reedy Creek watershed.

Table 7.1 Monitoring station IDs, station locations, and monitoring schedules for the James River - Richmond VADEQ stations.

Station ID	Stream Name and Location	Monitoring Period	Frequency
2-ALM000.42	Almond Creek at Rt. 5	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-BOR001.73	Bernards Creek at Rt. 711	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-FAC000.85	Falling Creek at Rt. 1	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-GIL000.42	Gillie Creek at Williamsburg Ave.	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-GOD000.77	Goode Creek at Commerce Road	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-JMS117.35	James River at Rt. 147	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-JMS115.29	James River at Ponypasture Park	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-JMS112.79	James River, off 42nd Street	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-JMS111.17	James River off Tredegar	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-JMS109.16	James River below Gillie Creek	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-JMS099.30	James River at Buoy 157	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-JMS087.01	James River at Buoy 137	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-XSZ001.58	No Name Creek at Rt. 1	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-PWT000.57	Powhite Creek at Forest Hill Ave.	1/2011-12/2012, 1/2017-12/2018	Bi-monthly
2-RDD000.76	Reedy Creek at Forest Hill Ave.	1/2011-12/2012, 1/2017-12/2018	Bi-monthly

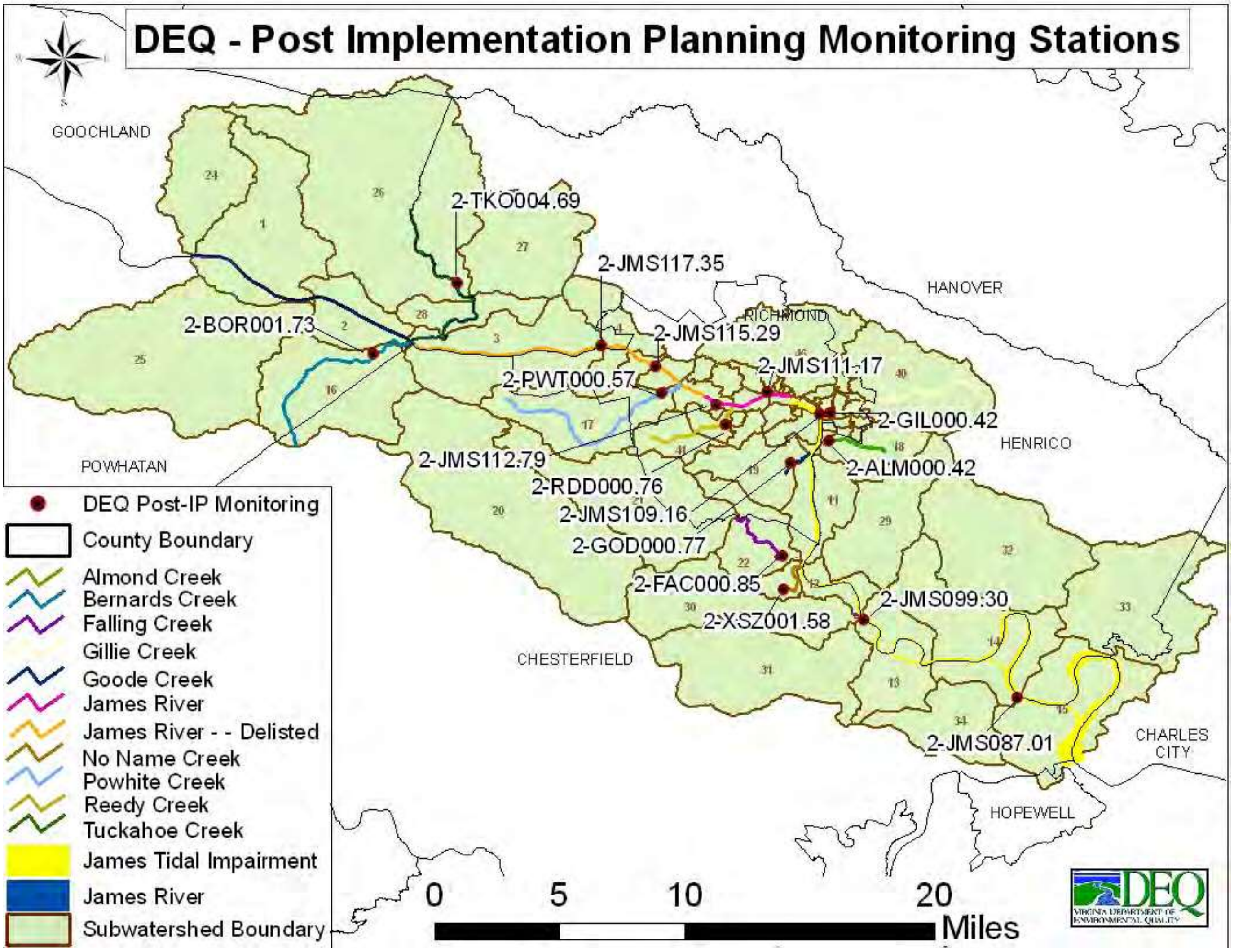

Figure 7.1 Location of monitoring stations in the James River - Richmond watershed.

7.5 Agricultural and Residential Education Programs

Education and outreach is a significant component of any TMDL implementation project. The SWCDs will be in charge of initiating contact with residents and farmers to encourage the installation of BMPs. This one-on-one contact will facilitate communication of the water quality problems and the corrective actions needed. The district staff can conduct a number of outreach activities in the watershed to promote participation and community support to attain the IP milestones and to make the community aware of the TMDL requirements. Such activities could include information exchange through newsletters, mailings, field days, demonstrations, organizational meetings, etc. The staff will work with appropriate organizations such as VCE to educate the public. Grazing land/ forage workshops, possibly with the Virginia Forage and Grassland Council, are venues to distribute agricultural education materials. Specific agricultural and residential outreach ideas are outlined in section 5.4.

A residential education program consisting of educational materials about pet waste and a pet waste composter program will be cost-effective options. Discussions to initiate a comprehensive media campaign for pet-waste education of the surrounding watersheds have been proposed by the Alliance for the Chesapeake Bay and the Middle James Roundtable. The ACB has volunteered to start an online forum where ideas and updates can be posted for any types of BMPs being installed in the watershed. This could serve as a tool for adaptive management.

7.5.1 Soil & Water Conservation Districts (SWCD)

The SWCD is a local government entity providing soil and water conservation assistance to farmers and residents. During the implementation project, the SWCDs will provide outreach, technical and financial assistance to farmers and homeowners in the James River - Richmond watershed through the Virginia Agricultural BMP Cost-Share and Tax Credit programs. Their responsibilities will include promoting implementation goals, available funding and the benefits of BMPs and providing assistance in the survey, design, layout, and approval of agricultural and residential BMPs. Education and outreach activities are a significant portion of their responsibilities. The SWCDs will be eligible for technical assistance funding to support their duties.

7.6 *Legal Authority*

State government has the authority to establish state laws that control delivery of pollutants to local waters. Local governments, in conjunction with the state, can develop ordinances involving pollution prevention measures. In addition, citizens have the right to bring litigation against persons or groups of people shown to be causing some harm to the claimant. The judicial branch of government also plays a significant role in the regulation of activities that impact water quality through hearing the claims of citizens in civil court and the claims of government representatives in criminal court.

7.6.1 EPA

The EPA has the responsibility of overseeing the various programs necessary for the success of the CWA. However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are four state agencies responsible for regulating activities that impact water quality in Virginia. These agencies are VADEQ, VADCR, VDH, and Virginia Department of Agriculture and Consumer Services (VDACS).

7.6.2 VADEQ

VADEQ has responsibility for monitoring waters to determine compliance with state standards, and for requiring permitted point dischargers to maintain loads within permit limits. It has the regulatory authority to levy fines and take legal action against those in violation of permits. Beginning in 1994, animal waste from confined animal facilities that hold in excess of 300 animal units (cattle and hogs) has been managed through a Virginia general pollution abatement permit. These operations are required to implement a number of practices to prevent surface and groundwater contamination. In response to increasing demand from the public to develop new regulations dealing with animal waste, the Virginia General Assembly passed legislation in 1999 requiring VADEQ to develop regulations for the management of poultry waste in operations having more than 200 animal units of poultry (about 20,000 chickens) (ELI, 1999). On January 1, 2008 DEQ assumed regulatory oversight of all land application of treated sewage sludge, commonly referred to as biosolids as a directed by the Virginia General Assembly in 2007. DEQ’s Office of Land Application Programs within the Water Quality Division to manages the biosolids program. The biosolids program includes having and following nutrient management plans for all fields receiving biosolids, unannounced inspections of the land application sites, certification of persons land applying biosolids, and payment of a $7.50 fee per dry ton of biosolids land applied.

7.6.3 VADCR

VADCR holds the responsibility for addressing nonpoint sources (NPS) of pollution. Historically, most VADCR programs have dealt with agricultural NPS pollution through education and voluntary incentive programs. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the level of participation required by TMDLs (near 100%). To meet the needs of the TMDL program and achieve the goals set forth in the CWA, the incentive programs are continually reevaluated to account for this level of participation. Although VADCR does not have regulatory authority over the majority of NPS issues addressed here, the department does administer the MS4 stormwater permit program.

7.6.4 ASA

Through Virginia's Agricultural Stewardship Act (ASA), the Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty of up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. VDACS has only two staff members dedicated to enforcing the Agricultural Stewardship Act, and very little funding is available to support water quality sampling. The Agricultural Stewardship Act is entirely complaint-driven.

7.6.5 VDH

The *Emergency Regulations for Alternative Onsite Sewage Systems*, adopted in April, 2010, require that all alternative onsite sewage treatment systems in Virginia be visited at least annually by a licensed operator. However, the Virginia Department of Health (VDH) does not currently have the authority, the mandate or the resources to require or conduct similar surveillance of all conventional onsite sewage treatment (septic) systems in the Commonwealth. (Note that, as resources allow, VDH may conduct or assist with such surveys that target localized areas of specific concern.)

Given the above limitations, VDH generally learns of failed septic systems directly or indirectly from the owners of those systems or through complaints from neighbors or other government agencies. Reports of straight pipes are less-frequently received from either source, since they are generally located in less-populated areas and are typically sited/intended to avoid detection.

When VDH receives a report of a non-compliant system, it performs a site inspection, if necessary, to verify the report. VDH then works with the homeowner to address the issue in an effective, timely and regulatory-compliant manner, generally through installation of a septic or alternative onsite system, repair or replacement of an existing system and/or failed components of that system, connection to a central collection/treatment system, or other appropriate measure(s). In the case of non-cooperative homeowners, VDH initially attempts to achieve compliance through internal enforcement actions and, ultimately, through the court system.

An impasse may be reached when a homeowner is willing, but financially unable to correct the non-compliance. In such situations, VDH assists in attempting to locate funding for the needed corrections, with the knowledge that many of the existing funding sources (State Revolving Loan Fund, Water Quality Improvement Fund, etc.) have significant shortcomings with regard to the onsite wastewater treatment arena. VDH, DEQ, and DCR have discussed those shortcomings and have agreed to collaborate in an effort to identify sources of financial assistance for owners of onsite wastewater systems located in the watersheds of impaired waters.

7.6.6 Local governments

The local governments can play a very active role in the implementation process. Goochland and Powhatan Counties could adopt practices from the Chesapeake Bay Protection Act, even though these areas are not within the current boundaries; a major component being the mandatory 5 year septic tank pump-out. Municipalities could help with education by handing out proper septic system maintenance and proper pet waste disposal literature when individuals apply for a building permit. When licenses for dog kennels are issued, the owners could be required to produce a plan for the proper disposal of waste from the facility. Future parks could be required to provide dog waste baggy stations and the maintenance of these. Ordinances could be enacted that require picking up after pets and incentives to hooking up homes to sanitary sewer. Future subdivisions should be developed with sustainable growth practices that minimize or eliminate stormwater runoff. New development within the 100-year floodplain could be prohibited or discouraged in order for riparian areas to grow and flourish.

7.7 Legal Action

The Clean Water Act Section 303(d) calls for the identification of impaired waters. It also requires that the streams be ranked by the severity of the impairment and that a Total Maximum Daily Load be calculated for that stream that would bring it back into compliance with the set water quality standard. Currently, TMDL implementation plans are not required in the Federal Code; however, Virginia State Code does incorporate the development of implementation plans for impaired streams. EPA largely ignored the nonpoint source section of the Clean Water Act until citizens began to realize that regulating only point sources was no longer maintaining water quality standards. Lawsuits from citizens and environmental groups citing EPA for not carrying out the statutes of the CWA began as far back as the 1970s and have continued until the present. In Virginia in 1998, the American Canoe Association and the American Littoral Society filed a complaint against EPA for failure to comply with provisions of §303d. The suit was settled by Consent Decree, which contained a TMDL development schedule through 2010. It is becoming more common for concerned citizens and environmental groups to turn to the courts for the enforcement of water quality issues.

Successful implementation depends on stakeholders taking responsibility for their role in the process. The primary role, of course, falls on the landowner. However, local, state and federal agencies also have a stake in ensuring that Virginia's waters are clean and provide a healthy environment for its citizens. An important first step in correcting the existing water quality problem is recognizing that there is a problem and that the health of citizens is at stake. Virginia's approach to correcting NPS pollution problems has been, and continues to be, encouragement of participation through education and financial incentives.

8. POTENTIAL FUNDING SOURCES

Potential funding sources available during implementation were identified during IP development. A brief description of the programs and their requirements is provided in this chapter. Detailed descriptions can be obtained from the SWCDs, VADCR, NRCS, and VCE. It is recommended that participants discuss funding options with experienced personnel. Information on program description and requirements was provided from fact sheets prepared by Virginia State Technical Advisory Committee, VADEQ, VADCR, and Southeast Rural Community Assistance Project, Inc. Funding from municipalities, local businesses, local stakeholders, or non-profit organizations could be investigated for the implementation of residential/urban LID BMPs.

Virginia Agricultural Best Management Practices Cost-Share Program

The cost-share program is funded with state and federal monies through local SWCDs. SWCDs administer the program to encourage farmers and landowners to use BMPs on their land to better control sediment, nutrient loss, and transportation of pollutants into our waters due to excessive surface flow, erosion, leaching, and inadequate animal waste management. Program participants are recruited by SWCDs based upon those factors, which have a great impact on water quality. The objective is to solve water quality problems by fixing the worst problems first. Cost-share is typically 75% of the actual cost, not to exceed the local maximum. The Virginia Water Quality Improvement Fund (WQIF) provides funding for this program, which is dependent upon a percentage of state surpluses.

Virginia Agricultural Best Management Practices Tax Credit Program

For all taxable years, any individual or corporation engaged in agricultural production for market, who has in place a soil conservation plan approved by the local SWCD, shall be allowed a credit against the tax imposed by Section 58.1-320 of an amount equaling 25% of the first $70,000 expended for agricultural best management practices by the individual. "Agricultural best management practices" are approved measures that will provide a significant improvement to water quality in the state's streams and rivers, and is consistent with other state and federal programs that address agricultural nonpoint source pollution management. Any practice approved by the local SWCD Board shall be completed within the taxable year in which the credit is claimed. The credit shall be allowed only for expenditures made by the taxpayer from funds of his/her own sources. The amount of such credit shall not exceed $17,500 or the total amount of the tax imposed by this program (whichever is less) in the year the project was completed, as certified by the Board. If the amount of the credit exceeds the taxpayer's liability for such taxable year, the excess may be carried over for credit against income taxes in the next five taxable years until the total amount of the tax credit has been taken. This program can be used independently or in conjunction with other cost-share programs on the stakeholder's portion of BMP costs. It is also approved for use in supplementing the cost of repairs to streamside fencing.

Virginia Agricultural Best Management Practices Loan Program

Loan requests are accepted through VADEQ. The interest rate is 3% per year and the term of the loan coincides with the life span of the practice. To be eligible for the loan, the BMP must be included in a conservation plan approved by the local SWCD Board. The minimum loan amount is $5,000; there is no maximum limit. Eligible BMPs include 23 structural practices such as animal waste control facilities, loafing lot management systems, and grazing land protection systems. The loans are administered through certain participating lending institutions.

Virginia Small Business Environmental Assistance Fund Loan Program

The Fund, administered through VADEQ, is used to make loans or to guarantee loans to small businesses for the purchase and installation of environmental pollution control equipment, equipment to implement voluntary pollution prevention measures, or equipment and structures to implement agricultural BMPs. The equipment must be needed by the small business to comply with the federal Clean Air Act, or it will allow the small business to implement voluntary pollution prevention measures. The loans are available in amounts up to $50,000 and will carry an interest rate of 3%, with favorable repayment terms based on the borrower's ability to repay and the useful life of the equipment being purchased or the life of the BMP being implemented. There is a $30 non-refundable application processing fee. The Fund will not be used to make loans to small businesses for the purchase and installation of equipment needed to comply with an enforcement action. To be eligible for assistance, a business must employ 100 or fewer people and be classified as a small business under the federal Small Business Act.

Virginia Water Quality Improvement Fund

This is a permanent, non-reverting fund established by the Commonwealth of Virginia in order to assist local stakeholders in reducing point and nonpoint nutrient loads to surface waters. Eligible recipients include local governments, SWCDs, and individuals. Grants for point sources are administered through VADEQ and grants for nonpoint sources are administered through VADCR. Most WQIF grants provide matching funds on a 50/50 cost-share basis. Successful applications are listed as draft/public-noticed agreements, and are subject to a public review period of at least 30 days. This fund was identified as a potential funding source for the urban stream buffers and pet waste composter program to be included in the implementation plan.

Virginia Environmental Endowment

"The mission of the Virginia Environmental Endowment (VEE) is to improve the quality of the environment by using its capital to encourage all sectors to work together to prevent pollution, conserve natural resources, and promote environmental literacy". Grant making priorities in the Virginia Program are focused on water quality research and monitoring of water quality conditions; land and open space conservation; Chesapeake Bay fisheries conservation, research, and education; and environmental education.

The Virginia Mini-Grant Program has enabled citizens to become actively involved in solving environmental problems in their hometowns. With grants of $5,000 or less, schools have initiated environmental science courses and outdoor classroom projects, volunteers have monitored water quality in dozens of streams and rivers, and communities have developed innovative strategies to ensure environmental quality is improved in their community. The Virginia Mini-Grant Program supports community-based efforts to strengthen environmental education and to promote stewardship. Preference is given to modest local projects. Public and private schools (K-12) and nongovernmental, nonprofit community organizations in Virginia are eligible to apply for a one-year Mini-Grant up to $5,000. Local, state, and federal government agencies and programs are not eligible. Guidelines and application form are provided on their website (antiquated link removed; see Virginia Environmental Endowment website).

Community Development Block Grant Program

The Department of Housing and Urban Development sponsors this program, intended to develop viable communities by providing decent housing and a suitable living environment and by expanding economic opportunities primarily for persons of low and moderate income. Recipients may initiate activities directed toward neighborhood revitalization, economic development, and provision of improved community facilities and services. Specific activities may include public services, acquisition of real property, relocation and demolition, rehabilitation of structures, and provision of public facilities and improvements, such as new or improved water and sewer facilities.

Conservation Reserve Program (CRP)

Offers are accepted and processed during fixed signup periods that are announced by Farm Service Agency (FSA). All eligible (cropland) offers are ranked using a national ranking process. If accepted, contracts are developed for a minimum of 10 and not more than 15 years. Payments are based on a per-acre soil rental rate. Cost-share assistance is available to establish the conservation cover of tree or herbaceous vegetation. The per-acre rental rate may not exceed the Commodity Credit Corporation's maximum payment amount, but producers may elect to receive an amount less than the maximum payment rate, which can increase the ranking score. To be eligible for consideration, the following criteria must be met: 1) cropland was planted or considered planted in an agricultural commodity for two of the five most recent crop years, and 2) cropland is classified as "highly-erodible" by NRCS. Eligible practices include planting these areas to trees and/or herbaceous vegetation. Application evaluation points can be increased if certain tree species, spacing, and seeding mixtures that maximize wildlife habitats are selected. Land must have been owned or operated by the applicant for at least 12 months prior to the close of the signup period. The payment to the participant is up to 50% of the cost for establishing ground cover. Incentive payments for wetlands hydrology restoration equal 25% of the cost of restoration.

Conservation Reserve Enhancement Program (CREP)

This program is an "enhancement" of the existing USDA CRP Continuous Sign-up. It has been "enhanced" by increasing the cost-share rates from 50% to 75% and 100%, increasing the rental rates, and offering a flat rate incentive payment to place a permanent "riparian easement" on the enrolled area. Pasture and cropland (as defined by USDA) adjacent to streams, intermittent streams, seeps, springs, ponds and sinkholes are eligible to be enrolled. Buffers consisting of native, warm-season grasses on cropland, to mixed hardwood trees on pasture, must be established in widths ranging from the minimum of 30% of the floodplain or 35 feet, whichever is greater, to a maximum average of 300 feet. Cost-sharing (75% - 100%) is available to help pay for fencing to exclude livestock from the riparian buffer, watering facilities, hardwood tree planting, filter strip establishment, and wetland restoration. In addition, a 40% incentive payment upon completion is offered and an average rental rate of $70/acre on stream buffer area for 10-15 years. The State of Virginia will make an additional incentive payment to place a perpetual conservation easement on the enrolled area. The statewide goal is 8,000 acres.

The landowner can obtain and complete CREP application forms at the FSA center. The forms are forwarded to local NRCS and SWCD offices while FSA determines land eligibility. If the land is deemed eligible, NRCS and the local SWCD determine and design appropriate conservation practices. A conservation plan is written, and fieldwork is begun, which completes the conservation practice design phase.

FSA then measures CREP acreage, conservation practice contracts are written, and practices are installed. The landowner submits bills for cost-share reimbursement to FSA. Once the landowner completes BMP installation and the practice is approved, FSA and the SWCD make the cost-share payments. The SWCD also pays out the state's one-time, lump sum rental payment. FSA conducts random spot checks throughout the life of the contract, and the agency continues to pay annual rent throughout the contract period.

Environmental Quality Incentives Program (EQIP)

This program was established in the 1996 Farm Bill to provide a single voluntary conservation program for farmers and landowners to address significant natural resource needs and objectives. This program replaces the Agricultural Conservation Program (ACP) and the Water Quality Incentive Program (WQIP). Approximately 65% of the EQIP funding for the state of Virginia is directed toward "Priority Areas." These areas are selected from proposals submitted by a locally led conservation work group. Proposals describe serious and critical environmental needs and concerns of an area or watershed, and the corrective actions they desire to take to address these needs and concerns. The remaining 35% of the funds are directed toward statewide priority concerns of environmental needs. EQIP offers 5 to 10-year contracts to landowners and farmers to provide 75% cost-share assistance, 25% tax credit, and/or incentive payments to implement conservation practices and address the priority concerns statewide or in the priority area. Eligibility is limited to persons who are engaged in livestock or agricultural production. Eligible land includes cropland, pasture, and other agricultural land in priority areas, or land that has an environmental need that matches one of the statewide concerns.

Wildlife Habitat Incentive Program (WHIP)

WHIP is a voluntary program for landowners and land users who want to develop or improve wildlife habitat on private agriculture-related lands. Participants work with NRCS to prepare a wildlife habitat development plan. This plan describes the landowner's goals for improving wildlife habitat and includes a list of practices and a schedule for installation. A 10-year contract provides cost-share and technical assistance to carry out the plan. In Virginia, these plans will be prepared to address one or more of the following high priority habitat needs: early grassland habitats that are home to game species such as quail and rabbit as well as other non-game species like meadowlark and sparrows; riparian zones along streams and rivers that provide benefits to aquatic life and terrestrial species; migration corridors which provide nesting and cover habitats for migrating songbirds, waterfowl and shorebird species; and decreasing natural habitat systems which are environmentally sensitive and have been impacted and reduced through human activities. Cost-share assistance of up to 75% of the total cost of installation (not to exceed $10,000 per applicant) is available for establishing habitat. Applicants will be competitively ranked within the state and certain areas and practices will receive higher ranking based on their value to wildlife. Types of practices include: disking, prescribed burning, mowing, planting habitat, converting fescue to warm season grasses, establishing riparian buffers, creating habitat for waterfowl, and installing filter strips, field borders and hedgerows. For cost-share assistance, USDA pays up to 75% of the cost of installing wildlife practices.

Wetland Reserve Program (WRP)

This program is a voluntary program to restore and protect wetlands on private property. The program benefits include providing fish and wildlife habitat, improving water quality, reducing flooding, recharging groundwater, protecting and improving biological diversity, and furnishing recreational and esthetic benefits. Sign-up is on a continuous basis. Landowners who choose to participate in WRP may receive payments for a conservation easement or cost-share assistance for a wetland restoration agreement. The landowner will retain ownership but voluntarily limits future use of the land. The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10-year duration. Under the permanent easement option, landowners may receive the agricultural value of the land up to a maximum cap and 100% of the cost of restoring the land. For the 30-year option, a landowner will receive 75% of the easement value and 75% cost-share on the restoration. A ten-year agreement is also available that pays 75% of the restoration cost. To be eligible for WRP, land must be suitable for restoration (formerly wetland and drained) or connect to adjacent wetlands. A landowner continues to control access to the land and may lease the land for hunting, fishing, or other undeveloped recreational activities. At any time, a landowner may request that additional activities be added as compatible uses. Land eligibility is dependent on length of ownership, whether the site has been degraded as a result of agriculture, and the land's ability to be restored. Restoration agreement participants must show proof of ownership. Easement participants must have owned the land for at least one year and be able to provide clear title.

Southeast Rural Community Assistance Project (SE/R-CAP)

The mission of this project is to promote, cultivate, and encourage the development of water and wastewater facilities to serve low-income residents at affordable costs and to support other development activities that will improve the quality of life in rural areas. Staff members of other community organizations complement the SE/R-CAP central office staff across the region. They can provide (at no cost to a community): on-site technical assistance and consultation, operation and maintenance/management assistance, training, education, facilitation, volunteers, and financial assistance. Financial assistance includes $1,500 toward repair or replacement or installation of a septic system and $2,000 toward repair or replacement or installation of an alternative waste treatment system. Funding is only available for families making less than 125% of the federal poverty level. The 2011 federal poverty threshold for a family of four is $27,938.

National Fish and Wildlife Foundation

Grants are awarded for the purpose of conserving fish, wildlife, plants, and their habitats. Offers are accepted throughout the year and processed during fixed signup periods. The signup periods are on a year-round, revolving basis, and there are two decision cycles per year. Each cycle consists of a pre-proposal evaluation, a full proposal evaluation, and a Board of Directors' decision. An approved pre-proposal is a pre-requisite to the submittal of the full proposal. Grants generally range between $10,000 and $150,000. Payments are based on need. Projects are funded in the U.S. and any international areas that host migratory wildlife from the U.S. Special grant programs are listed and described on the NFWF website (antiquated link removed). If the project does not fall into the criteria of any special grant programs, the proposal may be submitted as a general grant if it falls under the following guidelines: 1) it promotes fish, wildlife and habitat conservation, 2) it involves other conservation and community interests, 3) it leverages available funding, and 4) project outcomes are evaluated. A pre-proposal that is not accepted by a special grant program may be deferred to the general grant program.

Clean Water State Revolving Fund

EPA awards grants to states to capitalize their Clean Water State Revolving Funds (CWSRFs). The states, through the CWSRF, make loans for high-priority water quality activities. As loan recipients make payments back into the fund, money is available for new loans to be issued to other recipients. Eligible projects include point source, nonpoint source and estuary protection projects. Point source projects typically include building wastewater treatment facilities, combined sewer overflow and sanitary sewer overflow correction, urban stormwater control, and water quality aspects of landfill projects. Nonpoint source projects include agricultural, silvicultural, rural, and some urban runoff control; on-site wastewater disposal systems (septic tanks); land conservation and riparian buffers; leaking underground storage tank remediation, etc. Estuary protection projects include all of the above point and nonpoint source projects, as well as habitat restoration and other unique estuary projects.

EPA Environmental Education Grant Funding Opportunity

EPA has recently announced an exciting environmental education grant funding opportunity. The purpose of the grants is to promote environmental stewardship and help develop knowledgeable and responsible students, teachers and citizens. EPA expects to award at least 20 grants nationwide ranging from a minimum of $15,000 to a maximum of $100,000 and will accept applications until May 2, 2011. For the full EPA news release and more information on eligibility and application materials, please visit the U.S. EPA website (antiquated links removed).

The project start date in proposals should be no earlier than September 1, 2011. There is a requirement to specify an environmental issue, based on EPA's current priorities that the proposed project will focus on. There is more emphasis on expanding the conversation on environmentalism by including a variety of audiences in proposed projects. There is a strong emphasis on partner letters this year. Letters will be scored for their clarity and completeness. Incomplete applications will not be reviewed. If applying through grants.gov, make sure to register at least one week ahead of time. Check out the FAQ link for more information: antiquated links removed; see U.S. EPA website.

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APPENDIX A

Working Group and Steering Committee Minutes

First Agricultural Working Group Meeting
Meeting Minutes
James River and Its Tributaries
Water Quality Improvement Plan for Bacteria Impairments
6:00 PM, November 16, 2010
DEQ-PRO

Attendees:

Keith Burgess, Monacan SWCD
Lin Liang, Greely and Hansen
Michelle Virts, City of Richmond
Kelley West, DEQ-PRO
Ram Gupta – DCR-Richmond Regional Office

Ram Gupta with DCR-RRO led the facilitation at the Agricultural Working Group Meeting. He briefly stated the purpose of the working group meeting – to suggest control measures to obtain bacteria load reductions from agricultural lands, constraints of implementations, potential funding sources and the outreach methods as suitable to the James River watershed.

The attendees at the meeting received lists of few best management practices (BMPs) with their bacteria reduction efficiencies, and the cost of their implementation. Group reviewed the information. Keith indicated that in Bernards watershed, there weren't many dairy animals, and the only livestock needed to be fenced out is below the monitoring station. Buffers are good, but cost is the main issue. Ram Indicated that there are two type of grazing land protection practices available – LE-1T (35-ft buffer width) and LE-2T (10-ft buffer width), and the cost to farmers depends on type selected. The LE-1T practice has 85% cost-share funding, while LE-2T is 50% cost-share funding (with cap and other limitations). Keith also indicated that there are few horses above the monitoring station and only one cattle and sheep farm in Bernards watershed. Keith indicated that by the time fence and wells are installed it can cost up to $50,000. Again, cost is the main issue.

The horse farms would need only stream fencing, not the wells, as farmers already have wells on those farms.

Ram asked the suitability of other control measures like woodland buffer filter area (FR-3), reforestation on erodible crop and pasture lands (FR-1), stream protection (WP-2T) or conservation tillage for the impaired watersheds. The group thinks it is worthwhile to explore and include few such BMPs on suitable lands. Bernards Creek watershed does not have any poultry operation.

Michelle inquired on the productivity of the stream fencing. Ram indicated that fencing is one of the most effective control measures in reducing bacteria loading from pastureland. The practice is found to have a bacteria reduction efficiency of 100%. Also, water troughs are installed under the agricultural projects and cattle prefers drinking water from these troughs, not from the streams. Drinking water from troughs has also been found to have a positive effect on cattle health.

The group reviewed the costs of agricultural control measures. Keith mentioned that for grazing land operation, funding needs are estimated at minimum of $25,000. Operations currently being installed are costing $150,000 to $200,000 for the projects including 30 wells. Streamside fence maintenance cost and other costs were found to be reasonable. Ram mentioned the need to check on costs of loafing lot management.

Keith pointed out that Powhatan watershed has large lots under non-forested zoning, but land use data shows it as forested land. There are few large land parcels that are not forested. Michelle asked if MapTech is using updated land use data. Keith indicated that due to differences in land use codes, data being used may not have correct land use coding, and will need to be checked. Keith will explore availability of mapping data for Michelle.

Ram indicated that various federal and state funding is available for agricultural BMPs. Also, if IP is approved, projects can be submitted for grant funding as well. Keith stated that NRCS has limited funding for water quality and no BMPs projects are currently done under this funding in Bernards Creek watershed.

Concern was raised that voluntary BMPs are not being credited to water quality benefits. Keith indicated that the Monocan SWCD sent a few farmers for a course on no-till farming practices. Many farmers started using the practice voluntarily, but database still show those lands under tilling operation. Ram indicated that a process is currently being considered to include these BMPs in the database. He further stated that BMPs to be included need to meet quality control and quality assurance requirements for inclusion in the database.

Retention ponds would be considered for implementation only if other BMPs are not enough to meet water quality standards. The ponds are for agricultural runoff only, not for residential or urban land runoff. Keith indicated that ponds are used drinking water sources for horses and cattle.

The group emphasizes the need of educating the farmers on various control measures and their water quality benefits. Most of the full-time farmers are in contact with the Soil and Water

Conservation District. But, the District has not had much contact with small farmers. Contacting those farmers and land owners through flyers, door-to-door, and local newspapers are considered best way of promoting BMPs within the watersheds.

Ram suggested DEQ to include Henricopolis SWCD for next working group meeting (invited but did not attend). DEQ will schedule the next working group meeting and seek consensus on date/time/location. DCR will reach out to local SWCDs to encourage their involvement in IP process.

Residential Working Group Minutes

Facilitator: Margaret Smigo, DEQ
Margaret.Smigo@deq.virginia.gov
Note-taker: Warren Smigo

Group Members in Attendance: Grace LeRose (City of Richmond), Scott Burger (Sierra Club), John Newton (Henrico Co.), Bill Shanabruch (Reedy Creek Coalition), David Bernard (Sierra Club/Coastal Currents)

1. Sign in / Introductions

2. Review of Work Group purpose and responsibilities
   a. Group understands their only responsibilities are to attend meetings and actively participate during meetings. Meeting minutes (drafted and circulated by the facilitator) will be made available to the Steering Committee meeting to help them chose residential BMPs to include in the Implementation Plan.

   b. Group discussed the "Standard Toolbox" and "Outside the Box" corrective actions and question was asked, "Which BMPs are meant for the residential group (is there a list for just residential)? The group then had a discussion that yes, there are certain BMPs which citizens can initiate on their own (i.e. rain gardens being most common and educating homeowners about picking up after their pets). Also, some residents have a community or homeowners association where rain gardens and larger scale pet pick-up education/signage could be made into a project. Finally, there is expected to be some overlap between residential workgroup suggested BMPs with government / urban workgroup for larger projects such as bioretention basins, vegetated swales, porous pavement / pavers, cisterns, (etc) as implementation will require a coordinated effort.

3. Work Group Brainstorming Questions: Note - Facilitator read each of the bulleted questions and asked members to take ~5 minutes to write down a few ideas for each one. Then as a group discussed ideas for each question.
   a. Which residential BMPs deserve consideration based on your knowledge of these impaired watersheds?
      - Pet waste-pickup program – community / neighborhood associations to sponsor
      - Septic repair program and education program for homeowners Residential Working Group Minutes
      - Stormwater BMPs – including any and all types in the CSO watersheds to reduce the frequency of CSOs. Would like to see more green infrastructure used (fewer "big" infrastructure projects such as storage which doesn't really address the issue of stormwater runoff). Group member mentioned we need to see stormwater BMPs on residential property.
      - Education program for citizens with irrigation system to include proper use. Group member indicated that irrigation practices should be regulated given the water quantity and quality issues. Group discussed the potential of education citizens who irrigate about how they may use drip irrigation from rain barrels in order to reduce stormwater runoff, reduce water bills / reduce water usage.
   b. Which BMPs, in your opinion, would achieve the most success in terms of community buy-in and successful reduction of bacteria in the waterways? Note - For this question we not only listed ideas but placed them into prioritized groups with "I" being the first group implemented and "III" being the last.

      BMPs – Priority I:
      - Rain barrels – inexpensive and will save citizens $$ on water bill

- Initiation of Pet waste clean-up program – at citizen, community association, and locality levels
- Repair Septic failures / Sewer line leaks – requires a proactive inspection process involving the locality, VDH, and sewer authority (and possibly others)
- Initiate building code changes in order for green infrastructure and LEED development / projects to move forward. Currently restrictions in building code in some areas prevent certain BMPs (i.e. Vegetated Roofs) from being installed.
- Tree planting – promotes runoff absorption and beautification, increases property values, easy to get citizen buy-in, etc.

BMPs – Priority II:

- Rain gardens
- Homeowner education on responsibilities regarding their sewer connections (what can and cannot go down drain, also stormwater drains, report sewer leaks/issues, etc.)
- Emulate the "green alley" programs which have been initiated in other cities (i.e. Chicago)

BMPs – Priority III:

- Increased enforcement for failed septics and sewer leaks. Also should create a reward program or incentives for proper maintenance, upgrades on treatment (i.e. nutrient removal installed with septic system), etc.
- Install more "green pavers" in municipal areas. Group Member question – How did Cheswick Park in Henrico go about getting green pavers installed? Might their efforts be duplicated in order to get them installed elsewhere?
- Create a reward program for city residents and neighborhoods to promote competition for BMPs to promote water quality / quantity issues (i.e. Reward for "greenest" properties/communities).

- Which BMPs do you think would be too difficult to implement and why (cost, lack of buy-in, maintenance, etc)? Note – group members limited this discussion mostly to those BMPs previously discussed.
  - Regulation of irrigation practices
  - Vegetated Roofs (retrofits are especially expensive)
  - Green alleys (Member mentioned the extensive costs of current green alley pilot project by City)

- Can you think of any BMPs which should be considered because they would be particularly useful in a particular impaired watershed but aren't on the list?
  - Cisterns – Group members discussed there are code issues regarding grey-water which limit effectiveness of cisterns. VDH should be consulted regarding this issue. Was agreed that cisterns would offer multiple benefits especially in CSO watersheds.
  - Bring VA's "green restaurant" program to a local level. Education for local restaurant owners on water quality issues to promote not only proper grease disposal but also recycling
  - Pet waste collection for use in bio-energy generation

- How can we gain community buy-in with IP effort? What is the best way to connect with citizens of these impaired waterways in order to achieve positive change? Note – in the interest of time, these two questions were discussed together.
  - o Suggest BMPs that improve community beautification as these will increase property values and tend to be a no-brainer for folks to support (i.e. – tree planting, pet waste clean-up stations)
  - o Promote the issues of impaired waterways by linking with citizen usage of nearby parks – improving water quality improves human health
  - o BMPs need to offer some incentive to excite citizens. An example would be (in City of Richmond) stormwater fee reductions for implementing BMPs on property. Incentives must be advertised.
  - o Regulators (DEQ, EPA, DCR, VDH) should show more support of "regulatees" in their efforts to implement BMPs. Also, neighboring localities should be supportive of other localities' efforts. One member brought up that City of Richmond has been proactive by initiating a "Stormwater Fee" in conjunction with their stormwater program which made runoff from personal property a prominent issue for citizens to consider. Very little support has been offered by state regulators or neighboring localities regarding the City's stormwater fee. Communication between localities and regulators in addition to public approval of one another's efforts to improve water quality and quantity could boost citizen buy-in and encourage other localities to be more proactive.
  - o Promote citizen monitoring program of nearby waters. Allows citizens to learn as well as feel a sense of ownership for their local waterway.

- Ideas for future work group meetings (must be handicap accessible and free)?
  - o Recommendations included the City of Richmond WWTP and Henrico County Administration Building. Previous suggestion included a church in Forest Hill area.

4. Next Residential WG meeting/location: Monday December 13th at 3:30pm at the City of Richmond Waste Water Treatment Plant located at 1400 Brander St., Richmond, VA

For Your Information

Septic systems more prevalent in de-listed mainstem segments of the James watershed (approx. Bernards Creek to just above City).

Table 1. Residential control measure costs. If you do not see certain BMP types below – it's because we don't have estimates for them.

Residential and Urban Control Measure – Unit – Cost per Unit
Septic Systems Pump-outs (RB-1) – System – $220
Septic System Repair (RB-3) – System – $3,500
Septic System Installation/Replacement (RB-4) – System – $4,000
Alternative Waste Treatment System Installation (RB-5) – System – $15,000
Pet Waste Education Program – System – $3,750
Pet Waste Composters – Composters – $50

James River bacterial TMDL Implementation Plan
First Government/Urban
Working Group Meeting Summary
Piedmont Regional Office, DEQ
4949A Cox Rd, Glen Allen, VA 23060
Tuesday, November 16, 2010, 7:30 – 8:30 PM

1. Attending:
Rod Bodkin, MapTech
Ian Frost, EEE Consulting, for VDOT
Craig Lott, DEQ Facilitator
Federico Maisch, Greely & Hansen, for City of Richmond
Jeff Perry, Henrico DPW
Arthur Petrini, Henrico DPU
Bob Steidel, City of Richmond DPU
Rick Thomas, Timmons Group
Scott Williams, Chesterfield Co.
Mark Alling, DEQ note-taker

2. Craig Lott provided an overview of the Government/Urban Working Group (GUWG) Responsibilities:
• Identify funding sources
• Identify available technical resources
• Identify appropriate "measurable goals" and timeline for achievement
• Identify regulatory controls currently in place
• Identify potential parties to be responsible for agricultural, residential, and urban implementation
• Evaluate various corrective actions, costs, tracking procedures, and technical assistance needs
Lott handed out meeting Agenda to members.

3. Open discussion on permitting issues

A member asked whether BMPs would be put into facility permits. Lott replied BMPs would not be put into permits. Doug Fritz will be asked to attend future WG meetings and address MS4 permit issues. Government/Urban Working Group (GUWG) responsibilities are just to make recommendations for "urban" BMPs. Recommendations must be cost-effective and reasonable. EPA determines if IP is sufficiently cost-effective and reasonable. IP is not constrained by the EPA VPDES 5 yr permit cycle. The draft 20 year timeline was copied from the draft Lynchburg James River TMDL IP because it also involved CSOs.

The comment was made that cost-effectiveness is tied to the schedule, in that something not cost-effective in 20 yrs may be cost-effective in 50 yrs. Lott replied that DEQ will not go to that depth of cost-effective analysis with determinations differing over extended time periods. However if stakeholders can provide that resource GUWG will accept it and consider it beneficial. The

Steering Committee sends the IP to EPA to determine whether it agrees with TMDL and permits, but EPA does not officially approve the IP, approval is made by the SWCB.

A member commented that at a recent EPA MS4 meeting, EPA said everything we do here during implementation planning will end up in a permit, suggesting we talk to NVRO permit writers to confirm this, and, once in permits the period of implementation is only 5 yrs.

A member asked that once the Bay TMDL is complete, will localities get credit for meeting BAY TMDL reductions from the James bacterial TMDL IP regarding whatever nutrients are reduced by BMPs during implementation.

The comment was made that the time line can be stretched out. Lott replied that the IP document must be completed by July 2011. However, the schedule for implementing the BMPs in the plan will be completed in Phases (e.g.. Phase I; first 5 yrs, Phase II ; next 5 yrs, etc). Craig stated the Lynchburg draft IP document will be available for our review this December.

The group discussed the percent reductions and reasonable assurance in the Lynchburg TMDL. Lott responded that the reductions were similar to the Richmond area TMDL, above 90 percent. The question was asked whether the 95% reductions in the Lynchburg TMDL had reasonable assurance in the TMDL document. Lott replied that EPA considered reasonable assurance adequate in the Lynchburg TMDL. DEQ will distribute the Lynchburg draft IP to GUWG members as soon as it is available. The bottom line is that the IP must be designed to address bacteria reductions in the TMDL.

Localities pledged to supply their BMP data to Rod Bodkin of MapTech, possibly through Margaret Smigo of DEQ. The City of Richmond said that bacterial efficiencies of current BMPs was very low, but the City will share data.

GUWG decided that the baseline date for BMPs supplied and credited for localities should be the end date of the TMDL model calibration period. Mark Alling supplied the date, September 30, 2003, from v85 of the Richmond Area James River TMDL report.

Lott stated that the upstream James River portion delisted was possibly due to upstream localities putting in BMPs. Virginia Beach implemented BMPs before their IP was completed.

Greely and Hansen will provide bacterial efficiency data translated from nitrogen and phosphorus efficiency data.

A member asked if the Lynchburg IP is a template for DEQ IPs. Lott replied no because the Lynchburg IP was a plan in which the CSOs were addressed for the first time. The DEQ consultant added that most IPs have a 15 yr timeline, but the Lynchburg IP timeline as extended to 20 yrs because of the CSOs.

Members reiterated that Doug Fritz should be in the GUWG. Lott mentioned that he could contact Doug Fritz and planned to ask Charles Lunsford (DCR) to be involved too.

Ram Gupta (DCR) was at the meeting and was facilitating the agriculture workgroup at the request of DEQ.

Group discussed that investigating MS4 stormwater outfalls is in the Bay TMDL and will be added to stormwater permits, using the Fairfax permit as a template. Lott asked embers to supply permit related questions to him to get answers from DEQ CO permit managers. Allan Brockenbrough was recommended for this. The group decided the next GUWG meeting will be December 9, 2010 at 10AM at the Henrico Co. Administration Building, with an alternate date of December 10 if Doug Fritz cannot attend on December 9. Henrico DPU will email the meeting room location.

Action Items:
1. Rod Bodkin will email exact data needs to member localities asap.
2. Localities will respond with data by email before the next meeting.
3. MapTech will compile data as much as possible before next meeting for distribution.
4. DEQ will invite 3 academic institutions with MS4s to next GUWG meeting: CU, John Tyler CC and JS Reynolds CC.

A member noted that all VCU MS4 outfalls enter City MS4 system and VCU should not have a WLA.

Second Agricultural Working Group Meeting

Meeting Minutes
James River and Its Tributaries
Water Quality Improvement Plan for Bacteria Impairments
2:00 PM, December 13, 2010
Richmond Waste Water Treatment Plan
1400 Brander St., Richmond, 23224

Facilitator: Ram Gupta
Recorders: Kelley West
Attendees
Dan Lee, James River SWCD
Kelly West, DEQ-PRO
Seth Mullins, DEQ
Roger Harris, DEQ
Keith Burgess, Monacan SWCD
Ram Gupta – DCR-Richmond Regional Office
Margaret Smigo, DEQ
John Newton, Henrico, DPW
Grace LeRose, Richmond, DPU
Ed Cronin, Greely and Hansen

Agenda

- Review the pollutant reductions that the implementation plan must meet (Table 1).
- Discuss preliminary estimates of implementation measures that will result in reductions in Agricultural bacterial loads (Tables 4 and 5).
- Document existing efforts underway to address bacteria in Agricultural and Residential areas of the impaired watersheds (Table 3).
- Identify additional/alternative measures to reduce the bacteria load that the implementation plan can address.

Ram Gupta with DCR-RRO led the facilitation at the Agricultural Working Group Meeting. He briefly updated the group with the discussions of first Agricultural Working Group meeting held on November 16, 2010. He then stated the purpose of the working group meeting - to review bacteria reduction goals and preliminary estimates of control measures; to review existing water quality efforts currently underway; and to identify additional control measures needed to reduce bacteria loadings in James River watershed.

Attendees was asked to indicate their choice if they would like to be on IP Steering Committee, which would meet in January 2011.

The attendees reviewed bacteria load reductions as provided in TMDL development document. Bacteria reductions are required in Almond, Bernards, Powhite and James River (riverine) sub-watersheds. Keith Burgess indicated that - riverine section of James River not included in 1st meeting; Are Genito and Dover and portion of Goochland included in current IP; and Bernards has only one beef cattle and no dairy plant; and number provided in Table 2 seem different than actual data and need to be revised and/or updated. Margaret Smigo responded – James upper portion was delisted in 2008; Goochland portion is not currently included in IP, and Genito and Dover Creeks are of low priorities as these do not discharge directly into impaired segments; model runs will be made to include these; and MapTech gets watershed data from SWCDs, online database, and through various public sources.

A need of map indicating sub-watershed boundaries, water quality stations, and acreage was felt to review data and various control measure estimates. Without this, reviewing estimated numbers of beef cattle and various other bacteria contributing livestock/animals seems difficult or unrealistic. Daniel indicated that there are no beef cattle in Chesterfield; and livestock number shown in handout seem too high; also there are no dairy in Chesterfield portion of James (tidal). Ram suggested contractor to review these Table 2 data again and to verify with SWCDs and local sources. Margaret suggested attendees to provide any revised estimates they might have. Daniel indicated to provide horse data for Chesterfield by next week.

Ram indicated that stream fencing estimates in Table 3-5 include single- and double-sided fencing needs, considering pasture and forest land uses. He suggested using correct naming of LE-1T and LE-2T control measures. Generally, 7% of total fencing requirement is considered to estimate maintenance costs. Also, out-of-total, 90% or more are considered for SL-6/LE-1T, and 10% or less for WP-2T and LE-2T systems depending on local needs. Keith suggested that instead of code names, IP should use full names of control measures.

Roger questioned the fencing need of Powhite Creek within the segment falling in Chesterfield. Keith suggested that since Almond Creek has low livestock number, SWCD staff may field verify these. John wanted to clarify the fencing estimates of James River (riverine) listed in Table 5 – does it include delisted portion or not?

Keith suggested the Retention Ponds in pasturelands are not practically feasible. Ram stated that various control measures are implemented in stages. Under Stage I (1 through 6 years of implementation), control measures having high bacteria reduction and comparatively less expensive are implemented, while retention ponds and other expensive control measures are recommended for Stage II (7 through 10 years) only. EPA requires implementation plan to include all control measures needed to remove all bacteria loadings to zero level. Expensive BMPs, therefore are suggested for later years of the implementation, only when other control measures are not able to bring bacteria loading to zero level.

Keith expressed concerns on Table 5 – if Manure Incorporation and Loafing Lot Management are not practically feasible in Bernards Creek watershed, what other BMPs would be needed in their places. Ram indicated that in such case, contractor needs to run another model runs to either increase the quantities of recommended BMPs or suggest other BMPs suitable to obtain bacteria reductions needed to achieve water quality goals.

Table 6 – cost of $70-$80 per acre was suggested for Manure Incorporation on cropland. It includes costs for manure broadcast and for manure injection.

Group reviewed IP cost estimates of Stages I and II, and asked to have watershed boundaries map prior to confirming watershed and livestock data. Ram asked attendees to provide any updated land use and livestock data to Margaret. Keith emphasized the importance that implementation plan should have most updated data.

Next working group meeting would be in night and at a place close to public transportation. Tentative dates were January 24, 25, and 27, 2011. Urban Working Group will meet 10:00 am on January 26, 2011. DEQ will finalize meeting schedule and venue and will inform to all attendees.

Meeting adjourned at 3:30 PM.

Residential Workgroup

Meeting Minutes 12/13/10

Facilitator: Margaret Smigo
Recorders: David Bernard and Kelley West

In Attendance:

John Newton, Henrico DPW
Grace LeRose, Richmond DPU
Ed Cronin, Greeley and Hansen
Chuck Frederickson,James River Association
Kelley West, DEQ
Scott Burger, Sierra Club
Bill Shanabruch, Reedy Creek Coalition
Keith Burgess, Monacan SWCD
David Bernard, Sierra Club
Margaret Smigo, DEQ
Lorne Field, Chesterfield Env. Eng.
Scott Flannigan, Chesterfield Env. Eng.
Ram Gupta, DCR

Agenda:

Introductions and Sign-In

Steering Committee (select yes or no on sign-in-if you'd like to join).

Review of 11/16/10 Brainstorming Session – Questions

Goal of Meeting: Review BMP Data & Answer Group Questions

Septic Repair/Replacement/Pump-outs

Pet Education/Pet Composters

Review of costs/unit

Review of cost/unit by impaired watershed

Set next Residential WG meeting date/time with 2 back-up dates (must be an evening meeting)

Open discussion (as time allows)

During the introduction, the sign-in sheet was circulated. Attendees were instructed to circle a yes or no for the column labeled "Would you like to join the Steering Committee?" Margaret explained that as a workgroup member your responsibility to the group is confined to review of the minutes and showing up for meetings. If you join the steering committee, you will be expected to not only review minutes and attend steering committee meetings (there will be at least 2), but also be required to review additional materials relevant to IP development and provide input on these materials. The 1st steering committee meeting will be scheduled for early January. Those who circled "yes" and are volunteering for the steering committee from the residential group are; Grace LeRose, Ed Cronin, Chuck Frederickson, David Bernard, Margaret

Smigo, and Scott Flannigan. Also on the steering committee (as a member of the residential workgroup) but not present is Chris French (Alliance for the Chesapeake Bay).

Copies of the Brainstorming Session which took place on 11/16/10 at the first public Implementation Planning meeting were made available to those who needed a copy and there were no questions.

Margaret explained the purpose of the 1st brainstorm meeting was to list all of the BMPs we'd like to see for residential areas. This included traditional BMPs (such as septic repair and pet waste education) but also included a lot of un-traditional, "out-of-the-box "BMP suggestions (such as initiation of building code changes in order for green infrastructure and LEED development projects to move forward). Margaret stated while a lot of the BMPs discussed in the 11/16/10 meeting focused on stormwater volume control, the focus of today's meeting would be the BMPs which remove the source of bacteria from the watershed in residential areas. Therefore, the information prepared for review by the group, is related to septic/sewer BMPs and pet-waste BMPs. Numbers of failing septic systems and straight-pipes and pet-populations were estimated in the TMDL and used to determine the amount of bacteria in the watershed as a result of those source types. While stormwater is a big issue and we plan on discussing those types of BMPs in the next workgroup meeting, the most effective way to reduce bacteria in the watershed is to take it out of the equation by addressing the source.

Margaret explained Table 1 in the workgroup handout includes estimated numbers of failing septic systems and straight pipes from the TMDL. The TMDL estimates were used to develop the number of estimated septic system repairs, new septic systems, and alternative systems that must be implemented to meet water quality standards for each of the impaired waterbodies. The numbers in this table were also dependant on the final TMDL scenarios for each impaired waterbody in the report. The scenarios showed the estimated reduction of bacteria necessary for different land use types. For the residential workgroup, the land use types of "Human Direct" and "Human and Pet Land Based" are the factors which affect Tables 1 and 2 in the handout. It was explained that differences in land use affected the amounts of the "human and pet land based" reductions required. Because "human direct" sources of pollution are illegal, 100% of all septic failures and straight pipes must be corrected.

Margaret said she took original MapTech numbers and altered them based on conversation w/ VDH in the government/urban workgroup on 12/9/10. She upped the estimated alternative septic system cost to $20,000, and since she recently had her septic system pumped, she knew the pump-out cost was closer to $450 (original was estimate was $220).

Group asked how where the estimates from TMDL came from, to which Margaret answered the 2000 Census. The questionnaires not only offered population information (which could be extrapolated to the watershed area) but also what type of sewage treatment did their house have (public sewer, septic, other – and other was inferred to mean straight pipes). Also from 2000 Census, information on house age. TMDL estimated # of septic failures based on home ages. From set of age ranges can calculate an estimated number of failures using the expected % of failures for each age range (the older the house/system, the more likely it is to fail). Also, based on information DEQ received during public comment periods and throughout the TMDL development, these numbers would have been further adjusted. When no input is given, we must default to estimates that have been derived.

Group doubted the estimates based on the Census. Margaret explained that during TMDL development, MapTech and DEQ used the best information available and asked for public input. Where no input was offered, numbers remained the same. It is acknowledged that there may be inaccuracies, which is inherent given the use of estimates. Margaret asked the group to not get stuck on the numbers in the TMDL. Adjustments can be made in the Implementation Plan, based on information from workgroup members.

Margaret mentioned that VDH corrects septic failures and straight-pipes as they become aware of them. It is difficult to verify these numbers as a result, however, in speaking with Henrico Co., a straight-pipe was discovered and corrected in last 6 months.

Keith asked where did the "Septic Pump-Outs" number come from to which Margaret answered it is half of all septic systems per impairment.

The group was asked to answer 2 questions for Table 1:

Does the breakdown between septic repairs, new septic systems, and new alternative systems apply in these watersheds?

The group did not offer recommendations on these numbers however Ed Cronin suggested that for the "Septic Pump-Outs" column, a frequency should be associated.

Does sewer hook-up need to be added to the estimates? In which watershed would they be applicable? At what % of the total need (total failing/repairs/new)?

The group had a fair amount of discussion regarding this question. In order to determine feasibility for hooking-up homes to public sewer (who are currently on septic), we must know where the main pipes end and how much it will cost to hook up (based on distance from the main), and what is the need of surrounding homes. This could be determined by evaluating soil data, getting information from VDH on septic failures in the vicinity, and density of homes that would most benefit from public sewer connection.

Need information from localities in order to derive stage I and stage II plans for public sewer hook-up as a BMP in the IP plan.

Chesterfield Co. mentioned they have GIS layers which could help them determine which areas would be feasible for hook-up. Based on subdivision age, they can estimate the likelihood of septic failures. Scott said they could work with VDH to highlight failed septics which could indicate the possibility of other failures (given similarity of soils) which may be ongoing nearby. Scott (Flannigan) wasn't sure of the public sewer hook-up requirements.

The City of Richmond said their connection numbers do not seem to correspond to VDH's septic numbers. Grace and Ed said that density and soil maps should be consulted in order to determine where septic failures are most likely. Also age of house and proximity to nearby streams. Ed and Grace said they could do a hook-up estimate price per foot (or over 100'). The cost will depend on how far the house is from the main. Margaret suggested (overall in the IP) there could be a stage I effort where within a certain radius from the main(s) (in each impairment) sewer hook-up would be most cost-effective for as many homes possible. The stage II effort could include a distance with a wider radius which would be more expensive, but not cost prohibitive to hook-up as many homes as possible.

Ed mentioned that based on VDH comments, the septic system replacement estimates (table 3) should be $8,000.

Scott mentioned that in some underprivileged areas, there might be 13+ people living in a home with a septic system designed for a maximum of 4.

Ed said that in the City, its best to look at who has water connection and not sewer. VDH says they only have ~140 some homes on septic but City reports some 1300 have water connection but no sewer connection. That's a huge amount of unaccounted waste – where is it going?

Scott (Berger) mentioned it is possible that some folks are legally off public sewer through the use of composting toilets. Lorne mentioned that as far as the Census questionnaires, if they check "other", people might just not know what they have.

In the interest of time, the group was asked to move on to Table 2. Margaret explained that in terms of bacteria source control, pet waste is a major contributing factor. There are a variety of ways to remove the waste as a source. The two main methods represented in the table are pet composters ("doggy-dooley" type systems which could be distributed to individual homeowners or groups who would use them collectively) and pet-waste education program systems. The table is somewhat ambiguous because pet-waste education program is not defined, so it should be interpreted as whatever the group deems necessary for the watershed. Margaret explained that some areas (like Reedy Creek) are high-density residential centered around common space (Reedy Creek Park and Forest Hill Park) so a more intensive program (with higher cost) might be necessary. On the other hand, Bernards Creek is much more rural though there might be a few subdivisions where we might be able to work with the homeowners' association to undertake something of a smaller scale pet-waste education program (lower cost). Pet-waste education program can include anything from just flyers to signs, pet-stations, etc. Pet composters were noted as only being beneficial in certain soils and climates.

Keith asked why some columns had a "0" for pet composters. Margaret explained that some impairments required less reduction in bacteria to meet water quality standards. Having said that, Margaret reminded the group that additional scenarios would be run for the James riverine (lower, non-tidal segment) and Reedy Creek impairments. MapTech was working on that but didn't have them ready in time for the meeting. The group will review revised James riverine and Reedy Creek versions of estimated BMPs as soon as they are available. Because new Reedy Creek data (which was not included in TMDL) indicated a higher amount of bacteria than that demonstrated in the TMDL, it is realized that additional reductions will be necessary to meet water quality standards (and thus, likely more BMPs than these tables indicate). Margaret upped the Reedy Creek pet composter numbers to 500 (each stage) and 1 pet-waste education program in stage 1. The James riverine portion was delisted in 2008, and the City of Richmond requested that we include a scenario to reflect the delisting information, which may result in fewer reductions needed in that portion.

The City requested MapTech outlined how they intended to run the new scenarios, so that the City might provide commentary prior to the final scenarios. Given the narrow time frame for this IP development and the need to keep on schedule, Margaret agreed this was a good idea, and would contact MapTech to ask them to provide a summary of how they would run the scenarios.

Margaret asked the group to provide input on Table 2. Some members expressed that they were doubtful the pet composters would provide the intended benefit. Grace said that there is no metric to measure success (others suggested a survey could measure usage however). She said a successful pet-education campaign is based on repetition in order to have successful change in behavior. Keith said the pet-waste education programs would cost different for different areas. He suggested coming up with watershed totals and then divvying up the money by those watersheds which need pet-waste education the most. Margaret said that based on TMDL scenarios, the numbers needed are divvied up by watershed in order to meet water quality standards. We now need input on which watersheds need which BMPs the most, for example, which types will be most effective and where. All members thought the number of BMPs seemed low across the board. Scott said that often in high or medium density areas there are common spaces (like grass ditches along the roads) where folks walk pets. He said these spaces are often very close to streams or drainways. Ed said the pet-waste system and components should be defined so that members can see what is involved in the cost. Scott expected that depending on whether urban or rural, the costs would differ. Margaret said there are already pet stations and signage around the City and the localities. It would be best for the localities to let us know what they've paid for such BMPs (this was something the government/urban workgroups were asked to provide information on). In order to make effective recommendations in the plan, we need to know where these BMPs are already implemented anyways, cost information should also be available. DEQ would also like to know who is responsible for maintenance of these types of systems (county, city, homeowner associations?) and if agreements are in place. Scott asked who would be responsible for maintenance and costs to implement these BMPS (parks, DPU, neighborhoods?). Grace mentioned that parks, neighborhoods, counties, DPU, all have separate programs usually, it's the communication between them that isn't always clear (don't always know who is doing what). Margaret said the IP process was meant to facilitate that communication.

Finally, Margaret explained the estimates in Table 3 were for the BMPs in Tables 1 and 2. The remaining tables illustrate for each creek, based on the TMDL scenarios for meeting water quality standards, the number of BMPs needed and associated costs to implement them in each impaired watershed. It was again mentioned that the James riverine and Reedy Creek tables would likely change after the additional scenarios are completed. Margaret asked the group for input on the tables.

Keith mentioned that he would like to check to see how many houses are in Bernards Creek watershed and would also like to know from Chesterfield how many homes are connected to public sewer. Grace said that we would need to know what a pet-waste education entails and who would implement it. David suggested a pet-waste education plan that focuses on veterinary clinics. Someone would meet with the clinic and outline the problem of pet waste so they could educate their clients. Scott (Berger) said that most people don't think of it as a health issue, it's considered more of a common courtesy (aesthetics), in which case people are less inclined to pick-up after pets. If they were more aware of the human-health effect of pet waste on waterways they would see it in a way that might create a change their behavior. Grace said that whatever types of BMPs are put into place we must have a way to measure their successfulness. There should be measurable goals (not just fewer bacteria in samples taken). In other words, we should be able to say "yes, that worked" or "no, that didn't work". These could be number of bags used at a pet waste station, number of ads run to educate pet-owners about cleaning up after pets. She said is not feasible to measure goals from pet composter BMPs. Chuck said this is the same problem with E&S controls, once they are in there is no check and there is minimal follow-up. Bill suggested a survey a year or two after distribution of pet composters might offer some measure of success in regard to composters. Scott (Berger) said we need to look into what other states are doing. Scott (Flannigan) suggested looking into whether trash cans (bottomless) could be used in lieu of pet composters. Members were unsure if that would create issue with water table (pet composters only installed in short depths). If pet composters are used residents and localities should get credit somehow for using them.

Margaret told the group that the next meeting would likely focus on stormwater type BMPs. If you have any information regarding efficiency information on stormwater BMPs please send it to her. Because stormwater BMP efficiencies are more typically given in terms of volume, we don't have a lot of information in regards to bacteria removal. We need this information to incorporate into the IP.

The group discussed next meeting date and times. The 24th or 27th of January at 6pm were dates and time agreed (Margaret would secure location and announce to group). The agriculture and residential workgroups would meet again on same date with back-to-back meetings (for those who would like to attend both).

FOLLOW UP:

The agriculture workgroup meeting was scheduled for Monday January 24th, 2011 from 5:00 – 6:15pm. The residential workgroup meeting was scheduled for same date from 6:30-7:45pm.

James River bacterial TMDL Implementation Plan Government/Urban

Second Working Group Meeting Summary
Piedmont Regional Office, DEQ
4949A Cox Rd, Glen Allen, VA 23060
Thursday, December 9, 2010, 10:00 AM - 12:30 PM

1. Attending:
Margaret Smigo DEQ TMDL coordinator
John Woodburn Henrico DPU
Jeff Perry, Henrico DPW
Kenneth W. Smith, RCHD
Bill Mawyer, Asst. Director, Henrico DPU
Roy T. Mills, VDOT
Keith Burgess, Monocan SWCD
Mike Callahan, Henrico HD
Megan Sommers Bascone, DCR/VCR
Chris Swanson, EEE for VDOT
Ed Cronin, Greely & Hansen, for City of Richmond
Grace LeRose, City of Richmond
Lin Liang, Greely & Hansen, for City of Richmond
Chris French, ACB
Rick Thomas, Timmons Group
Mark Alling, DEQ Piedmont office
Lorne Field, Chesterfield Environmental Eng.
Scott Flanigan, Chesterfield EE
Craig Lott, DEQ Facilitator

2. Craig Lott provided an overview of the Government/Urban Working Group (GUWG) Responsibilities:

- Review the pollutant reductions that the implementation plan must meet.
- Discuss preliminary estimates of implementation measures that will result in reductions in urban loads.
- Document existing efforts underway to address bacteria in urban areas of the James River watershed.
- Identify additional measures needed to reduce the bacteria load that the implementation plan can address.

Lott handed out meeting Agenda to members.

Members discussed the first two agenda items at this meeting.

3. Ms. Smigo introduced stenciling storm drains as a BMP option. Burgess stenciled in Powhatan Co. with Board of Supervisors OK. In Henrico, stenciling encouraged but there are concerns on maintenance and it is done more in residential areas. There is an ordinance that no one may dump into sewer system. VDOT has a message built into the storm drain covers. Henrico also has message discs on storm drains. With 250 markers the cost goes down per marker.

4. Mr. Lott offered a draft Lynchburg IP. MapTech is not present today but will attend all the steering committee meetings. Mr. Lott offered a list of needs to the group and reminded the group to list BMPs since Sept. 30, 2003. Henrico stated they had not been contacted by MapTech for data needs. Henrico will provide contact info for their GIS person and Maptech will contact that person.

5. Open discussion on the pollutant reductions that the implementation plan must meet. The group reviewed pollutant reductions in Table 1 of today's handout. Ms. LeRose asked if MapTech was to do new reductions for Reedy Creek. Yes, as a new scenario. Another member asked if MapTech was to do new reductions for James River after upstream delisting. Yes, as a new scenario. These will be available before the first Steering committee meeting in January. Mr. Cronin explained the James scenario was needed because the upstream James segment was delisted after modeling and CoR wants to see if reductions change with upstream load reduced to the water quality standard.

Mr. Burgess stated that Bernards livestock numbers are incorrect and he had notified MapTech, however the original numbers stayed in the report. The Livestock numbers are too high, there has not been a dairy in the watershed in 30 yrs. There is only one livestock operation in the watershed, and it is downstream of the Rt. 711 monitoring station, but there are a number of horses. Mr. Lott asked for written data update. Mr. Burgess stated that current data is needed. Mr. Alling said he would check and supply current data, and add Bernards Creek at Rt. 711 to next two year ambient network in January 2011.

Mr. French mentioned that Tuckahoe Creek has a TMDL but no IP, and is in this James watershed. DEQ to check if included or can be added to this IP. Mr. Perry asked if Tuckahoe drained to an unimpaired segment. Yes. Mr. Lott asked for additional thoughts on Tuckahoe Creek and volunteered to check.

Henrico stated there are no livestock in Almond Creek, except possibly horses. The same question was asked of Chesterfield Co. and City of Richmond for Powhite Creek. Just because there is a # reduction for livestock does not necessarily mean livestock abide in the watershed. There could have been manure applied or livestock transported through watershed. There were several more comments on the accuracy of livestock populations numbers. Mr. Alling said that the group would simply not add cattle fencing as a BMP if there were no cattle in a watershed.

The No Name Creek subdivision was taken off septic systems and added to municipal sewerage three years ago. Comment was made that Falling Creek human and pet land based % reduction was low while the creek drained a large portion of Chesterfield County. DEQ requested current information for changes in No Name and Falling Creeks.

The baseline date for BMP information is 9/30/2003.

Mr. Perry asked for current BST data, and DEQ responded no longer sampling BST because of cost at $250 per sample X 12 samples per station. DEQ said localities could do BST if they desired, doing 12 monthly samples per station, or data could be spread out over 2 years bimonthly. He then asked how we evaluate improvement. DEQ explained improvement judged by *E. coli* sample result in at least the original listing stations down to water quality standard.

Mr. Cronin asked for all *E. coli* data from all stations since 2003 to be emailed to all members. DEQ agreed to make available electronically or to email the large spreadsheet. DEQ is not familiar with monitoring that localities may be doing, unless its submitted for assessment. Mr. French said that the ACB is currently partnering with the Reedy Cr Alliance to sample that watershed.

Mr. Thomas asked for an explanation of column headings in Table 1. Ms. Smigo explained.

Open discussion on the preliminary estimates of implementation measures that will result in reductions in urban loads. Mr. Lott asked group for contact information for member's GIS staff. He stated that EPA provides lists of BMPs online for FAQ and other question responses on efficiencies, costs, etc. He mentioned maintenance resource needs as an additional consideration in planning and budgeting. The comment was made that only the City has CSOs, none in counties. SW BMPs will only be needed to address these waters which required further reductions to meet the water quality standards (Gillie Ck, Almond Ck, etc).

Mr. Fritz stated there is a difference between stormwater volume control and volume reduction and types of BMPs for reduction of MS4/CSO flows, i.e. that some BMPs may reduce only flow, not bacteria numbers. Bacteria and LID don't match up; some BMPs may concentrate wildlife loads, so must carefully choose BMPs. Mr. Lott said that retention ponds can reduce bacteria, while detention ponds may increase bacteria loads from differences in turn-over, but that many sedimentation BMPs do reduce bacteria loads.

Mr. Perry asked for DEQ guidance on most efficient BMPs, that Table 2 does not convey efficiencies. Mr. Lott and Mr. Cronin said the International Stormwater BMP Database (antiquated link removed) provides efficiency data, though data are expressed in ranges of varying widths. One site in Charlottesville had only 3 datapoints. Mr. Lott said it is hard to justify benefits of non-mandatory BMPs but well-chosen prudent BMPs designed to reduce bacteria will be a benefit. BMPs efficiencies are dependent upon many variables, including hydrology, infiltration, sedimentation, filtration, exposure to sunlight, habitat for fecal bacterial predators, etc. USEPA, other United States agencies, and other countries contribute to the peer reviewed International BMP Database. It may be found online at the following address: antiquated link removed.

Note (The most recent addition to the database):

2010 Bacteria Technical Paper:

Antiquated link removed; see International Stormwater BMP Database website.

Spreadsheets:

Antiquated link removed; see International Stormwater BMP Database website.

• Regulatory context for pathogens in receiving waters
• Sources of pathogens and fecal indicator bacteria
• Fate and transport processes, removal mechanisms and associated BMP design considerations for fecal indicator bacteria and pathogens
• Overview and analysis of fecal indicator bacteria included in the International Stormwater BMP Database (BMP Database)
• Conclusions and recommendations
• Open Excel spreadsheet of data set used in analysis

Mr. Flanigan said that Chesterfield BMPs will be solid infrastructure rather than smaller 'green' infrastructure items. Mr. Lott said that Virginia Beach started grant applications during the Lynnhaven IP, including an aggressive "Find and Fix It' program for sewer lines. This was thought to be the most effective BMP used there. One shellfish growing area which had been impaired and restricted for over 75 continuous years was opened for shellfishing during this IP development and implementation.

The question was asked whether localities without CSOs would get credit for stormwater reductions. Yes, to the extent that they address their bacteria reductions.

Mr. Perry asked if localities will ever get efficiencies for bacteria BMPs? Mr. Fritz stated variability is great on BMP efficiencies, but that municipal sewer systems are already doing BMPs without realizing it, for example by requiring high standards, extending sewer lines, using most current technologies, and TVing lines.

Mr. Lott said that if members have questions on loadings from the TMDL, please contact DEQ.

Ms. LeRose commented that the most effective BMP would be to remove all septic systems and replace with sewer line connections. Several responded that distance and feasibility are determining factors. Ms. LeRose said we cannot do anything about livestock and pets, so find money to take septic systems offline.

Mr. Perry asked if no one can say what effect 1400 BMPs including wet ponds and detention ponds costing millions of dollars that Henrico has installed have on water quality, how do localities know what's effective? What should they install now?

Mr. French replied there is no easy answer. The only way to answer is by looking at locally collected water monitoring data. He said a JRA study in the tidal James area showed a 40-50% BMP failure rate simply because the BMPs were not installed correctly and/or maintained properly. Mr. Fritz stated there are "general effectiveness" data, not exact but more of a range, such as a list from EPA with design info included. He also said Knoxville has a BMP manual/database with a list and general effectiveness for bacteria, which could be used to set locality priorities for BMPs. Mr. Lott asked for members to supply any efficiency study data they find. (Craig will get link from Doug F.) (seems like Grace L. had a study from Oregon).

Mr. Mawyer stated that the planning commission approves whether septic fields will be used in new subdivisions. Henrico says that if the distance to a sewer connection is more than 300 ft then septic fields are approved. At less than 300 ft you must connect. He stated there is an alternative to build the sewer line connector up front and recoup costs when subdivision hook up but the problem there is who fronts the initial costs. Ms. LeRose stated that if ponds are put everywhere, there are continuing maintenance costs that add up too.

Mr. Perry asked how effective septic pumpouts would be, what is the cost benefit for these and other actions. Quantifying benefits of BMPs are important for citizens. Ms. Bascone added that Lynchburg study found it was cheaper longterm to hook up to municipal sewer, but selling that to public is hard. Lynchburg was looking at $20000 to hookup to city sewer and installing septic system costs about the same. Lynchburg urges septic tank owners to pump out each 5 years to extend the life and cost of their septic systems.

Mr. Lott said the Ches. Bay VA WIP states that some treatment systems may not be allowed in the future.

Mr. Flanigan stated that where 30 to 50 year old septic systems were installed where now there is considered not enough land to expand them, some owners install straight pipes to a creek through the old drainfield.

Mr. Cronin stated it costs about $25000 for a new installed septic system, which is a hard sell to homeowners.

Mr. Perry said group will not be able to quantify efficiencies of BMPs. Mr. Lott stated that if localities provide GIS layers with BMPs as asked, the efficiencies are provided in literature that will show costs and predicted reductions. Mr. Fritz stated that localities will have to provide BMPs to remove the excess bacteria loads in TMDLs.

Mr. Lott asked for any corrections to Table 1 on page 6 – Estimated residential BMPs needed.. Mr. Perry questioned data saying Almond Creek needed 148 septic pump outs but only 35 failed. DEQ will asked MaPTech to explain the numbers in Table 1. Table 4 Residential will be addressed in the Residential wg meeting. Ms. Bascone explained pet waste composters to the group. Mr. Perry asked why there were no pet waste composters required for Falling Creek, and Mr. Lott explained that there was a small pet reduction required for small Falling Cr pet load, so no composters added.

Mr. Lott explained the cost per units in Table 5. Mr. French asked what the $3750 for Pet Ed. Included. If a pet Ed. Program was done for each impaired watershed, does that mean they cost about $40000 each? DEQ will ask MapTech. (Craig getting Answer from MT)

Mr. Perry said that costs mean nothing to him unless he knows what he's getting for the cost. So why should Henrico spend dollars on BMPs.

Mr. Callahan provided updated cost information for 3 items in Table 5, which Mr. Lott recorded. (include here)

Mr. Mawyer stated his opinion that credit buying programs are a sham that will not improve the situation in future years.

Ms. LeRose provided a document on bacterial reduction for pet education and will email it to Mr. Lott. (Craig reminding Grace to get link)

Mr. Lott stated several of group will be needed in the Steering Committee. Ms. Smigo stated the size of the Steering Committee may be limited by certain number per locality so that all localities may be members. Ms. Smigo said that SC responsibilities include reviewing documents and commenting outside of meetings. There is more outside meeting works necessary to be on the steering committee. There are usually 2 SC meetings, but may need a third.

Ms. Smigo stated there is a strict timeline for completing the IP due to stimulus funding source. A draft IP must be available by July 30, so it must go out to public comment in mid to late May.

Mr. Mills asked how do we reconcile the different efficiency data that may be used by two different groups? Mr. Perry stated that if asked what Henrico Co. will do for BMPs he will say we do not know because we do not know the efficiencies. Mr. Mills added that developers and home buyers will also dispute BMPs needed because of cost.

Mr. Fritz stated that stormwater permits must be consistent with TMDL WLAs. The IP is meant for NPS, the WLAs are for PS. Additionally, this analysis being provided by the federal funding, will enable localities toEventually effluent limits will be in stormwater permits (WQBELs), in the meantime looking at PBM implementation where there is now flexibility what can be done there.

Mr. Lott stated that most IPs are developed to address problems throughout the watershed. If you meet use attainment in one segment, then we may begin to focus another area, but typically address watershed wide reductions in phases throughout the watershed. If the WLAs are demonstrated early as being met, the determination from that is usually that the BMPs are where they should be and engineered correctly. Mr. Fritz said that because of land use changes, planning for BMP implementation is not always that simple and it may not work out that way.

The next Govt/urban workgroup meeting will be January 26 at 10am at the Henrico County Administrative Annex Building.

Action Items:

Mark Alling will provide Bernards Creek data and insert Bernards Creek Rt. 711 station into 2011-12 sample rotation if necessary.

Mark Alling will retrieve all data for all stations used in the James City of Richmond TMDL and distribute to group by email.

Henrico will supply GIS contact so that MapTech can request needed data. Doug…Grace…Craig…

James River bacterial TMDL Implementation Plan First Steering Committee

Meeting Summary
Westover Hills Library
1408 Westover Hills, Boulevard
Richmond, VA 23225-3110
Wednesday, January 12, 2011, 1:00 PM - 3:00 PM

Attending:
Margaret Smigo DEQ TMDL coordinator and meeting facilitator
Keith Burgess, Monocan SWCD
Kemper Loyd, VDH
John Newton, Henrico County
Debbie Byrd, Goochland Co.
Sarah Stewart, RRPDC
Bob Steidel, City of Richmond
Hope Weaver, ACB Intern
Ram Gupta, DCR-RRO
David Bernard, Sierra Club & Coastal Canoeists
Ed Cronin, Greely & Hansen, for City of Richmond
Grace LeRose, City of Richmond
Chris French, ACB
Mark Alling, DEQ Piedmont office
Lorne Field, Chesterfield Environmental Eng.
Scott Flanigan, Chesterfield EE
Craig Lott, DEQ CO TMDL Coordinator

Margaret Smigo provided a historical overview of the James River bacterial TMDL and IP to date and established 2 ground rules: No talking over each other and using a “Parking Lot” for any irresolvable topics for later resolution.

The committee made introductions.

Ms. Smigo discussed the Four Goals of the Steering Committee:
1. To review all minutes and discussions made by Work groups
2. To make final decisions in IP development
3. To review progress of BMP installation over time
4. To review future water sampling results

There were three work groups: Government/urban, residential, and agricultural. First WG meetings occurred 11/16/2010, second formal meetings occurred December 9 and 13, 2010. All minutes are posted online.

Mr. Gupta summarized the Agricultural workgroup activity to date. See the First Steering Committee meeting – Summary of Agricultural Working Group meetings document dated

1/12/2011, attached, for details. Mr. Burgess added that he is still checking livestock numbers for Goochland and Powhatan Counties. Ms. Smigo stated there would be no updated population / cost handouts for this meeting because the numbers are still changing almost daily. Final such handouts will be provided at the second Steering Committee meeting.

Ms. Smigo summarized the Residential workgroup activity to date. See the First Steering Committee meeting – Summary of Residential Working Group meetings document dated 1/12/2011, attached, for details. Ms. Smigo noted that the WG wanted Stormwater BMPs in all watersheds of the TMDL including those without CSOs. Mr. Steidel stated there are no City code restrictions on installing Vegetated Roofs, but there are on grey water use. Mr. French stated there were inconsistencies between localities regarding the permitting and installation of rainwater harvesting cisterns due to local interpretations of health and building codes. A group spearheaded by the Rivanna River Basin Commission and the Thomas Jefferson Soil & Water Conservation District is currently working with state agencies to address the matter so there is statewide consistency for permitting cistern systems.

Ms. Smigo stated that septic failure rates are hard to count, as well as how the numbers of straight pipes. Mr. Flanigan stated that Chesterfield Co. was doing digital mapping of septic failure and using VDH data to see where failures exist. All types of failures were considered one category. Multiple areal grouping popped up. This also showed proximity of septic failure groupings to municipal hookups and surface waters. Mr. Steidel asked who pays in Chesterfield Co.? Mr. Flanigan replied that all residents pay $3500 to connect to municipal sewer regardless of length to sewer line. Staff found some failures with sewer hookup in front of the home. There are no rules to require hookup in Chesterfield Co. Mr. Steidel asked if county condemns failed septic properties. Mr. Flanigan did not know, that was a VDH issue, but that people have not been cleared out of homes. Ms. Smigo stated sometimes hookup cost varies by radius to hookup. Ms. LeRose asked if the cheapest cost is at the connection point. Mr. Flanigan stated Chesterfield Co. made maps of the sewer failure groupings. Mr. Loyd stated that STPs may be overwhelmed with excess flow with many more hookups.

Mr. Bernard stated that Austin TX pet waste program information is interesting, and past around a handout. It is a comprehensive 10 year old program. There are posters in Vet offices recommended by the Sierra Club. Such posters already designed could save design costs for this IP. Ms. Smigo stated that pet waste composter construction involved plastic drums put in the ground, but it is unknown if they are used correctly after installation. These were included in the pet waste IP analysis but the group questioned their efficiency.

Mr. Lott summarized the Government / Urban workgroup activity to date. See the James River Bacterial TMDL Implementation Plan Government / Urban Work Group Meetings (1 & 2) Highlights document, attached, for details. He stated that DEQ got all stormwater data and bacterial BMP efficiency data from localities. MapTech is working with the data. Mr. Steidel noted differences between the Lynchburg and Richmond CSO situations. Mr. Lott stated that efficiency data and cost/efficiency comparisons are real issues for local governments. These data need to be created at the local level. The WGs will recommend BMPs using the EPA International efficiency database. Mr. Cronin stated there may not be a translator between nutrient BMP efficiency and bacterial efficiency. Greely and Hanson summarized efficiency rates for BMPs and will forward this information to the groups. Mr. Alling and Mr. Burgess will discuss monitoring on the cattle farm on Bernards Creek downstream of Robious Rd. DEQ asked permission from the owner to monitor on the farm and await a decision. Mr. Burgess talked with the owner about BMP programs. The Bernards Creek station at Rt. 711 was added for monitoring in 2011 bimonthly.

Mr. Lott stated that DEQ is still considering including the earlier Tuckahoe Creek bacterial TMDL in this IP. MapTech is still evaluating also. Ms. Smigo stated that the committee will need DEQ's decision by the end of January work group meetings to be able to include Tuckahoe Creek in this IP. Mr. Steidel stated that if Tuckahoe Creek is not included in the IP, the City will do a Source Water Protection Plan because Tuckahoe Creek is a source for the City drinking water.

Ms. Maggard by phone addressed activity by each WG. For the agricultural WG she thanked all for improved livestock information, which changed the NPS BMP needs. MapTech had a lot of WG questions to answer. She said there will be no livestock BMPs in the urban watersheds. The land use reduction percents are changing daily due to so many updates. Five sections of the IP with a map plus land use will be available for the next WG meetings. For the residential WG, Ms. Maggard noted a lot of questions on riparian buffer locations, what streams, whether costs were per foot or per acre. MapTech has septic system repair data. All the changes will be in the next WG handout. The City said they have no livestock reduction, but the James riverine has city reductions for other non-ag BMPs. For pet education, whether its bags, refills, signs, at community events, vets, SPCAs, hunt clubs, flyers, billboards; this can be done any way the group wants it, just write it into the plan. Pet waste reduction comes from actual pet waste pickups, so pickups are needed for bacteria improvements. This will be included in the next handout. Ms. Smigo will also have slides on this. For the government/urban WG , Ms. Maggard stated that for LID BMPs she added efficiencies to the table from the ACB submittals; there is always a range of efficiencies and they are not gross efficiencies. There are variable efficiency results. She did not update costs because she received no updated costs. Ms. Maggard stated she received no data from Goochland Co. however, Ms. Smigo has this. MapTech will add it for the next WG meeting. MapTech needs the maximum acres that could be treated by Vegetated Roofs, rain barrels, and permeable pavement to see changes of needs. She cannot promise this will be done by the next WG meeting.

Mr. French asked for clarification on the modeled BMPs. Ms. Maggard stated that MapTech would model three BMPs(Vegetated Roofs, rainbarrels, and permeable pavement) to translate those removal efficiencies (both stormwater volume reduction and bacteria) to rain gardens and other LID/Stormwater BMPs. Ms. Maggard stated MapTech was using Vegetated Roofs for large buildings and rain barrels for small buildings. MapTech needs to know the maximum area of impervious surface to remove by Vegetated Roofs. Ms. Smigo asked Ms. Maggard to explain how this modeling will be done through a forthcoming handout. Mr. Lott summarized changing pervious to impervious is doable, but accurate efficiencies are harder. Once all changes to pervious are made, what can be done otherwise with BMPs? Ms. Byrd stated that Vegetated Roofs can only economically be done on new buildings because retrofitting Vegetated Roofs is too expensive, so why even include Vegetated Roof changes to current buildings, because this will not happen. She stated it would be more effective to make a field BMP over a larger area for a cheaper price than to do a Vegetated Roof. Mr. Cronin stated Vegetated Roofs cost $200,000 / acre, the most expensive BMP. Mr. French agreed that raingardens are much more cost-effective

BMPs because they are less expensive and can be designed to accept large water volumes provided adequate installation space is available. Mr. Lott also explained that acres changed to one or another BMP ultimately will be decided by the WGs and Steering committee, and a lot depends upon hydrology. Mr. Cronin stated that the need to understand efficiency, cost, liabilities and limitations of BMP technologies, and wants to discuss this at the next gov't / urban WG meetings. Ms. Byrd wanted a figure to look at showing roofs staying impervious, and considering what type of landuse area BMP efficiencies will be needed to counteract not changing buildings to Vegetated Roofs. She continued that roof top conversion will not be made, so we should look at pervious areas that could be improved to counteract leaving rooftops alone, for example, to see what reductions retention ponds, swales, etc, are needed to overcome not changing roofs.

Ms. Maggard discussed the James subwatershed 6 delisted scenario done at the city's request. The city contacted Jim Kern of MapTech asking for further refinement before modeling. Please see the attached handout distributed at the meeting. Mr. Cronin stated he wanted to see where we are with the James remodeled and then decide how to form new scenarios, and said he will discuss this at the next WG meeting. Ms. Maggard and Mr. Cronin spent time discussing this and trying to understand each other and seemed to come to agreement. Mr. Cronin explained to the committee that he wants to take a step back to evaluate the difference between the geometric mean standard and the remodeled geometric mean result, to show what happened with the delisting. This would be important if the delisting dropped the percent reduction down to 30%, and would show how many fewer BMPs for urban stormwater were needed in the upper watersheds.

Ms. Maggard discussed the Reedy Creek re- modeling, explaining per the handout provided, and also discussed optical brightener data regarding human bacteria impacts. Please see the attached handout distributed at the meeting. Ms. LeRose asked whether other watersheds were re-evaluated and their bacteria results went down, while Reedy's went up. It was explained that the Reedy remodeling occurred because more recent citizen and DEQ data from the upper parts of the watershed were collected and remodeled. None of the other watersheds had needed such remodeling. She asked if BST needed to be evaluated for the newer Reedy Creek data to be useful. Ms. Maggard explained that was not the case. Ms. LeRose stated that two samples at stations RC3 and RC4 in 2010 occurred while a sewer line break was present, were these included?

Mr. Bernard asked whether pet waste bags decompose in the environment. Committee members related they were aware of biodegradable pet waste bags, for example those used in Nags Head, NC are made of corn products. He also asked what other breakdown occurs from old asphalt shingle roofs. This was put in the parking lot for later. Mr. Lott stated that EPA List Serve may answer these questions.

Ms. Smigo in response to a former comment by the City stated that the IP has a firm deadline of June 30 for a finished product, and to stay on schedule for that, the next steering committee meeting needs to occur in the first week of March. She suggested dates that week. She asked for location for the meeting and offered the DEQ headquarters or Piedmont Regional Offices. She reminded the committee that the next ag and residential WG meetings were on 1/24 and the next govt / urban WG meeting was on 1/26 at the Henrico Co. Offices at 10AM.

Mr. French stated that we should be cautious about focusing on bacterial BMP efficiencies when deciding potential options for LID BMPs, as many are designed to reduce stormwater volume. He understood the model determines stream flows and corresponding bacterial loads based on those flows. Any BMP that reduces flows to an impaired stream should have a positive effect in reducing bacterial loads from the landscape. He asked if flow reductions from LID BMPs are reflected in the implementation model scenarios.

Mr. Field asked if non-CSO localities "get credit" for rain barrels. Mr. Lott explained that the TMDL determined that stormwater volume reduction was needed to help meet bacteria water quality standards in two CSO impacted watersheds, Gillie and Almond Creeks. Rainbarrels effectively reduce stormwater volume. Therefore they would not be a required BMPs in the non-CSO watersheds, but they would reduce stormwater volume and thus also bacteria load to a degree in those watersheds, and could certainly be recommended and useful there.

Parking Lot issues:

Stormwater BMP issues

Asphalt shingle roof contaminants.

Third Agricultural Working Group Meeting
Meeting Minutes
James River and Its Tributaries
Water Quality Improvement Plan for Bacteria Impairments
5:00 PM, January 24, 2011
Westover Hills Library
1408 Westover Hills Blvd., Richmond, 23225

Facilitator: Ram Gupta, DCR
Recorder: Kelley West, DEQ
Attendees
Kelly West, DEQ-PRO
Seth Mullins, DEQ
Keith Burgess, Monacan SWCD
Margaret Smigo, DEQ
Grace LeRose, Richmond, DPU
Ed Cronin, Greely and Hansen
Debbie Byrd, Goochland CO.
Lance Gregory, VDH
Megan Maggard (on phone), MapTech
Ram Gupta – DCR-Richmond Regional Office

Meeting started with a introduction of attendees. Margaret Smigo distributed and briefly explained the content in the agricultural handouts. Ram Gupta indicated that the handouts have TMDL and some information which has already been shared at previous working group meetings, and also some new details on livestock, BMPs and landuse. He indicated to discuss and devote more time on new information. Tuckahoe Creek, which is a part of James River watershed, will be indicated separately in the IP document.

Livestock Population: Group discussed livestock numbers (Table 2). The numbers have been revised since last meeting. Keith indicated that there is no dairy in Bernards Creek sub-watershed, and only one with CAFO in Tuckahoe watershed. Megan indicated that this has been modeled as in subwatershed 2, falling into James River (Riverene). Keith suggested to keep 700 milkers in subwatershed-1. Margaret would email to SWCD and local staff to confirm livestock population in Almond and Powhite Creek watersheds; and to Chesterfield County for horse numbers. Grace does not think there are any horses in Reedy Creek watershed. Availability of subwatershed maps to the working group members would now enable to provide correct information on landuse and livestock population. Margaret will email questions to the group members for their response. Ram suggested that in absence of any new data, numbers listed in TMDL development document would be used.

Agricultural BMPs: Agricultural BMPs already installed in the watersheds were taken from DCR-BMPs Tracking program. The group feels that BMPs listed there-in seem reasonable. Keith indicated that there is nothing in Bernards Ck watershed for Nutrient Management Plan (NMP). Seth stated that there is NMP for biosolids. Biosolids, if applicable, should be applied properly as per its permit requirements. NMP has not been treated as BMP while modeling the water quality.

Debbie informed the group that some of the areas that are agricultural zoned now actually are wetland bank. She wanted to know how model is analyzing the cropland which has now permanently been converted to wetland. Megan asked her to provide converted acreage, so that land use in model is revised. Watershed maps provided with handouts would help modifying the landuse. Keith and Debbie would check it and provide revised data. Ram indicated that changes in cropland/wetland acreage would result into reduced bacteria loading, leading to changes in BMPs requirements needed to attain water quality standard (Tables 4 and 5). He also stated that subwatersheds maps would now enable to identify pasture and hayland separately, which might result in reduced stream fencing estimates. Also, Keith and Debbie thought stream fencing estimates are high and would review the watershed maps for pasture and hayland acreage.

Since, Tuckahoe Creek is now included in this IP, BMPs needs and implementation costs will be listed separately in IP document.

As suggested in previous working group, Reforestation of erodible crop and pastureland (FR-1) practice is added. Ram indicated that implementation of FR-1 is watershed-specific and may vary. A 5%-10% of crop and pastureland may be considered for FR-1. Megan wanted to know bacteria reduction efficiency of FR-1. Ram indicated that there is no efficiency available, and bacteria reductions are simulated by computer modeling. The changes in acreages in crop and pastureland will help simulating reduced bacteria loads from these sources. Ram also suggested to change “Retention Pond” to “Retention Basin”, as ponds is constructed on live stream, while basin is at down gradient of grazing areas to collect surface water runoff, prior to any concentrated flow entering to stream. Megan would make change accordingly. However, working group thinks that retention basin is not the preferred BMP in study watersheds; and that to use proper names for SL-6, LE-1T and LE-2T practices in IP document.

The Improved pasture management includes practices to manage pasture, fencing for rotational grazing and watering system. One question is could we drag the pasture with a piece of fence to speed up the bacteria die-off; and if done what its cost and efficiency would be. Dragging could be a highly effective BMP in reducing bacteria, and be a part of nutrient management practice NMP. Megan will look into these details to see if it could be included in IP document. Keith was of the opinion that improved pasture management practice should be funded even if it is added later. SWCD would provide information on number of dairy, beef and horse farms, if any, benefiting from management areas required to reduce bacteria loadings (Table 5).

<u>BMPs Cost and Efficiencies:</u> Information was discussed in previous working group meetings and group found them reasonable. Keith and Seth indicated that there are no loafing lots for beef in Powhatan, concrete feeding facility for beef, all horses are confined, and a horse manure storage shed (3-5 horses) would cost approximately $3,000. Margaret will email questions to the group members for their response. Cost of livestock exclusion systems with buffer 35-ft or greater would be same. The owner would like to leave land fellow, but will have reservations on giving up their productive land. Also, in Table 5, Nutrient Management Plan– cropland would change to stream mileage with buffers (linear feet).

Megan indicated that BMPs recommended with their efficiencies meet the target bacteria reduction from agricultural sources in impaired watersheds. Availability of sub-watershed maps would enable SWCD to provide correct pasture and crop landuse data, and livestock population. Model re-runs would be made upon receipts of revised data.

Ram indicated that IP document to have implementation time-line and water quality milestones are included in the document. Implementation time-line for Ag BMPs is about 10 years. It might be different for urban and residential BMPs.

Meeting adjourned at 6:30 pm.

Third Residential Working Group Meeting
Meeting Minutes
James River and Its Tributaries
Water Quality Improvement Plan for Bacteria Impairments
6:30 PM, January 24, 2011
Westover Hills Library
1408 Westover Hills Blvd., Richmond, 23225

Facilitator: Margaret Smigo, DEQ
Recorder: Kelley West, DEQ
Attendees
Grace LeRose, City of Richmond
Lorne Field, Chesterfield Co
Lance Gregory, VDH
Debbie Byrd, Goochland Co
Keith Burgess, Monacan SWCD
David Bernard, Sierra Club and Coastal Currents
Bill Shanabruch, Reedy Creek Coalition
Chris French, Alliance for the Chesapeake Bay
Ed Cronin, Greeley and Hansen
Scott Flanigan, Chesterfield Co
John Newton, Henrico Co
Scott Burger, City of Richmond, Sierra Club
Kelley West, DEQ
Margaret Smigo, DEQ
Megan Laird-Maggard, MapTech Inc – via teleconference

Accounting for residential BMP's installed:

In regard to Chesterfield County they have initiated a pilot project on looking for sewer connections, we will be discussing this on Wednesday at the government workgroup. There was a brief discussion of the "sewer-connection BMP" and the need for localities Chesterfield (who has done pilot study), Henrico, Powhatan, and Goochland to evaluate areas within their jurisdiction where septic failures have occurred to determine feasibility and potential of sewer connections in those areas. Goal would be to provide DEQ with an estimated number of homes to be connected and approximate cost per home to connect. Stage I of IP would include those homes which would be biggest bang for the buck (close to impaired waters and close to sewer mains (cheapest to connect)), while Stage II of IP would include those homes that are further from sewer mains and more expensive to connect (for example). Lance mentioned that for Powhatan and Richmond, he only had septic-repairs "locality-wide", in which case Megan would have to area-weight them. Ed said that if he is provided with addresses he would geocode them so the analysis could be done. It was not clear if Ed was willing to do this for all localities that would need addresses geocoded (may only be willing to do this for City of Richmond).

Residential Waste treatment BMP's needed:

There was a question if we could add Tuckahoe creek to the IP, yes we are able to add it. The Tuckahoe Creek TMDL was modeled is differently and therefore we cannot just lump in the results of that study with this one. We will take the 3 subwatershed segments of 26, 27, and 28 out of the James River Riverine segment and re-assign them as Tuckahoe Creek. You can see that in table 1. Based on information from VDH on septic repairs, the Chesterfield numbers were updated in Table 1. Megan said septic pump outs are a good BMP's because during a pumpout it is possible for the technician to tell if there is a septic failure or issue. Group discussed that because they are not in the mandatory pump-out area, Powhatan and Goochland should be included – the portions allotted to other localities should be removed as BMPs because they are already required to do it. Ed suggested we should just keep it as a general recommendation instead of "mandatory" since it is not technically reducing bacteria. Chris said in counties where you do not have an enforcement program (Goochland and Powhatan) it would be good to have a pump out program initiated there to increase the chance of people actually doing this preventative maintenance for their systems. Megan said we could include for only Goochland and Powhatan - it would be up to the group and the steering committee. John said in Henrico County they are making people pump out that are in riparian protection areas.

Questions for the group:

Do any municipalities have information or estimates that would help determine which areas would be feasible for sewer hookup?

Grace asked what do you mean by "feasible"? Margaret responded that this question was to find out which Counties intended to do the "sewer BMP analysis", such as the pilot which Chesterfield initiated. Debbie said Goochland is interested and Grace said Richmond is interested as well. John said Henrico would not be doing the analysis. Chesterfield hopes to continue their pilot study for the area within the watershed area to provide info on the "sewer connection BMP".

Scott Flanigan said there will be some help or guidance he can send out this week for the counties that are interested. Information related to the Chesterfield pilot will also be posted on the DEQ website for groups and steering committee to review.

2. Do any municipalities have estimates for the number of composting toilets or other "Alternative" Residential Waste Treatment systems already installed in each watershed? Lance said there is a permitting process for composting toilets- there are 2 in powhatan, there is a permitting process for that- usually if someone has a outhouse and they want to convert it from outdoor to indoor they install a composting toilet. There is one proposed in the James River State Park and 2 proposed for Powhatan State Park. However, composting toilets are something people could install without permits or letting anyone know.

3.Is City of Richmond and VDH looking into difference in homes with septic systems in VDH data (~140) and homes with only water connections in Richmond data (~1300). Grace said answer is yes.

Residential NPS BMP's Needed

Table 2 shows the number of pet waste composters needed to meet TMDL scenarios for watershed. The table has been updated to include Tuckahoe creek. All pet composters would be included in Stage II of project. The total number of composters has been reduced by utilizing more stormwater BMPs.

Questions for the group:

What areas already have pet waste stations? Grace said she can provide Richmond's pet stations (where they are and how many they are). As a follow-up - Richmond provided this information. Lorne said Chesterfield county parks have a few and can find out where they are.

Margaret mentioned that she has obtained a park shapefile from the RRPDC – if localities have additional green-space layers we would like to use them (discussion somewhat addressed question 3). These layers can be used to help us determine where pet stations are so we can determine where they are needed. Scott said many new apartment complexes are putting them in, do you want us to let you know where those are located? Margaret welcomed that information. Scott said Chesterfield could place these new developments in shapefiles and color code it if it's a "park" or a homeowners assoc (Margaret said that'd be great). John said Henrico would look into it but didn't think they have any specific programs and didn't think they had any additional information to share. Keith asked what if you don't have any near streams? Would it still be a benefit to pick up after your pets even if you do not live near a stream? Megan responded that there is always a benefit to picking up after your pet, that's why we have pet composters in the plan so people can pick up even in their own yard. The topic of wildlife was brought up – what about nuisance populations? Megan responded that the goal of the TMDL is not to kill off wildlife, if there are nuisance populations there are options. These mitigation efforts aren't necessarily something that a minicipilatiy must do, it's just an option, and would only be included if it is feasible. Margaret said that if there is interest, a wildlife management plan could be included, however DGIF must be involved in that process. Ed said that the City of Alexandria used something like that and DGIF approved it. Chris mentioned the city of Richmond has expanded their bow season for deer to 6 months (which is very unusual). Megan pointed out that while geese may be an issue in some areas of the watershed, dogs overall have a higher load of bacteria than geese. Scott also mentioned that we may have populations that are protected (heron rookeries and extensive beaver populations). He said in his opinion, education for pet waste pick up would be more effective than trying to lower wildlife populations. Ed said that we would need to know what the population's amounts are and the amount of bacteria they contribute. Bill suggested that "wildlife bacteria mitigation" is not Stage I topic, rather, it is something that could be Stage II. Megan and Margaret agreed.

What municipalities already have a pet pick-up ordinance? Henrico said they don't have one, Chesterfield doesn't think they have one but will check, and Richmond said yes and will provide the code. As a follow-up, the City did provide the ordinance link. It is assumed that Powhatan and Goochland do not have a pet-waste pick-up ordinance.

What other parks/highway rest stops/community dog areas are in each watershed? How many stations would each need? Chris mentioned that the Alliance for Chesapeake Bay is doing audits in Reedy Creek the previous week and everyone was walking dogs – there is a need for waste stations. Bill said this is true, especially with grassy areas around Reedy Creek and around impoundments that drain to creeks. Scott Flanigan asked if areas with large kennels, such as doggy daycares or kennels could qualify? Margaret said definitely – these are areas that if a station was not appropriate, perhaps the owners could be educated on waste disposal. Lance said if you have a dog kennel on septic you have to increase the strength and the building inspectors section of a county would know if any kennels have a septic.

Chris said he thought the SPCA disposed of pet waste in dumpster (Margaret would check). He said he Vet on Hermitage Road also disposed of waste in dumpster. Keith said in Powhatan, it's mandatory that all the kennels they know of be tied into the septic systems. Bill said some of the new developments are including dog stations, that is something that can be pitched to older apartment complexes as a retrofit.

What volunteer organization/municipalities/agencies could install, maintain, empty trash cans? Scott Burger said they installed 5 stations in his neighborhood but he thinks that the parks and rec service in Richmond actually maintain it now. It's not always done regularly but he knows that someone other than residents maintain them. Scott followed up by providing the links to the stations his community installed (included price info).

Grace said she thinks its reasonable for the municipalities to be in charge of maintenance of things on their own parks.

Table 3: Estimated Costs of Residential BMPs

Included below the table are the links to where information within the table was derived (including cost). Keith noted that costs in the table don't include labor. Scott B. thought the price for 320 bags seemed high and that a $20 bag of quickrete and an hour of your time is all that it takes to install a pet station. Grace said the mailings and education are not a one time thing, that will cost more money, a pet education program is posters, PSA, a mailing a month a mailing a quarter, for it to be realistic or effective it needs to be defined distinctly. Chris mentioned that this is where social media comes in to play, its inefficient to look at one area – need to address the problem watershed-wide. The state is about to spend $ to advertise the use of native plants (for example). Also – Chris said DCR needs to be included and all the localities and jurisdictions should take part in the media campaign. If done on a broad spectrum, you can hit online media it will spread to the entire region not just one small area, it's a much more effective use of funds as well. Keith said his concern is that someone will look at the and it will say "we need 10 baggy stations and the amount of stations" and there will be no appropriate places to put them. The group discussed that if money is awarded as a lump sum, it could be appropriated to where the need is most. Grace said people have to be hit 8 times to get the point across so it will be necessary to do more than just one brochure – so we must factor in ample education BMPs. Margaret said that as a group, we can check with DCR about "vet education" programs and what DCR is already doing with vet clinics (and similar facilities).

Potential residential and urban Stormwater BMP's

Table 4 showed the SW BMPs that filter/store/prevent SW runoff from residential and/or commercial land uses. Margaret asked the group to consider which BMPs are most likely to be implemented in the project and which BMPs the group would like to be included in the IP.

Megan also asked the group to discuss which are difficult, costly, etc. and therefore would be unlikely to be implemented.

Difficulty of installation – Group discussed that pervious pavers can be difficult – it depends on the scope of the project. If you are talking about the use of pavers instead of concrete for a driveway – that's not a true "pervious paver" although they are often recommended over impervious surface. The concrete blocks with holes for example (used on a path or driveway or parking lot) are not difficult to install. The pavers used on road surfaces require engineering and to get "credit" on your SW bill in Richmond, the design must be engineer approved. Grace asked if these BMPs would be tied to blue book or clearing house. Chris said when we look at the various standards the blue book is DCR's "old" SW book and the clearing house is the most up to date science (work in progress though). Debbie mentioned that grass swales are easy however Chris said grass swales require engineering also. Debbie said that only the size is an issue to get the credit. Chris mentioned that he had seen many grass swales "butchered", in which case perhaps an engineer wasn't consulted.

Megan asked which of these would the group like to see in the project?

She said that riparian forest buffer, gutter disconnect, rainbarrel, raingarden, pervious pavers, infiltration trench, are all "quantified" therefore they can be included in the modeling. All others we do not have efficiencies for, so those could be promoted in the text of the document. Grace asked efficiencies were available for all BMPs noted as "quantify", to which Megan said yes. There was confusion in regard to why we don't have efficiencies for "French drain, level spreader, and grass swales". Megan replied that she cannot model these – only can model if there is a direct land use change. Chris mentioned his conversation the previous week with Megan and Margaret, in the conversation he said they told him about the plan for modeling SW and that they do not intend to exclude practices. When there is efficiency data available that will be added to the load model calculator, however, when it comes to things that reduce volume, Megan will run the model with the reduced hydrology and the result in change of amount of flow. There are two ways they are quantifying the bacteria, one way is the volume. The SW BMP information has never focused on bacteria, we all know reducing volume, however, will help reduce bacteria.

James River bacterial TMDL Implementation Plan Third Government/Urban Working Group Meeting Summary

Henrico Co. Administration Building

Wednesday, January 26, 2011, 10:00 AM – 12:00 PM

1. Attending:

Mike Callahan, Henrico Co. Health Dept.
Ed Cronin, Greeley and Hanson
Kemper Loyd, VDH
Mark Alling, DEQ
Craig Lott, DEQ
Margaret Smigo, DEQ
Debbie Byrd, Goochland County
Keith Burgess, Monacan SWCD
Rick Thomas, Timmins Group
Becky Zeckoski, Timmins Group
Shaun Reynolds, Powhatan County
Mark Bittner, Crater PDC
Kenneth W. Smith, Richmond City Health Dept.
John Woodburn, Henrico Co. DPW
Carter Teague, EEE
Bill Mawyer, HCDPU
John Fowler, HCDPW
Grace LeRose, CoR
Scott Flanigan, Chesterfield Co.
Sarah Stewart, RRPDC
Lorne Field, Chesterfield Co/MJRT
Megan Sommers Bascone, DCR/VCU
Megan Maggard, MapTech, by phone

Mr. Lott introduced rules for the meeting. The group will address issues at hand on the agenda. Other issues will be discussed at the end of the meeting as time allows. Ms. LeRose stated she would address other issues by email after the meeting.

Mr. Lott introduced maps from the handout on PowerPoint. He stated there are still information gaps that need to be filled.

The group discussed whether the James River tidal failed septic systems and costs should be included in the IP. Mr. French stated that they should be included. Mr. Perry asked what commitment would there be to correct them if in the IP. Mr. Lott stated the TMDL required NO reductions from failed septics in the tidal segment. Mr. Burgess stated that all failed septics within the landuse on Figure 6 should be included. The group voted to include all James River tidal segment failed septic systems in the IP.

Henrico DPU stated they have a code that requires anyone within 300' to connect if new construction or a failed septic. Beyond that there is no requirement to connect. There is a special program in code with cost reduction for existing homes to connect (i.e. 50% of normal fee) that they must pay and stated this might try to move us in that direction. Henrico looks to tax funds to pay rather than existing customers to pay. For folks miles away from sewer (who would have septics in the first place), it is difficult to ask them to connect and pay the fee. Mr. Lott stated it is group intent to delineate where hookups should be. Subdivisions or commercial areas pay for extension of sewer lines. If a subdivision has many failed septic systems, then Henrico Co. estimates the costs and the subdivision pays.

Mr. Flanigan stated Chesterfield Co. requires a 50% hookup in a neighborhood to put in a sewer line, but cannot make homes hook up. He thinks there is a 20yr loan program in which the county fronts the costs, which is then added to county resident's tax bills.

From the handout "Questions for the Group", Mr. Lott asked do any municipalities have information or estimates that would help determine which areas would be feasible for sewer hook-up?

Chesterfield has this information. Henrico Co. Utilities does not know but says that is Henrico health Dept responsibility. Ms. Smigo stated that when this question was asked in the residential work group meeting, Henrico County said they did not have such information but Richmond said they working on it and Goochland was interested. Mr. Burgess stated that Powhatan Co. does not have such information.

Mr. Lott asked question 2 – Do any municipalities have estimates for the number of composting toilets or other "alternative" residential waste treatment systems already installed in each watershed? Chesterfield Co. has 507 alternative systems. Powhatan Co. has 116 alternative systems county wide and said they could try to parcel these out by subwatershed. DEQ stated we could make shapefiles available on the FTP site for counties. Henrico does not have this information, but group should ask Henrico Health dept. Henrico says they have septic failures county wide but not by watershed. Ms. Maggard said these estimates will give localities credit for what has been put into watershed, what's already been done. Henrico stated they have 425 failing septics county wide. Ms. Maggard said as long as we can get estimates these can be put in the IP.

Mr. Lott asked question 3 – Is the City and VDH looking into the differences in homes with septic systems in VDH data (140) and homes with only water connections in City data (1300)? VDH said thinks there are some errors between reporting, that there may be more than what they have and fewer than what COR reports. They are working together. Mr. Smith of the City HD stated the problem occurred in the 60s and 70s when Richmond annexed part of Chesterfield. A lot of that information was lost due to changes in infrastructure. The information they have is there are 130 homes in annexed area on septic systems. The City sends them pumpout letters every year. Utilities might say 1300 but City HD has no idea where that number comes from. Ms. LeRose says they are not just in the annexed portion; some are in the City portion of the Falling Creek watershed.

Mr. Lott moved to next agenda item, Potential measures to address urban sources of bacteria and/or stormwater volume. MapTech added columns describing difficulty of installation and how to include in IP. Quantify vs. Promote – to be able to quantify we must have efficiency values to include the BMPs in the model. Promoted practices do not have efficiency data but are deemed to be beneficial. Ms. LeRose wanted to clarify...when you say "quantify" you mean you have efficiencies and Ms. Maggard agreed, either efficiencies or we can model the storage/removal of rainfall/runoff and get an amount of removal of bacteria in the HSPF model. Table footnotes will be rectified. in table 3, which does not include all the footnotes because modeling is not finished yet. There are some estimates in a table that are tentative and mostly ranges. Ms. LeRose noted that there is a big leap from volume retention to pathogen removal. Mr. Lott agreed and said there are effects in both directions between the two.

Mr. Lott stated Table 2 shows specific bmps and how they might be described in IP. Again, for SW and will go into the modeling portion of the IP, affecting the volume retention and dilution capacity.

Table 3 – Potential control measure efficiencies – will used to calculate removal where special information is not available or included in the model in some way. If there is other information we need to include it. The list continues to grow. Mr. Cronin brought handouts for what G&H have so far for the group, to be discussed if there is time. Mr. Cronin and Ms. LeRose also have some items that could be discussed in the next steering committee meeting.

Mr. French sought better references for Appendix 7. Ms. Maggard stated that those references came from the ACB by email from study summaries, from which she found bacteria and range. Ms. Maggard will rectify and provide all references.

Mr. Perry asked how are loads factored into volumes. Ms. Maggard said she will calculate the relative load reduction benefits of say residential pet waste vs. vegetative filters She asked the group not to get stuck on how she does the percentages, although the group needs to understand that. Mr. Perry asked for example if Henrico gives Ms. Maggard a specific number of BMPs, she will respond if that resulted in a sufficient reduction. Ms. Maggard said yes that is how it will work. From the practices in table, she will tell us how we'll include each in the project. For example tree planting is a great idea in any landscape but not a specific bacteria removal BMP – that's why it's in the "PROMOTE" category. To specify the number of trees we need to plant is hard to quantify. So, trees planted will not get a quantifiable reduction, but will benefit above and beyond the estimated BMP load reductions.

Ms. Maggard gave a brief description of how the reductions and loads are determined: We have a bacteria load reduction required by the TMDL (by source/land use). Any direct source like removing cattle from the stream takes load out of the system. She has bacteria removal efficiency, direct load efficiency, land use efficiency, which is how well the BMP removes bacteria from the land use type, and buffer efficiency. A pet waste program on residential land, fencing cows out on pasture land are different types of bacteria removal. She makes sure her BMPs are based on where she puts in land use. She models what if I get rid of all straight pipes, fence out all cattle and take away 75% pet waste; what percent reduction does that equal. For SW BMPs like raingardens, she puts in acreage total treated by each BMP. She tries to put in as few BMPs as she can to get the TMDL load for that impairment. Bernard's Creek has its own model. As long as she has correct land use and loads from the TMDL and she has relatively reasonable bacteria removal efficiencies, we can get to scenarios that make sense.

Mr. Perry asked one more question on quantity control for storms and runoff of different sizes, like a 10 yr storm when we get surges to system. Rain barrel efficiencies impact a 1 year storm but probably lees so a 10 year storm. How will we quantify that? Mr. Lott said we will work on that, but that question makes sense Ms. Maggard said we have to use the efficiencies in Table 3. There are other SW BMPs that are less about bacteria and more about runoff. She puts those into a model and that will tell us based on the volume retention what kind of a reduction we get.

Moving to "questions for the group" on page 4 of the handout, Mr. Lott asked of the SW BMPs in Table 3, are any more likely to be installed than others? He recognized that it could be a very detailed answer – a response might be more appropriate in an email, but he wanted to present this to the work group as a whole.. Ms. Maggard needs to know as a whole – what is preferred by the GUWG for SW BMPs?

Ms. LeRose stated this answer returns to efficiencies. She said first it must be decided which are the most efficient BMPs. She stated that rainbarrels do not remove bacteria, so cannot start with them. If the group makes the assumption that phosphorus removal equates to bacteria removal, she thinks that is a slippery slope. She wants a defensible path forward, for example, the group prefers BMPs xyz because they remove bacteria, and here is the proof. She can take that to ratepayers and justify large expenditures.

Mr. Burgess stated his email of yesterday expressed his concerns. He asked if it was better to remove flow.

Mr. Cronin stated that group cannot rely on one efficiency either, that there is a range.

Mr. Lott replied that the IP is a model to provide us with an estimate. He asked if the group would like to be conservative in expressing efficiencies and have more BMPs required. There are a lot of factors (placement, engineering capacity, and maintenance), etc…which we can't address in the IP. The IP will address model description (like Lynchburg did), and describe drawbacks/difficulties in model assumptions, which could relate to calculations, which could result in poor decision making – but we will state that that the goal is to minimize the chance of that happening. So WG – do you want conservative estimates on the "ranges" of BMPS, or not? We have to plug one efficiency number for each BMP into the model, so do you agree that we should use the most conservative number in the BMP range?

Mr. Cronin repeated the idea that with high reductions required by the TMDL, are we being truthful we will get to an endpoint. So can group give a range?

Mr. Lott replied that the literature efficiencies are the best we have, and asked the group to please provide better ones if anyone has them. We are soliciting for additional information to get a better technical document than we've done in the past.

Mr. Cronin agreed, saying that Ms. LeRose is right that we need good understanding of efficiency of the BMPs because of wide ranges in the literature. Today might not be right place for this discussion.

Mr. Lott repeated the question; which BMPs does the group want to install, how do we select the most likely things to install? And if the group is not ready to answer today, that is OK.

Mr. Perry stated that it is easy to eliminate the ones we won't use, like green roofs which are too expensive. The choice may come to whether there is the occasional grant, but the question comes back to the quantity. Let's say we have a green roof and pet waste on yard below it. He can calculate the reduction of bacteria removal from the buffer…but has a hard time configuring what the green roof gives based on volume reduction So what is the better reduction – green roof or the pet waste program? He said unless there was a great reduction in volume going to sanitary sewer overflows, he has a hard time recommending volume control.

Mr. Lott stated that volume control is specific ally for CSO watersheds in the TMDL. If considering a non-CSO watershed, we just consider including them. Henrico staff stated they do have sewer system overflows (SSOs).which come from groundwater through I&I, so a connection to rainbarrels is a jump.

Mr. French mentioned it's a good thing if the IP includes LID practices because it opens up options for NGOs to work within their toolbox to help with these things. He doesn't want to see limitations in the document. The ACB wants to help localities that want to see these implemented. Ms. LeRose stated that is a nice goal but it is more important to keep bacteria out of the James River, that LID does not give a large bacteria reduction. Mr. French disagreed with this premise due to the existence of literature that shows LID BMPs do have an affect on reducing bacteria levels.

Mr. Lott stated his understanding is that governments wouldn't want to direct money for reducing bacteria to be spent reducing volume (Ms. LeRose said correct) but he understands the reasons to not limit ourselves in the IP.

Ms. Maggard stated that half of these questions are answered later in the handout.

Mr. Lott referenced group to Table 4 – MapTech hasn't done the analysis for all streams – this is for green roofs and rainbarrels? Ms. Maggard had information on their water holding capacities and their hydrologic functions to include in the model. This was done as an exercise to see where these reductions would get us. Mr. Lott said the benefit of including SW BMPS, that we will get limited reductions of bacteria to get us to goal but potentially have better access to funding of things we'd like to see (but less efficient in addressing our problem).

Mr. Lott asked the second question for the group about SW BMPS tables 2 and 3 – any BMPs missing from the list that the group wants to use? MapTech did calculations on green roofs and rainbarrels. Any others you'd like to see in the IP that might get us to bacteria reductions? MapTech asked if any other BMPs besides those in the tables have been installed?

Henrico staff asked if there is any way to have some pet waste collection system? Ms. Maggard replied yes, as a non-structural BMP. Ms. Maggard stated that Table 2 does not include not ALL SW BMPs technically, but that she pulled table 3 out of table 2 because she has efficiencies for those. Mr. Alling said we would add BMPs from Table 3 back into Table 2. The group stated that a sand filter is not a SW reduction but probably it could be added. Mr. Burgess asked how does a sand filter benefit bacteria loading? Ms. Maggard replied that they filter solids to get to reduce bacteria.

The group asked where would we include stream restoration? Ms. Maggard said she considers that would more likely benefit sediment removal, but she does not have a bacteria efficiency for that.

Mr. Flanigan asked the group to add stream restoration and stream stabilization, the goal being to improve substrate and to get the flow more into the floodplain. Mr. Flanigan offered to submit a description of the problem and how this would remove bacteria, working with Ms. LeRose. Ms. Maggard said she cannot quantify efficiency for stream restoration/stabilization.. Mr. Lott said if it includes a stream buffer that could be included as an extension of a vegetative buffer BMP. Mr. French thought this a good idea but people would have sticker shock over the cost (average of $300+ per linear foot of streambank restored),. Mr. Flanigan added it may open up other funding sources.

Mr. Lott asked for costs on SW BMPS from the group, to be submitted via email. This would be very important. Mr. Burgess said most costs would be in the blue book or online data clearinghouse. Mr. French said the Stormwater BMP Clearinghouse hosted by the VA Water Resources Research Center at Virginia Tech has the latest information regarding available stormwater BMPs and the DCR "blue book" while still in use is largely considered outdated. Mr. Lott asked group to include sources to the costs.

Mr. Perry asked if there is a bacterial benefit to street sweeping? Ms. Maggard said that is an excellent question, this has been used with pervious pavers and there have been studies but she doesn't have any reference. This can be included in the plan. She thought there may be a 30% reduction involved. Mr. French said there was a lot of work with this in the Baltimore area. He will consult with them to try to get that information. Ms. Maggard said this was included in sediment TMDLs in the past. The city stated they may have the average lane/mile they sweep. Mr. Perry said Henrico also has this information, and that VDOT probably has a number for that too. Ms. Maggard stated that if the group has an efficiency for this she can include it. Mr. Lott asked when did this start? Mr. Perry thought in 2004.

Mr. Lott asked question 4 – Are there are any BMPs in the watershed listed in the tables (or others) can you look up and provide? The stakeholders said they would provide this information. These do count toward the overall reduction goal. They might not contribute equally but the group would want an inventory in the IP.

Mr. Lott asked the last question - what counties/cities have mandatory pet waste pickup programs? Richmond does. Mr. Lott said he was unsure how to include the question of parks/highways/rest stops pet waste collection, but does anyone have specific programs for pet waste collection watershed wide?

Goose control is applicable but its unsure sure if that falls within pet waste collection. Mr. Burgess stated its not known how to measure the amount and reduction, but it's a valid number and just as heavy as pet waste (Ms. Smigo notes that pet waste is a heavier load) but goose waste is something we cannot control. Ms. Bascone stated that was something JRAC was trying to control. It is a special issue those folks are trying to address. It is also being addressed in the Park system by some direct means and some indirect (education program) they want non-controversial methods, such as dogs and landscaping which can help. Mr. French stated that goose egg oiling programs have been effective at reducing populations in some urban areas. Simply removing eggs is bad because geese will lay more. Mr. Cronin stated goose control was written into the Hunting Creek TMDL. Ms. Maggard said the DGIF is involved too. Mr. Lott and Ms. Maggard discussed this on Monday, consulting DGIF to try and pull that into the plan. Mr. Lott volunteered to check on nuisance level, Mr. Cronin questioned what would be a nuisance level, so we can see what would be reduction? Ms. Maggard said we can write a wildlife management plan into the IP. Mr. Lott said this would contribute to the overall reduction goal. Ms. Maggard can include this in all sectors, agricultural, residential and urban. Mr. Lott said that if localities put in ordinances to discourage feeding geese this can help in reducing the fecal from wildlife, as was done in Virginia Beach. This was included in other plans. Mr. French said there is a 6 month archery season for deer in the city.

Mr. Flanigan presented a Chesterfield Co. project counting failed septic systems using GIS tools in the Powhite Creek watershed, trying to identify where to make repairs for the least expense (biggest bang for the buck) for removing failed septics and hooking them up to county sewerage. He first showed a layer with the Powhite watershed and 3 DEQ bacteria stations. The entire creek is impaired for E.coli but there may be variations (hotspots). He added a GIS layer with septic systems installed between 1930-1990, there were 671 of these. Most were in the southern half of the watershed in the older lots. Older septic systems have more problems. He also had newer septic systems (1991-2011) on the layer to differentiate between older and newer septic systems. He added a layer for 105 septic repairs between 2000 – 2010. There are clusters of septic lots and failures on the map. There could be other important layers to add, such as soil level, distance to water table, etc. He next added a layer with a 1000 ft setback from creeks, showing that most of the lots and repairs are outside the 1000 ft setbacks, farther from the creeks, which is good. Next he added a layer for sanitary sewer lines. It is unknown if I&I contribute to Powhite bacteria load. He believes the county should not automatically assume that bacteria load comes mostly from storm water in Powhite Creek, that the large number of failed septics may be more of a problem. All lots are less than 1 acre. Lots colored yellow are close to sanitary sewer lines, where there would be an approximate $5-6000 hook-up fee (actually $3200 hookup plus $1500-5000 Installation fee). Of the 671 septic systems, 522 lots < 1 ac and 151 are within 100 ft of the sanitary sewer line. The Chesterfield Health Dept. says the hook-up fee is $6-8000 whereas a repair might cost $1500, therefore a homeowner is most likely to make a septic repair rather than hook up to the county line. There are large areas/neighborhoods with septic problems not close to the sewer lines, and Chesterfield Co. is working with the utilities dept. on how to work on that problem. If there was a way to bring that sewer connection cost DOWN – to make that more favorable, .maybe the county could encourage folks to connect to sewer lines.

Mr. Gregory stated that the five or six areas at the bottom need sewer assessment district to come in and assign a dollar figure which may be more like $35K each to connect for example). Even an alternative system would be less costly than connecting these homes.

Mr. Lott asked how the other localities deal with this. Lynchburg has failing infrastructure, so they asked for the IP to include a white paper on this to take to funding sources. Mr. Lott asked the group localities to think about this, are we facing the same problem? Do we want to describe it in detail in the IP (within the confines of our mapping). The IP might not make a specific recommendation (i.e. this locality must do this and that), rather, it could define the problem in more detail. He asked that localities state their status.

. Henrico Co. stated that as localities develop SW utilities to address the Bay TMDL – it will be interesting how to address the issue. Henrico will collect $$ to reduce N,P, and sediment load. They think failing septics may be creating a larger load than anyone else, citing studies in Maryland. Should those on septics get a bigger charge because they have septics – even if operating properly? Could this encourage them to connect to public sewer? VDH said there is a 4% nitrogen load from onsite estimate in the Ches. Bay TMDL.

Ms. LeRose brought up shifting of costs. If on septic – families do not have utility bills. Churches don't think they should pay the stormwater fee. How do we charge and how do we spend it?

Mr. Flanigan said the bottom line is to improve water quality of Powhite Creek. He wants to address each station to see where are the hotspots, to correct areas where connections would be prudent. He wants to see if pollution problems are from septics or public sewer connections (infrastructure failure).

Mr. French agrees that human health issues should come before LID concerns.

Craig says we answered all the questions for the group, with 5 minutes left in the meeting There are some action items:

He would like to get feedback from the group, especially to the items they stated in this meeting they would provide..

Mr. Lott proposed another meeting of this work group, however Ms. Smigo said that will be difficult to do with the tight timeline to have a draft IP by the deadline. Mr. Lott didn't want to discount any suggestions.

Ms. LeRose said we could do the IP fast or do it good, and she would rather it be late. The group does not have an option to be late because of the stimulus funding return deadline. The group must have a draft IP. If there are considerations we ignored because of time or cannot address resulting in significant change, we can come back and withdraw the report to the SWCB and fix it. Mr. Perry asked if we can ask EPA for an extension. Mr. Lott stated it is not EPA actually, they are just the conduit for the stimulus funds. Stimulus funding extensions are usually not granted. If we have no draft report at end of the timeline, we must give back the money we accepted.

Mr. Burgess asked what happens if the IP is drafted, but it's not the best it can be?

Mr. Lott said the Lynchburg had a 20 yr schedule w/ 5 year Phased evaluations, the first time a 20 yr schedule was used, because of the CSO situation. The IP is not a permit or regulation. We will evaluate the post implementation monitoring and what practices are put into place (and try to play into the Bay TMDL) during the first 5 yr period (and subsequent periods). Gov't. urban group members are welcome to make recommendations to the steering committee or provide emails.

Mr. Lott asked if this group would like a similar 20 year timeline? Ms. LeRose stated the City wants no timeline.

Mr. Burgess said the Bay TMDL will achieve what we're trying to do because it will also require the same things. The same BMPs in urban will address same BMP reductions.

Ms. LeRose stated the difference is the endpoints in bacteria load in this IP and nutrients and sediment in the Bay IP. If asking for 99.5% reduction in bacteria load, how do we get there?

Mr. Burgess said that if we check back in 5 yrs, are we achieving what we are supposed to?

Mr. French said that is a reasonable timeline and can guide us.

Ms. Maggard said that the standard timeline is 15 years, with 5 year checkpoints. Lynchburg was first to have a 20yr long timeline.

Ms. Byrd stated that in this economy, for the first 5 years you won't see typical development, people are doing less because of the economy, so we should not do evaluations like we normally would. And there will be less investment in retrofitting. The first phase should be extended because of this.

Mr. French said we could rather interpret this as a challenge. For example, state ag BMP got started in 1985 and took a while to become commonplace. Timelines for reviewing progress of this effort are necessary, otherwise the funds used for the Implementation Plan would be wasted by producing a document that does nothing more than sit of a shelf and gather dust. The concerns stakeholders have are understandable. However, if the information DEQ is providing is correct, no one's wrists will be slapped if interm goals are not met. The process is established so that we can check on progress of the implementation effort if it is extended over a long time period. Check ups every 5 years would be a reasonable timeline.

Mr. Burgess said we will forget about this because of personnel changes, we will have many new people at the table in 5 years.

Mr. Flanigan believes the MS4s will somehow be tied to TMDL BMPs. Mr. Fritz (not attending today) said this in the first meeting. The group asked if localities can use the IP to help achieve permit requirements.

Mr. Lott said yes, localities should use the recommendations in the IP as a planning tool in MS4 permits.

Mr. Lott asked that members email additional questions to him.

The meeting adjourned at 12:08.

James River Bacteria IP Steering Committee Meeting #2 Minutes 3/9/2011

Introductions (10 Min)

Steering Committee Meeting #3 (5 min)- The tentative meeting date for the 3rd meeting needs to be set soon, the meeting will be at PRO again around 2pm. Let Margaret know about any conflicts, the week of April 11 would be the last SC meeting; we plan to get you a draft IP the week before the meeting. March 23 is the deadline for any data/information to be included in the draft IP. Public meeting for the draft IP would be May 18th. That date will not change; we have to have the draft finalized by end of July.

Recap (30 Min)-the summary is to tell you what it is that we still need in terms of information, not all are to do's.

-In first SC meeting held on Jan 12th there was concern about how SW BMPs would be modeled. Megan's synopsis on the modeling was sent out in an email and she has not received any comments to date.

-Localities that were working on recommended numbers of sewer connections and cost- we will need any of that data by the deadline, we need the # of connections and the cost.

- pet education and pet waste BMPs- if you can send us any layers of green spaces then we could get an idea on where and how many pet waste stations are needed. Large scale media campaigns were discussed in the last residential work group meeting specifically for pet-waste education however, could combine pet waste and stormwater education in media outreach.

- throughout the process we are getting ideas as we go about new BMP's if you know of any BMPs that have been completed please let us know so we can add those (and give credit for what has already been done).

-please send us any information or literature regarding sources for BMP efficiencies. There was previous discussion on if we could use efficiency ranges, we are unable to use ranges.

-street sweeping- please send us the average lane miles and areas that currently have sweeping, if you want to install pervious pavement and need more equipment for street sweeping let us know.

-Wildlife management plan, Craig has comments he wants to discuss on what he talked to DGIF about. Craig will follow-up with SC members regarding that discussion.

-if you have any good practices or BMP's that are already being done but don't have efficiencies then please let us know. These things can be "promoted" items in IP.

Questions?

Where is the bibliography on the BMPs that you are using, how do we know what BMPs you are using? Megan will take another look at Clearinghouse SW BMP site. There weren't many included on the site so she had to look elsewhere for efficiency values for some practices.

Everything that is here is in your footnotes right? Yes

Is this what EPA uses? Not sure if they use this Clearinghouse – they have sited various sources in some publications.

If we are not using ranges don't we have to use BMP's that show growth too? Not sure that we can "show growth", will be part of adaptive management.

Handouts (1 Hr. 15 min)

Page 1 handout: Residential BMP's- Any practice to eliminate straight pipes and failing systems. There is no removal efficiency associated with pump outs (preventative maintenance). Megan removed the counties that had required pump outs under CBA; the only areas that have pump out needs are in the 2 counties that don't fall under CBA for mandatory pumpouts (Goochland and Powhatan).

-Pet waste education program, 3 things have been included: baggie sign waste basket station, bag refills and mailings. Richmond sent the # of stations they already had, they had 28 parks and 28 baggie stations (inferred that all necessary stations were installed but stakeholders can recommend more – need to know where and how many). Chris French thinks that the numbers of parks are wrong for the city of Richmond (was based on the green space layer provided from RR PDC). Megan says it was for the James River riverine section. Chris thinks its many more parks than that. For bag refills she assumed there are 10 bags used per day at each station.

-Margaret, we would want to find out from the City Of Richmond how many more pet waste stations we would need to add for James Riverine section.

-For mailings Megan estimated the number of houses by the census, she has one mailing per household in stage 1 and one mailing again during stage 2. If you want to do radio or TV commercials she can add them in but will need costs. If we did TV commercials in the IP report could separate out pet-waste education or have a huge table with everything in it. You are supposed to have a plan/IP for each creek so she would divide the TV commercial cost and resources equally between all the creeks. What is also not included in the report was education to Vet offices and SPCA's. She couldn't quantify that number but localities/stakeholders can provide an estimate per Creek.

-Mark Alling recently participated in a video that was done by students at U or R, for awareness for the James River.

-In the future, all the counties will have MS4's according to EPA, so most counties and cities already have to spend money on educating for MS4's (comment by Bob Steidel).

-Megan says let's get the best average cost for all these things that we want in the plan, that will be something to start with.

-Bob-How are you applying 75% efficiency for pet waste?

-Megan-dog waste is applied on residential land use, when you apply a dog waste program then you can say there is 75% less now. Then the spreadsheet will add up all the BMP's and get a total and see if it is less or more than the target load. It will all be delisted based on the monitoring data. Park land is not added into the land use (would probably be considered "forest" in land use information). Megan said all BMPs in Stage I were included there because they are the best bang for the buck and in some cases there are already cost share in place for some of these BMPs

Page 2 handout: Megan said for cattle she assumed the number of 50 cattle per farm, for horse numbers she estimated 5 horses per farm. For retention basins (for pasture) that is a last ditch effort BMP", the districts don't like them, however, often they are what gets the plan to the target load. With the inclusion of "reforestation of crop and pasture land" we were able to meet the loads without having retention basins on farms (thanks for suggestion Ram).

-Residential BMP's – pet waste composter are in Stage II, it would get to more than 75% compliance. 99% efficiency is what is used for composting. Not all streams required the composters. Mailings were included again, the same number as stage 1 and bag refills.

-Margaret explained the composters were removed from Stage I because the City of Richmond suggested composters were not a measurable goal because you don't know who uses them. If you want them in Stage I then please let us know. Bob asked, what is the 99% of composters from, is it part of the 49% of people that pick up after their dog? Megan said she would say we want 50 composters for 50 houses, that would service 25 dogs that would be 25 dogs' bacteria which would be removed from the watershed.

- Residential urban SW BMP's- these are land use based % reductions to any and all bacteria flowing in the runoff from the land use. Megan put an acre for each practice. ET is evapotransporation. These were on CSO and Non-CSO residential urban land uses.

-CSO SW Volume reduction BMP's were only quantified for CSO subwatersheds (b/c to derive numbers must use City's CSO model). The James River Riverine, the James River tidal and Reedy creek did not require any reductions for CSOs, only Almond and Gillie have SW BMPs quantified and the cost as a requirement for reaching the target load. The James River Riverine, the James River tidal and Reedy Creek #s for SW Volume reduction BMPs were quantified in the very last table, they are not needed in the CSO subwatersheds that's why they are not in the IP tables. They can be included in the IP if the SC thinks the information would be helpful for those working in the watershed.

-There are some green roofs that are already in place, the City of Richmond and SunTrust building are in the James River tidal. 11600 square feet is the size of the SunTrust building. Also 2 at VCU (Trani Life Science building and Engineering building) and one is planned for the Science Museum.

- Ed mentioned on the residential and urban stormwater BMP's – we need to be clear on how many data points the clearing house has. On #6 there are only 11 data points. We need to know how many data points are on some of these references, Ed will go back and cite how many points are on this and provide.

- Bob asked are we using DCR clearing house data? City Of Richmond bases their whole Storm Water program on the database. Megan will look again but there weren't many and she needed efficiencies for practices not listed there.

-Ram said if you stop the flow then you will have fewer bacteria, that's what it is based on in the DCR database.

-Chris French said the best information is from NC State - for bio retention basins.

-Ram- for the agriculture data the time frame we use is 10 years; we have 20 years for the agriculture phases.

- Megan is putting all the agriculture practices in Stage I. There is not a lot of agriculture closer to Richmond.

-Keith said the agriculture industry in these watersheds are going to change dramatically in the next 10 years, currently there is land that is being turned from forested to agriculture and the Bay TMDL will change agriculture practices dramatically in the next 10 years. Megan said if you want the agriculture to change to "5 year stages" we can do that – please let her know.

-Chris said he didn't see anything on "riparian buffers" in suburban areas. Megan said she included them for agriculture by looking at all the cropland, and anytime a stream was flowing through it or adjacent to it she counted the stream miles that could have a 35% buffer, she can do that for residential also, they have not been accepted in the past because they take up landowner yards or baseball fields. We could change the buffer widths for residential (make them smaller if that would make them more appealing).

-Craig L said there are some buffers that are already in place, they don't have to be fenced out, and it doesn't have to be 35 feet but there could be an account for some of those reductions.

-Megan asked SC members if they would want that analysis done for riparian buffers?

-Chris said it can be left up to the group, as long as it's a tool available to us to use in the future then he is fine with that. As long as it is in the report as a practice that could be looked at.

-Megan said the reductions would be the same as for agriculture buffers, it would be just any width. It would not have to be 35 feet, however, it would not be the same % reductions as agriculture because it wouldn't have the same filtration. Buffers will do more for water quality than what her model can estimate.

Page 3 handout: Megan said that when she provided the SW BMP modeling summary, she didn't realize the model needed more inputs that she had, there were not enough time or data to enter in the TMDL model. What she did do was similar to the rain barrel model. She used the model output straight from the City Of Richmond that is from their sewer system model. She used that to build the TMDL model. They sent her the inputs from every hour output and how much was from their overflows, the data was from 1974-1978. Using the acres in table 2 and all of the assumptions for the runoff holding capacity for the BMPs Megan was able to estimate a volume of water if these BMPs were implemented and the volume it would hold back from entering the system. It's a max amount of acres of runoff that we would get. It was interesting to see the maximum, what the benefit would be to reducing the # of times it overflows, and the total gallons (look at tables 3-6). Table 2 potential roof runoff would be catching anything that could be caught from roofs. These figures are only for areas that are in the CSO's.

-Ed said we should look at buildings that we can control, government owned properties. In the CSO areas if we control areas we could only get less than 10% of the land area. The analysis is done but people in private property will not have to do it, however if they did they could get a credit on their stormwater bill.

-Craig said to Ed, if you have a summary of what you just regarding what to put in the text about the SW BMPs – please provide.

Page 4 handout: The area could go to a rain barrel, 50 gallons drained each day to a pervious land use so it stays out of the CSO. One cistern =10 rain barrels.

-The days that it was a small overflow - flow was reduced. The rain barrels help with smaller rainfall events. The second number is the CSO number, the total gallons of overflow estimated during the 74-78 time period.

Page 5 handout: 80% of the roof would be green; it would retain 1" of rainfall. The analysis is the max # of green roofs installed in these watersheds. It retains 16% of CSO's days.

Page 8 handout: Megan calculated the maximum daily amount of volume storage they would get. The City Of Richmond would need to build a system to hold 2 million more gallons of water. The analysis was not done on all the streams because not all streams have any CSO's.

-Megan thinks the maximum number for rain barrels should stay and we could educate people on those, she can redo the numbers for pervious pavement and green roofs if SC members think they would be implemented

Page 9 handout, Bernards Creek: And remaining tables (except last one) you have to read the top to know what stream you are on (FYI), the only thing different in tables would be the number of units and the costs, in the plan the zero's will be erased unless SC members would like them included to show the practice was evaluated but unnecessary.

-Creek was mostly an agriculture watershed; it has livestock exclusions, and a 10-35 foot buffer. The improved pasture management she estimated the acres needed already so she included that there.

-Ram stated the improved pasture is more than fencing, it should be included in the cost; he doesn't remember how much it cost (Ram please provide if you can).

-The reforestation acres re 10 % and the buffers of cropland, she has it in acres because that's the measure buffers were given in.

-Residential BMP's, if you sent us data we included it.

-Alternative septic systems: 90-95% in Henrico will need alternative systems.

- Ed asked if there are citations for where costs were derived or estimated. He said the Center for Watershed Protection has cost estimates and they are about 3 times the amount of these (bio retention cost about 30-$35,000 per acre). The center for watershed protection would be what he would use, if it is going to be done in 10 to 20 years it will be about 3 times the cost to retrofits. Megan can include a reference for costs.

-Megan said no pet waste composters were needed to meet target in Bernards Creek. We are concentrating on bacteria loads, so if you are treating runoff from areas then you are going to get bacteria from many sources, and if you have pet composters it only targets dogs. There is a lot of agriculture in Stage 1 because we are familiar with that and we know it will reduce a lot of bacteria from the stream. Residential bacteria removal is also focused in Stage 1 because it deals with human waste. Pet waste is in Stage 1 because it's an education tool therefore it needs to get started early.

-Ram asked after Stage 1 how much bacteria will we be able to remove? Megan said she hasn't figured that out yet because it will change. Once she does that she will put it in a table, there is a Stage 3 that we don't talk about that is 5 years of monitoring. Typically after each stage the Steering Committee will meet and bring data and go over progress of installation and the monitoring data.

Page 10 handout, Tuckahoe Creek: There was more agriculture then she thought, Goochland said they had wetlands (county and SWCD was going to provide info she thought but she hadn't received the converted wetland number from them) Quite a few livestock exclusion systems needed and there were quite a few of residential BMPs. There is a 10 for pet waste education because she had there were 5 parks (2 stations at each). There is quite a bit of streamside fencing maintenance, and to meet target load didn't need pet waste composters.

-Bob said this creek is public water supply for COR - was that taken into account? No, this analysis is for recreation use standard.

Page 11 handout, Powhite Creek: Megan did estimate a few cattle and fencing needed, this needs to be verified by SWCD or locality that population exists. Residential systems have a low need that is estimated on corrected septic systems by Chesterfield VDH has already done. No pet composters are needed but there are residential Storm Water BMP's.

-Bob stated in the Ches. Bay WIP there are Storm Water reductions in areas that there are not CSO's. Will we include the equivalent nutrient reductions for BMPs? No – that was not within the scope of the bacteria IP. Chris asked does it make sense if something is already being quantified to add it? Margaret said we don't want to duplicate the effort and Megan said the hope is that WIP would take this document to use in the WIP. Craig said the documentation in the layers can be used in that effort.

Page 12, Reedy Creek: Upstream is not CSO but downstream contributes to CSO diffuser # 40. Pet waste composters were needed and residential urban Storm Water BMP's were necessary.

Page 13, James River Riverine: The pump-outs there are for Goochland County, the pet stations were already implemented (City of Richmond) so none were include there but more can be added if Megan knows green-space area and # of stations (estimate to be based on the area – can't just pull a number from the air).

Page 14, Gillie Creek: The cost of millions of dollars are because the CSO volume reductions are very expensive, the extra storage was COR estimates minus the total gallons you would get from the LID practices, those could change if you could give me numbers of what the City could do. She could always put zero and leave their estimate in. The City's dollar figures are from previous comments made by the City.

Page 15, Almond Creek: Some livestock is estimated, we have not gotten verification for that one livestock exclusion. Chris asked if Henricopolis SWCD involved and helping with this? Margaret said no, Keith Burgess from Monacan SWCD is the only rep that has been involved. Keith may have been coordinating with them however.

Page 19, James River tidal: Megan added corrected failing septic systems from VDH. There were no required reductions for CSO's.

Page 20- The last table would be the maximum quantification of the CSO SW BMP's. They are here so people can see. They are very expensive so they are not in the draft tables; they are in the tables in the back. If someone wants to see what the rain barrels quantify then they are here and they can see the cost. Megan needs info on the SunTrust building, planned Science Museum, and 2nd VCU green roof. Bob said there are 2 on VCU buildings, there is one on VACO building (Mosley architects). All these are in the riverine section.

Ram said he thought the Virginia Museum of Fine Arts has a parking deck that has a green roof, the science museum might be having one added in the future.

Discussion (1 hour)

"Social Media" Campaign

In regards to discussion at the last residential WG meeting- Margaret had discussions with HR PDC and DCR. There needs to be one major entity that will take the lead with organizing the effort, everyone has SW issues. The alliance of Chesapeake Bay and the Middle James Round Table will be the leads on the effort. They are going to have a kickoff meeting in the next week to have stakeholders join (No date for the kickoff meeting yet set).

Chris will be looking at work that has been done in HR PDC over the past 8-9 years, we should look to them. These are just discussions, there are no plans that have been set, and this just came up as discussion after the last IP meetings. For the RR PDC the political leaders on the board could not take the lead, they could participate however. City of Richmond asked if The Chesapeake Club could be the lead. Chris said they are very focused on their grant which revolves around Bay issues and focused on planting more plants campaign. Ram said the social media campaign will be expensive however stations offer public service announcements which are free.

Margaret said for IP, we need in the short term a figure for what the social media campaign would cost and what would be included. HRPDC their total SW budget is $75,000, ½ that they said is used for TV and radio (some 15 localities participate). It would cost 200-$250,000 over the time of the IP Lorne stated (avg of $12,500/year).

Wildlife Management Plan (update)

Mr. Bernard asked, what about the Canada geese? Craig said a wildlife management plan would include them. He can email out the update for this, DGIF has a plan that individuals and entities can follow – they are to provide additional info.

Forum for watershed stakeholders (blog, post, updates, etc)

Craig and Margaret talked about setting up forums where stakeholders can have discussions or post to keep up to date info on the watershed. Margaret has talked to a few people about options. Craig said apart from IP he thinks this is a separate project. DEQ doesn't do a good job of its adaptive management and follow up to a TMDL. DCR does a better job of this. In order to make adaptive management real-time it would be helpful if we talked about these things somewhere (such as an online forum) for things such as implemented BMPs and cost changes. It would be good to learn the lesson upfront instead of throwing money away on things that will not be helpful – a forum would be a good way of exchanging this type of information. He thinks a forum would be beneficial to the stakeholders; it can include updated maps, and information on streams that are upstream.

Chris said Alliance for Ches Bay has the infrastructure to do this already, it is set up now and there are already 3000 people connected. Local governments and watershed groups are involved, we can set up a forum that could be public or private, and he could give a short five minute presentation at the next Steering Committee meeting if we like. Network is already in place and is free, Alliance just has to pay a staff member to update it, so if anyone wants to donate funds toward the effort they would welcome it. There is a main overall forum, and there are separate groups you can connect. Watershed groups share meeting minutes and sensitive documents.

Margaret stated she has not heard of any other ideas so we should have some internal calls about this and a presentation at the next meeting would be great.

Sewer connection BMP

Scott Flanigans from Chesterfield County gave a summary of their analysis. Analysis included Residential connections in Chesterfield that are in watersheds which drain to the James. In the last 10 years there have been about 50 homes connected to public sewer. They wanted to project the numbers for the future. First came up with 3% of the total connections for the past 10 years. They estimated 3% per year. They backed off that because there are some home owners that are not interested in connecting to the sewer, so then they figured out the amount of 1 acre or less lots because they would need to connect due to lack of acreage (sizing not adequate for system). They extracted values for every 10 years up to 2050. The total cost would be around $6000 per house to connect to public sewer and that does not include removing the old system. From 2010-1020 the cost would be around $2 million, they did cost for each year and each watershed. It took a few hours to figure out the numbers, the sewer connections were a little tricky, they are not tracked so another set of staff had to look at building permits. Anyone who wants to provide estimates could come up with them in a few hours time.

Margaret said if any other localities are interested in sending information for this we would need it by 3/23. So the final numbers that we end up from you would say? Scott said for the last 10 years about 50 homes connected so, from 2010-2020 per year would be 33. Margaret asked if Megan should use 2010-2020 numbers for Stage 1 and 2020-2030 for Stage II? Scott said the idea that they had was to put a percentage reduction instead of a number. Each watershed would have its own number based on a percentage reduction (32%).

Meeting adjourned at 5pm.

James River Richmond, Bacteria Implementation Plan Steering Committee Meeting #3
Monday 4/11/11

In Attendance: Kemper Loyd (VDH), Ed Cronin (Greeley and Hansen), Keith Burgess (Monacan SWCD), Grace LeRose (City of Richmond), Michelle Virts (City of Richmond), Craig Lott (DEQ), Margaret Smigo (DEQ), David Bernard (Sierra Club and Coastal Canoeists), Ram Gupta (DCR), John Newton (Henrico Co.), Sarah Stewart (Richmond Reg. Planning Dist. Comm.), Debbie Byrd (Goochland Co.), Chris French (Alliance for Ches. Bay), Leigh Dunn (Goochland Co.), Kelley West (DEQ), Mark Alling (DEQ), Megan Maggard (MapTech)

Agenda:

· Introductions & Affiliations
· Draft IP Presentation and Overview - Megan Maggard (MapTech)
- Comments questions about presentation
· Chesapeake Network Presentation - Chris French (Alliance for the Chesapeake Bay - ACB)

In our last SC meeting, we discussed the use of a website where stakeholders could discuss ongoing watershed implementation as well as experiences with BMPs. This "forum" could also house documentation such as tables and maps and perhaps be an interactive tool where those with limited access (select users) could update lists of implemented actions or BMP efficiencies. This forum would be a benefit because the Implementation Plan is a snapshot of current conditions. As we go through implementation over the next 10-20 years, the thought was that it could be a tool for adaptive management as water quality and technology will change over time. It could also be the central location for implementation related activities for this project. Chris French (ACB) volunteered the use of the Chesapeake Network as a possible site for such a forum. Chris's presentation will provide an overview of the site and its usability.

- Does steering committee have any questions/concerns about the use of the Chesapeake Network site for the forum? Are there any other options to be considered?

- What sort of things would the steering committee like the site to include or offer the ability to do in a forum?

- Would you like to see additional information related to the forum (any of the information we've talked about) further outlined in a section of the draft IP?

· Open discussion/questions about draft report (v16)

Maptech Presentation – Steering Committee Comments:

-Slide 4- Map of impairments- comment that the whole James River upper (near Bernards Creek) should be added to map

-Slide 5- need a zoomed in map

-Slide 6- need an explanation of why there is a need to improve quality

-Slide10- IP development - Outlines “actions”, should say outlines recommendations to improve water quality

-Slide 11- Where are we now? -Please put months (Nov 2010) in instead of numbers (11/10)

-Slide 12- Should allude to what BMP’s are in the plan

-Slide 13- Assessments of Needs – Debbie said we should include financial assistance, (don’t take it out) because that is a big part of “needs” if we are going to meet goals

-Slide 14- Ag BMP’s Needed- Keith mentioned agriculture folks will think 252 acres conservation tillage is nothing, you should leave off the figures because if a farmer see’s that they will think the number is not worth it – its almost better to not include the figure for that BMP b/c that might limit what farmers are willing to do. Chris thought it might be a good idea to leave that figure in b/c that might be a way of throwing them a bone. Keith recommended changing verbiage to “increase conservation tillage”. Ram said to change the NRCS to 528 instead of 512.

-Slide 15- Livestock Exclusion Practices- Chris said if you are going to take a picture out remove the one on the far left. Keith asked if it would be beneficial to include the bacteria reduction credits for each. If you put the % reduction, people would get a better idea of how far each practice will get us toward the goal.

-Slide 17- Residential/urban BMPs Needed- Grace asked what will be the regulatory driver for septic system repairs (how will we make people repair systems) and how to accomplish it? Craig said it depends on the locality, we do not mandate any the BMPs included in an IP, and neither is DEQ saying localities must implement BMPs included in the IP. Ed said it’s easy to know when a system is failing but it’s hard when you don’t know when it is failing. Grace said its fine to include in the IP, but we should state the regulatory way to enforce. Craig said Chesterfield County is the only county that gave us a recommendation for sewer-connections based on VDH failures in their watershed over past 10yrs. Grace asked, will 750 failing septic systems will be required? Craig/Megan said perhaps the thing to do is change the slide from “needs” to “recommendations”. We need to include the language that says VDH is the agency which regulates/permits septic systems (Kemper Loyd agreed after the meeting to provide appropriate language to include). Grace asked, if VDH is involved in repairs and replacements why do we have so many failing systems? How do they find all the problems and how do they fix all the problems? She said, there needs to be clear steps of what the pathway is to getting them corrected, this is a big issue, the more specific and direct it is it will be helpful. Craig mentioned at the Lynchburg Steering Committee meeting they got to this point also. Chris stated that James City has one of the best pump out programs. Megan asked Grace if this topic could be clarified in the report and not the presentation to which Grace responded it should be included in the presentation because the public should know and be aware of the issue and clearly understand who is responsible for fixing them. You should add a slide after this one that shows how to identify a failing system and information about it. Michelle asked if DEQ would add efficiencies here, because the City of Richmond is concerned about the quality of the data for efficiencies. Ram stated that we don’t need to put numbers of dog waste refill bags on the slide, however, Keith thought inclusion of the numbers were important b/c it shows the public the amount of bags that are needed (160,000 might make an impression).

Slide 18- should include information regarding how a citizen can detect and fix a failing system

Slide 20- What's in the plan- Keith said that for Stage I, it looks like we saying that City Of Richmond doesn't have to do anything in the first 10 years because stormwater-reductions come in Stage 2. By not mentioning LID in the first 10 years are we hurting ourselves in the long run by limiting practices? It looks as though we are targeting agriculture. ED said the document talks about additional reductions which will need to be done even after the LTCP. Grace suggested this slide would be the appropriate time to talk about upgrades that have been done to the CSO system and tell the public what is being done currently. Megan said she has asked Ed for wording related to CSO improvements to include in the IP but has never received it. Chris said that if we talked about completed BMPs here, it would address Keith's' concerns and perhaps we could tie it in to the James de-listed segments. Showing completed BMPs here would show what's been done and that no particular groups are being "targeted". You can add a slide after 10 that say's "where are we now".

-Slide 21- Urban Stormwater reduction BMP's-Ram asked if the statement on the slide would be included in the IP (it should be)? Ed said he would send Megan verbiage to update IP.

-Slide 22- Volume reduction- Michelle – said she'd like to hand the information on this slide to their administration to ensure the language is consistent with their permits.

-Slide 23- Vegetated roofs- Michelle asked why Almond and Gillie are singled out in this slide. She stated Richmond's concerns are with the selection of the removal efficiencies and the most expensive BMP's were also selected. Their concern with stage 2 BMP's are that we are setting the plan up for failure. Grace asked how do you get the home owners to put these on the ground? Chris suggested we look at programs that have been completed elsewhere for proposals on how to get homeowners in on IP; there are model programs that are already being done in other areas we can look at (ie Riverscapes in DC) We should look at these programs at another meeting, if this is adopted by localities then that would be a start. Grace stated that if a BMP is called in the IP, a road map be provided to tell you how to get it done. There was a brief exchange b/w Craig and City of Richmond folks where Craig explained that DEQ does not want to be prescriptive in the IP. By being too specific, it might limit people's thought processes in the long run about the multitude of ways one might achieve these goals. Examples can be provided if that is what the Steering members would like to see. Ed stated that the TMDL report reduction for CSOs is conflicting with what the City plans in the LTCP, some of the information about the CSO's in the IP should be pulled out so people will not be confused. DEQ's permit for the City will be the path for meeting the reductions, not the IP. Megan suggested the SW BMP's be combined in a slide and that way people know that these are options rather than what is "mandatory". Obviously, it will be made clear that the entire IP is just a plan and nothing suggested within it will be enforceable. Keith brought up that this slide presentation is for the general public so it's unlikely that some folks will be interested in or understand the more technical information. This meeting is not the place to put out technical information. It is up to the Steering Committee to explain to boards and others that request technical information and details. Craig suggested we tell the public that this IP is just one way to meet the standard. We can say we have the benefits and the costs that are associated with these particular options. Mr. Bernard said what you might expect from a larger meeting is concerned citizens, city council members, board of supervisors, they will say there has been an incredible amount of technical people that really know their stuff, but naturally, DEQ is hesitant to be prescriptive because of the cost. I understand that the questions are still there, everyone at the meeting may be looking for or expecting specifics. However, you shouldn't propose a 20 year plan and then say it "might work" or "maybe work". He said as far as figures for Agricultural, those should be kept in. Urban BMP's are the most expensive ways to go, and there are a lot of questions about efficiencies and cost. The IP could state we are still working on Urban BMP's but we want to go ahead with pet waste and agriculture BMP's because we know how to deal with it and we know what the efficiencies are and that they are indeed cost effective. John Newton said in regard to urban BMP's, the localities don't regulate everything. Henrico can't force someone who doesn't drain to their MS4 system to do something to reduce SW. It's important that when we talk about BMP's we need to explain who is going to be the driving force for getting them installed. Michelle said there is no sound science for bacteria BMPs yet so you can't say anything about the number of green roofs that should be put in.

-Slide 28- How are we going to pay for it? Chris asked if this could be made into 2 slides? Keith said there are more private funds than what you have listed. Ram said most of the funding listed is for agriculture and residential, but, are there any funds out there for stormwater BMPs? Michelle stated that some of the funding is the same.

-Slide 31 -DEQ stations – Margaret will fix map

(Supplemental) Slide 37-Grace stated that Crooked Branch is missing from the chart. Was the new data collected by the reedy creek folks? Mark stated it was collected by DEQ and citizens. Grace asked us to identify which is citizen data and which are these BST data. (Mark did) She stated she was confused because the TMDL report (BST) listed the human contribution at 9%, pet at 11%, and wildlife higher, therefore, how do we get to compliance knowing that 80% is wildlife? How are you going to account for wildlife in meeting the standard?

Slide 38- Ed stated in regard to table ES1 in the draft, he was comparing that to table 6-13 and was surprised because in Phase 3 we showed there are no exceedances. If we are not addressing wildlife consistent that does not seem consistent. Megan said VA and EPA don't require wildlife bacteria load reductions in IP documents (regardless of what BST analysis suggests). Wildlife management plans can be put into place should stakeholders feel they are necessary (wildlife management plans are not typically written within IP documents).

Ram asked on 6-13 when you say there is 0% violation do you say all the Combined Sewer Outfalls have been taken care of? Megan answered no, a 0% a violation means we met the GM standard per the computer model, and the bacteria load reductions were achieved. There has never been any discussion or text that says "all the Combined Sewer Overflows are taken care of". Alternative E was assumed to be completed by year "20" at the end of Stage II in the timeline.

Chesapeake Network Forum:

Following Craig's introduction and Chris's overview, Margaret asked the group if they had questions or concerns about using the Chesapeake forum? None were stated. Any other ideas on what we could use it for? None were stated. She asked in regard to including references of the Chesapeake Network "forum" in the IP document there are only 2 small references. Would the steering committee like to see additional information? Chris stated he didn't have a preference for using the Network. John stated the key will be to getting the word out, we need to collaborate in one form or another, it is a way to start. Sarah Stewart stated she has heard about this from many people and thinks it's a great option. Craig asked for a show of hands if we should use the Forum, how many localities would be interested in using this? Majority of members raised their hands. Chris stated that if anyone wants to use it, he would rather people here start it or be the "administrator" but it was not a site that had to be managed. Chris suggested we make sure that VITA would be okay with this. Margaret mentioned she was already a member of the Chesapeake Network and has had no issues (but still a very good idea to make sure).

Question/Discussion:

Ed: The IP is really to address the NPS, however many people will look at the document so it needs to be documented that this is one example of how to meet standards and that it will address regional assurance or NPS but some of the tables address watersheds with CSOs. Where we have the % reductions in CSO watersheds, that it is not how the LTCP is written. The IP is addressing areas the City does not own and would be difficult to meet the number of BMPs suggested. There will be two documents that the public will have access to (TMDL and IP). Anything where we can identify a process for how we come into compliance with the WLA we should make that effort and we also need to document what this will cost. Megan asked Ed to send a revised paragraph in (pg 5-32).

Ram had a question for 5-49, said there is no section in the benefit of urban and residential BMP's Ram also mentioned in Table 6-13, it is good to indicate that all the BMP's in the LTCP have been taken care of (if that is the case – needs to include language which states what has been done and what is planned). Lynchburg LTCP was not included (reference might help) and that Megan should add the City's choice in the LTCP, "Alternative E" to the table.

John Newton said pg 5-45 in last sentence under technical assistance; he said that sentence make it sound like localities are in charge of BMP's. We need to make sure the public knows every BMP cannot be done by localities because the localities do not own all property in the watershed. Grace stated that John's point should be reiterated that for private property, the homeowner will be responsible for the entire process of the BMP. Keith said we should also include that it's in the public's best interest to implement the BMP's because they quite possibly will become mandates eventually. It's better to do it now while there is cost-share available to help them.

Craig stated that this is where a "forum" and central repository for discussion/documents/etc would be useful to stakeholders and the general public. If the "implemented" list of BMPs are maintained anyone can go on and see what works and a homeowner can decide what the real efficiencies are and where to put their money.

Spelling errors Pg 15- line 4, Chesapeake Baby; Pg 1-3 second paragraph- 200, should be 2006

Chickahominy was spelled wrong several places

Ram stated in table 5-13 in calculating CSO overflows, what is there a reason to go that far back? Megan explained this was due to the calibration period – those years included specific flow events (5 yr storm, etc.) the age has no bearing on the integrity of the data.

Ed stated again that the IP tables are not out of the LTCP, there are different approaches, the COR is looking at water quality, if you are looking at the two differences we ultimately look at geomean because that is what the permit is based on. That fact is not referenced in the body of the IP. The City looks at volume of water opposed to cost.

Meeting Adjourned ~5pm.

APPENDIX B

Powhite Creek Mapping Analysis by Chesterfield Co

James River Bacteria TMDL

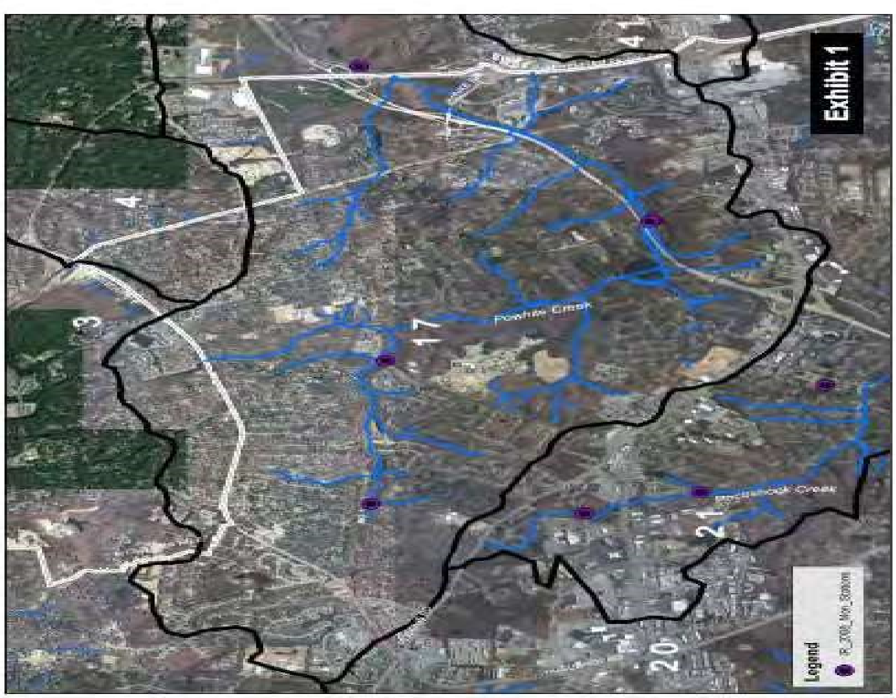
Pilot Program – Mapping & Identifying Areas of Concern within the Powhite Creek Watershed

The following slides contain information to assist in the identification of potential bacteria contributions to the receiving stream from on-site sewage disposal systems for residential developments.

The figures contain information from a collaborative exchange of data from DEQ, Virginia Health Department and Chesterfield County.

STEP 1 – Using GIS develop a base map from existing data in order to understand the areas of potential concern. Each exhibit builds on the preceding information.

- – Exhibit 1 – DEQ Watershed Boundaries & Stream Sample Locations.
- – Exhibit 2 – County records identifying parcels (671) having on-site sewage disposal systems. Systems are mapped according to the age of the structure. Red indicates structures built before 1991. Tan identifies structures built from 1991.
- – Exhibit 3 – VDH records identifying those systems requiring repairs between 2000 and 2010 (Total Repairs 105).
- – Exhibit 4 – Represents those systems located within a 1000 feet buffer along the mainstem of Powhite Creek.
- – Exhibit 5 – Locates the existing county sanitary system in relation to septic systems.
- – Exhibit 6 – Identifies those neighborhoods or areas which could benefit from sewer connections.



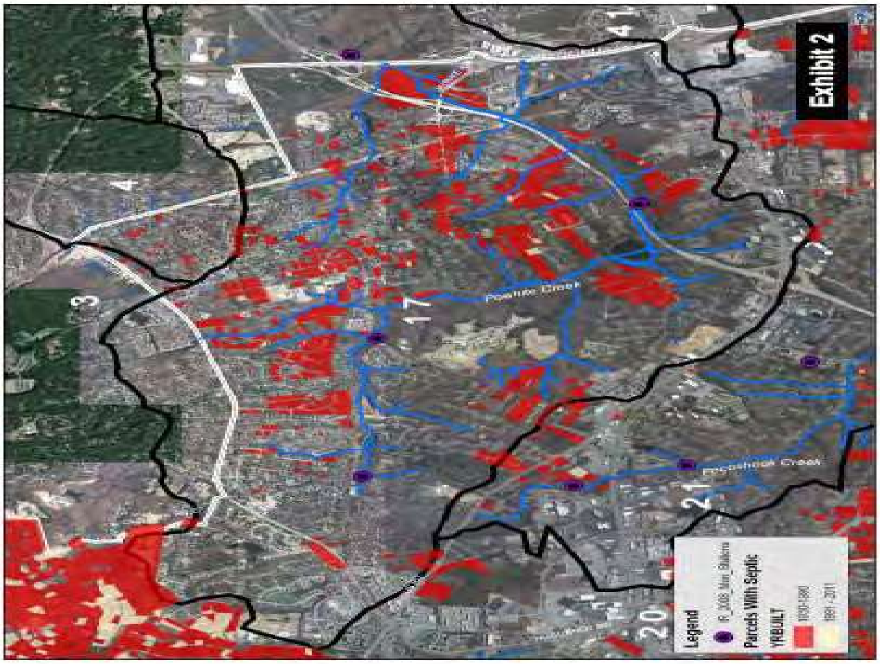


Exhibit 2
Legend
Parcels With Septic
YRBUILT


Exhibit 4

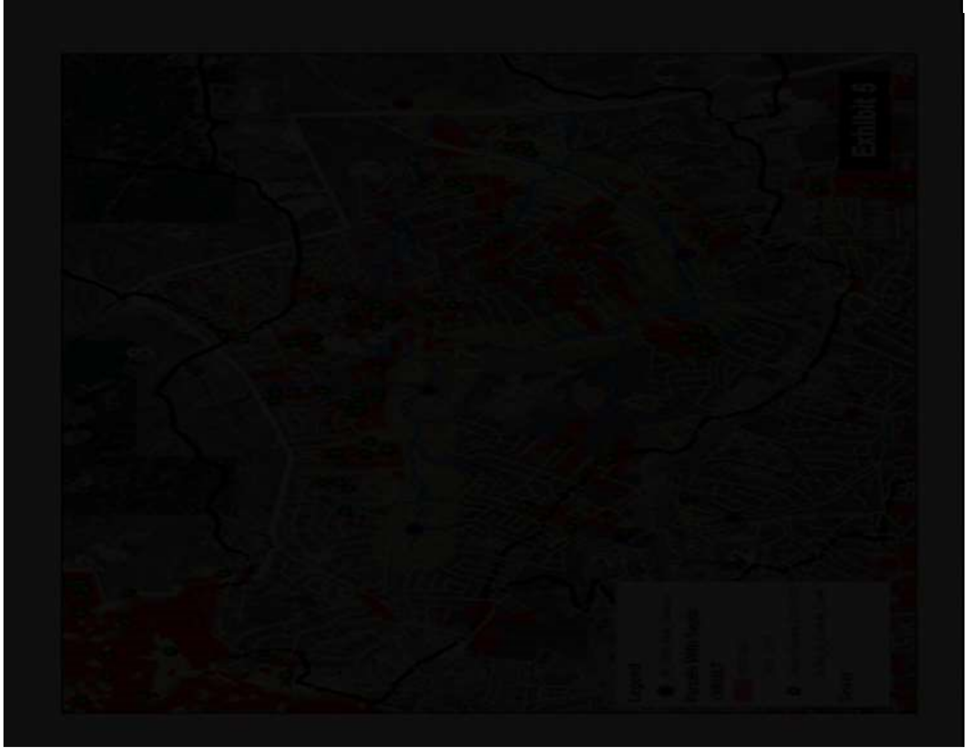


Exhibit 5

Additional Mapping Exercises:

- Step 2 - Using the existing Septic System Base Map:
  - – Refinement Map to include:
    - Soil Types
    - Ground Water Impacts
    - Required Cleanouts
    - Census Data
    - Data Gaps
  - – Cost Analysis
    - Identify & Refine Potential Trouble Spots
    - Identify Areas/Parcels requiring sewer Extension vs. Connection
    - Cost Estimates for hook-up
    - Identify or Set Standard for Distance to Sanitary Sewer
- Step 3 – Generate Base Maps for the identification of other potential bacteria contributions to the receiving stream from:
  - – Livestock
  - – Agricultural
  - – Straight Pipes
  - – Residential Stormwater
  - – SSO
  - – Wildlife
- Step 4 – Review existing DEQ stream data in order to target bacterial concentration trends within the Powhite Creek watershed. Please note that this is a mapping exercise and is not intended to address the legal issues or ability to require sanitary sewer connections or who would be responsible to bear these costs.

APPENDIX C

City of Richmond's Long Term Control Plan (LTCP) Map

Courtesy of the City of Richmond and Greeley & Hansen

Richmond's original wastewater collection system, formed in the late 1800s, was comprised of combined sewer pipes carrying both sanitary sewage and stormwater runoff to the James River. For the past 40 years, Richmond has invested several hundred million dollars, largely through funds raised by ratepayers, to alleviate combined sewer overflows (CSOs). To date, the City of Richmond has completed two phases of its CSO Control Plan and is implementing Phase III CSO Controls.

Phase I CSO Controls, completed in the 1980s, consisted of construction of the Shockoe Retention Basin and upgrading the wet weather treatment capacity at the Richmond wastewater treatment plant (WWTP) to empty the Shockoe Retention Basin in two days. The Shockoe Retention Basin is a 50-million-gallon (MG) offline storage facility (35 MG in the retention basin itself and 15 MG in system conduit storage) that retains the "first flush" combined sewer flow from the City's largest CSO basin , the 8,000-acre Shockoe Creek CSO area.

In 1988, the City completed a comprehensive CSO study defining the Long-Term Control Plan (LTCP) for CSOs discharging to the James River and Gillies Creek. The State Water Control Board (SWCB) approved the plan in March 1989. The City began implementing the LTCP in 1992 under a special agreement with the Virginia Department of Environmental Quality (DEQ), which initiated the Phase II CSO Controls. Completed Phase II projects are as follows:

- CSO Project No. 1 – Southside conveyance system between Canoe Run and near Mayo's Island completed in 1998.
- CSO Project No. 2 – Southside conveyance system between 42nd St & Canoe Run completed in 1998.
- CSO Project No. 3 – Northside conveyance system between Park Hydro and Shockoe completed in 1998.
- CSO Projects Nos. 4 & 5 – Hampton & McCloy CSO Retention Tunnel completed in 2003.

For Phase I & II CSO controls, the City invested $242 million dollars funded largely by its ratepayers. This more than doubled the percentage of James River miles meeting bacteriological water quality standards (34% prior to CSO Control and 70% after Phase II CSO controls for Richmond and 20 miles downstream). The City complied with all of the CSO Special Order requirements, including the requirement to re-evaluate the final phase of its CSO Control Plan and to develop a LTCP after completing the Phase II controls. The CSO LTCP Re-Evaluation final report dated January 2, 2002, identified elements of potential Phase III CSO controls, referred to as "Plan E". Plan E is estimated to cost approximately $400 to $500 million in 2010 dollars, bringing the total cost to address CSOs to approximately $750 million dollars. DEQ has concurred with Plan E and the City has entered into a CSO Special Order by Consent issued by the State Water Control Board that includes the elements of Plan E.

The Order also requires the Board to determine that "Plan E satisfies all the criteria under Section II.C.4.b.i and ii of the CSO Policy" prior to proceeding with construction of the larger CSO controls in Requirements 13 through 19. During the August 31, 2004 Board meeting, the Board approved the CSO Special Order by Consent and directed DEQ to conduct the Water Quality Standards Coordination defined in Section III of EPA's CSO Control Policy.

EPA's CSO Policy requires an approved LTCP to meet water quality standards. The EPA's CSO Control Policy states, "the planned control program will provide the maximum pollution reduction benefits reasonably attainable" (CSO Policy - Section II.C.4.b.iii). The City continues to try to develop controls "to allow cost effective expansion or cost effective retrofitting if additional controls are subsequently determined to be necessary to meet WQS or designated uses" (CSO Policy -Section II.C.4.b.iv).

The current version of the bacteria TMDL for Gillies Creek indicates that additional CSO controls are required beyond those identified in Plan E of the City's CSO LTCP. The City is concerned that waste load allocations identified in the TMDL do not appear to be "reasonably attainable".

In order to complete the Water Quality Standards Coordination process, the City requested that the State Water Control Board allow the City to conduct a Use Attainability Analysis to provide the City the opportunity to determine if the Gillies Creek paved channel CSO waste load allocations in the TMDL are "reasonably attainable". Although the State Water Control Board did not act on DEQ's recommendations, the Board voted in favor of the following:

"1. Recognize that the City of Richmond can conduct a use attainability analysis for recreational uses in Gillie Creek according to criteria established pursuant to the Clean Water Act.

2. Request that the City include in the use attainability analysis a detailed examination of how any change to the recreational use in Gillie creek would avoid impacting the primary contact recreational use of the James River adjacent to, and downstream of, the confluent with Gillie Creek.

3. Direct the staff to report to the Board upon completion of the UAA study whether the results of the study are deemed consistent with federal and state regulations and warrant initiating a regulatory process to consider removal of the recreational use or establishing a subcategory of recreational use in Gillie Creek."

The City of Richmond is in the process of updating the LTCP to meet WQS in Gillie's and Almond Creek. Richmond has indicated that the development of a UAA for the Gillies Creek paved channel will help the City identify the most appropriate investments in water quality and inform the public of changes to the City's CSO LTCP through an adaptive management process. Large CSO storage facilities do not lend themselves to phasing opportunities. The UAA process will help the City understand the compliance endpoint before investing 500 million dollars in additional CSO controls.

As of April 2011, the City has completed construction of 11 out of 19 Special Order requirement projects and a functioning element of No. 17. The schedule for implementing the remainder of Phase III CSO controls is based on the Special Order by Consent and will depend on the outcome of the UAA study for the Gillies Creek paved channel.

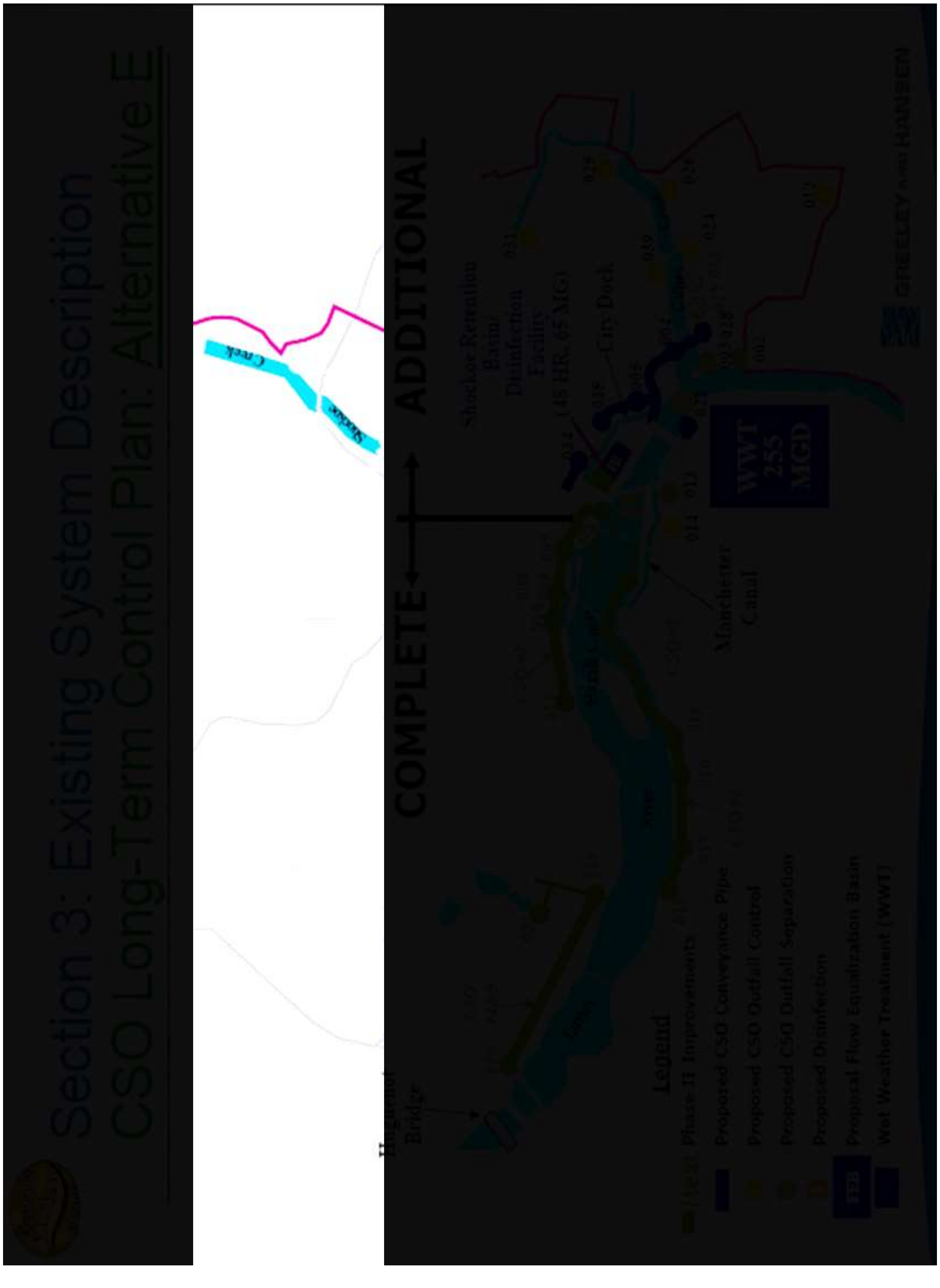


Figure C. 1 A map of the City of Richmond's Long Term Control Plan - Alternative E (Greeley and Hansen, 2006).

APPENDIX D

City of Richmond's Pet Waste Program

March 23, 2011

The City of Richmond Stormwater Utility's Pet Waste Education Program "Pick Up the Poop! Don't Pollute!" was created to change attitudes and behavior about picking up pet waste. The goal was to increase awareness of domestic pet waste contribution to bacterial pollution in stormwater (antiquated link removed; see Richmond VA government website).

The Public Education and Outreach coordinators distribute pet waste management dispensers and bags to citizens throughout the Richmond area during outreach presentations. The community meetings include City Council District meetings and Neighborhood Association meetings. We discuss the facts and benefits of proper disposal of pet waste at each public meeting.

Our upcoming plans are to partner with Richmond SPCA, Animal Adoption and Rescue, Richmond Animal League, Richmond Emergency Animal shelter and other animal groups to further educate the citizens of Richmond about the benefits of picking up pet waste. We want to provide a "doggy gift bag" for each adoption at the various groups. The Stormwater Utility will provide pet waste kits and information to the groups and train them on how to disseminate the kits and pet waste information to pet owners.

We also use social media to remind citizens of the benefits of picking up pet waste by mentioning "Pick up the Poop, Don't Pollute" through the City's and DPU's Twitter, Blog and Website. Finally, the Stormwater Utility provides and tracks usage for pet waste bags for the City parks and open spaces.

Some examples of our literature and materials are included below:

Pet waste brochure:

Spanish version:

Recoger La Caca!
No Contaminar!

APPENDIX E

Example of How to start a Pet Waste Pick-Up Campaign

How to Guide: Pet Waste Station Community Program

Based on Arundel on the Bay Program, Annapolis, Maryland

Written April, 2010 [adapted here to apply to JR – COR]

This is a description of the elements needed for setting up a neighborhood or community based Pet Waste Station Program. The elements of the community pet waste program are:

1. **Lead Coordinator**
2. **Pet waste station equipment**
3. **Permits**
4. **Station Maintenance**
5. **Outreach**

1. Lead Coordinator

Identify a lead person in the community who will coordinate all things related to pet waste stations. This person ideally should live in the community and their duties will include coordination to:

- Order of station parts and store stock of refill bags (both dog bags and trash can liners).
- Obtain a county permit for station installations [if needed].
- Insure assembly and installation of stations.
- Insure maintenance of stations (minimal); insures contractor is removing full bags.
- Be in contact with the other neighborhood committees who deal with common area services and maintenance to coordinate activities related to these areas.
- Provide outreach about the dog waste stations.

2. Pet Waste Station Equipment: Pet Station Equipment and Bag Order

Note: other sources and types of equipment are available; this company was chosen as the best price competitive against three other bids in spring 2009; equipment was chosen based on price and potential for durability in salt air environment. The source is: antiquated link removed.

- One station is about $350.00 for parts:
- Pet litter bag dispenser (comes with 400 bags); DP-1002-2; **$90.00**; Quantity = 1 Recommend ordering extra bags and storing with neighbor lead coordinator
- 10 gallon round waste receptacle (aluminum green); DP-1206; **$180.00**; Quantity = 1
- Heavy waste bag receptacle liner bags; DP-1404**;** **$19.00**; Quantity = 1 Recommend ordering extra waste bag receptacle liners and storing with neighbor lead coordinator
- 2" X 2" square mounting post - 4' to 8' telescopic post galvanized; DP-1301-P; **$61.00**; Quantity = 1

Assembly and Installation

- Assembly is based on the equipment described above. It is simple to assemble, requires two people and about 40 minutes per station. A screw driver, wrench and socket are required. Consider asking a neighborhood Boy Scout, who will earn community service credit for assisting, for help.
- Installation, after site selection and permitting, can be completed by a neighbor or contractor.
- Prior to installation day, mark selected sites with surveyor's paint.
- DoodyCalls installs stations.

Site Selection for Stations

- Work with the community home owner's association.
- Consider locations that are on community property. Avoid private property.
- Locations need to be on the route that people are known to use when walking dogs. Talk with the dog owners and observe the area for a few weeks prior to final site selection.
- Locations need to be accessible, visible (without impairing view lanes), yet far enough off of the road to be safely away from snow plows and areas needed for access by public utility service vehicles.

3. Permits

Before installation, make sure a permit is not required from the local county/city.

4. Maintenance

- The primary maintenance tasks are emptying the trash can liner full of used dog bags and replacing a new trash can liner, and replacing the dog bag with refills as necessary.
- We encourage that trash filled with dog waste go to the land fill where it becomes both controlled and a point source (by being part of the land fill).
- DoodyCalls maintains stations:
- All bag refills (dog poop bags and trash can liners) are provided to the contractor by the community through the lead coordinator to contractor.

5. Outreach

Possible Sign Messages:

- Picking up your pet's waste helps keep our water clean.
- Pet waste contains bacteria which damages the Chesapeake Bay's waters.
- Rainwater will carry these pollutants to the Bay.
- Removal of pet waste is required by [indicate local ordinance here]
- Neighbors will like NOT having to avoid doggie poop while out walking.

- Location of pet waste stations.
- Periodic reminders to community that the stations are there and recommending continual use.

Create a Google Map showing the locations of the pet waste stations in your community.
Outreach opportunities:

- Community newsletter.
- Community web site.
- Community email list serve messages.
- Announcements at community parties, gatherings, home owner general meetings.
- If you have a dog, on walks, talk up the pet stations with neighbors while walking your dog.
- Letter to local paper editor letting them know that pet waste stations are now in your neighborhood and well accepted!

Original Author and Contact: Julie Winters, Master Watershed Steward winterstime@aol.com

APPENDIX F

New Bacteria Data on Bernards Creek

Table F.1 below shows *E. coli* bacteria data results sampled in the James River just upstream from Bernards Creek confluence (2-JMS123.79), in Bernards Creek just before the confluence (30 meters upstream) with the James River (2-BOR000.02), and in Bernards Creek upstream of a large livestock farm downstream of Rt. 711, Robious Road (2-BOR001.73). All samples were taken during storm events.

Table F.1 New 2011 bacteria data for Bernards Creek.

DEQ Station Id	Collection Date Time	E. COLI - MTEC-MF N0/100ML Value*	Location Description
2-BOR001.73	01/26/2011 13:55	200	Bernards Creek at Rt. 711
	03/01/2011 14:05	**250**	
	05/17/2011 14:10	**2000**	
2-BOR000.02	01/26/2011 15:00	**600**	30meters upstream into Bernards Creek
	03/01/2011 14:35	**625**	
	05/17/2011 15:05	**8000**	
2-JMS123.79	01/26/2011 14:40	25	James River just above the mouth of Bernards Creek, mid-channel
	05/17/2011 15:00	**500**	

***Bold** values are above the single sample standard (235 cfu/100mL)

The January samples are interesting as the upstream station (2-BOR001.73) sample was below the standard and the sample from the station downstream of the large farm (2-BOR000.02) was above the standard, indicating the farm was a large source of bacteria to the stream. The other two samples mirrored this trend even though the upstream sample was already above the standard. This data is helpful in targeting where agricultural BMPs are needed in the Bernards Creek watershed.

APPENDIX G

Public Comments and Responses

Comments regarding
Bacterial Implementation Plan Development for the James River & Tributaries – City of Richmond

Prepared by Heather Barrar
Chesterfield County Planning Department
P. O. Box 40
Chesterfield, VA 23832
(804) 748-1778

- Page 1-8: 2nd paragraph – Chesterfield County also qualifies for the wildlife management urban archery deer season extension
- Page 5-14: Chesterfield County also has distributed 632 rain barrels through a workshop series since 2008.
- Page 5-25: 2nd paragraph under 5.3.3, the Ruff House Dog Park in Rockwood Park is located in Chesterfield County, not the City of Richmond
- Page 5-26: Chesterfield County has a restriction on the number of dogs per residence and citizens must apply for a Special Exception to keep more than 3 dogs. The Virginia Health Department will respond to pet waste complaints with a letter to the offender of the health risks and options on how to properly dispose of the pet waste.

From: Barrar, Heather [BarrarH@chesterfield.gov]
Sent: Friday, June 03, 2011 10:46 AM
To: Smigo, Margaret (DEQ)
Cc: Lee, Dan; Flanigan, Scott; Megan Maggard
Subject: RE: Public Comment

Thank you for your quick response and for letting us know the outcome of the comments.

From: Smigo, Margaret (DEQ) [mailto:Margaret.Smigo@deq.virginia.gov]
Sent: Thursday, June 02, 2011 11:17 AM
To: Barrar, Heather
Cc: Lee, Dan; Flanigan, Scott; Megan Maggard
Subject: RE: Public Comment

Good Morning Ms. Barrar,

Thank you for you comments and for your review of the draft IP. From your comments, DEQ will ask MapTech to make the following changes (in blue) per your request:

- Page 1-8: 2nd paragraph – Chesterfield County also qualifies for the wildlife management urban archery deer season extension. We will add text to that effect.
- Page 5-14: Chesterfield County also has distributed 632 rain barrels through a workshop series since 2008. We will add text to that effect.
- Page 5-25: 2nd paragraph under 5.3.3, the Ruff House Dog Park in Rockwood Park is located in Chesterfield County, not the City of Richmond. We will add text to that effect.
- Page 5-26: Chesterfield County has a restriction on the number of dogs per residence and citizens must apply for a Special Exception to keep more than 3 dogs. The Virginia Health Department will respond to pet waste complaints with a letter to the offender of the health risks and options on how to properly dispose of the pet waste. We will add text to that effect.

Again, we sincerely appreciate your review and are happy to add this important info!

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Piedmont

Visit the VA DEQ Website

From: Barrar, Heather [mailto:BarrarH@chesterfield.gov]
Sent: Thursday, June 02, 2011 10:24 AM
To: Smigo, Margaret (DEQ)
Cc: Lee, Dan; Flanigan, Scott

Subject: Public Comment

Margaret,

Please find attached a few comments I had on the draft IP for the James River Bacteria TMDL. I believe that Scott Flanigan will also be submitting additional comments on behalf of Chesterfield County.

Heather

~~~~~~~~~~~~~~~~~~~~

Heather Barrar
Senior Planner

(804) 748-1778 (phone)
(804) 717-6295 (fax)

Chesterfield County
9800 Government Center Parkway
Chesterfield, VA 23832
~~~~~~~~~~~~~~~~~~~~

Mark S. Alling June 17, 2011

9345 Ashking Drive

Mechanicsville, VA 23116

Margaret J. Smigo

Piedmont Regional Office – DEQ

4949-A Cox Road, Glen Allen, VA 23060

Re: Public Comment on James River – City of Richmond Bacterial TMDL IP

Dear Ms. Smigo:

I have a very important point on which to comment on this TMDL Implementation Plan.

The total costs projected at more than $880,000,000 for Best Management Practices (BMPs) for this James River Bacterial TMDL Implementation Plan are exorbitantly high. However the single highest projected BMP cost is for Increased Storage within the CSO System at $269,160,000 for 27.3 MG (Table ES.2 bottom). Almost all (95.5%) of that cost is for a large volume (25.7MG) of added storage for the Gillie Creek CSO System. However I believe that volume and cost estimate is too high. Long before the James River Bacterial TMDL was approved, t he CoR estimated that it would take 29.2 MG storage costing $300 million to eliminate all CSO overflows in Gillie Creek. The CoR historically tried to show that correcting the Gillie Creek bacteria impairment would not be cost effective and would place an economic hardship on the city. I believe the $300 million estimate was made very high for that reason.

A much smaller volume of added storage should be sufficient to reduce Gillie Creek E. coli under the E. coli water quality standard, so that Gillie Creek may be de-listed. In written public comments dated December 9, 2009, the CoR stated that adding a 5 MG storage to Gillie Creek CSO system would cost approximately $50 Million and be cost-effective according to the “knee-of-the-curve” analysis. Right after that statement DEQ asked their TMDL consultant Maptech to model the reduction in the number of CSO overflows that an additional 5 MG storage would prevent. MapTech predicted that a 5 MG storage costing $50 million would eliminate 97 percent of the Gillie Creek CSO overflows, from 297 days down to only 9 days over 5 years. This reduction would cause a tremendous improvement to Gillie Creek water quality for bacteria, nutrients, and oxygen demand, and probably bring primary contact recreational instantaneous E. coli standard violations down under 10 percent. Gillie Creek would be removed from the 303(d) impaired waters list if/when that occurred.

That CoR 5 MG storage at $50 million public comment also appeared in the attached CoR comments with DEQ responses document dated May 7, 2010. The relevant comment and Figure (3-1) were made in section 3.3.2 on page 14 of the document, which stated "The knee-of-the-curve analysis indicates that a volume of approximately 5 million gallons would represent the limit of cost effective use of resources." Figure 3-1 clearly shows that the overflow volume of 5MG would cost approximately $50 million and be in the acceptable "knee-of-the-curve" range. It is important to note that the CoR recognized in the title of

Figure 3-1 that this reduction would meet the primary contact recreational water quality standard of 126 geometric mean E. coli.

I believe it is of paramount importance that DEQ keep this 5MG concept present in the IP document even though it is explained in the approved TMDL. The cost reductions possible with only 5 MG storage rather than 29.2 MG originally estimated by the CoR would reduce the CoR volume and cost estimates for Increased Storage within the Gillie Creek CSO System by more than 80 percent in Tables 6.1, 6.7 and ES.2, the Grand total for Stage I and II IP goals for Gillie Creek by more than 50 percent, and the Grand Total cost for the whole James River IP by 25 percent in Tables 6.1 and ES.2. The magnitude of this 5MG Gillie Creek resource reduction is so huge it is MOST important to be described in the IP.

I recommend adding the following sentence to the ends of the footnotes in Tables 6.1 and 6.7: "A 5 MG volume of added storage for the Gillie Creek CSO system, at approximately $50M, may return Gillie Creek E. coli below the primary contact recreational water quality standard by decreasing the frequency of CSO overflows by 97 percent. This could significantly reduce total costs for the IP by up to 25 percent."

Because this is such an important probable resource reduction I believe it should also go in the Executive Summary Table ES.2 with a more general statement. I recommend adding 2 less specific sentences as a footnote to the Increased Storage within the CSO System line: " * A significantly lower volume of added storage for the Gillie Creek CSO may achieve implementation goals for Gillie Creek. This could significantly reduce the total costs of the IP by up to 25 percent."

The Gillie Creek fix can occur with far less volume and cost than the 29 MG at $300 million quoted by the CoR, which the steering committee and MapTech used to calculate the $269,160,000 for 27.3 MG in the IP.

From: Smigo, Margaret (DEQ)
Sent: Monday, August 08, 2011 3:07 PM
To: 'Mark Alling'
Subject: RE: Public comment on James River Bacterial TMDL IP document
Attachments: 8_8_11_DEQ_re_MSAlling_comment_Final.pdf

Good Afternoon Mr. Alling,

DEQ greatly appreciates your participation in the IP development and for you comments received on 6/17/11. DEQ has responded to your comments in the attached letter.

Please do not hesitate to contact me should you have further questions.

Respectful Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Visit the VA DEQ Website

-----Original Message-----
From: Mark Alling [mailto:loraxmark@gmail.com]
Sent: Friday, June 17, 2011 5:09 PM
To: Smigo, Margaret (DEQ)
Subject: Public comment on James River Bacterial TMDL IP document

Margaret, Please find attached my public comment on the James G3 Bacterial TMDL IP document.

To: Mark S. Alling

Date: 8/8/2011

Re: Response to comments received June 17, 2011; public comment on James River – City of Richmond Bacterial TMDL IP

Dear Mr. Alling:

Comment #1:

The total costs projected at more than $880,000,000 for Best Management Practices (BMPs) for this James River Bacterial TMDL Implementation Plan are exorbitantly high. However the single highest projected BMP cost is for Increased Storage within the CSO System at $269,160,000 for 27.3 MG (Table ES.2 bottom). Almost all (95.5%) of that cost is for a large volume (25.7MG) of added storage for the Gillie Creek CSO System. However I believe that volume and cost estimate is too high. Long before the James River Bacterial TMDL was approved, t he CoR estimated that it would take 29.2 MG storage costing $300 million to eliminate all CSO overflows in Gillie Creek. The CoR historically tried to show that correcting the Gillie Creek bacteria impairment would not be cost effective and would place an economic hardship on the city. I believe the $300 million estimate was made very high for that reason.

A much smaller volume of added storage should be sufficient to reduce Gillie Creek E. coli under the E. coli water quality standard, so that Gillie Creek may be de-listed. In written public comments dated December 9, 2009, the CoR stated that adding a 5 MG storage to Gillie Creek CSO system would cost approximately $50 Million and be cost-effective according to the “knee-of-the-curve” analysis. Right after that statement DEQ asked their TMDL consultant Maptech to model the reduction in the number of CSO overflows that an additional 5 MG storage would prevent. MapTech predicted that a 5 MG storage costing $50 million would eliminate 97 percent of the Gillie Creek CSO overflows, from 297 days down to only 9 days over 5 years. This reduction would cause a tremendous improvement to Gillie Creek water quality for bacteria, nutrients, and oxygen demand, and probably bring primary contact recreational instantaneous E. coli standard violations down under 10 percent. Gillie Creek would be removed from the 303(d) impaired waters list if/when that occurred.

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I believe it is of paramount importance that DEQ keep this 5MG concept present in the IP document even though it is explained in the approved TMDL. The cost reductions possible with only 5 MG storage rather than 29.2 MG originally estimated by the CoR would reduce the CoR volume and cost estimates for Increased Storage within the Gillie Creek CSO System by more than 80 percent in Tables 6.1, 6.7 and ES.2, the Grand total for Stage I and II IP goals for Gillie Creek by more than 50 percent, and the Grand Total cost for the whole James River IP by 25 percent in Tables 6.1 and ES.2. The magnitude of this 5MG Gillie Creek resource reduction is so huge it is MOST important to be described in the IP.

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Because this is such an important probable resource reduction I believe it should also go in the Executive Summary Table ES.2 with a more general statement. I recommend adding 2 less specific sentences as a footnote to the Increased Storage within the CSO System line: " * A significantly lower volume of added storage for the Gillie Creek CSO may achieve implementation goals for Gillie Creek. This could significantly reduce the total costs of the IP by up to 25 percent."

The Gillie Creek fix can occur with far less volume and cost than the 29 MG at $300 million quoted by the CoR, which the steering committee and MapTech used to calculate the $269,160,000 for 27.3 MG in the IP.

Response: *Bacteria loading models (used to support either the LTCP or the TMDL), proposed engineered solutions/projects, and cost information provided by the City of Richmond are estimates. A lower cost may be sufficient to achieve the water quality standard goals described. The City of Richmond and Virginia DEQ have a responsibility to be pragmatic and prudent in the stewardship of our stakeholders' financial resources.*

The TMDL IP must describe a cost estimate of the proposed schedule and plan to attain the scenario chosen to restore the currently impaired bacterial primary contact water quality use. The published value should be recognized as an estimate and representative of what the stakeholders agree to during TMDL IP development, in particular those asked to perform the work which involves raising and spending that money. During the TMDL development process, the city withdrew their original estimate of their so-called 'knee-of-the-curve' analysis as it did not appear to meet their own, City of Richmond's, full engineering and cost analysis criteria to use this approach. This comment and response will be added to the TMDL IP document record. Additionally, two footnotes will be added to the final wording for Table ES.2, Table 6.1 (currently no footnote), Table 6.7(Gillie Creek existing footnote), and Table 6.8 (Almond Creek existing footnote). The two new footnotes to be added to the four tables are as follows:

1. *Values are based on stakeholder estimates and input*
2. *Additional engineering study and analysis during the traditional adaptive management process may reduce the design criteria and costs needed.*

From: LeRose, Grace A. - DPU [Grace.LeRose@richmondgov.com]
Sent: Monday, June 20, 2011 10:18 AM
To: Smigo, Margaret (DEQ)
Cc: Steidel, Robert C. - DPU; Horton, Willie R. - DPU; Virts, Michelle M. - DPU; Ochsenhirt, Lisa; Cronin, Edward
Subject: James River - City of Richmond IP comment
Attachments: BacteriaTMDL IP Comments Draft Jun 20 2011 gal ver.pdf

Margaret – Attached are the comments from the City of Richmond regarding the DEQ Draft Report "Bacterial Implementation Plan Development for the James River and Tributaries – City of Richmond" for the James River Bacteria TMDL. The City appreciates the opportunity to make these comments.

Respectfully,

Grace A. LeRose
City of Richmond DPU
730 East Broad St.
Richmond, VA 23219

office: 804-646-0033
mobile: 804-332-2704

From: Smigo, Margaret (DEQ) [mailto:Margaret.Smigo@deq.virginia.gov]
Sent: Thursday, June 16, 2011 3:15 PM
Cc: Megan Maggard; James Kern; Alling, Mark (DEQ); West, Kelley (DEQ); Lott, Craig (DEQ)
Subject: **Reminder** James River - City of Richmond draft Implementation Plan comment period ends this Monday June 20th...

Good Afternoon,

This is a friendly reminder that comment period for the draft Implementation Plan (IP) developed for the James River – City of Richmond Total Maximum Daily Load (TMDL) will end this coming Monday June 20, 2011.

The draft plan is available on the DEQ website.

The presentation given at the final meeting on May 18th summarized the draft.

DEQ will accept written comments by e-mail, fax or postal mail. Written comments should include the name, address and telephone number of the person commenting and be received by DEQ during the comment period. Comments received after June 20th may not be accepted. Please send comments to:

Mail: Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060

Email: Margaret.Smigo@deq.virginia.gov
If sending your comment by email, please include "James River – City of Richmond IP comment" in the subject line.

FAX: "Attn: Margaret Smigo" (804)527-5106

BACKGROUND:

A TMDL study is meant to address "what" the problem is and how much of the pollutant must be reduced to meet water quality standards. The TMDL is then followed by Implementation Planning (or IP), which addresses "how" we meet the reductions identified in the TMDL study in order to meet water quality standards and restore the uses of the waterways.

DEQ seeks public comment and review of an implementation plan (IP) developed for the James River and tributaries around the Richmond area. The goal of the IP process is to outline a plan for reaching the reduction goals of the completed TMDL study. The plan identifies the types of "best management practices" (BMPs) which may be implemented to reduce bacteria pollution in the waterways. The plan also identifies potential funding opportunities and estimates the costs of remedial efforts. The final draft IP and comments received along with DEQ responses will be submitted to the State Water Control Board for approval. Implementation Plan development is required by Virginia state law under the Water Quality Monitoring, Information, and Reporting Act (WQMIRA).

****NOTE**** The BMPs identified within the plan represent one way in which the necessary bacteria reductions may be achieved to meet water quality standards. While these efforts are highly recommended, they are not mandatory. The IP is not a regulatory document. In addition, no single state/local government agency or non-profit group is responsible for the implementation of the plan, rather, it will be the responsibility of all watershed stakeholders, citizens included, to achieve the bacteria reductions required to meet water quality standards.

Please don't hesitate to contact me with any questions and feel free to pass this email along to friends, neighbors, and colleagues you think might be interested.

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Visit the VA DEQ Website

Department of Environmental Quality
James River Bacteria TMDL IP

City of Richmond Comments on DEQ's Draft Report *"Bacteria Implementation Plan Development for the James River and Tributaries – City of Richmond"*

June 20, 2011

Comments on DEQ's Draft Implementation Plan

Part 1. Executive Summary

1.1 Introduction

On May 19, 2011, the Virginia Department of Environmental Quality ("DEQ") opened a public comment period for the James River bacteria TMDL Implementation Plan ("Bacterial Implementation Plan Development for the James River and Tributaries-City of Richmond"). The purpose of the Implementation Plan ("Draft IP" or "IP") is to establish one plan to achieve the total maximum daily load for bacteria (E.coli) on two segments of the James River (lower and tidal) and eight of its tributary creeks (Almond, Bernards, Falling, Gillies, Goode, NoName, Powhite, and Reedy). Public comments are due by June 20, 2011.

The City of Richmond ("City" or "Richmond") provides the comments herein regarding the Draft IP. The City has been an active participant since the inception of the bacteria TMDL ("Bacteria TMDL") and has participated in all of the Agricultural, Residential and Urban/Government Working Group meetings and the Steering Committee meetings.

1.2 Richmond's Interest in This Proceeding

As the owner and operator of a large wastewater treatment plant, a municipal separate storm sewer system, and a combined sewer system, all of which received wasteload allocations as a part of the Bacteria TMDL, Richmond has a strong interest in this proceeding. Richmond is a CSO city; approximately one-third of the City is served by a combined system.[1] Although the system was designed to collect and discharge stormwater and wastewater during wet-weather, the City has committed significant resources to developing and implementing a long-term control plan ("LTCP"),[2] meant to reduce the number of system overflows.[3] Of equal importance, the City has MS4 outfalls in Goode Creek, Reedy Creek, Powhite Creek, and James River (above the fall line).

1.3 The Most Crucial Goal of the Draft IP

[1] The combined system includes multiple CSO outfalls in Almond and Gillies Creek, and in the lower and tidal James.

[2] To date, Richmond has spent approximately $242 million to complete Phases I and II of its long-term control plan, and anticipates spending an additional $400 million (in 2004 dollars) to complete Phase III.

[3] The City is subject to a Consent Order for CSOs (approved by the SWCB in 2005 (effective date: March 17, 2005), and incorporated into the City's VPDES permit).

The City appreciates the opportunity to provide comments with regard to the Draft IP. As this proceeding draws to a close, the City reiterates what it views as the most important goals of the Draft IP: (1) achievability of the plan and (2) a strong emphasis on local planning.

State law requires that the Board "…develop and implement a plan to achieve fully supporting status for impaired waters."[4] This plan must include: (a) a date for expected achievement; (b) measurable goals; (c) actions needed to correct the impairment; and (d) the costs, benefits and impact of addressing the impairment.[5] In addition, DEQ's own guidance directs staff to consider questions of cost, available funds, reasonable assurance of implementation, and water quality impacts, in order to write an achievable plan: "Implementation actions chosen should be practical, cost-effective, equitable (i.e., dealing fairly with all problem areas), and based on the best science and research that is available."[6] In short, the plan must be achievable.

Moreover, throughout the Draft IP, DEQ has acknowledged that this plan is voluntary, and that it is not prescriptive, but is rather a "tool that watershed stakeholders may use to reach watershed bacteria reduction goals."[7] The City agrees with this premise. The plan should respect and incorporate local planning goals. Unfortunately, DEQ's Draft IP includes a great deal of language that is not reflective of the City's long-term plan for improving its combined sewer system. DEQ should rely heavily on feedback from stakeholders regarding the most cost-effective and reasonable approach when it develops any IP. That was not done in this case.

Developing an implementation plan that complies with the technical requirements of the statute but that is entirely unrealistic is inconsistent with the law's intent. Expecting stakeholders to achieve reductions at levels that are financially and technically impossible pre-destines us to fail. The City is committed to improving water quality in the James and in its tributaries. We recognize the uniqueness of this natural asset and want to preserve it for future generations. However, we must do this in a way that is thoughtful—dollars should be spent conservatively, and only after careful consideration of the effectiveness and cost associated with certain management measures.

The City respectfully requests that DEQ consider the City's comments below about the achievability and local planning aspects of the Draft IP, and correct the flaws in the document before sending it to the State Water Control Board (Board or SWCB) for review and approval.

[4] Va. Code §62.1-44.19:7.

[5] Id.

[6] Guidance Manual for Total Maximum Daily Load Implementation Plans (July 2003) ("TMDL IP Guidance").

[7] Draft IP at ES-xvi.

1.4 Summary of Comments

1.4.1 The Draft IP Is Not Reasonably Achievable

In Section 7, Reasonable Assurance and Accountability Framework, of the Chesapeake Bay TMDL (published 29 December 2010 after the final DEQ document), it states on page 7-1: "***Where a TMDL is developed for waters impaired by both point and nonpoint sources, in EPA's best professional judgment, determinations of reasonable assurance that the TMDL's LAs will be achieved could include whether practices capable of reducing the specified pollutant load: (1) exist; (2) are technically feasible at a level required to meet allocations; and (3) have a high likelihood of implementation."*** In the current report there is no assurance any of these conditions can be reasonably attained. Identifying reasonable best management practices (BMPs) that will reduce the level of bacteria in the James River and its tributary creeks is the sole reason for writing an implementation plan. The City supports this goal, and has already taken steps through its LTCP to achieve significant reductions. However, the City is concerned that the plan DEQ has drafted is not achievable for the following reasons:

1.4.1.1 The Draft IP Fails to Provide Regulatory Approach to Failing Septic Systems

Table ES.2 recommends a number of actions to address existing septic systems in the watershed. In Stage I of implementation, DEQ recommends septic pump-outs, septic system repair (206 units), septic system installation/replacement (482 units), and sewer connections for 100 units.[8] In Stage II of implementation, DEQ recommends sewer connections for an additional 69 units.

The City agrees that failing septic systems are a concern. However, the Draft IP fails to provide a realistic approach for addressing this issue, given current regulatory constraints. From the City's perspective, we do have the authority, by City Code, to mandate septic system pump-outs and maintenance. However, the City does not have the authority to force homeowners to abandon their septic systems and connect to the sanitary sewer system, as this authority has only been granted to specific localities, pursuant to Virginia Code §15.2-2110. In addition, as the Draft IP acknowledges, VDH's powers to regulate septic systems are limited by law and resources.[9] Without fundamental regulatory changes and significant funding, it is unclear how the stakeholders will achieve the goals set in the Draft IP.

1.4.1.2 The Draft IP Fails to Address Wildlife

[8] Draft IP at Table ES.2.

[9] Draft IP at 7-9 to 7-10.

Table ES.1 shows the bacteria load reductions to meet the water quality standards ("WQSs") for the James River watersheds and Tuckahoe Creek watershed. A footnote to Table ES.1 states that wildlife load reductions to achieve the WQSs "*will not be explicitly addressed by this implementation plan,*" which indicates there is no reasonable assurance that Bernards Creek, Reedy Creek, James River (riverine) and Tuckahoe segments will meet the water quality standards.

The City acknowledges that this is a difficult issue, but DEQ's response that it will consider a re-designation of the stream's designated use through a UAA "after demonstrating that the source of *E.coli* contamination is natural and uncontrollable by effluent limitations and BMPs" [10] really means that other stakeholders will be spending significant amounts of money ($93.7 million in Reedy Creek, for example) to comply with a water quality criteria, and its associated designated use, that may change in the future. The City submits that it is clear today that it will be impossible to comply with existing WQS under any scenario in certain creeks—for example, as noted above, Reedy Creek would need a 97% reduction in wildlife loads to comply with standards. In such a situation, it would be preferable to consider now whether there is an appropriate link between the designated use and the natural environment of the Creek before installing expensive BMPs. This would also be consistent with the National Academy of Sciences' National Research Council suggestion that states consider designated uses even before TMDLs are written: "[s]tates should develop appropriate use designations for water bodies in advance of assessment and refine these uses prior to TMDL development" and "use attainability analysis should be considered for all water bodies before a TMDL is developed."[11]

1.4.1.3 Implementation Options for the City's MS4s Are Limited

The Draft IP fails to consider inherent limitations in the City's ability to institute additional programs or install BMPs. Although the City has taken a number of positive steps to improve water quality in the watershed,[12] there are practical limitations to the City's ability to take the kinds of steps included in the Draft IP under "Residential/Urban BMPs." Since complying with the TMDL IP requires stormwater BMPs on an area of land greater than the total owned by local, state and federal governments, the City would be faced with the very difficult choice of either seeking condemnation authority to install publicly-owned BMPs (at significant cost and with high risk of litigation) or waiting for the General Assembly to clarify the City's authority to mandate retrofits on private property. Either option is highly complex from a legal perspective. DEQ's refusal to acknowledge the inherent difficulties involved in compliance is

[10] Draft IP at section 1.2.2.

[11] NRC, Assessing the TMDL Approach to Water Quality Management (2001).

[12] For example, the City has an active pet waste program and an ordinance to regulate the proper operation of septic systems. In addition, the City has proactively deeded much of the land in the James River Parks System into a conservation easement in order to provide a buffer for the associated waterways.

another example of why the plan is unrealistic and ultimately unachievable. Furthermore, the City's decision to take a bold environmental step, *i.e.*, establishing a conservation easement, means that there are fewer publicly-owned acres that the City can use to install the Residential/Urban BMPs recommended for Stage II.

1.4.1.4 Low Impact Development BMPs Not Designed for Bacteria Removal

DEQ has chosen a number of "Residential/Urban BMPs" in Table ES.2, including, sewer connections, wet ponds, rain gardens, bioretention facilities, infiltration trenches, and rain gardens. The City believes that several of these selections are not well chosen and do not recognize the following:

- These BMPs are not designed to remove bacteria. They are designed to reduce peak flows or remove sediment, nitrogen and phosphorus.
- There is very limited data on the bacteria removal efficiencies of these BMPs. Of the data that does exist, the efficiency range is wide, with several BMPs having some negative removals (higher values going out of the BMP that coming in).
- Most of the lands available for BMP retrofits are private property. The City questions whether it is reasonable to assume that the BMPs chosen will be workable given this limitation.
- There is no information to support the conclusion that local soils would allow for 13,600 acres in infiltration trenches.

1.4.1.5 Implementation Time Frame is too Short

As noted above, the Virginia Code section governing the implementation of a TMDL requires that the plan include an expected achievement date. In the Draft IP, DEQ has recommended that the work needed to implement measures to comply with the TMDL be accomplished in two stages over 20 years. During Stage I (the first 10 years), much of the work would be done by the agriculture community, by owners of septic systems and by pet owners (through a pet waste pick-up program). During Stage II (the second 10 years), MS4s and the City's combined system would be expected to implement hundreds of millions of dollars in BMPs.

The City requests that DEQ reconsider this approach. Stakeholders should be given significantly more time to get this work done. At a minimum, DEQ should consider adding a third 10-year stage for implementation efforts. In addition, DEQ should consider whether a use attainability analysis (UAA) study is indicated for particular streams where the cost of implementation is either extraordinarily high or the likelihood of achieving water quality goals is particularly low (perhaps because of natural wildlife conditions).

1.4.2 DEQ's Draft IP Fails to Adequately Incorporate Local Planning

The City requested that DEQ remove discussions regarding the CSO from the Draft IP, and provided a write-up related to the CSO to be added to the main body of the IP. DEQ has not honored this request, choosing instead to incorporate a discussion of future efforts for the CSO in the Draft IP.[13] Respectfully, if the goal of the Draft IP is to establish a plan that will be used to achieve the underlying WQSs, DEQ should look to the City for direction with regard to its CSO. The City has been working for decades to reduce the frequency of overflows from its combined system, at a cost of hundreds of millions of dollars, and has a unique understanding of its combined system. Furthermore, the responsibility and cost to comply with the WLAs identified in the Bacteria TMDL will be borne by the City. DEQ's evaluation in Section 5.3.5 of the Draft IP is not the City's plan. Indeed, DEQ's plan is $90 million more than the City's estimate provided during the development of the Bacteria TMDL.

1.4.3 Major Technical Issues

1.4.3.1 Reedy Creek

DEQ has recalibrated reductions for Reedy Creek from the levels included in the Bacteria TMDL. As a result, the Draft IP calls for 97% and 99.5% reductions in wildlife and urban runoff loads in the Creek, respectively.[14] The recalibrated model shows that over 80% of land area of Reedy Creek would need to be treated with BMPs. Reedy Creek is the only watershed requiring BMPs to treat runoff from impervious surfaces. It is unlikely that there would be substantial sources of bacteria (other than from geese or other birds) on the impervious surfaces within the Reedy Creek Watershed. Additionally, the City does not have the authority to retrofit BMPs on private property.

1.4.3.2 WQS attainment without addressing wildlife

Table 6-13 shows that there will be zero percent violations by Stage III. However, footnotes to Table ES.1 indicated that wildlife loads will not be addressed. It would be reasonable to expect that percent violations would remain at the end of Stage III, especially if wildlife loads are not reduced. Please refer to paragraph 2.1.1 below for comments and information requests.

[13] Draft IP at section 5.3.5 ("Urban Stormwater Volume Reduction BMPs for CSO Areas").

[14] Id. at Table 3.5.

1.5 Recommendations

1.5.1 Develop Regulatory Approach to Failing Septic Systems

The City recommends that the Virginia Department Health (VDH) develop a regulatory approach to address failing septic systems. This may require additional state legislation.

1.5.2 Develop Plan to Reduce Wildlife Loads or Evaluate Recreational Uses

The City recommends that DEQ consider whether the Draft IP will realistically be achievable without some plan to address wildlife loads. If, as DEQ has suggested, reducing wildlife loads is too difficult, then DEQ should evaluate use of several creeks with high wildlife loads <u>before</u> requiring stakeholders to spend dollars that will not result in WQS compliance.

1.5.3 Use Attainability Analysis for Gillies Creek Paved Channel

The City recommends that DEQ include a discussion of the need for a Use Attainability Analysis ("UAA") for Gillies Creek and of the EPA's work to develop new water quality criteria in the Draft IP.

Table ES.2 further documents the need to conduct a UAA to determine the highest and best designated use possible for the Gillies Creek paved channel. From DEQ's TMDL IP Guidance, Section 9.0 page 61, TMDLs should be integrated with other watershed plans under the continuing planning process to develop and update statewide plans that include TMDL development and adequate implementation of new and revised water quality standards, among other components. Two water quality standards issues that were raised with staff during this process, but that are not discussed in the Draft IP, include: EPA's 2007 Critical Path Science Plan for the Development of New or Revised Recreational Water Quality Criteria and the City of Richmond's UAA study of Gillies Creek.

With regard to Gillies Creek, Ephraim King, EPA OST Director acknowledged, what has been the City's position on the UAA process all along, in a 2006 memo to the regions: "We need to work together with states and tribes to ensure that as we develop TMDLs, we also coordinate on issues related to use attainability as needed." However for the James River TMDL, the SWCB voted not to do so during the TMDL development. He goes on: "In practice, the information gathered to develop a TMDL, and the allocations in a TMDL, may point to the need to pursue a UAA." This is the case for Gillies Creek and should be stated so in the IP as the City will conduct this study and present the findings to DEQ and the Commonwealth may use the results from the City UAA study as the basis for considering a water quality standards change.

Both issues (the UAA and EPA's possible criteria changes) will provide important information that will occur during Stage I of the implementation plan and have the potential for significant change. They should be described and reviewed as part of a future milestone established in an iterative process.

1.5.4 Guidance to Permit Writers

The City recommends that DEQ add language to the Draft IP that explains to current and future permit writers that the plan is voluntary. There is language that explains: "The BMPs chosen in this IP are not the only types which stakeholders can choose to implement, rather they are options among many." However, language that goes on to caution permit writers that they should not incorporate the recommendations into a permit verbatim would provide additional clarity, and reinforce the idea that localities retain the authority to design implementation based on local planning goals. The City believes that this Implementation Plan should not be the template that is used in development or implementation of future permits.

1.5.5 Description of City's CSO LTCP

The City recommends that DEQ remove the discussion of the City's CSS system from the Draft IP, and substitute instead language submitted to DEQ on April 15, 2011. A detailed explanation for this request, including the requested language, is provided in paragraph 2.4.6 below.

As support for this request, the City notes the fact that the primary goal of the Draft IP is to develop a plan to meet load allocations, because NPDES permits will be used for wasteload allocation implementation. This is clear in DEQ's TMDL IP Guidance: "In most cases, and for NPS dominated watersheds, the WLA portion of the TMDL does not need to be a part of the IP. There is, however, one exception. WLAs will need to be addressed in an IP **for an urban watershed that is covered by a municipal separate storm sewer system (MS4) permit (Phase I or II)**."[15] Consistent with this approach, the Draft IP should not include specific approaches for the City's CSS system.

1.5.6 Correct Technical Flaws

The City recommends that DEQ review the Technical Comments provided below and incorporate changes to the Draft IP explained therein. For ease of reference, the Technical Comments are provided in response to the Draft IP in the order in which they appeared in that document.

[15] TMDL IP Guidance at 12.

Part 2. Technical Comments

2.1 Comments to IP Executive Summary

2.1.1 Wildlife Loads

Table ES.1 shows the bacteria load reductions to meet the WQSs for the James River watersheds and Tuckahoe Creek watershed. Footnotes to Table ES.1 states that wildlife load reductions to achieve the WQSs "*will not be explicitly addressed by this implementation plan*", which indicates there is no reasonable assurance that Bernards Creek, Reedy Creek, James River (riverine) and Tuckahoe segments will meet the water quality standards. Additionally, if Table ES.1 indicates that Wildlife loads "*will not be explicitly addressed by this implementation plan*", it is reasonable to expect that there will be exceedances of the water quality standards associated with Wildlife loads. How can Table 6.13 show zero estimated Geometric Mean percent violations for Bernards Creek, Reedy Creek, James River (riverine) and Tuckahoe segments if wildlife loads will not be addressed? Please provide a description of the methodology used to determine the percent violations and the relationship with load reductions. Please provide the model (including all pre- and post- processing tools) used to development the relationship between the load reductions and percent violations.

2.1.2 Public Participation

As noted above, one of the City's chief goals throughout this process has been to assist DEQ in the development of an implementation plan that is achievable and based on local planning. The City has participated in the development of TMDL and attended every Working Group and Steering Committee meeting. Unfortunately, the IP was developed on an accelerated timetable, which did not allow appropriate time to verify and comment on data provided. Additionally, feedback provided through the Working Groups and Steering Committee appears not to have been considered in the development of the Draft IP. As a specific example the City requested that the information related to the CSO LTCP be removed from the IP report, which was not considered.

2.1.3 Table ES.2

Table ES.2 summarizes the Stage I and II implementation goals.

2.1.3.1 "CSO SW Volume Reduction BMPs" costs

The "CSO SW Volume Reduction BMPs" costs are higher than those provided by the City during the TMDL development. The City requests that stormwater volume reduction BMPs be removed from the IP and replaced with the costs provided by the City during the TMDL.

Additionally, a footnote should be provided to indicate that states the following: "The bacteria reductions for CSOs will be based on the City's LTCP, which will be updated to be consistent with the outcome of the City's UAA study for the Gillies Creek paved channel."

2.1.3.2 *"Residential/Urban BMPs" are arbitrarily applied*

The evaluation/selection of the "Residential/Urban BMPs" is arbitrarily applied and do not recognize the following:

- Urban/Residential BMPs are not designed to remove bacteria – they were designed to reduce peak flows or remove sediment, nitrogen and phosphorus. Urban/Residential BMPs will not provide consistent removal from storm to storm based on the nature of how and where the rain falls.
- Most of the lands available for BMP Retrofits are private property. Therefore, there is no reasonable assurance that 80% of the total land area in Reedy Creek could be retrofit, especially in the 20-year timeframe prescribed in the IP.
- Did DEQ evaluate the soil types in the watersheds requiring BMP retrofits that would justify the ability to install approximately 13,600 acres of infiltration trenches?
- Table ES.2 shows that more than 30,600 acres will be retrofitted some form of BMP. Has DEQ conducted an evaluation of all the open space in the watersheds available for BMP retrofits?
- DEQ has shown that most of the BMP retrofits are required to the pervious cover landuse category. Although we would agree that bacteria loads from wildlife would most likely be on the pervious cover, did DEQ quantify the amount of forested land area in the pervious category?

2.1.4 Evaluation of Affordability

The IP does not address the financial impacts to ratepayers, citizens, or farmers. The City requests that DEQ conduct an economic evaluation to define the financial burden on the households, farmers and local economies. The economic evaluation should include at least the following steps:

- <u>Outline plan for economic analysis</u>: Circulate to Steering Committee for comments, provide initial responses to Steering comments, and conduct a conference call to discuss comments and responses
- <u>Develop draft economic evaluation</u>: Circulate to Steering Committee for comments, provide initial responses to Steering comments, and conduct a conference call to discuss comments and responses

- Included in the IP final report.

2.2 Comments to IP Section 1 - Introduction

2.2.1 Indicator Organisms

The first paragraph in the introduction states that E. coli 0157:H7 and E. coli 0111 are pathogenic strains, which are clearly the case. However, this is misleading. The pathogenic E. coli is not easily determined due to the uncertainty in determining the pathogenic nature of isolated E. coli strains. Furthermore, the sampling methods cannot distinguish between pathogenic and non-pathogenic strains and the relationship between serotype and pathogenicity is questionable (Standard Methods, 1989). The City requests that the first paragraph be deleted in its entirety and replaced with a more appropriate description of Escherichia coliform as an indicator organism, which better represents the E. coli referenced in DEQ's TMDL and IP. Possible replacement language could include the following:

> "Escherichia coli is a member of the coliform bacteria family that may be used to indicate fecal sources. It is typically found in human and animal digestive tracts. The use of E. coli as an indicator organism is somewhat restricted by (1): there are multiple species of E. coli; (2): certain species, such as Proteus and Aerobacter are normally found outside the human intestinal tract in soil, and (3): E. coli identical to that found in humans is also found in the intestinal tract of other warm-blooded animals. However, because studies had shown that E. coli was a much better indicator of disease risk than fecal coliform, EPA (1986 Bacteria Criteria) indicated that E. coli should be used as the recommended indicator organism for classifying waters for fresh water contact recreation." (Tchobanoglous and Schroeder, 1985)

2.2.2 TMDL IP incorporation into Water Quality Management Plan

Section 1.1 states that: "VADEQ will request SWCB authorization to include the TMDL implementation plan in the appropriate Water Quality Management Plan (WQMP) in accordance with CWA Section 303(e)." The City assumes that DEQ intends to incorporate the IP into the appropriate WQMP, consistent with previous TMDL Implementation Plans,[16] and not to include a reference to the WQMP in the regulations (WQMPR). The City suggests making this point clear in the IP.

[16] For example, in the IP for the Smith Creek Watershed, the document cites 18 current WQMPs developed per Section 208 and 303(e) of the CWA, and that these plans will be updated, in part, to "serve as repositories for all TMDLs approved by EPA and adopted by the Board, as well as IPs approved by the Board." TMDL IP at 88.

Additionally, for purposes of providing guidance to the reader on how the IP will be used, the City suggests that DEQ add language to the IP that explains to permit writers that this plan should not be used for purposes of developing future permit language. The Draft IP makes it clear that the specific plan provisions are "merely options," and "not the only types which stakeholders can choose to implement…"

2.3 Comments to IP Section 3 – Review of TMDL Development

2.3.1 Reedy Creek Model Recalibration

The reallocation of Reedy Creek calls for 97% and 99.5% reductions in wildlife and urban runoff loads, respectively. There is no reasonable assurance that reductions of these magnitudes are attainable. Please refer to paragraph 1.4.3.1 above for additional comments regarding Reedy Creek.

2.4 Comments to IP Section 5 – Assessment of Implementation BMPs

2.4.1 Flexibility in Implementation Efforts

The notice for public meeting stated: "The BMPs identified within the plan represent one way in which the necessary bacteria reductions may be achieved to meet water quality standards. While these efforts are highly recommended, they are not mandatory. The IP is not a regulatory document." While this is a factually correct statement, Jon M. Capacasa, Director, Water Protection Division, EPA Region III states the following well understood fact of the TMDL program in a 4 November 2011 letter to Ellen Gilinsky who was at that time the DEQ Director, Division of Water Quality Programs: "***As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL allocations pursuant to 40 CFR § 122.44 (d)(1)(vii)(B). Please submit all such permits to EPA for review as per EPA's letter dated September 29, 1988***." In fact the decision rational attached to that letter states: "***For implementation of the WLA component of the TMDL, the Commonwealth intends to utilize the VPDES program, which typically includes consideration of the WQMIRA requirements during the permitting process***." The critically important regulatory component will be the reissuance of the City's VPDES individual permit for the wastewater facility or the MS4 general permit with bacterial allocations that are not reasonably attainable under the plan. For this reason the City has participated in every meeting regarding the TMDL and implementation plan requesting analysis of reasonably attainable technologies for compliance with the allocations and absent such, using best professional judgment, that the IP be written in clear iterative process that can be the basis of drafting language for the permits referenced above.

Section 6.3.2.1 of the Bacteria TMDL (November 2010), titled "*Municipal Separate Storm Sewer System – MS4*" indicates that the "*For MS4/VSMP permits, the Commonwealth expects the permittee to specifically address the TMDL wasteload allocations for stormwater through the iterative implementation of programmatic BMPs. BMP effectiveness would be determined through permittee implementation of an individual control strategy that includes a monitoring program that is sufficient to determine its BMP effectiveness.*" Urban/Residential BMPs, identified throughout the TMDL IP, are not designed to remove bacteria. These BMPs were designed to reduce peak flows or remove sediment, nitrogen and phosphorus. Urban/Residential BMPs will not provide consistent removal from storm to storm. Until the BMP technologies improve their efficiencies and reliability in the removal of bacteria from stormwater, the City will not be able to accept the types and quantities of BMPs identified in the IP.

2.4.2 Table 5.1

2.4.2.1 Table 5.1 does not include costs

The title of Table 5.1 is "*Potential control measure costs and efficiencies in removing bacteria*". However, the table does not include costs. Suggest editing the title of the table to remove "*costs and*".

2.4.2.2 Show Range and Value Used

Vegetated Buffer, Loafing Lot Management, Sand Filter, Street Sweeping include a range and the value used. The City requests that all of the BMPs be provided with a range observed and value used.

2.4.2.3 Bacteria Removal Efficiencies

Wet Ponds, Rain Gardens, Bioretention Basins, Submerged Gravel Wetland, Sand Filter, Shallow Marsh, Extended Detention Pond, and Infiltration Trench BMPS were not designed to remove bacteria. Most of the studies on these BMPs are aimed at reducing peak flows or removing sediment, nitrogen and phosphorus. Therefore, there is very limited data on the bacteria removal efficiencies of these BMPs. Of the data that does exist, the efficiency range is wide, with several BMPs having some negative removals (higher values going out of the BMP that coming in). For these residential/urban BMPs, it is recommended that number of independent sampling events be listed in Table 5.1 as well. If the information cited does not include a range or number sampling event, then it should be footnoted as such. The general public, future state employees and future local government staff will need to understand that the removal efficiencies are based on very limited performance data. The City requests that a paragraph be added to describe the uncertainty of the BMP performance. The paragraph should also include a description showing that the removal efficiencies will vary between storm events.

2.4.2.4 Table 5.1 footnotes cites EPA's Fact Sheets

Footnotes 4 and 14 cite bacteria removal efficiencies from US EPA fact sheets. However, the removal efficiencies referenced in the fact sheets are not EPA's studies. These fact sheets only reference other studies conducted in the early 1990's or program assumptions. The City requests that all footnotes be based on the original studies that derived the value used in Table 5.1.

2.4.2.5 Table 5.1 footnote 10

The shallow marsh removal efficiency is based on studies from King County, Washington. Washington State has a substantially different climate and weather pattern compared with the Richmond, Virginia area. The City requests a new study be found for the removal efficiency of the Shallow Marsh BMP that is more consistent with our local climate.

2.4.3 Table 5.1 footnote 17

It is not appropriate to use sediment or nutrient removal efficiencies as a surrogate for bacteria removal efficiencies. The City requests that all footnotes be based on actual bacteria sampling.

2.4.4 Table 5.2

The Residential/Urban BMPs referenced in Table 5.2 do not match the Runoff Treatment Efficiency BMPs referenced in Table 5.1. The City requests that all the BMPs identified in Table 5.1 be listed and classified in Table 5.2.

2.4.5 Section 5.3.4 – Residential/ Urban BMPs

2.4.5.1 Extent that BMP could be installed

How was the "*knowledge of the extent that each BMP could be installed in the watershed*" determined? It appears that the quantity (acres-treated) of BMPs installed was based on bacteria removal required and not the "extent that each BMP could be installed". No information was presented during the Steering Committee and Work Group meetings that showed how these BMPs could be installed. It is recommended that the sentence be rewritten to more accurately describe basis of the values in Table 5.10 or more information be provided to justify the "knowledge of the extent" (soil surveys, public land availability, open spaces, etc).

2.4.5.2 Table 5.10

Why were Wet Ponds and Rain Gardens excluded in the Tuckahoe Creek and James River (riverine) stream segments? What soil surveys/ evaluation were conducted to ascertain that

Infiltration Trenches could be installed in the watersheds, especially given the extent of Class C and D soil types? Why were the BMPs distributed uniformly within a watershed?

2.4.6 Section 5.3.5 - Urban Stormwater Volume Reduction BMPs for CSO areas

The primary goal of the TMDL IP is to develop a plan to meet Load Allocations, because NPDES permits (either VPDES permit for CSO or MS4 permit) will develop plans to meet the WLA in accordance with the TMDL report. Section 5.3.5 was not developed with any direction from the City of Richmond, in fact, the City has consistently requested during and after the Working Group Meetings and the Steering Committee Meetings that this information be removed from the IP report in its entirety. On April 15, 2011 the City submitted to DEQ a formal written request to remove this information from the IP, which is as follows:

- Evaluations in Subsection 5.3.5 requires that BMPs be installed on private property. The City does not have the authority to install BMPs on private property.
- It is not realistic to assume that BMPs could be installed to treat 100% of any facility or property. For instance, assuming that "all buildings" with roofs greater than 10,000 sq ft could support a vegetative roof is not founded on any evaluation of the structural integrity of the roofs in the watersheds.
- There was no discussion in Subsection 5.3.5 regarding how the BMP facilities would be maintained. For the City to show consistent compliance with the WLAs, an operation and maintenance plan would need to be developed. The City does not have the authority to enter private property to maintain or replace failing BMP facilities. Additionally, it is not realistic that 196,420 rain barrels will operate consistently over time and we cannot assume that the property owners will maintain the rain barrels.
- Tables 5.12 through 5.16 presents results that are not consistent with any of the metrics and/or requirements of EPA's CSO Control Policy. The City has selected the demonstration approach as defined by the CSO Control Policy and any CSO improvements installed should be compared with the water quality improvement in terms of the monthly geometric mean.
- The City's CSO LTCP meets the WLAs in the James River sections (riverine and tidal). Therefore showing additional BMPs in these watersheds are not required and would cause unnecessary rate increases.
- The estimated costs shown in Gillies Creek and Almond Creek are higher than the preliminary estimates provided by the City during the development of the Bacteria TMDL.

The City of Richmond requests that Subsection 5.3.5 titled "Urban Stormwater Volume Reduction BMPs for CSO Areas" and associated costs provided elsewhere in the implementation plan be removed in its entirety. The City of Richmond will be evaluating additional improvements required to meet its Waste Load Allocations (WLAs) in the Gillies Creek and Almond Creek watersheds. As indicated by DEQ during multiple Working Group and Steering Committee meetings, the Bacteria TMDL Implementation Plan is to provide reasonable assurance for non-point sources and VPDES permits will provide reasonable assurance for point sources.

The City will develop a specific plan to meet the WLAs in Gillies Creek and Almond Creek. The City is developing a path forward to address the WLAs, which may include conducting a Use Attainability Analysis for the paved channel portion of Gillies Creek. The City suggests that DEQ place the following CSO related information into the draft Bacteria TMDL Implementation Plan as follows:

"*EPA's CSO Control Policy requires the DEQ and the City to complete the Water Quality Standards Coordination Process to show that the controls in the Long-Term Control Plan (LTCP) meet the WLAs needed to attain the water quality standards. The Bacteria TMDL indicates that additional controls may be required in Gillies Creek and Almond Creek. The City is developing a plan to evaluate controls needed to meet the WLAs in the Bacteria TMDL, which may include conducting a Use Attainability Analysis for the paved channel portion of Gillies Creek. The City will be engaging the citizens of Richmond and other interested parties during the development of the plan for Almond Creek and Gillies Creek*."

The responsibility and costs to comply with the WLAs identified in the Bacteria TMDL will be born solely by the City of Richmond. The DEQ evaluation in Section 5.3.5 of the Draft IP is not the City's plan. The cost of DEQ's plan is $90 million dollars higher than the preliminary information provided by the City during the development of the TMDL. DEQ's plan does not address operation and maintenance costs or the reliability of BMPs identified in Section 5.3.5. Furthermore, the City does not own the majority of land that DEQ shows as requiring a BMP. DEQ's plan is neither cost effective nor implementable. Therefore, the City of Richmond requests that the entire Section 5.3.5 be deleted and that DEQ use the paragraph provided on April 15, 2011.

2.4.7 Section 5.5.4 Residential/Urban BMPs

The primary anthropogenic bacteria sources in residential/urban areas include failing septic systems, straight pipes, and pet waste. The remaining bacteria generators are wildlife, which will not be addressed as indicated in footnotes to Table ES.1 the TMDL IP Draft Report. Therefore, the Residential/Urban BMPs would be targeting pet waste. There is no discussion in the draft report of heavier pet densities for the targeted 30,616 acres to be treated by Residential/Urban BMPs.

Additionally, it is not reasonable or feasible to retrofit 80% of all the land area in the Reedy Creek watershed. The City does not own the land to install these BMPs. Further, it is unlikely that the impervious cover will have much pet waste. The stormwater quantity reductions associated with the BMPs servicing the impervious cover may result in increased bacteria concentrations in Reedy Creek.

2.4.8 Section 5.5.5 Urban Stormwater Volume Reduction for CSO

2.4.8.1 Delete Section 5.5.5

Again, DEQ's plan is showing costs that are substantially higher than the preliminary estimates provided by the City during the development of the TMDL. As indicated above, the City requests that Section 5.5.5 be deleted in its entirety.

2.4.8.2 Table 5.22

The total costs to retrofit green infrastructure was almost $3 BILLION. Additionally, this assumes that almost the entire area be retrofitted on property that the City does not own. The City does not have the authority to force residents to install BMPs on their property. Every house would have multiple rain barrels. Furthermore, the City's CSO Long-Term Control Plan for these areas will meet the water quality standards.

2.4.9 Section 5.6 Benefit Analysis

2.4.9.1 Cost Effectiveness shown in Table 5.23

DEQ does not provide any explanation/ interpretation of Table 5.23. The CSO controls are the least cost effective of any controls identified in Table 5.23.

2.4.9.2 What is the benefit?

Typically a benefit to cost analysis includes an evaluation of increasing levels of control to identify inflection points where the benefits become less cost effective. The City requests that a benefit to cost analysis be conducted to better inform stakeholders, elected officials, and the general public on their investments in clean water.

2.4.9.3 *LID BMPs*

Low Impact Development (LID) practices are designed to reduce peak runoff, and remove solids and nutrients. Although, bacteria may be removed by LID BMPs, it is not their primary function. The four BMP practices included this Bacteria TMDL IP have a wide range of performance as indicated in the following table.

Residential BMP	Median	Min	Max	Number of Sampling Events	Source
Retention Pond	70%	-6%	99%	11	CWP National Pollutant Removal Performance Database V3
Rain garden	92%	0%	100%	14	Hal Marshal Bioretention
Bioretention Basin					
Infiltration Trench	NA	NA	NA	NA	No Specific Study Data Available

In general, sediment and nutrients are more uniformly distributed over the watershed compared to bacteria. The non-human sources of bacteria in an urban environment would typically be generated from pets or wildlife (i.e. geese, deer, raccoons, etc). These source are transient (will move throughout the watershed), which will make it very difficult to site LID BMPs because they will not discharge their waste in same locations consistently. Additionally, the footnotes to Table ES.1 indicate that wildlife loads will not be addressed in this IP. Therefore, LID BMPs are not a practical solution for controlling bacteria.

2.5 Comments to IP Section 6 – Measurable Goals & Milestones

2.5.1 Stage I and II Implementation Goals and Costs

Table 1 summarizes the James River Bacteria TMDL IP estimated costs by watershed for Agricultural, Residential and CSO. Table 2 shows the City's portion of the Bacteria TMDL IP cost estimates, which will include the costs for the Phase III CSO LTCP (Alternative E). Figure 1 shows that City of Richmond's share is about 76% of the total cost for James River bacterial TMDL IP. The City of Richmond requests that the entire Section 5.3.5 be deleted and that DEQ use the paragraph provided on April 15, 2011. Refer to paragraph 2.4.6 for additional comments.

2.5.2 Table 6-13: Timeline for Implementation

2.5.2.1 *Wildlife Compliance*

Table 6-13 shows that there will be zero percent violations by Stage III. However, footnotes to Table ES.1 indicated that wildlife loads will not be addressed. It would be reasonable to expect that percent violations would remain at the end of Stage III, especially if wildlife loads are not reduced. Please refer to paragraph 2.1.1 above for comments and information requests

2.5.2.2 Timeline for CSO LTCP based on Richmond's Special Order by Consent

Please add a footnote to Table 6-13 regarding the implementation schedule for the City's CSO LTCP that states: "(2) Estimated timeline based on 100% grant funding. The schedule for the implementing the Phase III CSO controls is based on the Special Order by Consent."

Table 1

Summary Total IP Costs

IP Table	Watershed	Estimated Costs			
		Agri-cultural	Residential/ Pet	CSO	Total
6.2	Bernards Creek	$390,353	$3,866,082	$0	$4,256,435
6.3	Tuckahoe Creek	$1,779,712	$164,108,298	$0	$165,888,010
6.4	Powhite Creek	$0	$46,898	$0	$46,898
6.5	Reedy Creek	$0	$93,707,424	$0	$93,707,424
6.6	James River riverine	$2,948,910	$139,329,924	$0	$142,278,834
6.7	Gillies Creek	$0	$36,879,753	$390,130,455	$427,010,208
6.8	Almond Creek	$25,021	$121,934	$22,692,340	$22,839,295
6.9	Goodes Creek	$0	$23,269,586	$0	$23,269,586
6.10	Falling Creek	$0	$224,384	$0	$224,384
6.11	No Name Creek	$0	$3,481,126	$0	$3,481,126
6.12	James River tidal	$0	$768,000	$0	$768,000
	Total	**$5,143,996**	**$465,803,409**	**$412,822,795**	**$883,770,200**

Table 2

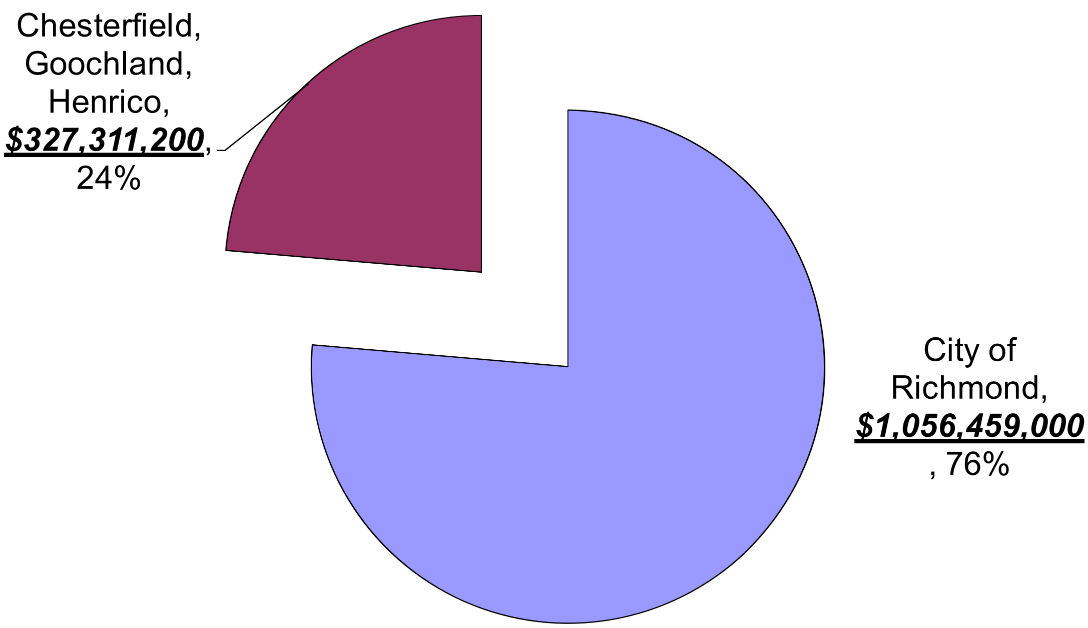
City's Share of Bacteria IP Costs

IP Table	Watershed	Percent City Area	City's Portion of Estimated Costs			
			Agri-cultural	Residential/ Pet	CSO	Total
6.2	Bernards Creek	0.0%	$0	$0	$0	$0
6.3	Tuckahoe Creek	0.0%	$0	$0	$0	$0
6.4	Powhite Creek	24.6%	$0	$12,000	$0	$12,000
6.5	Reedy Creek	97.9%	$0	$91,718,000	$0	$91,718,000
6.6	James River riverine	15.9%	$0	$22,179,000	$0	$22,179,000
6.7	Gillies Creek	17.2%	$0	$6,350,000	$390,131,000	$396,481,000
6.8	Almond Creek	6.1%	$0	$7,000	$22,693,000	$22,700,000
6.9	Goodes Creek	100.0%	$0	$23,270,000	$0	$23,270,000
6.10	Falling Creek	10.7%	$0	$24,000	$0	$24,000
6.11	No Name Creek	0.0%	$0	$0	$0	$0
6.12	James River tidal	9.7%	$0	$75,000	$0	$75,000
		Subtotal	**$0**	**$143,635,000**	**$412,824,000**	**$556,459,000**
		Phase III CSO LTCP (Alt E)			**$500,000,000**	**$500,000,000**
		Total			**912,824,000**	**$1,056,459,000**
						76.3%(1)

Note: (1) Based on including Phase CSO LTCP (Alt E) in the TMDL IP costs, which increases the total IP estimate to $1,383,770,200.

Figure 1

City of Richmond's Share* of the Total Cost of JR Bacterial TMDL IP



* Includes Phase III Long Term Control Plan Alternate"E"

2.6 Comments to IP Section 8 – Potential Funding Sources

The costs of these are unfunded state mandates will keep us from complying. Of the $883,761,198, it is proposed that in stage I (years 1 – 10) will spend $14,556,600 for agricultural and residential BMPs and a pet waste pick up program. In stage II (2nd 10 years) $412,822,795 is to be spent for CSO SW volume reduction BMP and $455,015,000 is to be spent for residential / urban BMPs. Due to this unfunded state mandate cost it is unlikely the BMPs will be budgeted. To put it in perspective the City of Richmond annual school budget is approximately $150,000,000 per year, the DPU wastewater annual budget is $68,000,000 per year and the DPU stormwater annual budget is $7,500,000. The sources cited in the report for funding are without funding. The Virginia WQIF balance will be zero on 1 July 2011. COR was granted $46,615,858 from that fund, of which we project we will only receive $15,273,835 prior to the fund balance going to zero. This will require the COR fund the $31,342,023 with a bridge loan as the project under construction is a current regulatory requirement and cannot be deferred awaiting grant funding. Perhaps Secretary Domenech said it best in a letter to EPA Region III 29 November 2010 regarding the Virginia Chesapeake Bay implementation plan: "***It is important to emphasize again that this plan is being developed during the worst economy in***

generations. Virginians have already invested billions of dollars in Chesapeake Bay water quality improvement to date. Full implementation of this plan will likely cost more than $7 billion new dollars which would be another federal unfunded mandate on the state, localities, private industries, and homeowners. In addition to the new health care law and other new regulatory burdens, it is placing enormous new fiscal stress on state budgets."

2.7 Conclusion

The stated goal of the IP process is to outline a plan for reaching the reduction goals of the completed TMDL study and we have not achieved that goal. However in Jon M. Capacasa's 4 November 2011 letter to Ellen Gilinsky there appears a workable plan upon which we can overlay a workable schedule. The Decision Rationale document states:

In general, Virginia intends for the required reductions to be implemented in an iterative process that first addresses those sources with the largest impact on water quality.

In both urban and rural areas, reducing the human bacteria loading from straight pipe discharges and failing septic systems will be a primary implementation focus because of their health implications.

These components could be implemented through education on septic tank pump-outs, a septic system installation/repair/replacement program, and hookup to the existing wastewater treatment plant.

In urban areas, reducing the human bacteria loading from leaking sewer lines could be accomplished through a sanitary sewer inspection and management program.

Other BMPs that might be appropriate for controlling urban wash-off from parking lots and roads, and that could be readily implemented, may include more restrictive ordinances to reduce fecal loads from pets, improved garbage collection and control, and improved street cleaning.

The iterative implementation of BMPs in the watershed has several benefits:

a. ***To enable tracking of water quality improvements following BMP implementation through follow up stream monitoring;***
b. ***To provide a measure of quality control, given the uncertainties inherent in computer simulation modeling;***
c. ***To provide a mechanism for developing public support through periodic updates on BMP implementation and water quality improvements;***
d. ***To help ensure that the most cost effective practices are implemented first; and***

e. To allow for the evaluation of the adequacy of the TMDL in achieving water quality standards.

This is somewhat in alignment with the stage I and stage II implementation (except agricultural controls are not mentioned), but the City would recommend that we have similar milestones in the plan to the Chesapeake Bay TMDL instead of waiting until the end of year 10. This is especially important as EPA could complete the bacteriological alternate test protocols and propose revised water quality criteria in the 2012 time frame and the City will be completing the Gillies Creek UAA to determine the compliance endpoint.

RICHMOND

VIRGINIA

SM

From: Smigo, Margaret (DEQ)
Sent: Tuesday, August 16, 2011 4:54 PM
To: 'LeRose, Grace A. - DPU'
Cc: Steidel, Robert C. - DPU; Horton, Willie R. - DPU; Virts, Michelle M. - DPU; Ochsenhirt, Lisa; Cronin, Edward
Subject: RE: James River - City of Richmond IP comment
Attachments: 8_16_11_DEQ_re_CoR_JG3IP_response_final.pdf

Good Afternoon Ms. LeRose,

DEQ has responded to comments submitted by you on behalf of the City of Richmond, in the attached letter. Again, DEQ greatly appreciates the participation of the City's staff in the development of the IP document. If you have any questions, please do not hesitate to contact me.

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Visit the VA DEQ Website

From: LeRose, Grace A. - DPU [mailto:Grace.LeRose@richmondgov.com]
Sent: Monday, June 20, 2011 10:18 AM
To: Smigo, Margaret (DEQ)
Cc: Steidel, Robert C. - DPU; Horton, Willie R. - DPU; Virts, Michelle M. - DPU; Ochsenhirt, Lisa; Cronin, Edward
Subject: James River - City of Richmond IP comment

Margaret – Attached are the comments from the City of Richmond regarding the DEQ Draft Report "Bacterial Implementation Plan Development for the James River and Tributaries – City of Richmond" for the James River Bacteria TMDL. The City appreciates the opportunity to make these comments.

Respectfully,

Grace A. LeRose
City of Richmond DPU
730 East Broad St.
Richmond, VA 23219

office: 804-646-0033
mobile: 804-332-2704

From: Smigo, Margaret (DEQ) [mailto:Margaret.Smigo@deq.virginia.gov]
Sent: Thursday, June 16, 2011 3:15 PM

Cc: Megan Maggard; James Kern; Alling, Mark (DEQ); West, Kelley (DEQ); Lott, Craig (DEQ)
Subject: **Reminder** James River - City of Richmond draft Implementation Plan comment period ends this Monday June 20th...

Good Afternoon,

This is a friendly reminder that comment period for the draft Implementation Plan (IP) developed for the James River – City of Richmond Total Maximum Daily Load (TMDL) will end this coming Monday June 20, 2011.

The draft plan is available on the DEQ website.

The presentation given at the final meeting on May 18th that summarized the draft.

DEQ will accept written comments by e-mail, fax or postal mail. Written comments should include the name, address and telephone number of the person commenting and be received by DEQ during the comment period. Comments received after June 20th may not be accepted. Please send comments to:

Mail: Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060

Email: Margaret.Smigo@deq.virginia.gov

If sending your comment by email, please include "James River – City of Richmond IP comment" in the subject line.

FAX: "Attn: Margaret Smigo" (804)527-5106

BACKGROUND:

A TMDL study is meant to address "what" the problem is and how much of the pollutant must be reduced to meet water quality standards. The TMDL is then followed by Implementation Planning (or IP), which addresses "how" we meet the reductions identified in the TMDL study in order to meet water quality standards and restore the uses of the waterways.

DEQ seeks public comment and review of an implementation plan (IP) developed for the James River and tributaries around the Richmond area. The goal of the IP process is to outline a plan for reaching the reduction goals of the completed TMDL study. The plan identifies the types of "best management practices" (BMPs) which may be implemented to reduce bacteria pollution in the waterways. The plan also identifies potential funding opportunities and estimates the costs of remedial efforts. The final draft IP and comments received along with DEQ responses will be submitted to the State Water Control Board for approval. Implementation Plan development is required by Virginia state law under the Water Quality Monitoring, Information, and Reporting Act (WQMIRA).

****NOTE**** The BMPs identified within the plan represent one way in which the necessary bacteria reductions may be achieved to meet water quality standards. While these efforts are highly recommended, they are not mandatory. The IP is not a regulatory document. In addition, no single state/local government agency or non-profit group is responsible for the implementation of the plan, rather, it will be the responsibility of all watershed stakeholders, citizens included, to achieve the bacteria reductions required to meet water quality standards.

Please don't hesitate to contact me with any questions and feel free to pass this email along to friends, neighbors, and colleagues you think might be interested.

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
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COMMONWEALTH of VIRGINIA

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Director

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August 16, 2011

Ms. Grace LeRose
City of Richmond – Public Utilities
730 East Broad St.
Richmond, VA 23219

RE: James River - City of Richmond IP public comment received June 20, 2011

Dear Ms. LeRose,

DEQ appreciates the involvement of all City of Richmond staff throughout the TMDL and IP development process. DEQ thanks you for your comments, below in bold, and has responded below in italics.

1.3 The Most Crucial Goal of the Draft IP

The City appreciates the opportunity to provide comments with regard to the Draft IP. As this proceeding draws to a close, the City reiterates what it views as the most important goals of the Draft IP: (1) achievability of the plan and (2) a strong emphasis on local planning.

State law requires that the Board "...develop and implement a plan to achieve fully supporting status for impaired waters."4 This plan must include: (a) a date for expected achievement; (b) measurable goals; (c) actions needed to correct the impairment; and (d) the costs, benefits and impact of addressing the impairment.5 In addition, DEQ's own guidance directs staff to consider questions of cost, available funds, reasonable assurance of implementation, and water quality impacts, in order to write an achievable plan: "Implementation actions chosen should be practical, cost-effective, equitable (i.e., dealing fairly with all problem areas), and based on the best science and research that is available."6 In short, the plan must be achievable.

Moreover, throughout the Draft IP, DEQ has acknowledged that this plan is voluntary, and that it is not prescriptive, but is rather a "tool that watershed stakeholders may use to reach watershed bacteria reduction goals."7 The City agrees with this premise. The plan should respect and incorporate local planning goals. Unfortunately, DEQ's Draft IP includes a great deal of language that is not reflective of the City's long-term plan for improving its combined sewer system. DEQ should rely heavily on feedback from

stakeholders regarding the most cost-effective and reasonable approach when it develops any IP. That was not done in this case.

Developing an implementation plan that complies with the technical requirements of the statute but that is entirely unrealistic is inconsistent with the law's intent. Expecting stakeholders to achieve reductions at levels that are financially and technically impossible pre-destines us to fail. The City is committed to improving water quality in the James and in its tributaries. We recognize the uniqueness of this natural asset and want to preserve it for future generations. However, we must do this in a way that is thoughtful—dollars should be spent conservatively, and only after careful consideration of the effectiveness and cost associated with certain management measures.

The City respectfully requests that DEQ consider the City's comments below about the achievability and local planning aspects of the Draft IP, and correct the flaws in the document before sending it to the State Water Control Board (Board or SWCB) for review and approval.

[4] Va. Code §62.1-44.19:7., [5] Id., [6] Guidance Manual for Total Maximum Daily Load Implementation Plans (July 2003) ("TMDL IP Guidance"). [7] Draft IP at ES-xvi.

DEQ Response: DEQ acknowledges that the Implementation Plan outlines voluntary methods by which the TMDL reductions can be achieved.

The majority of stakeholders involved in the workgroups and steering committee meetings approved the draft IP document be made available for public comment. The TMDL and IP development processes are required by the state of Virginia and by federal laws and regulation. WQMIRA requires that Implementation Plans be developed to address the TMDL. The purpose of the IP is to provide at least one path by which the water quality standard of impaired designated use(s) can be achieved. The stakeholders are encouraged to pursue and implement more pragmatic approaches while reducing both costs and bacteria concentrations to desired levels. The implementation plan outlines a staged course of action so that throughout the entire process, evaluation of the effectiveness of current bacteria reduction practices can help guide subsequent stages of implementation management.

1.4.1 The Draft IP Is Not Reasonably Achievable

In Section 7, Reasonable Assurance and Accountability Framework, of the Chesapeake Bay TMDL (published 29 December 2010 after the final DEQ document), it states on page 7-1: "Where a TMDL is developed for waters impaired by both point and nonpoint sources, in EPA's best professional judgment, determinations of reasonable assurance that the TMDL's LAs will be achieved could include whether practices capable of reducing the specified pollutant load: (1) exist; (2) are technically feasible at a level required to meet allocations; and (3) have a high likelihood of implementation." In the current report there is no assurance any of these conditions can be reasonably attained. Identifying reasonable best management practices (BMPs) that will reduce the level of bacteria in the James River and its tributary creeks is the sole reason for writing an implementation plan. The City supports this goal, and has already taken steps through its LTCP to achieve significant reductions.

DEQ Response: The issues associated with the controls for the reduction of bacterial sources are complex. DEQ considers the proposed reductions in bacteria from sources including *wildlife, land runoff, and CSOs are each parts of the overall solution. Much of the detail and associated reasonable assurance were developed during the TMDL Implementation Plan (IP) development process with diverse, active, and numerous Stakeholder participation and approval, following EPA approval of the TMDL. The LTCP focuses on reductions in WLA, rather than LA. While the WLA bacteria reductions will help achieve the Chesapeake Bay Nutrient and Sediment TMDL and associated WQSs for these pollutants, the statement quoted above, primarily focuses on LA (nonpoint source) reductions. The James River – Richmond Bacteria TMDL modeling indicated that the LTCP alone would not provide sufficient WLA reductions to meet bacteria water quality standards for primary contact. As required by WQMIRA, the IP has specifics such as BMPs, their associated placement, costs, a conservative estimate of expected efficiencies, and a schedule to achieve the bacteria water quality standard for each segment. Additionally, see response to section 1.3, above.*

1.4.1.1 The Draft IP Fails to Provide Regulatory Approach to Failing Septic Systems
Table ES.2 recommends a number of actions to address existing septic systems in the watershed. In Stage I of implementation, DEQ recommends septic pump-outs, septic system repair (206 units), septic system installation/replacement (482 units), and sewer connections for 100 units.[8] In Stage II of implementation, DEQ recommends sewer connections for an additional 69 units.
The City agrees that failing septic systems are a concern. However, the Draft IP fails to provide a realistic approach for addressing this issue, given current regulatory constraints. From the City's perspective, we do have the authority, by City Code, to mandate septic system pump-outs and maintenance. However, the City does not have the authority to force homeowners to abandon their septic systems and connect to the sanitary sewer system, as this authority has only been granted to specific localities, pursuant to Virginia Code §15.2-2110. In addition, as the Draft IP acknowledges, VDH's powers to regulate septic systems are limited by law and resources.[9] Without fundamental regulatory changes and significant funding, it is unclear how the stakeholders will achieve the goals set in the Draft IP. **[8]Draft IP at Table ES.2. [9]Draft IP at 7-9 to 7-10.**

DEQ Response: Implementing bacteria reduction BMPs is an iterative process using those which provide the best improvement for the least cost. A logical plan forward for dealing with failed septic systems in the City may be to use the present City Code authority to mandate septic system pumpouts and maintenance. The completion of the IP document and its detailed analysis of source issues could be used by localities to assist with acquiring funding, prioritize spatial focus areas and scale of BMPs, and these are among the major benefits of a completed and approved IP document. Future monitoring would indicate whether or not this, in combination with other BMPs, would be sufficient.

1.4.1.2 The Draft IP Fails to Address Wildlife
Table ES.1 shows the bacteria load reductions to meet the water quality standards ("WQSs") for the James River watersheds and Tuckahoe Creek watershed. A footnote to Table ES.1 states that wildlife load reductions to achieve the WQSs "will not be explicitly addressed by this implementation plan," which indicates there is no reasonable assurance that Bernards Creek, Reedy Creek, James River (riverine) and Tuckahoe segments will meet the water quality standards.

The City acknowledges that this is a difficult issue, but DEQ's response that it will consider a re-designation of the stream's designated use through a UAA "after demonstrating that the source of E.coli contamination is natural and uncontrollable by effluent limitations and BMPs"[10] really means that other stakeholders will be spending significant amounts of money ($93.7 million in Reedy Creek, for example) to comply with a water quality criteria, and its associated designated use, that may change in the future. The City submits that it is clear today that it will be impossible to comply with existing WQS under any scenario in certain creeks—for example, as noted above, Reedy Creek would need a 97% reduction in wildlife loads to comply with standards. In such a situation, it would be preferable to consider now whether there is an appropriate link between the designated use and the natural environment of the Creek before installing expensive BMPs. This would also be consistent with the National Academy of Sciences' National Research Council suggestion that states consider designated uses even before TMDLs are written: "[s]tates should develop appropriate use designations for water bodies in advance of assessment and refine these uses prior to TMDL development" and "use attainability analysis should be considered for all water bodies before a TMDL is developed."[11] **[10] Draft IP at section 1.2.2. [11] NRC, Assessing the TMDL Approach to Water Quality Management (2001).**

DEQ Response: Section 1.2 of the IP states that in Virginia state law 9 VAC 25-260-10 (Designation of uses), A. All state waters, including wetlands, are designated for the following uses:...wildlife:.... DEQ believes this approach provides reasonable assurance that Bernards Creek, Reedy Creek, James River (riverine) and Tuckahoe segments will meet the water quality standards, because the counties and the City have the authority to enact wildlife management and population control measures. In fact the City already has an extended urban archery deer season in place for portions of the James River watershed. In addition, the IP offers multiple suggestions for Canada Goose management.

1.4.1.3 Implementation Options for the City's MS4s Are Limited
The Draft IP fails to consider inherent limitations in the City's ability to institute additional programs or install BMPs.

DEQ Response: A statement that "Stakeholders acknowledge the inherent difficulties involved in implementation of Residential/Urban BMPs in limited urban acreages." will be inserted at the end of the first paragraph in Section 5.3.4 of the IP. However, stakeholders also recognize that installing Residential/Urban BMPs will cause a significant improvement to bacterial loads. Therefore where possible these should be implemented.

1.4.1.4 Low Impact Development BMPs Not Designed for Bacteria Removal
DEQ has chosen a number of "Residential/Urban BMPs" in Table ES.2, including, sewer connections, wet ponds, rain gardens, bioretention facilities, infiltration trenches, and rain gardens. The City believes that several of these selections are not well chosen and do not recognize the following: "..."

DEQ Response: There existed referenced reduction efficiencies for these BMPs as shown in Table 5.1, irrespective of whether each was designed for removing bacteria. There was much discussion of reduction efficiencies by stakeholders during the IP workgroup and steering committee meetings, and stakeholders recognized that a range of data existed for these BMPs.

Stakeholders agreed to use the removal efficiencies in Table 5.1 of the IP for modeling purposes. In the comment above (see comment and response section 1.4.1.3) the recognition that private property presents challenges is addressed.

1.4.1.5 Implementation Time Frame is too Short

As noted above, the Virginia Code section governing the implementation of a TMDL requires that the plan include an expected achievement date. In the Draft IP, DEQ has recommended that the work needed to implement measures to comply with the TMDL be accomplished in two stages over 20 years. During Stage I (the first 10 years), much of the work would be done by the agriculture community, by owners of septic systems and by pet owners (through a pet waste pick-up program). During Stage II (the second 10 years), MS4s and the City's combined system would be expected to implement hundreds of millions of dollars in BMPs.

The City requests that DEQ reconsider this approach. Stakeholders should be given significantly more time to get this work done. At a minimum, DEQ should consider adding a third 10-year stage for implementation efforts. In addition, DEQ should consider whether a use attainability analysis (UAA) study is indicated for particular streams where the cost of implementation is either extraordinarily high or the likelihood of achieving water quality goals is particularly low (perhaps because of natural wildlife conditions).

DEQ Response: The City is not required to wait for the start of the second 10 year period to proactively work on BMP improvements and resources may be allotted over more of the 20 year period. The 20-year achievement period is an extension of the standard 10 year IP period which is commonly used, which was afforded only one other time, to the James River IP for the Lynchburg CSO area, for similar reasons. There will be re-evaluations of progress during the 20 year timeframe for the Richmond area CSO IP, at which time, stakeholders may consider a further extension is needed. DEQ considered, and the SWCB recognized, that the City has the right to perform a UAA.

1.4.2 DEQ's Draft IP Fails to Adequately Incorporate Local Planning

The City requested that DEQ remove discussions regarding the CSO from the Draft IP, and provided a write-up related to the CSO to be added to the main body of the IP. DEQ has not honored this request, choosing instead to incorporate a discussion of future efforts for the CSO in the Draft IP.[13] Respectfully, if the goal of the Draft IP is to establish a plan that will be used to achieve the underlying WQSs, DEQ should look to the City for direction with regard to its CSO. The City has been working for decades to reduce the frequency of overflows from its combined system, at a cost of hundreds of millions of dollars, and has a unique understanding of its combined system. Furthermore, the responsibility and cost to comply with the WLAs identified in the Bacteria TMDL will be borne by the City. DEQ's evaluation in Section 5.3.5 of the Draft IP is not the City's plan. Indeed, DEQ's plan is $90 million more than the City's estimate provided during the development of the Bacteria TMDL. **[13] Draft IP at section 5.3.5 ("Urban Stormwater Volume Reduction BMPs for CSO Areas").**

DEQ Response: There are two paragraphs in Section 5.3.5 that deal with the City's CSO program, the first paragraph of the section (page 5-30) and the paragraph at the top of page 5-33. Both are complimentary to the City's CSO program. The remainder of the section describes *innovative LID practices that may be placed within the Gillie and Almond Creek watersheds, irrespective of the CSO program. DEQ does not believe it is necessary to alter the section because recognizing both the good work the City has done with the CSO program and the opportunities for LID improvements in these watersheds is important to the success during implementation.*

1.4.3 Major Technical Issues 1.4.3.1 Reedy Creek

DEQ has recalibrated reductions for Reedy Creek from the levels included in the Bacteria TMDL. As a result, the Draft IP calls for 97% and 99.5% reductions in wildlife and urban runoff loads in the Creek, respectively.[14] The recalibrated model shows that over 80% of land area of Reedy Creek would need to be treated with BMPs. Reedy Creek is the only watershed requiring BMPs to treat runoff from impervious surfaces. It is unlikely that there would be substantial sources of bacteria (other than from geese or other birds) on the impervious surfaces within the Reedy Creek Watershed. Additionally, the City does not have the authority to retrofit BMPs on private property. [14] Id. at Table 3.5.

DEQ Response: Table 3.5 addresses Human and Pet land based reductions of 99.5% and wildlife land based reductions of 97%. DEQ believes the City has misinterpreted the acres-treated for Residential/Urban BMPs. Focused BMP implementation upstream in Reedy Creek would require minimal acreage of the Reedy Creek watershed. The substantial sources of bacteria exiting via runoff from impervious surfaces would come from many species of wildlife, including birds and ground mammals, including dogs. Also see DEQ response for comment section 1.4.1.3.

1.4.3.2 WQS attainment without addressing wildlife

Table 6-13 shows that there will be zero percent violations by Stage III. However, footnotes to Table ES.1 indicated that wildlife loads will not be addressed. It would be reasonable to expect that percent violations would remain at the end of Stage III, especially if wildlife loads are not reduced. Please refer to paragraph 2.1.1 below for comments and information requests.

2.1.1 Wildlife Loads

Table ES.1 shows the bacteria load reductions to meet the WQSs for the James River watersheds and Tuckahoe Creek watershed. Footnotes to Table ES.1 states that wildlife load reductions to achieve the WQSs "will not be explicitly addressed by this implementation plan", which indicates there is no reasonable assurance that Bernards Creek, Reedy Creek, James River (riverine) and Tuckahoe segments will meet the water quality standards. Additionally, if Table ES.1 indicates that Wildlife loads "will not be explicitly addressed by this implementation plan", it is reasonable to expect that there will be exceedances of the water quality standards associated with Wildlife loads. How can Table 6.13 show zero estimated Geometric Mean percent violations for Bernards Creek, Reedy Creek, James River (riverine) and Tuckahoe segments if wildlife loads will not be addressed? Please provide a description of the methodology used to determine the percent violations and the relationship with load reductions. Please provide the model (including all pre- and post- processing tools) used to development the relationship between the load reductions and percent violations.

DEQ Response: In Table 6.13, all Geometric Mean standard % violations were set to 0% after Stage III for all impaired streams. This is the anticipated time when the implementation de-listing goals will be met.

The end of Stage II is the last model run. The differences between the % GM standard violation estimates in Table 6.13 and the final TMDL scenarios in Tables ES.1 and 3.5 are explained here:

- *The final TMDL scenarios are determined so that all subwatershed outlets along the impaired length of stream have zero violations of the water quality standard.*
- *In Table 6.13 MapTech showed the % violations for the outlet subwatershed only in an attempt to show the estimated water quality closest to the listing DEQ monitoring station. Page 6-13 "The TMDL model (HSPF) was used to estimate the water quality (geometric mean) of the impaired streams at each outlet (mouth)."*
- *In the case of Reedy Creek, the most limiting subwatershed that drove the needed reductions in the TMDL scenario was the upstream subwatershed (#41). However, the % violations at the outlet subwatershed (#57) were shown in Table 6.13 as this is closest to the listing DEQ monitoring station.*
- *After Stage II of implementation, it was estimated that in Reedy Creek subwatershed #41 the % Geometric Mean standard violations would be 22%. This shows the presence of wildlife bacteria loads.*

Bernards Creek and the James River (riverine) IP modeling results show % violations of the GM standard after BMP implementation is completed (after Stage II) of 13% and 10%, respectively. These values match the TMDL modeling results well and show the presence of wildlife bacteria loads.

The Tuckahoe Creek TMDL was calculated using the Load Duration Approach, so there are no TMDL model results to compare with the Table 6.13 results.

Also, see DEQ responses for sections 1.4.1.2 and 1.4.3.2.

Part of the modeling 'tools' requested by the City is proprietary, and part is available for distribution or publication. The pre-processing calculator is not a part of the DEQ contractor deliverable and is considered proprietary. There is no post-processing calculator. The models and other inputs and outputs are available and DEQ will provide to City, once the final electronic files have been made available to DEQ from MapTech Inc.

1.5.1 Develop Regulatory Approach to Failing Septic Systems

The City recommends that the Virginia Department Health (VDH) develop a regulatory approach to address failing septic systems. This may require additional state legislation.

DEQ Response: DEQ will refer this comment to the VDH. The VDH provided text for the IP document which illustrates the "path" by which a failing septic is corrected. The text has been added to section 7.6.5 XX, XX, and states," The Emergency Regulations for Alternative Onsite Sewage Systems, adopted in April, 2010, require that all alternative onsite sewage treatment systems in Virginia be visited at least annually by a licensed operator. However, the Virginia Department of Health (VDH) does not currently have the authority, the mandate or the resources to require or conduct similar surveillance of all conventional onsite sewage treatment (septic) systems in the Commonwealth. (Note that, as resources allow, VDH may conduct or assist with such surveys that target localized areas of specific concern.) Given the above limitations, VDH generally learns of failed septic systems directly or indirectly from the owners of those systems or through complaints from neighbors or other government agencies. Reports of straight pipes

are less-frequently received from either source, since they are generally located in less-populated areas and are typically sited/intended to avoid detection.
When VDH receives a report of a non-compliant system, it performs a site inspection, if necessary, to verify the report. VDH then works with the homeowner to address the issue in an effective, timely and regulatory-compliant manner, generally through installation of a septic or alternative onsite system, repair or replacement of an existing system and/or failed components of that system, connection to a central collection/treatment system, or other appropriate measure(s). In the case of non-cooperative homeowners, VDH initially attempts to achieve compliance through internal enforcement actions and, ultimately, through the court system.
An impasse may be reached when a homeowner is willing, but financially unable to correct the non-compliance. In such situations, VDH assists in attempting to locate funding for the needed corrections, with the knowledge that many of the existing funding sources (State Revolving Loan Fund, Water Quality Improvement Fund, etc.) have significant shortcomings with regard to the onsite wastewater treatment arena. VDH, DEQ, and DCR have discussed those shortcomings and have agreed to collaborate in an effort to identify sources of financial assistance for owners of onsite wastewater systems located in the watersheds of impaired waters."

1.5.2 Develop Plan to Reduce Wildlife Loads or Evaluate Recreational Uses
The City recommends that DEQ consider whether the Draft IP will realistically be achievable without some plan to address wildlife loads. If, as DEQ has suggested, reducing wildlife loads is too difficult, then DEQ should evaluate use of several creeks with high wildlife loads <u>before</u> requiring stakeholders to spend dollars that will not result in WQS compliance.

DEQ Response: See DEQ responses for Section 1.4.1.2, 1.4.3.2 and 2.1.1.

1.5.3 Use Attainability Analysis for Gillies Creek Paved Channel
The City recommends that DEQ include a discussion of the need for a Use Attainability Analysis ("UAA") for Gillies Creek and of the EPA's work to develop new water quality criteria in the Draft IP. Table ES.2 further documents the need to conduct a UAA to determine the highest and best designated use possible for the Gillies Creek paved channel. "..." the information gathered to develop a TMDL, and the allocations in a TMDL, may point to the need to pursue a UAA." This is the case for Gillies Creek and should be stated so in the IP as the City will conduct this study and present the findings to DEQ and the Commonwealth may use the results from the City UAA study as the basis for considering a water quality standards change.

DEQ Response: DEQ considered, and the SWCB recognized, that the City has the right to perform a UAA. Section 5.3.5 includes text stating the intent of the City to perform a UAA. DEQ believes further explanation of need for a UAA is premature at this time. Future possible EPA criteria changes are speculative, and as such are not appropriate for inclusion in the IP at this time.

1.5.4 Guidance to Permit Writers
The City recommends that DEQ add language to the Draft IP that explains to current and future permit writers that the plan is voluntary.

DEQ Response: The Executive Summary states on page xvl that "all of the BMPs outlined in the IP document are voluntary practices." The IP is not a regulatory document affecting permit guidance, but rather an advisory document written by stakeholders for stakeholders to use in the selection, funding and implementation of BMPs.

1.5.5 Description of City's CSO LTCP

The City recommends that DEQ remove the discussion of the City's CSS system from the Draft IP, and substitute instead language submitted to DEQ on April 15, 2011.

2.4.6 Section 5.3.5 - Urban Stormwater Volume Reduction BMPs for CSO areas

The primary goal of the TMDL IP is to develop a plan to meet Load Allocations, because NPDES permits (either VPDES permit for CSO or MS4 permit) will develop plans to meet the WLA in accordance with the TMDL report. Section 5.3.5 was not developed with any direction from the City of Richmond, in fact, the City has consistently requested during and after the Working Group Meetings and the Steering Committee Meetings that this information be removed from the IP report in its entirety.

DEQ Response: See DEQ response to comment section 1.4.2. DEQ believes that the City's CSO system is integral to the bacterial water quality impairments in Gillie and Almond Creeks and the tidal James River, and therefore should be included in the IP document.

2.1.2 Public Participation

As noted above, one of the City's chief goals throughout this process has been to assist DEQ in the development of an implementation plan that is achievable and based on local planning. The City has participated in the development of TMDL and attended every Working Group and Steering Committee meeting. Unfortunately, the IP was developed on an accelerated timetable, which did not allow appropriate time to verify and comment on data provided. Additionally, feedback provided through the Working Groups and Steering Committee appears not to have been considered in the development of the Draft IP. As a specific example the City requested that the information related to the CSO LTCP be removed from the IP report, which was not considered.

DEQ Response: The City favored moving directly into the IP after TMDL approval, concurrent with a UAA. Due to increasing resource limitations DEQ funded the IP with Federal stimulus funds, which had an end date of June 2011(for draft document). This was the reason for the steady IP schedule. The City is one of many stakeholders in the collaborative IP process.

2.1.3.1 "CSO SW Volume Reduction BMPs" costs

The "CSO SW Volume Reduction BMPs" costs are higher than those provided by the City during the TMDL development. The City requests that stormwater volume reduction BMPs be removed from the IP and replaced with the costs provided by the City during the TMDL. Additionally, a footnote should be provided to indicate that states the following: "The bacteria reductions for CSOs will be based on the City's LTCP, which will be updated to be consistent with the outcome of the City's UAA study for the Gillies Creek paved channel."

DEQ Response: The overall cost of the CSO SW Volume Reduction BMPs is greater than the cost of increased storage for Gillie and Almond Creek provided by the City, because MapTech *and DEQ wanted to include LID BMPs in the IP as well as increase storage within the CSO system. It is reasonable to consider the positive effects that LID BMPs will have on water volume reductions if local homeowners, business and industry implement them. Also, citizens mentioned many times throughout the IP development that they wanted to see LID BMPs within the Plan.*

The IP incorporates costs for the entire watershed. While the cost to implement all of the BMPs in the plan is high, the cost to implement Stage I ($14,581,600) is considered reasonable. The size of the watershed (289,470 acres) and the number of impairments (11 streams) should also be taken into consideration when taking into account the overall cost. Given the economic and recreational value of the James River to citizens, DEQ believes the cost of doing nothing to improve water quality would be far more costly to the City and its citizens in the long term. Additionally, the IP is based on what was a TMDL with very conservative estimates meaning that it is very possible that many of the BMPs may never need to be implemented. Percent reductions in the TMDL were set to result in zero violations of the water quality standard for each impaired waterbody, as required by EPA. The waterbodies will be de-listed when violations reach 10.5 percent or less, which is likely to be much earlier than a de-list at zero violations. Because we will rely on water quality monitoring to indicate our progress overall, the de-listing of impaired waterways will let us know when we can pull back on implementation efforts. Actual BMP costs in the watersheds may be significantly less than projected.

It is also important to mention that a large proportion of the total cost was derived from the City of Richmond's estimates to meet the TMDL for the bacteria load reductions to Gillie Creek and Almond Creek CSO watersheds. The estimated cost for storage within the CSO watersheds (primarily Almond and Gillie Creek) were estimated at $300Million and are figures which were supplied to DEQ. The DEQ trusts that the City of Richmond used their best available judgment and resources to estimate these values.

2.1.3.2 "Residential/Urban BMPs" are arbitrarily applied
The evaluation/selection of the "Residential/Urban BMPs" is arbitrarily applied and do not recognize the following: "..."

DEQ Response: The areal footprint of these BMPs is the minute amount of the 30,616 acres. Wildlife are not constrained to forested land among the types of pervious cover, as they also inhabit open land and residential areas. Therefore, quantifying the amount of forested land in pervious cover was not germane.

2.1.4 Evaluation of Affordability
The IP does not address the financial impacts to ratepayers, citizens, or farmers. The City requests that DEQ conduct an economic evaluation to define the financial burden on the households, farmers and local economies. The economic evaluation should include at least the following steps: "..."

DEQ Response: The IP contains cost and benefit analyses for each type of BMP. It is not within the purview of an IP to discern financial impacts for all locality ratepayers. While important, localities can make such determinations much more accurately. The cost to ratepayers depends on the locality's level of effort to obtain grant and low-cost loan funding for BMPs. The more *effort a locality expends on locating outside funding sources, the lower the financial burden placed on ratepayers.*

2.2.1 Indicator Organisms

The first paragraph in the introduction states that E. coli 0157:H7 and E. coli 0111 are pathogenic strains, which are clearly the case. However, this is misleading. The pathogenic E. coli is not easily determined due to the uncertainty in determining the pathogenic nature of isolated E. coli strains. Furthermore, the sampling methods cannot distinguish between pathogenic and non-pathogenic strains and the relationship between serotype and pathogenicity is questionable (Standard Methods, 1989). The City requests that the first paragraph be deleted in its entirety and replaced with a more appropriate description of Escherichia coliform as an indicator organism, which better represents the E. coli referenced in DEQ's TMDL and IP. Possible replacement language could include the following:

"Escherichia coli is a member of the coliform bacteria family that may be used to indicate fecal sources. It is typically found in human and animal digestive tracts. The use of E. coli as an indicator organism is somewhat restricted by (1): there are multiple species of E. coli; (2): certain species, such as Proteus and Aerobacter are normally found outside the human intestinal tract in soil, and (3): E. coli identical to that found in humans is also found in the intestinal tract of other warm-blooded animals. However, because studies had shown that E. coli was a much better indicator of disease risk than fecal coliform, EPA (1986 Bacteria Criteria) indicated that E. coli should be used as the recommended indicator organism for classifying waters for fresh water contact recreation." (Tchobanoglous and Schroeder, 1985)

DEQ Response: *DEQ will insert the following statement at the end of the third paragraph of section 1.2, which discusses the applicable water quality standards: "E. coli is used as an indicator organism for other pathogenic bacteria, viruses and parasites that may be present in the water. It is difficult to analyze for pathogenic bacteria, viruses and other parasites, however, quantifying E. coli is considered reliable and cost-effective. EPA believes that E. coli is a much better indicator of possible health risk to humans from water borne bacteria than fecal coliform bacteria, of which E. coli is a subset. EPA recommends that E. coli should be used as the indicator organism for assessing fresh water contact recreation."*

2.2.2 TMDL IP incorporation into Water Quality Management Plan

Section 1.1 states that: "VADEQ will request SWCB authorization to include the TMDL implementation plan in the appropriate Water Quality Management Plan (WQMP) in accordance with CWA Section 303(e)." The City assumes that DEQ intends to incorporate the IP into the appropriate WQMP, consistent with previous TMDL Implementation Plans,[16] and not to include a reference to the WQMP in the regulations (WQMPR). The City suggests making this point clear in the IP. Additionally, for purposes of providing guidance to the reader on how the IP will be used, the City suggests that DEQ add language to the IP that explains to permit writers that this plan should not be used for purposes of developing future permit language. The Draft IP makes it clear that the specific plan provisions are "merely options," and "not the only types which stakeholders can choose to implement..." [16] **For example, in the IP for the Smith Creek Watershed, the document cites 18 current**

WQMPs developed per Section 208 and 303(e) of the CWA, and that these plans will be updated, in part, to "serve as repositories for all TMDLs approved by EPA and adopted by the Board, as well as IPs approved by the Board." TMDL IP at 88.

DEQ Response: This is not a sufficiently important distinction to make in the IP, and would potentially confuse readers. See Response for Section 1.5.4 for explanations to permit staff.

2.3.1 Reedy Creek Model Recalibration

The reallocation of Reedy Creek calls for 97% and 99.5% reductions in wildlife and urban runoff loads, respectively. There is no reasonable assurance that reductions of these magnitudes are attainable. Please refer to paragraph 1.4.3.1 above for additional comments regarding Reedy Creek.

DEQ Response: Reedy Creek remodeling identified Human and Pet land based reductions of 99.5% and wildlife land based reductions of 97%. As stated in previous comment responses during TMDL development, the City misinterprets reduction percentages as exact percentages of reduced load to be attained. Reductions are representations from the model with an implicit Margin of Safety which result in conservative model inputs that all feasible load reduction BMPs should be attempted. It may not take every BMP to reach attainment during staged implementation. Most bacterial TMDLs contain similarly high percent reductions, intended to show that bacteria levels are high enough that all feasible load reductions should be undertaken. Also see response for section 2.1.3.1.

2.4.1 Flexibility in Implementation Efforts

The notice for public meeting stated: "The BMPs identified within the plan represent one way in which the necessary bacteria reductions may be achieved to meet water quality standards. While these efforts are highly recommended, they are not mandatory. The IP is not a regulatory document." While this is a factually correct statement, Jon M. Capacasa, Director, Water Protection Division, EPA Region III states the following well understood fact of the TMDL program in a 4 November 2011 letter to Ellen Gilinsky who was at that time the DEQ Director, Division of Water Quality Programs: "*As you know, all new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL allocations pursuant to 40 CFR § 122.44 (d)(1)(vii)(B). Please submit all such permits to EPA for review as per EPA's letter dated September 29, 1988.*" In fact the decision rational attached to that letter states: "*For implementation of the WLA component of the TMDL, the Commonwealth intends to utilize the VPDES program, which typically includes consideration of the WQMIRA requirements during the permitting process.*" The critically important regulatory component will be the reissuance of the City's VPDES individual permit for the wastewater facility or the MS4 general permit with bacterial allocations that are not reasonably attainable under the plan. For this reason the City has participated in every meeting regarding the TMDL and implementation plan requesting analysis of reasonably attainable technologies for compliance with the allocations and absent such, using best professional judgment, that the IP be written in clear iterative process that can be the basis of drafting language for the permits referenced above.

Section 6.3.2.1 of the Bacteria TMDL (November 2010), titled "Municipal Separate Storm Sewer System – MS4" indicates that the "For MS4/VSMP permits, the Commonwealth expects the permittee to specifically address the TMDL wasteload allocations for stormwater through the iterative implementation of programmatic BMPs. BMP

effectiveness would be determined through permittee implementation of an individual control strategy that includes a monitoring program that is sufficient to determine its BMP effectiveness." Urban/Residential BMPs, identified throughout the TMDL IP, are not designed to remove bacteria. These BMPs were designed to reduce peak flows or remove sediment, nitrogen and phosphorus. Urban/Residential BMPs will not provide consistent removal from storm to storm. Until the BMP technologies improve their efficiencies and reliability in the removal of bacteria from stormwater, the City will not be able to accept the types and quantities of BMPs identified in the IP.

DEQ Response: The quotations cited in this comment are correct, however this does not mean that wording from the IP is appropriate for drafting permit language. See response for Section 1.5.4. The IP is written in a clear iterative process using implementation planning which recommends BMPs in the first stage which should provide the best improvement for the least cost. Also, see Response for section 1.4.1.4.

2.4.2.1 Table 5.1 does not include costs

DEQ Response: Costs have been added to Table 5.1

2.4.2.2 Show Range and Value Used
Vegetated Buffer, Loafing Lot Management, Sand Filter, Street Sweeping include a range and the value used. The City requests that all of the BMPs be provided with a range observed and value used.

DEQ Response: Not all references contained a range of values. Ranges for Wet Ponds, Sand Filter, and Shallow Marsh were added. A column was added to indicate the values used in the IP model.

2.4.2.3 Bacteria Removal Efficiencies
Wet Ponds, Rain Gardens, Bioretention Basins, Submerged Gravel Wetland, Sand Filter, Shallow Marsh, Extended Detention Pond, and Infiltration Trench BMPS were not designed to remove bacteria. Most of the studies on these BMPs are aimed at reducing peak flows or removing sediment, nitrogen and phosphorus. Therefore, there is very limited data on the bacteria removal efficiencies of these BMPs. Of the data that does exist, the efficiency range is wide, with several BMPs having some negative removals (higher values going out of the BMP that coming in). For these residential/urban BMPs, it is recommended that number of independent sampling events be listed in Table 5.1 as well. If the information cited does not include a range or number sampling event, then it should be footnoted as such. The general public, future state employees and future local government staff will need to understand that the removal efficiencies are based on very limited performance data. The City requests that a paragraph be added to describe the uncertainty of the BMP performance. The paragraph should also include a description showing that the removal efficiencies will vary between storm events.

DEQ Response: The number of sampling events was added in parenthesis after each reference. Text added to page 5-1: "The BMP bacteria removal efficiencies shown in Table 5.1 are based *on the experiments performed as noted in the applicable reference. It is understood that BMP performance varies based on storm events, climates, collection methods, laboratory methods and protocols, and various other factors, which leads to uncertainty in the results. When available the range of percent bacteria removed is shown with the values used in the modeling efforts of this project shown in parenthesis."*

2.4.2.4 Table 5.1 footnotes cites EPA's Fact Sheets

DEQ Response: Reference #4 and #14 were updated.

2.4.2.5 Table 5.1 footnote 10
The shallow marsh removal efficiency is based on studies from King County, Washington. Washington State has a substantially different climate and weather pattern compared with the Richmond, Virginia area. The City requests a new study be found for the removal efficiency of the Shallow Marsh BMP that is more consistent with our local climate.

DEQ Response: The Shallow Marsh BMP was not used in the IP project. It was included in the Table 5.1 because it was included in the original table handed out during WG/SC meetings.

2.4.3 Table 5.1 footnote 17
It is not appropriate to use sediment or nutrient removal efficiencies as a surrogate for bacteria removal efficiencies. The City requests that all footnotes be based on actual bacteria sampling.

DEQ Response: There was no study found of the bacteria removal efficiency from Conservation Tillage. However, observation shows us that there is a correlation between the control of sediment and nutrients and the control of bacteria concentration. It is known that bacteria attached to sediment will have similar transport mechanisms as sediment from the soil surface to a water body.

2.4.4 Table 5.2
The Residential/Urban BMPs referenced in Table 5.2 do not match the Runoff Treatment Efficiency BMPs referenced in Table 5.1. The City requests that all the BMPs identified in Table 5.1 be listed and classified in Table 5.2.

DEQ Response: The BMPs in Table 5.2 were mentioned in meetings, but there are no references for bacteria removal efficiencies for these BMPs. Therefore, they are noted in Table 5.2, but do not appear in Table 5.1.

2.4.5.1 Extent that BMP could be installed
How was the "knowledge of the extent that each BMP could be installed in the watershed" determined? It appears that the quantity (acres-treated) of BMPs installed was based on bacteria removal required and not the "extent that each BMP could be installed". No information was presented during the Steering Committee and Work Group meetings that showed how these BMPs could be installed. It is recommended that the sentence be rewritten to more accurately describe basis of the values in Table 5.10 or more information

be provided to justify the "knowledge of the extent" (soil surveys, public land availability, open spaces, etc).

DEQ Response: Text was added and updated: "Dog waste is the predominate source of bacteria in a residential/urban landscape once all failing septic systems, straight pipes, sewer leaks, and non-permitted sewer overflows are corrected. However, the documented bacteria removal efficiency of a pet waste pick-up program is not enough reduction to meet the TMDL bacteria goals for most of the impaired stream segments. Therefore, other BMPs were needed that treat runoff and remove bacteria from runoff waters. The quantification of residential/urban BMPs to reduce bacteria in stormwater runoff was limited by the bacterial removal efficiency information available (Table 5.1) and by using the acreages of Commercial, Low/Medium Intensity Residential, and Open Space land uses as the maximum extent that each BMP could be installed in the watersheds. Due to these constraints, four residential/urban BMPs were quantified: Wet Ponds, Rain Gardens, Bioretention Facilities, and Infiltration Trenches."

2.4.5.2 Table 5.10

Why were Wet Ponds and Rain Gardens excluded in the Tuckahoe Creek and James River (riverine) stream segments? What soil surveys/ evaluation were conducted to ascertain that Infiltration Trenches could be installed in the watersheds, especially given the extent of Class C and D soil types? Why were the BMPs distributed uniformly within a watershed?

DEQ Response: The James River (riverine) impairment needed high bacteria reductions even after failing septic systems, straight pipes, sewer leaks, and non-permitted sewer overflows were corrected in the load model, and the pet waste pick-up program was applied in the load model. Therefore, the residential/urban BMPs with the higher bacteria removal efficiencies were utilized first to meet the bacteria load goal. [Infiltration Trenches and Bioretention Basins are modeled with 90% bacteria removal efficiency. Rain Gardens and Wet Ponds are modeled with 70% bacteria removal efficiency.] Once the amount of acres-treated by Infiltration Trenches and Bioretention Basins was determined from the load model, no more treatment by Rain Gardens and Wet Ponds was needed to meet the bacteria load goal.

2.4.6 Section 5.3.5 - Urban Stormwater Volume Reduction BMPs for CSO areas

The primary goal of the TMDL IP is to develop a plan to meet Load Allocations, because NPDES permits (either VPDES permit for CSO or MS4 permit) will develop plans to meet the WLA in accordance with the TMDL report. Section 5.3.5 was not developed with any direction from the City of Richmond, in fact, the City has consistently requested during and after the Working Group Meetings and the Steering Committee Meetings that this information be removed from the IP report in its entirety. On April 15, 2011 the City submitted to DEQ a formal written request to remove this information from the IP, which is as follows: "..."

The City of Richmond requests that Subsection 5.3.5 titled "Urban Stormwater Volume Reduction BMPs for CSO Areas" and associated costs provided elsewhere in the implementation plan be removed in its entirety. The City of Richmond will be evaluating additional improvements required to meet its Waste Load Allocations (WLAs) in the Gillies Creek and Almond Creek watersheds. As indicated by DEQ during multiple Working Group and Steering Committee meetings, the Bacteria

TMDL Implementation Plan is to provide reasonable assurance for non-point sources and VPDES permits will provide reasonable assurance for point sources.
The City will develop a specific plan to meet the WLAs in Gillies Creek and Almond Creek. The City is developing a path forward to address the WLAs, which may include conducting a Use Attainability Analysis for the paved channel portion of Gillies Creek. The City suggests that DEQ place the following CSO related information into the draft Bacteria TMDL Implementation Plan as follows: "..."
The responsibility and costs to comply with the WLAs identified in the Bacteria TMDL will be born solely by the City of Richmond. The DEQ evaluation in Section 5.3.5 of the Draft IP is not the City's plan. The cost of DEQ's plan is $90 million dollars higher than the preliminary information provided by the City during the development of the TMDL. DEQ's plan does not address operation and maintenance costs or the reliability of BMPs identified in Section 5.3.5. Furthermore, the City does not own the majority of land that DEQ shows as requiring a BMP. DEQ's plan is neither cost effective nor implementable. Therefore, the City of Richmond requests that the entire Section 5.3.5 be deleted and that DEQ use the paragraph provided on April 15, 2011.

DEQ Response: See responses for section 1.4.2 and 1.4.1.3 for section 5.3.5 and private property. It is beyond the scope of the IP to evaluate the structural integrity of roofs. If some roofs are not strong enough for a vegetative roof, one should not be installed. The IP is just one possible path to reach attainment of water quality standards. Many alternatives to reach reduction goals are possible. Future maintenance of BMPs is important, but is outside of the scope of the IP. It is for the stakeholders to determine how many of what types of BMPs can be installed, taking into account structural integrity, maintenance, etc. Tables 5.12-5.16 are an innovative method for comparing BMP installation with potential reduction of CSO overflows outside of the scope of EPAs CSO Policy. Instream bacteria results due to any CSO improvements installed will be compared with the appropriate water quality standard. DEQ believes there is value in showing additional BMPs in the James River riverine and tidal sections and a number of stakeholders requested the addition. DEQ believes Section 5.3.5 does not need to be replaced in the IP document.

2.4.7 Section 5.5.4 Residential/Urban BMPs
The primary anthropogenic bacteria sources in residential/urban areas include failing septic systems, straight pipes, and pet waste. The remaining bacteria generators are wildlife, which will not be addressed as indicated in footnotes to Table ES.1 the TMDL IP Draft Report. Therefore, the Residential/Urban BMPs would be targeting pet waste. There is no discussion in the draft report of heavier pet densities for the targeted 30,616 acres to be treated by Residential/Urban BMPs.
Additionally, it is not reasonable or feasible to retrofit 80% of all the land area in the Reedy Creek watershed. The City does not own the land to install these BMPs. Further, it is unlikely that the impervious cover will have much pet waste. The stormwater quantity reductions associated with the BMPs servicing the impervious cover may result in increased bacteria concentrations in Reedy Creek.

DEQ Response: The number of dogs estimated in the TMDL was in part determined using the number of housing units from the US Census. Therefore, some areas may have higher pet densities than others.
Impervious area can have bacteria as pervious land drains to it. Examples of bacteria loading are dogs which are curbed in a city; police occasionally ride horses, in addition to wildlife waste. Reedy Creek was unique as the maximum amount of the common BMPs did not reduce bacteria loads to the TMDL goal even without addressing wildlife. Because no land-based BMP is 100% effective at reducing bacteria from runoff, the maximum pervious acres of the BMPs chosen did not reduce to levels to meet the goal. Therefore, acreage of impervious acres was modeled as having their runoff treated from these BMPs in order to meet the TMDL bacteria reduction goal. This was not viewed as plausible due to the Reedy Creek citizen groups who expressed interest in implementing urban BMPs to obtain bacteria reductions and for other reasons (lowering peak flows and overall runoff volumes, etc).
The City may have misinterpreted the values in Table 5.10. The unit for these values is "acres-treated" or in other words "acres whose runoff needs treatment by this BMP" or "acres draining to the BMP", not acres required by the BMP footprint.

2.4.8.1 Delete Section 5.5.5

Again, DEQ's plan is showing costs that are substantially higher than the preliminary estimates provided by the City during the development of the TMDL. As indicated above, the City requests that Section 5.5.5 be deleted in its entirety.

DEQ Response: A consensus of stakeholders desired to have the LID practices included in Section 5.5.5. See response to sections 2.1.3.1 and 2.4.6. DEQ believes Section 5.5.5 should be retained in the IP document.

2.4.8.2 Table 5.22

The total costs to retrofit green infrastructure was almost $3 BILLION. Additionally, this assumes that almost the entire area be retrofitted on property that the City does not own. The City does not have the authority to force residents to install BMPs on their property. Every house would have multiple rain barrels. Furthermore, the City's CSO Long-Term Control Plan for these areas will meet the water quality standards.

DEQ Response: As is the case for all IPs within Virginia, BMP installation is voluntary. Also there is no section within the Plan which states the City is in charge of installing all urban/LID BMPs. On the contrary, on page 5-31 it states, "Any interested private landowner, business, or industry is encouraged to pursue the installation of green LID practices at any time. The quality of public surface waters is the responsibility of people utilizing the water, including landowners, stakeholders, and municipalities within the watershed. For the implementation of LID BMPs to be effective all parties should work together to promote and educate landowners regarding the benefits, costs, operation/maintenance, and design specifications of these practices."
This text was added as an encouragement to any and all interested parties to install LID BMPs on their property. The City is not expected to be responsible for all BMP installments within CSO areas. This section of the IP is showing the total amounts of CSO water that could potentially be removed from the system via different LID practices. Only the Almond Creek and Gillie Creek values are used in the final IP tables in Chapter 6. Additionally, all LID BMPs

were placed in Stage II of implementation, and would only be necessary if the installation of the most cost-effective BMPs (in Stage I) were unable to achieve the water quality standards.

2.4.9 Section 5.6 Benefit Analysis ***2.4.9.1 Cost Effectiveness shown in Table 5.23***
DEQ does not provide any explanation/ interpretation of Table 5.23. The CSO controls are the least cost effective of any controls identified in Table 5.23.

DEQ Response: Added on page 5-45: "Table 5.23 shows the cost efficiencies of BMPs by amount of bacteria removed per $1000. One impairment watershed did not need all BMPs within the plan so the watershed area used in the analysis is indicated in the second column. The Targeting Section 6.3 shows how these values can be used to target the BMPs in order of their efficiency of removing bacteria per their cost of installation."

2.4.9.2 What is the benefit?
Typically a benefit to cost analysis includes an evaluation of increasing levels of control to identify inflection points where the benefits become less cost effective. The City requests that a benefit to cost analysis be conducted to better inform stakeholders, elected officials, and the general public on their investments in clean water. DEQ Response: Although not done to the technical degree the COR is asking for, the benefit analysis for this project has the "cost-effectiveness inflection point" between Stage I and Stage II with the most cost effective BMPs for bacteria reduction in Stage I and those more costly in Stage II.

DEQ Response: Although not done to the technical degree the COR is asking for, the benefit analysis for this project has the "cost-effectiveness inflection point" between Stage I and Stage II with the most cost effective BMPs for bacteria reduction in Stage I and those more costly in Stage II.

2.4.9.3 LID BMPs
Low Impact Development (LID) practices are designed to reduce peak runoff, and remove solids and nutrients. Although, bacteria may be removed by LID BMPs, it is not their primary function."..."
In general, sediment and nutrients are more uniformly distributed over the watershed compared to bacteria. The non-human sources of bacteria in an urban environment would typically be generated from pets or wildlife (i.e. geese, deer, raccoons, etc). These source are transient (will move throughout the watershed), which will make it very difficult to site LID BMPs because they will not discharge their waste in same locations consistently. Additionally, the footnotes to Table ES.1 indicate that wildlife loads will not be addressed in this IP. Therefore, LID BMPs are not a practical solution for controlling bacteria.

DEQ Response: Urban BMPs have been included in the discussion since the start of the planning process with active citizens and citizen groups citing they want these BMP types included. The City calls these "LID" BMPs, however the 4 practices included in the table of the comments are not what are termed "LID"BMPs in the Plan. These are termed "residential/urban BMPs" in the Plan.
The inclusion of the residential/urban BMPs was in response to the need to further reduce dog bacteria in the watershed. Many citizen members of working groups and the steering committee

strongly suggested including urban type BMPs in the Plan aimed at residential stormwater flow reductions, which can also benefit the reduction of bacteria, nutrients, and sediment. They are effective because they diminish the stormwater runoff from residential lands which are frequently deposited with pet and wildlife fecal material. Reducing those flows should in turn reduce the amount of those sources entering the waterways. In this urban setting where runoff water volume is a large problem, especially with the presence of the CSO, DEQ believed it paramount to include many "volume" reducing BMPs. By removing some of the stormwater volume, one would also expect to reduce the nutrients, sediment, and bacteria which picked-up by runoff as it travels to nearby impaired waterbodies. While it may be more difficult to obtain buy-in of BMPs on these un-regulated, privately-owned properties, it is not impossible to do. This effort can be facilitated by incentives by the localities and education. This in turn, should also help achieve bacteria, sediment, and nutrient reductions in the localities' own MS4s and the CSO. While this IP is intended for reductions of bacteria specifically, the same efforts will also provide beneficial reductions to help meet the Bay TMDL goals.

As indicated in the comments, the City was present at all working group and steering committee meetings and had several opportunities to make recommendations regarding the BMPs to include in the Plan to meet the bacteria TMDL goals.

2.5.1 Stage I and II Implementation Goals and Costs

Table 1 summarizes the James River Bacteria TMDL IP estimated costs by watershed for Agricultural, Residential and CSO. Table 2 shows the City's portion of the Bacteria TMDL IP cost estimates, which will include the costs for the Phase III CSO LTCP (Alternative E). Figure 1 shows that City of Richmond's share is about 76% of the total cost for James River bacterial TMDL IP. The City of Richmond requests that the entire Section 5.3.5 be deleted and that DEQ use the paragraph provided on April 15, 2011. Refer to paragraph 2.4.6 for additional comments.

DEQ Response: See portions of response for section 2.4.6. DEQ believes section 5.3.5 does not need to be replaced in the IP document.

2.5.2.1 Wildlife Compliance

Table 6-13 shows that there will be zero percent violations by Stage III. However, footnotes to Table ES.1 indicated that wildlife loads will not be addressed. It would be reasonable to expect that percent violations would remain at the end of Stage III, especially if wildlife loads are not reduced. Please refer to paragraph 2.1.1 above for comments and information requests.

DEQ Response: See Response for Section 2.1.1.

2.5.2.2 Timeline for CSO LTCP based on Richmond's Special Order by Consent

Please add a footnote to Table 6-13 regarding the implementation schedule for the City's CSO LTCP that states: "(2) Estimated timeline based on 100% grant funding. The schedule for the implementing the Phase III CSO controls is based on the Special Order by Consent."

DEQ Response: Footnote added.

2.6 Comments to IP Section 8 – Potential Funding Sources

The costs of these are unfunded state mandates will keep us from complying. Of the $883,761,198, it is proposed that in stage I (years 1 – 10) will spend $14,556,600 for agricultural and residential BMPs and a pet waste pick up program. In stage II (2nd 10 years) $412,822,795 is to be spent for CSO SW volume reduction BMP and $455,015,000 is to be spent for residential / urban BMPs. Due to this unfunded state mandate cost it is unlikely the BMPs will be budgeted. To put it in perspective the City of Richmond annual school budget is approximately $150,000,000 per year, the DPU wastewater annual budget is $68,000,000 per year and the DPU stormwater annual budget is $7,500,000. The sources cited in the report for funding are without funding. The Virginia WQIF balance will be zero on 1 July 2011. COR was granted $46,615,858 from that fund, of which we project we will only receive $15,273,835 prior to the fund balance going to zero. This will require the COR fund the $31,342,023 with a bridge loan as the project under construction is a current regulatory requirement and cannot be deferred awaiting grant funding. Perhaps Secretary Domenech said it best in a letter to EPA Region III 29 November 2010 regarding the Virginia Chesapeake Bay implementation plan: "It is important to emphasize again that this plan is being developed during the worst economy in generations. Virginians have already invested billions of dollars in Chesapeake Bay water quality improvement to date. Full implementation of this plan will likely cost more than $7 billion new dollars which would be another federal unfunded mandate on the state, localities, private industries, and homeowners. In addition to the new health care law and other new regulatory burdens, it is placing enormous new fiscal stress on state budgets."

DEQ Response: All stakeholders should recognize the estimated costs are high. DEQ has reiterated the reasons for this throughout the planning process. The public perception of willingness to make water quality improvements is important for the economic and aesthetic future of the City. Costs of many LID BMPs would be borne by landowners if installed and the costs for the CSO SW Volume Reduction BMPs in the Gillie and Almond Creek watersheds may be significantly less than projected.

2.7 Conclusion

The stated goal of the IP process is to outline a plan for reaching the reduction goals of the completed TMDL study and we have not achieved that goal. However in Jon M. Capacasa's 4 November 2011 letter to Ellen Gilinsky there appears a workable plan upon which we can overlay a workable schedule. ... This is somewhat in alignment with the stage I and stage II implementation (except agricultural controls are not mentioned), but the City would recommend that we have similar milestones in the plan to the Chesapeake Bay TMDL instead of waiting until the end of year 10. This is especially important as EPA could complete the bacteriological alternate test protocols and propose revised water quality criteria in the 2012 time frame and the City will be completing the Gillies Creek UAA to determine the compliance endpoint.

DEQ Response: DEQ believes that the multijurisdictional collaborative stakeholder effort involved in this IP has reached the goal of outlining a plan for reaching the reduction goals of the TMDL. DEQ agrees that Mr. Capasaca's statements mentioned in your comment are *somewhat in alignment with the stage I and stage II implementation, especially the iterative implementation concept. The City would put itself in an admirable position with the public should it decide to proactively begin the second 10-year stage of implementing CSO SW Volume Reduction BMPs or other BMP improvements. DEQ would gladly assist the City in any way possible toward those efforts.*

Again, DEQ is appreciative of the time devoted by the City's staff in regards to the IP development and for your careful review of the draft document. We hope the revised draft will meet your satisfaction as many of the recommendations made in your comments have been included.

Best Regards,

Margaret Smigo

Margaret Smigo
DEQ-Piedmont Regional TMDL Coordinator

Cc:

Robert Steidel
Willie R. Horton
Michelle M. Virts
Lisa Ochsenhirt
Edward Cronin

From: Gupta, Ram (DCR)
Sent: Monday, June 20, 2011 5:09 PM
To: Smigo, Margaret (DEQ)
Subject: Comments on James River IP Draft
Attachments: DCR-comments-James-River-IP.doc

Margaret,

Attached are DCR's few comments and/or suggestions on the Bacteria Implementation Plan Development for the James River and Tributaries - City of Richmond, draft document as presented at the public meeting on May 18, 2011. Hope these would help improve the quality of the document. Please consider these while finalizing the draft document.

Thanks very much,

Please note NEW address

Ram Gupta, Ph.D.
TMDL Project Manager
Division of Storm Water Management
Department of Conservation & Recreation
203 Governor Street, Suite # 217
Richmond, VA 23219

Phone: (804) 371-0991
Fax: 804-786-1798

Few comments/suggestions on James River IP draft document (Ram Gupta, DCR)

(Draft document as presented at public meeting on May 18, 2011)

Executive Summary xiii - Table ES.2 – Under Stage II, There is no Winter Feeding Facility BMP under DCR's cost-share program. Remove code WP-4D, instead Waste Storage Facility – Beef (WP-4) may be included. Similar change needs also to be made within the document – text and tables.

Page 5-20 and others - Table 5-3 and others – clarify and/or indicate in text or in tables that BMPs "needed" are the difference of total BMPs required minus BMPs already installed after completion of TMDL development study.

BMPs Timeline - Timeline (BMPs installed versus bacteria loading reductions) - include it in line-diagram format, easier to follow, as was done in James River-Lynchburg IP document.

City's LTCP - LTCP is an important component of IP development for four segments where Alternate "E" and additional reductions are needed. Include a sub-section on this describing briefly its current status, future plan of action (even if tentative), and financial resources needs.

\- The City of Richmond and/or DEQ has already initiated the Use Attainability Analysis study for the Gillies Creek (public notice issued already), it would be better to reference in this IP document also.

Page # 5-36 - Table 5.13 – modeling time period selected is 1974-78 - state the reasons of that much old time-period, compared to any more updated and available time period.

Page # 5-40 - Is it possible to include load reductions obtained separately by agricultural, residential, urban and stormwater BMPs. Also, if possible, include comparison of these reductions with those indicated in TMDL development study.

Page # 5-45 – Expand section 5.6 on Benefit Analysis to include detailed benefits expected to be delivered by implementing this IP. Considering a substantially high cost of BMP implementations, the section needs to include detailed benefit analysis.

Page # 5-49 - Since Urban and Government BMPs are significant part of BMPs, include a section on Benefits of Urban/Government BMPs; and also on Benefits of LTCP in the text - similar to that written on agricultural and residential BMPs.

Page # 6-12 - Bacteria load reductions indicated in Table 6.13 are after implementing ALL BMPs listed in the IP (i.e., agricultural, residential, urban, and stormwater) and also with City of Richmond's LTCP. Write some text clarifying this.

Page # 8-1 - Funding sources listed is the same as in other IPs for agricultural and residential BMPs. Are there any other sources for stormwater/urban BMPs.

Remove Federal Clean Water Act 319 Incremental Funds, due to limited amount of funding and federal budget cuts beginning with 2012, grant award of this source is not applicable.

Section 5 refers to a variety of urban and stormwater BMPs (i.e., green alley, vegetative roof etc) installed on private and/or public properties. Sources of funding from City of Richmond, local businesses and stakeholders (e.g. non-profit organizations) and other diverse sources should be included in section 8. Funding will not just be limited to State and Federal programs as described.

From: Smigo, Margaret (DEQ)
Sent: Monday, August 08, 2011 2:46 PM
To: Gupta, Ram (DCR)
Cc: Sommers, Megan (DCR)
Subject: RE: Comments on James River IP Draft
Attachments: 8_8_11_DEQ_response_DCR_JamesIP_final.pdf

Good Afternoon Dr. Gupta,

DEQ appreciates your participation in the development of the James River – City of Richmond IP. Your support in the working group meetings and facilitation of the ag-working group meetings was incredibly helpful! Your knowledge of DCR BMP practices led to the additions of a few BMPs which otherwise would not have been included, and many inconsistencies were corrected based on your comments.

DEQ has responded to your comments in the attached letter.

Please do not hesitate to contact me if you have further questions.

Best Regards,

Margaret Smigo
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Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Visit the VA DEQ Website

From: Gupta, Ram (DCR)
Sent: Monday, June 20, 2011 5:09 PM
To: Smigo, Margaret (DEQ)
Subject: Comments on James River IP Draft

Margaret,

Attached are DCR's few comments and/or suggestions on the Bacteria Implementation Plan Development for the James River and Tributaries - City of Richmond, draft document as presented at the public meeting on May 18, 2011. Hope these would help improve the quality of the document. Please consider these while finalizing the draft document.

Thanks very much,

Please note NEW address

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203 Governor Street, Suite # 217
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8/8/2011 DEQ Response to comments/suggestions on James River IP draft document from Ram Gupta, DCR (dated 6/20/11)

Comments from DCR appear in black and DEQ responses are in blue.

Executive Summary xiii - Table ES.2 – Under Stage II, There is no Winter Feeding Facility BMP under DCR's cost-share program. Remove code WP-4D, instead Waste Storage Facility – Beef (WP-4) may be included. Similar change needs also to be made within the document – text and tables.

This change has been made – thank you for the recommendation.

Page 5-20 and others - Table 5-3 and others – clarify and/or indicate in text or in tables that BMPs "needed" are the difference of total BMPs required minus BMPs already installed after completion of TMDL development study.

This change has been made – thank you for the recommendation. Pg 5-20 explained this information for Table 5.5. Text was also added to pg 5-21 for Table 5.6. Table 5.7 has a footnote and text above it to clarify.

BMPs Timeline - Timeline (BMPs installed versus bacteria loading reductions) - include it in line-diagram format, easier to follow, as was done in James River-Lynchburg IP document.

While this timeline was provided for the Lynchburg IP, it was not provided for the James IP because it is very time and labor intensive to compile. There is a table which displays this information in a simpler format within the document.

City's LTCP - LTCP is an important component of IP development for four segments where Alternate "E" and additional reductions are needed. Include a sub-section on this describing briefly its current status, future plan of action (even if tentative), and financial resources needs.

The COR's LTCP is referenced throughout the document and a brief description and schedule contingency are included in Appendix C (courtesy of the City of Richmond and Greeley & Hansen).

\- The City of Richmond and/or DEQ has already initiated the Use Attainability Analysis study for the Gillies Creek (public notice issued already), it would be better to reference in this IP document also.

There has been no formal UAA document presented by the City to DEQ or the SWCB and the draft IP currently includes references in regards to the City's intent to develop a UAA. Further documentation is not believed to be necessary at this time.

Page # 5-36 - Table 5.13 – modeling time period selected is 1974-78 - state the reasons of that much old time-period, compared to any more updated and available time period.

The time period is explained on page 5-34 and in more detail within the TMDL document. The modeling time period is simply a use of representative rainfall data and does not reflect older land use acreages or older BMPs.

Page # 5-40 - Is it possible to include load reductions obtained separately by agricultural, residential, urban and stormwater BMPs. Also, if possible, include comparison of these reductions with those indicated in TMDL development study.

This is not feasible. It would take many man-hours with little benefit to the reader or someone interested in implementing a BMP. In addition, the "benefit table" currently included has bacteria loads reduced per $1000, which explains the difference between the bacteria load reduced in relation to the different BMP types.

Page # 5-45 – Expand section 5.6 on Benefit Analysis to include detailed benefits expected to be delivered by implementing this IP. Considering a substantially high cost of BMP implementations, the section needs to include detailed benefit analysis.

Thank you for your recommendation. Added to pg 5-45: "Reductions in bacteria and other pathogens through the implementation of the BMPs in this plan will ensure that recreation within the James River can continue safely. Also many of the BMPs recommended in this plan will help reduce erosion or filter sediments and nutrients from runoff water, which will help meet load reductions needed in the Chesapeake Bay TMDL."

Page # 5-49 - Since Urban and Government BMPs are significant part of BMPs, include a section on Benefits of Urban/Government BMPs; and also on Benefits of LTCP in the text - similar to that written on agricultural and residential BMPs.

Section 5.6.3 was written after the last Steering Co meeting and includes text to this effect. "The installation of Low Impact Development (LID) Best Management Practices (BMPs) can benefit water quality by filtering runoff, removing solids, oil, nutrients, bacteria, and other pollutants. Some LID BMPs increase infiltration, so runoff water has time to percolate through the soil matrix arriving at streams slower or even deep infiltrating to the ground water table. Other LID BMPs trap runoff water allowing plants to utilize this water and transpiring it into the air and/or allowing it to evaporate into the air. All LID BMPs are designed to make impervious surfaces act more like pervious ones, allowing stormwater to do what it most naturally does in a landscape.

Besides benefiting water quality as this project has emphasized, LID BMPs can also decrease urban heat island effects, benefit air quality, increase human health and moods, decrease the strain on the WWTP (lower incoming water volumes), decrease storm peak stream flows, increase shade, increase transpiration, and contribute to the beautification of a city."

Page # 6-12 - Bacteria load reductions indicated in Table 6.13 are after implementing ALL BMPs listed in the IP (i.e., agricultural, residential, urban, and stormwater) and also with City of Richmond's LTCP. Write some text clarifying this.

We apologize for any misinterpretation, however, Table 6.13 does not show bacteria load reductions, rather it shows the cumulative implementation goals in % BMPs installed for each 5 years of implementation, the estimated geometric mean % violations within each impaired stream after each 5 year stage of implementation, and the overall cost in % after each 5 year period. "ALL BMPs" should be understood when the percentage of 'Cumulative Progress Toward BMP Installation' is at 100%.

Page # 8-1 - Funding sources listed is the same as in other IPs for agricultural and residential BMPs. Are there any other sources for stormwater/urban BMPs.

Remove Federal Clean Water Act 319 Incremental Funds, due to limited amount of funding and federal budget cuts beginning with 2012, grant award of this source is not applicable.

Removed – thank you for your recommendation.

Section 5 refers to a variety of urban and stormwater BMPs (i.e., green alley, vegetative roof etc) installed on private and/or public properties. Sources of funding from City of Richmond, local businesses and stakeholders (e.g. non-profit organizations) and other diverse sources should be included in section 8. Funding will not just be limited to State and Federal programs as described.

Thank you for your recommendation. Added to pg 8-1 "Funding from municipalities, local businesses, local stakeholders, or non-profit organizations could be investigated for the implementation of residential/urban LID BMPs."

From: Keeper [keeper@jrava.org]
Sent: Monday, June 20, 2011 2:47 PM
To: Smigo, Margaret (DEQ)
Cc: Adrienne Kotula; Bill Street
Subject: Richmond Bacteria TMDL Implementation Plan Comments
Attachments: RICbacipcomments.docx

Margaret,
Attached are our comments on the Richmond Bacteria TMDL Implementation Plan.

Regards, Chuck

Chuck Frederickson
Lower James Riverkeeper
James River Association
9 South 12th Street
Richmond, VA 23219
804-337-9283

James River Association
9 S. 12th Street
Richmond, VA 23219
June 20, 2011

Dear Ms Smigo,

Thank you for the opportunity to comment on the Bacterial Implementation Plan Development for the James River and Tributaries-City of Richmond Technical Report. This was a large undertaking and we were pleased with the amount of public participation during the development process. We realize that this process was complicated by the urban nature of most of the area under consideration and the fact that several waters are impacted by the Richmond Combined Sewer Overflow. In general, the Best Management Practices (BMPs) and phased approach to implementation seem realistic, measurable and achievable.

We are concerned with the language put forth in Section 5.3.5, Urban Stormwater Volume Reductions BMPs for CSO Areas. In this section, it states that additional controls may be required in Gillie Creek and Almond Creek to lower bacteria loads from CSOs. It then states that the City of Richmond is developing a plan to evaluate controls needed to meet waste load allocations outlined in the TMDL which may include conducting a Use Attainability Analysis (UAA) for the paved channel portion of Gillie Creek. As we stated in our comments on the TMDL development, UAA should only come into play as a last resort or when natural causes are the source of the impairment and cannot be controlled.

We were extremely glad to see the discussion in Section7.1, Integration With Other Watershed Plans, of the other programs and activities related to this plan. As we stated in our comments on the TMDL development, new stormwater and MS4 requirements along with the Chesapeake Bay TMDL effort are closely linked to this project and the BMPs/controls outlined in this plan will also have beneficial impacts on nutrient and sediment reductions. This is an ambitious plan and will require extensive resources but if it can be shown that multiple benefits are gained it may be easier to garner the necessary support. We continue to strongly support the development of a comprehensive watershed plan that would address the interlinking aspects of each and we would be more than willing to help with this effort.

Again, thank you for your work on this TMDL Implementation Plan. We look forward to continuing working with you to improve the quality of the James River.

Sincerely,

Chuck Frederickson
Lower James Riverkeeper

From: Smigo, Margaret (DEQ)
Sent: Monday, August 08, 2011 3:25 PM
To: 'Keeper'
Cc: 'bstreet@jrava.org'; Adrienne Kotula
Subject: RE: Richmond Bacteria TMDL Implementation Plan Comments
Attachments: DEQ_ChuckFredrickson_JamesIP_response_signed_8_8_11.pdf

Good Afternoon Mr. Fredrickson,

DEQ appreciates your participation in the development of the James River – City of Richmond IP and for your comments on the draft document received on 6/20/11. DEQ has responded to your comments in the attached letter.

If you have any further questions, please do not hesitate to contact me.

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Piedmont

Visit the VA DEQ Website

From: Keeper [mailto:keeper@jrava.org]
Sent: Monday, June 20, 2011 2:47 PM
To: Smigo, Margaret (DEQ)
Cc: Adrienne Kotula; Bill Street
Subject: Richmond Bacteria TMDL Implementation Plan Comments

Margaret,
Attached are our comments on the Richmond Bacteria TMDL Implementation Plan.

Regards, Chuck

Chuck Frederickson
Lower James Riverkeeper
James River Association
9 South 12th Street
Richmond, VA 23219
804-337-9283

COMMONWEALTH of VIRGINIA

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Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

August 8, 2011

Mr. Chuck Frederickson
Lower James Riverkeeper
James River Association
9 S. 12th Street
Richmond, VA 23219

Dear Mr. Fredrickson,

DEQ greatly appreciates your participation in the Implementation Plan development for the James River and Tributaries – City of Richmond and for your public comments on the draft plan. DEQ agrees that the overall goals within the plan are realistic and achievable. Evaluation of progress within the watershed will be ongoing throughout the implementation process.

DEQ understands your concerns in regards to Section 5.3.5 Urban Stormwater Volume Reduction BMPs for CSO areas. The document states that the City of Richmond is evaluating how they will meet the WLAs in the TMDL which may include a UAA for Gillie Creek. A UAA is simply a study of a use within a waterbody which anyone has the authority to conduct. Any recommendations made from a UAA study would need to be presented to the State Water Control Board who would in turn, require a notice for public comment on those recommendations. To date, there has been no "use removal" or "use modification" of any state waterbody as a result of a UAA study.

DEQ agrees that integration and coordination with local watershed efforts will be critical to the success of implementation.

Again, DEQ thanks you for your dedication to protecting and improving the water quality of the James River and its tributaries and for your assistance in the TMDL and IP project.

Best Regards,

Margaret Smigo

Margaret Smigo
VA DEQ
Piedmont Regional TMDL Coordinator

Cc: Mr. William Street
Ms. Adrienne Kotula

From: Joseph Lerch [jlerch@VML.ORG]
Sent: Monday, June 20, 2011 5:00 PM
To: Smigo, Margaret (DEQ)
Attachments: VML Comment Letter June 20.pdf; 2006_12_05_standards_uses_uaa_la_channels.pdf

Dear Ms. Smigo,

Attached are the VA Municipal League's comments on the draft IP for the James River bacteria TMDL.

Let me know if you have any questions.

Regards,

Joe Lerch
Director of Environmental Policy
Virginia Municipal League
13 E Franklin Street
Richmond, VA 23219

804-523-8530 - office
804-640-5615 - mobile

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June 20, 2011

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060

Re: James River – City of Richmond TMDL IP comment

Dear Ms. Smigo,

On behalf of the Virginia Municipal League (VML), I am submitting our written comments in support of the City of Richmond's request that DEQ include a discussion of the need for a Use Attainability Analysis ("UAA") for Gillies Creek in the Draft IP. As noted in their comments, the City of Richmond will be conducting the UAA and the results should inform both DEQ and the State Water Control Board "… as the basis for considering a water quality standards change" for Gillies Creek.

Pursuant to VA Code, the Federal Clean Water Act (CWA), and the documentation provided by the City of Richmond, we find that there may be sufficient "reasonable grounds" that attainment of a recreational use for this concrete channel is not feasible. In particular, VML notes that the estimated cost to upgrade the CSO (as noted in the draft IP) of $390 million – to attain a recreational use for a channel clearly not used for this purpose – is both unjustified and unreasonable.

As supporting relevant documentation, please find attached an EPA case study file entitled "Suspension of Recreational Beneficial Uses in Engineered Channels during Unsafe Wet Weather Conditions" (2006). Following a UAA conducted for concrete channels within the Los Angeles region, the EPA approved a modification of the water quality control plan that suspended the recreational use criteria during high flow conditions. VML finds the similarities between this UAA and the one sought for Gillies Creek a compelling argument for granting the City of Richmond's request.

In summary, VML recognizes and takes seriously our role in supporting the goals of providing clean water to all Virginians. Given that our member governments face mounting costs for water quality improvements for sewage treatment plants, urban stormwater, combined sewer overflows (CSOs), and sanitary sewer overflows (SSOs), it is imperative that we as a Commonwealth are prudent in matching our financial resources with our water quality priorities. As TMDLs are developed in urban areas across the Commonwealth VML will support the inclusion of UAAs as a means to make wise decisions in the allocation of limited resources. Lastly, by recognizing the City of Richmond's UAA for Gillies Creek in the draft IP, the State Water Control Board will have the necessary information to determine whether a recreational use is justified for this section of Gillies Creek.

Sincerely,

Joe Lerch
VML Director of Environmental Policy

Enclosure

Suspension of Recreational Beneficial Uses in Engineered Channels during Unsafe Wet Weather Conditions

Abstract

Complexity: Simple
Region: 9
Type of Action: Temporary suspension of recreational use
131.10(g) Factors: 2, 4

The Los Angeles Region has many rivers and streams that have been straightened, concrete-lined, or both to move floodwaters from urban areas to the ocean. These channels transport large volumes of water that might not be of adequate quality to support Clean Water Act (CWA) section 101(a) uses (i.e., "fishable/swimmable"). The water quality goals set forth in the Los Angeles Region's Basin Plan specify that all waters in the state should be "fishable/swimmable."

Under certain conditions recreational uses are inappropriate for these channels. During high flow flood conditions, it is not safe to swim in the waters; during summer dry periods, the flow is insufficient for swimming. The Los Angeles Region has opted to issue a suspension of recreational use during periods of high flow. Through a revision to its water quality control plan, the Los Angeles Region established that during high flow events, when it is not safe to be in the modified channels, these waterbodies do not have to meet bacteria criteria. The suspension of recreational uses applies under the rainfall conditions that trigger the Region's swift-water protocols (i.e., rescue squads are on alert if someone should happen to enter the water). With this use attainability analysis (UAA), EPA approved the revision to the *Water Quality Control Plan for the Los Angeles Region*.

Background

Currently, all waterbodies in the Los Angeles Region include use designations for water contact recreation (REC-1) and, in most cases, for non-contact water recreation (REC-2). There are no seasonal restrictions on recreational uses in Los Angeles. The uses apply at all times, regardless of weather conditions or any other condition that might make recreational activities unsafe or infeasible.

Figure 1. High-flow conditions in Ballona Creek (DeShazo, 2005).

Current conditions physically prevent full attainment of the recreational beneficial uses during high-flow or high-velocity conditions. Many waterbodies in the Los Angeles Region have been straightened, concrete-lined, or both to reduce the occurrence of flooding in urbanized areas by moving stormwater from those areas to the ocean (or an alternative outfall). These channels transport large amounts of water that might not be of adequate quality to support Clean Water Act (CWA) section 101(a) uses. This condition does not meet the water quality goals set forth in California's Basin Plan, which specifies that all waters in the state should be designated for recreational use and should be "fishable/swimmable."

Designating recreational uses for highly modified channels in the Los Angeles Region is complicated by the fact that under certain conditions recreational uses are not appropriate for some waterbodies. Channel modifications can create life-threatening conditions during and immediately following storm events. The steep-sided slopes of the channels also make them very difficult to exit when the water if slowing swiftly. During high-flow conditions, it is not safe to swim in the channels.

Approach

The Los Angeles Regional Water Quality Control Board (RWQCB) opted to issue a temporary suspension of the designated use (recreation) during and immediately after defined storm events (periods of high-flow). By suspending recreational uses during high-flow conditions, the RWQCB acknowledges the danger of recreating in the channels during wet weather conditions. Through a revision to its water quality control plan, the Region indicated that during high-flow events (when it is unsafe to be in the channels) waterbodies do not have to meet bacteria criteria. The aquatic life standards for these channels have not been revised, although subcategories of aquatic life uses might be developed in the future. This approach—using revisions to the basin plan to further specify designated uses—is a flexible means to establish water quality goals.

The high-flow suspension applies only to water contact recreation activities regulated under the REC-1 use, non-contact water recreation involving incidental water contact regulated under the REC-2 use, and the associated bacteriological criteria set to protect those activities. The suspension of uses is applied when there is rainfall greater than or equal to ½ inch and remains in effect during the 24 hours following the rain event, which is consistent with the Los Angeles County Level 1 Alert threshold.

The inherent danger of recreating in engineered channels during and immediately after storm events is widely recognized and has already been addressed by Los Angeles and Ventura counties through county policies. Los Angeles County's Multi-Agency Swift Water Rescue Committee has set protocols for locking access gates to flood control channels and preparing for possible swift-water rescues in the channels during defined storm events. In Ventura County, access gates to such channels are always locked, which prevents people from engaging in recreational activities in the channels during swift-water conditions.

The RWQCB's suspension would apply to inland, flowing, engineered channels where it is possible to restrict access during the defined conditions. Water quality criteria set to protect other recreational uses associated with the fishable goals, as expressed in CWA section 101(a)(2) and regulated under the REC-1 use and other REC-2 uses (e.g., uses involving the aesthetic aspects of water) still remain in effect.

Downstream REC uses must continue to be protected. Suspension of portions of the REC-1 and REC-2 uses during swift-water conditions reflects the current conditions in certain engineered channels; it does not relieve or diminish obligations to reduce bacteria loading at the beaches.

The RWQCB remains committed to reevaluating the attainability of the REC-1 and REC-2 uses in the future, supporting efforts to reclaim engineered channels as natural watercourses, and supporting the beneficial reuse of stormwater. Within 3 years of the amendment's effective date, the RWQCB will reconsider the continued appropriateness of the suspension of recreational uses in engineered channels during and immediately following the defined storm events.

Data Collection and Analysis

To support the suspension of the recreational uses, the RWQCB conducted a use attainability analysis (UAA) for each waterbody where the suspension would apply. The RWQCB used two of the 40 CFR 131.10(g) factors as the basis for the UAA:

> **Factor 2:** Natural, ephemeral, intermittent, or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating state water conservation requirements to enable uses to be met.
> **Factor 4:** Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use.

RWQCB staff evaluated whether to conduct waterbody-by-waterbody UAAs or a categorical UAA covering all waterbodies meeting certain criteria. For this situation, the staff proposed a regional approach because all waterbodies subject to the suspension of recreational uses had similar features. The waterbodies to which the suspension would apply (during the defined conditions) include inland waterbodies, flowing waterbodies, engineered channels, and waterbodies where access can be restricted or prohibited (through fencing or signs).[1]

The staff first identified all inland, flowing waterbodies listed in Table 2-1 of the Basin Plan for which the REC uses were qualified due to restricted or prohibited access. They then circulated the list internally to confirm that each of the waterbodies met the criteria for inclusion in the proposed amendment. Where necessary, the staff followed up with field surveys of the candidate waterbodies to confirm physical characteristics and access restrictions. They specifically noted GPS coordinates, channel flow, the geometry and construction materials of the channel bottom and sides, and the presence of restricted access in terms of gates and signage.

The staff evaluated several possible triggers for the suspension of REC uses in engineered channels with restricted or prohibited access. These included (1) flow and velocity (e.g., swift water conditions); (2) depth (e.g., outside low flow channel); and (3) rainfall (e.g., total daily rainfall).

On the basis of their evaluation, the staff concluded that rainfall is the most appropriate trigger for the temporary suspension of recreational uses. The RWQCB outlined three reasons for this decision. First, the Los Angeles County, California, Multi-Agency Swift Water Rescue Committee uses rainfall prediction as the basis for routinely locking access gates to county flood control channels and putting swift-water rescue personnel on alert. Written guidance outlines protocols to prepare for and provide swift-water rescues for county personnel and other involved agencies. Under the "Water Rescue Pre-Deployment Section," three storm levels are defined based on storm warnings with an 80 percent prediction of specified levels of rain over 24 hours. The three alert levels are as follows:

[1] Although not adequate alone to trigger a suspension of recreational uses, restricted or prohibited access to the channels is proposed as a requirement for the suspension to ensure that people cannot access a waterbody during the defined wet weather period.

- Level 1: 1 inch of rain if unsaturated ground or ½ inch if saturated ground
- Level 2: 1½ inches of rain if unsaturated ground or 1 inch if saturated ground
- Level 3: rainfall/saturation levels exceeding those listed for Level 2; generalized flash floods, urban flooding, or mud and debris flows; urban flooding with possible life hazards.

At the Level 1 Alert threshold, Los Angeles county personnel routinely lock all access gates to flood control channels for at least 24 hours after the storm event.

Second, there are numerous rain gauges throughout Los Angeles and Ventura counties that can provide precipitation data. Flow is not used because velocity and depth data are not available for all candidate channels.

Third, rainfall is an adequate proxy for high flows and high velocities that result in unsafe conditions, given the reliance on rainfall prediction by the Multi-Agency Swift Water Rescue Committee. To confirm this, the staff used 5 years of data (water years 1998–2002) to match days above the Level 1 Alert rainfall thresholds of ½ inch or 1 inch with corresponding flow, velocity, and depth data in several local channels and compared these data with swift water rescue data from the same channels, as well as other agencies' protocols for evaluating when conditions in the channels are unsafe. The staff specifically relied on a protocol used by the U.S. Geological Survey (USGS) and Orange County, in which in-stream conditions are evaluated using the following calculation to determine whether it is safe for monitoring personnel to be in a stream or channel: peak depth (in feet) multiplied by peak velocity (in feet per second). If the result is greater than or equal to 10, conditions are considered unsafe.

The results of the analysis show that 63 percent of unsafe days followed days with more than ½ inch of rainfall. Therefore, using days with greater than ½ inch of rainfall and the 24 hours following the event provides protection by suspending recreational use during 63 percent of unsafe days. This trigger appears appropriate and justifiable because, on average, 82 percent of the days on which the preceding day's rainfall was greater than ½ inch were considered unsafe.

On the basis of the data analysis described above, the staff proposed to use the Level 1 Alert threshold (rainfall greater than or equal to ½ inch as measured at the closest rain gage with saturated conditions) as the trigger for suspending the REC uses assigned to a particular engineered channel. This fits with Los Angeles's policy to keep all access gates locked for at least 24 hours following the specified rain event.

In the UAA the RWQCB showed that recreation is not an existing use because the channels were modified before 1965 and the swift water conditions existed before this the present. In addition, the study showed that the use would not be attained through effluent limits or best management practices (BMPs) because the physical characteristics of the waterbody, rather than the water quality, preclude the use.

Conclusion
Following this UAA, EPA approved the revision to the *Water Quality Control Plan for the Los Angeles Region*.

References

DeShazo, R. 2005. Summary: Basin Plan Amendment to Suspend the Recreational Beneficial Uses in Engineered Channels during Unsafe Wet Weather Conditions (Los Angeles Region). Presented at the Designated Use Co-Regulator Workshop, San Francisco, July 2005.

From: Smigo, Margaret (DEQ)
Sent: Monday, August 08, 2011 2:35 PM
To: 'Joseph Lerch'
Subject: RE: James River - City of Richmond IP comments
Attachments: DEQ_VML_response_signed_8_8_11.pdf

Good Afternoon Mr. Lerch,

DEQ appreciates the comments received by you on 6/20/11, on behalf of the VML. DEQ has responded to those comments in the attached letter.

If you have further questions, please do not hesitate to contact me.

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Visit the VA DEQ Website

From: Joseph Lerch [mailto:jlerch@VML.ORG]
Sent: Monday, June 20, 2011 5:00 PM
To: Smigo, Margaret (DEQ)
Subject:

Dear Ms. Smigo,

Attached are the VA Municipal League's comments on the draft IP for the James River bacteria TMDL.

Let me know if you have any questions.

Regards,

Joe Lerch
Director of Environmental Policy
Virginia Municipal League
13 E Franklin Street
Richmond, VA 23219

804-523-8530 - office
804-640-5615 - mobile

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Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

August 8, 2011

Mr. Joseph Lerch
Director of Environmental Policy
Virginia Municipal League
13 E Franklin Street
Richmond, VA 23219

Dear Mr. Lerch,

DEQ greatly appreciates your comments submitted on behalf of the Virginia Municipal League for the James River and Tributaries – City of Richmond the draft Implementation Plan (IP).

Your comments included the following 3 themes:

1- The implementation plan should include verbiage specific to Gillie Creek referencing the City of Richmond's intention to complete a Use Attainability Analysis (UAA) study

2- Attainment of the primary contact standard in Gillie Creek is not feasible and is cost prohibitive

3- Los Angeles, California's completion of a UAA and approval by EPA for a temporary use suspension of primary contact in "Engineered Channels during unsafe wet weather conditions" provides a rationale for the City of Richmond to complete a similar UAA study for Gillie Creek and for the State Water Control Board (SWCB) to consider a use modification.

DEQ has the following responses based on the above summarization of your comments:

1- The purpose of an Implementation Plan in the James River – City of Richmond project was to determine how the primary contact bacteria standards would be met in each impaired waterbody. In the absence of a completed UAA study or an approved use modification for any waterbody in the study area, DEQ and MapTech were required to develop the IP to the current standard. DEQ understood it is the City's intent to complete a UAA at some point; therefore, verbiage to that effect was included in Section 5.3.5 Urban Stormwater Volume Reduction BMPs for CSO Areas. In addition, text provided by the City of Richmond and Greely and Hansen related to the LTCP and development of a UAA was also included in Appendix C.

2- The draft IP cites a total cost of approximately $410Mil to reduce CSO overflows in all of the City of Richmond. Of that cost, the City of Richmond provided an estimate of $300Mil in order to increase the storage capacity within the CSO system to meet primary contact recreation use attainment specifically in Gillie Creek. These were the only estimates available.

3- The information you provided on LA's UAA of Ballona Creek for "Suspension of Recreational Beneficial Uses in Engineered Channels during Unsafe Wet Weather Conditions" is a similar situation to that of

Gillie Creek, where there is an approximately 1.7 mile concrete channel. There is also a distinct difference between the two, as Gillie Creek is a CSO watershed and Ballona Creek is not. The UAA study for Ballona Creek also states, "Downstream REC uses must continue to be protected.". In Gillie Creek, one of the main concerns regarding a use modification of the stream are the downstream affects of the James River near Rockett's Landing, where the water is frequently used for primary contact recreation purposes, including swimming.

Again, DEQ thanks you for your comments and appreciates your participation. Your comments along with DEQ's response will be included with the final IP presented to the SWCB for review.

Best Regards,

Margaret Smigo

Margaret Smigo
VA DEQ
Piedmont Regional TMDL Coordinator

From: Pomeroy, Chris [chris@aqualaw.com]
Sent: Monday, June 20, 2011 3:58 PM
To: Smigo, Margaret (DEQ)
Subject: James River - City of Richmond IP Comment
Attachments: VAMSA VAMWA James BacT TMDL IP Comments 6-20-11.pdf

Ms. Smigo:

Please accept the attached comments on behalf of the Virginia Municipal Stormwater Association (VAMSA) and Virginia Association of Municipal Wastewater Agencies (VAMWA).

Thank you.

Chris Pomeroy
Counsel to VAMSA and VAMWA

From: Smigo, Margaret (DEQ) [mailto:Margaret.Smigo@deq.virginia.gov]
Sent: Thursday, June 16, 2011 3:15 PM
Cc: Megan Maggard; James Kern; Alling, Mark (DEQ); West, Kelley (DEQ); Lott, Craig (DEQ)
Subject: **Reminder** James River - City of Richmond draft Implementation Plan comment period ends this Monday June 20th...

Good Afternoon,

This is a friendly reminder that comment period for the draft Implementation Plan (IP) developed for the James River – City of Richmond Total Maximum Daily Load (TMDL) will end this coming Monday June 20, 2011.

The draft plan is available on the DEQ website.

The presentation given at the final meeting on May 18th summarized the draft.

DEQ will accept written comments by e-mail, fax or postal mail. Written comments should include the name, address and telephone number of the person commenting and be received by DEQ during the comment period. Comments received after June 20th may not be accepted. Please send comments to:

Mail: Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060

Email: Margaret.Smigo@deq.virginia.gov
If sending your comment by email, please include "James River – City of Richmond IP comment" in the subject line.

FAX: "Attn: Margaret Smigo" (804)527-5106

BACKGROUND:

A TMDL study is meant to address "what" the problem is and how much of the pollutant must be reduced to meet water quality standards. The TMDL is then followed by Implementation Planning (or IP), which addresses "how" we meet the reductions identified in the TMDL study in order to meet water quality standards and restore the uses of the waterways.

DEQ seeks public comment and review of an implementation plan (IP) developed for the James River and tributaries around the Richmond area. The goal of the IP process is to outline a plan for reaching the reduction goals of the completed TMDL study. The plan identifies the types of "best management practices" (BMPs) which may be implemented to reduce bacteria pollution in the waterways. The plan also identifies potential funding opportunities and estimates the costs of remedial efforts. The final draft IP and comments received along with DEQ responses will be submitted to the State Water Control Board for approval. Implementation Plan development is required by Virginia state law under the Water Quality Monitoring, Information, and Reporting Act (WQMIRA).

****NOTE**** The BMPs identified within the plan represent one way in which the necessary bacteria reductions may be achieved to meet water quality standards. While these efforts are highly recommended, they are not mandatory. The IP is not a regulatory document. In addition, no single state/local government agency or non-profit group is responsible for the implementation of the plan, rather, it will be the responsibility of all watershed stakeholders, citizens included, to achieve the bacteria reductions required to meet water quality standards.

Please don't hesitate to contact me with any questions and feel free to pass this email along to friends, neighbors, and colleagues you think might be interested.

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Visit the VA DEQ Website

VIRGINIA MUNICIPAL STORMWATER ASSOCIATION

June 20, 2011

By Email (margaret.smigo@deq.virginia.gov)

Margaret Smigo, TMDL Coordinator
Virginia Department of Environmental Quality
Piedmont Regional Office
4949A Cox Road
Glen Allen, VA 23060

Re: TMDL Implementation Planning:
James River Bacteria TMDL IP (May 2011 Draft)

Dear Ms. Smigo:

Please accept the attached comments on behalf of the Virginia Municipal Stormwater Association (VAMSA) and Virginia Association of Municipal Wastewater Agencies (VAMWA) and contact me should you have any questions.

Sincerely,

Christopher D. Pomeroy, Esq.
General Counsel

Copy to:
VAMSA Members
VAMWA Members

TMDL IMPLEMENTATION PLANNING:
JAMES RIVER BACTERIA TMDL IP (MAY 2011 DRAFT)

These comments are made jointly by the Virginia Municipal Stormwater Association (VAMSA) and the Virginia Association of Municipal Wastewater Agencies (VAMWA), collectively referred to below as the "Municipal Clean Water Associations".

VAMSA is an environmental organization of 20 localities that supports the development and implementation of stormwater-related policies based on good science and public policy, including a balanced approach to environmental and fiscal sustainability.

VAMWA is an environmental organization comprised of the local government and wastewater authorities that own and operate highly-regulated publicly owned treatment works (POTWs), commonly referred to as municipal wastewater treatment plants (WWTPs), which collectively serve over 95% of Virginia's sewered population. Like VAMSA, VAMWA supports the development and implementation of water quality policies based on good science and public policy.

The Muncipal Clean Water Associations are concerned that DEQ's plans for clean water are growing so expensive, so fast, that DEQ risks losing public support for this important mission. Thus, VAMWA has previously urged the State Water Control Board (SWCB) to exercise its discretion in setting water quality standards and related plans and implementation policies so as to make wise and efficient use of available water quality funding. On November 1, 2010, for example, VAMWA commented in support of the City of Richmond's proposal to conduct a Use Attainability Analysis ("UAA"). In those comments, VAMWA noted that historically Virginia and other states designated uses without regard for attainability and the negative socioeconomic impacts that may caused by related federal and state implementation mandates.

Over the past decade, as recommended by the National Academy of Sciences' National Research Council, it has instead come to be widely-accepted among water quality professionals that "[s]tates should develop appropriate use designations for waterbodies in advance of assessment and refine these use designations prior to TMDL development" and, further, that "use attainability analysis should be considered for all waterbodies before a TMDL is developed." NRC, *Assessing the TMDL Approach to Water Quality Management* (2001).

Clearly the water quality needs of Virginia are great. Given the long-term financial predicament facing the federal, state and local governments as well as the financial challenges confronting the public at large, it is imperative that water quality planning strive to promote the most benefit possible from every dollar that is or will be invested. Based on our understanding of the Draft IP and the City of Richmond's Comments (June 20, 2011), the Municipal Clean Water Associations are concerned that DEQ's proposed $884 million plan misses the mark.

State law mandates that the Board "develop and implement a plan to achieve fully supporting status for impaired waters...." Va. Code §62.1-44.19:7. The plan must include: (a) a date for expected achievement; (b) measurable goals; (c) actions needed to correct the impairment; and (d) the costs, benefits and impact of addressing the impairment.

In addition, DEQ guidance directs staff to consider questions of cost, available funds, reasonable assurance of implementation, and water quality impacts, in order to write an achievable plan: "Implementation actions chosen should be practical, cost-effective, equitable (*i.e.*, dealing fairly with all problem areas), and based on the best science and research that is available." *See* Guidance Manual for Total Maximum Daily Load Implementation Plans (July 2003).

The Municipal Clean Water Associations concur with the considerations listed in the statute and DEQ's related guidance. However, from our review the Draft IP as well as the City of Richmond's comments, it is not clear that these considerations have been applied here so as to create a plan for success.

Quite the opposite, the Municipal Clean Water Associations are concerned that this plan may only set up regulated entities for failure, by which we mean exposure to substantial new regulatory liabilities and with little assurance of tangible water quality improvement in the form of designate use attainment. This possibility should be considered carefully given the high level of investment that that DEQ is recommending be made on this one water quality challenge among many.

The Municipal Clean Water Associations highlight the following aspects of the Draft IP as areas that appear to warrant further analysis prior to adoption of a Final IP:

Total Cost ($883 Million) – The Draft IP assumes an implementation cost of $883 million. While the Municipal Clean Water Associations support water quality improvement, we are also cognizant that this amount is a tremendous liability for DEQ to impose upon the residents of the watershed. To put the Draft IP in context, this amount far exceeds the Commonwealth's investment in point source treatment technology (WQIF) for the high-profile Chesapeake Bay cleanup.

Implementation Time Frame (20 Years) – With the proposed 20-year schedule, the Draft IP assumes an average expenditure of $44 million per year toward implementation. Again, the source of this funding is unknown and can only be assumed to be required of the residents of the watershed. To maintain maximum flexibility to account for the ability of the residents to pay, the implementation schedule should either be eliminated from the plan, or be revised based on perhaps five 10-year phases with the opportunity to accelerate should funding become available.

Wildlife Loads That Preclude Designated Use Attainment – The Municipal Clean Water Associations are concerned that the plan appears to call for tremendous investment with the likelihood that the result will continue to be impaired waters (i.e., failure to comply with the primary contact bacteria standard). If the use is not going to be restored for the public in portions of the watershed, that fact should be considered before the implementation level is determined.

Choice of Residential/Urban BMPs – The Draft IP envisions installation of approximately $455 million in "Residential/Urban BMPs," including wet ponds, rain gardens, bioretention facilities, and infiltration trenches. The Municipal Clean Water Associations question whether these BMPs are appropriate, because their primary design function is to reduce peak flows or to remove sediment or nutrients, not bacteria.

Lack of Coordination with Other Water Quality Goals – Having recently participated in the initial TMDL development and Phase I implementation planning process for the Chesapeake Bay TMDL for nitrogen, phosphorus and sediment, the Municipal Clean Water Associations are concerned that the un-coordinated continuing development of various individual TMDLs, each with very large implementation costs for citizens in the same area, represents a lost opportunity to plan smartly for maximum water quality gains. Indeed, the associated compliance costs for the various TMDLs appear at to be so high, that it will probably be difficult for many of the associations' members to proceed with serious efforts to incorporate TMDL compliance into local budgets. We are also concerned that the implementation costs are so high that they will discourage the public from supporting implementation. We encourage DEQ to work toward more efficient and realistically achievable TMDLs and implementation plans.

Consideration of Comments of Municipal Clean Water Associations' Members – We respectfully ask the Board's consideration of comments submitted by the local governmental bodies that own and operation municipal wastewater or stormwater systems in the watershed.

* * *

From: Smigo, Margaret (DEQ)
Sent: Monday, August 08, 2011 2:59 PM
To: 'Pomeroy, Chris'
Subject: RE: James River - City of Richmond IP Comment
Attachments: DEQ_re_VAMSA_VAMWA_response_signed_8_8_11.pdf

Good Afternoon Mr. Pomeroy,

DEQ appreciates your comments on behalf of VAMWA/VAMSA received on 6/20/11. DEQ has responded to your comments in the attached letter.

If you have any further questions, please do not hesitate to contact me.

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060
Office (804)527-5124
Fax (804)527-5106

Visit the VA DEQ Website

From: Pomeroy, Chris [mailto:chris@aqualaw.com]
Sent: Monday, June 20, 2011 3:58 PM
To: Smigo, Margaret (DEQ)
Subject: James River - City of Richmond IP Comment

Ms. Smigo:

Please accept the attached comments on behalf of the Virginia Municipal Stormwater Association (VAMSA) and Virginia Association of Municipal Wastewater Agencies (VAMWA).

Thank you.

Chris Pomeroy
Counsel to VAMSA and VAMWA

From: Smigo, Margaret (DEQ) [mailto:Margaret.Smigo@deq.virginia.gov]
Sent: Thursday, June 16, 2011 3:15 PM
Cc: Megan Maggard; James Kern; Alling, Mark (DEQ); West, Kelley (DEQ); Lott, Craig (DEQ)
Subject: **Reminder** James River - City of Richmond draft Implementation Plan comment period ends this Monday June 20th...

Good Afternoon,

This is a friendly reminder that comment period for the draft Implementation Plan (IP) developed for the James

River – City of Richmond Total Maximum Daily Load (TMDL) will end this coming Monday June 20, 2011.

The draft plan is available on the DEQ website.

The presentation given at the final meeting on May 18th summarized

DEQ will accept written comments by e-mail, fax or postal mail. Written comments should include the name, address and telephone number of the person commenting and be received by DEQ during the comment period. Comments received after June 20th may not be accepted. Please send comments to:

Mail: Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
4949-A Cox Road
Glen Allen, VA 23060

Email: Margaret.Smigo@deq.virginia.gov

If sending your comment by email, please include "James River – City of Richmond IP comment" in the subject line.

FAX: "Attn: Margaret Smigo" (804)527-5106

BACKGROUND:

A TMDL study is meant to address "what" the problem is and how much of the pollutant must be reduced to meet water quality standards. The TMDL is then followed by Implementation Planning (or IP), which addresses "how" we meet the reductions identified in the TMDL study in order to meet water quality standards and restore the uses of the waterways.

DEQ seeks public comment and review of an implementation plan (IP) developed for the James River and tributaries around the Richmond area. The goal of the IP process is to outline a plan for reaching the reduction goals of the completed TMDL study. The plan identifies the types of "best management practices" (BMPs) which may be implemented to reduce bacteria pollution in the waterways. The plan also identifies potential funding opportunities and estimates the costs of remedial efforts. The final draft IP and comments received along with DEQ responses will be submitted to the State Water Control Board for approval. Implementation Plan development is required by Virginia state law under the Water Quality Monitoring, Information, and Reporting Act (WQMIRA).

****NOTE**** The BMPs identified within the plan represent one way in which the necessary bacteria reductions may be achieved to meet water quality standards. While these efforts are highly recommended, they are not mandatory. The IP is not a regulatory document. In addition, no single state/local government agency or non-profit group is responsible for the implementation of the plan, rather, it will be the responsibility of all watershed stakeholders, citizens included, to achieve the bacteria reductions required to meet water quality standards.

Please don't hesitate to contact me with any questions and feel free to pass this email along to friends, neighbors, and colleagues you think might be interested.

Best Regards,

Margaret Smigo
VA DEQ Piedmont Regional
TMDL Coordinator
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Visit the VA DEQ Website

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

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Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

August 8, 2011

Mr. Christopher Pomeroy
General Counsel for VAMSA/VAMWA
P.O. Box 51
Richmond, VA 23218

Dear Mr. Pomeroy,

DEQ greatly appreciates your comments submitted on behalf of the Virginia Municipal Stormwater Association (VAMSA) and the Virginia Municipal Wastewater Association (VAMWA) for the James River and Tributaries – City of Richmond the draft Implementation Plan (IP).

Your comments included the following 6 themes:

1- The draft IP's estimated cost of $884Mil is too expensive.

2- The uses of waterbodies should be considered prior to TMDL development.

3- The IP schedule should be eliminated or revised to include 5 10-year phases with the option to accelerate if funding is available.

4- Wildlife is not accounted for in the IP but is a significant source.

5- Use of residential BMPs in the plan at an estimated cost of $455Mil will be difficult to implement and are primarily aimed at volume/sediment/nutrient reduction versus bacteria reduction.

6- Development of individual TMDLs doesn't facilitate coordination at a local level and costs within the IP are too large for localities to consider incorporating into TMDL compliance budgets.

DEQ has the following responses based on the above summarization of your comments above:

1- The IP incorporates costs for the entire watershed. While the cost to implement all of the BMPs in the plan is high, the cost to implement Stage I ($14,581,600) is considered reasonable. The size of the watershed (289,470 acres) and the number of impairments (11 streams) should also be taken into consideration when considering the overall cost. Additionally, the IP is based on a TMDL with conservative estimates meaning that it is possible, that through adaptive management, some BMPs may never need to be implemented. DEQ will rely on water quality monitoring to track our progress, therefore, the de-listing of impaired waterways will guide implementation efforts. It is also important to note that a large proportion of the total cost of the plan includes the City of Richmond's estimated costs to meet the bacteria load reductions (which are required in order to meet the TMDL) within the Gillie Creek and Almond Creek CSO watersheds. The City's estimated costs for storage within the CSO watersheds (primarily Almond and Gillie Creek) were estimated at $300Million and are figures which were supplied to DEQ. DEQ trusts the City of Richmond used their best available judgment and resources to estimate these values. In addition, percent reductions in the TMDL were set to result in zero violations of the water quality standard for each impaired waterbody, as required by EPA. The waterbodies will be de-listed when violations reach 10.5 percent or less. BMP costs in the watersheds may be significantly less than projected, especially in Gillie Creek. The CoR and DEQ estimated approximately $50 million may be a more accurate dollar figure for meeting the required bacteria reductions in Gillie Creek.

2- Virginia DEQ believes that all waterbodies should support the recreational (primary contact) designated use. The Creeks in the TMDL and IP show evidence of this use.

3- The plan schedule can be revised as needed. The timeline included was recommended but is not mandatory and is meant to serve as a guideline for obtaining measurable progress. Please see Section 2.2 of the IP: EPA outlines that a timeline for implementation be included in all IPs. In order to comply with EPA guidelines for the IP, and when funding sources are available, the implementation of the IP proceeds to meet all standards/requirements/guidelines from possible funding agencies. A timeline is an important tool to guide the Steering Committee (SC) during the implementation process. The Steering Committee should reconvene every 5 years to look at BMP installation progress as well as water quality results. The SC can identify how many of each BMP have been installed and can compare those installations with instream bacteria results.

4- Wildlife contributions of bacteria are considered as background loads. VA DEQ is not the purview agency for wildlife and relies on the state's Dept. of Game and Inland Fisheries to determine which wildlife populations are in need of control. This is done based on their surveys and information from the public. DGIF has informed us that there is a wildlife management plan in the City of Richmond to control nuisance populations. Wildlife bacteria loads are acknowledged in the IP and wildlife management options were included should the localities be interested in that approach. The presence of human waste in surface waters has the greater likelihood of causing human illness during recreation within that water body. Because wildlife bacteria are ubiquitous and indigenous, anthropogenic sources are the targets in implementation plans for reducing bacteria. While many have claimed that wildlife sources are the "big" problem in this project watershed, the TMDL reductions for wildlife bacteria were far lower than other TMDLs which have been approved in Virginia.

5- The inclusion of the residential/urban BMPs was in response to the need to further reduce dog bacteria in the watershed. Many citizen members of working groups and the steering committee strongly suggested including urban type BMPs in the Plan aimed at residential stormwater flow reductions, which can also benefit the reduction of bacteria, nutrients, and sediment. They are effective because they diminish the stormwater runoff from residential lands which are frequently deposited with pet and wildlife fecal material. Reducing those flows should in turn reduce the amount of those sources entering the waterways. In this urban setting where runoff water volume is a large problem, especially with the presence of the CSO, DEQ believed it paramount to include many "volume" reducing BMPs. By removing some of the stormwater volume, we would also expect to reduce the nutrients, sediment, and bacteria which would be picked-up by the runoff as it travels to the nearby impaired waterbodies. While it may be more difficult to obtain buy-in of BMPs on these un-regulated, privately-owned properties, it is not impossible to do. This effort can be facilitated by incentives by the localities and education. This in turn, should also help achieve bacteria, sediment, and nutrient reductions in the localities' own MS4s and the CSO. While this IP is intended for reductions of bacteria specifically, the same efforts will also provide beneficial reductions to help meet the Bay TMDL goals as well.

6- Separate reduction calculations were derived for each of the impaired waterbodies. While some would argue one calculation could have been developed for the riverine segments and one for the tidal segment, because this was such a large watershed with variables like the CSO, it is believed that the individual loadings provided us with more information about the sources in each watershed and how best to target remedial efforts. We also believe that the overall IP effort was a very great example of collaboration between the counties, localities, citizens, and watershed groups involved. While the time frame was short, a great deal of communication occurred and through the establishment of an online forum and continued dialogue, we believe that coordination through the implementation phase will continue.

Again, DEQ thanks you for your comments and appreciates your participation. Your comments along with DEQ's response will be included with the final IP presented to the SWCB for review.

Best Regards,

Margaret Smigo

Margaret Smigo
VA DEQ
Piedmont Regional TMDL Coordinator

Cc: Please forward this response to VAMSA and VAMWA Members