



## Richmond Area Bacteria TMDL for James River and its Tributaries

### Reasonable Grounds Documentation to Conduct a Recreational Use Attainability Analysis for Gillies Creek, City of Richmond, Virginia under VAC 62.1-44.19:7

**Submitted To:**  
Virginia Department of Environmental Quality and  
Virginia State Water Control Board

**Submitted By:**  
City of Richmond

August 24, 2010





# Reasonable Grounds Documentation

**Section 1 - Introduction / Background ..... 1-1**

1.1 General ..... 1-1

1.2 Purpose..... 1-1

1.3 Background..... 1-2

1.4 Water Quality Standards Coordination Process..... 1-8

1.5 Project Statement..... 1-8

1.6 Use Attainability Analysis Process ..... 1-11

1.7 Development of a Use Attainability Analysis and TMDL Implementation Plan..... 1-11

**Section 2 - Legal Standards for Designated Use Changes (40 CFR 131.10 and 9 VAC 25-260-10) ..... 2-1**

2.1 General ..... 2-1

2.2 Downstream Uses: 40 CFR 131.10 (b) and 9 VAC 25-260-10 C. .... 2-1

2.3 Attainable Uses Defined: 40 CFR 131.10 (d) and 9 VAC 25-260-10 E. .... 2-1

2.4 Existing Uses: 40 CFR 131.10 (g) & (h) and 9 VAC 25-260-10 H & I ..... 2-1

**Section 3 - 9 VAC 25-260-10 H. Use Change Factors ..... 3-1**

3.1 General ..... 3-1

3.2 Natural or Intermittent High Flow Conditions (Factor 2) ..... 3-2

3.3 Hydrologic Modifications (Factor 4) ..... 3-2

3.4 Substantial and Widespread Economic and Social Impacts (Factor 6)..... 3-2

**Section 4 - Next Steps..... 4-1**



## Reasonable Grounds Documentation

### Section 1 - Introduction / Background

#### 1.1 General

The Virginia Department of Environmental Quality (“DEQ”) has prepared the James River bacteria TMDL (“Bacterial Total Maximum Daily Load Development for the James River and Tributaries-City of Richmond”). The purpose of this TMDL was to establish a total maximum daily load, or a pollution budget, 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, Powwhite, and Reedy).

The City of Richmond (“City” or “Richmond”) has been an active participant to this proceeding since it began in 2006. Richmond has been pleased to provide monitoring data to DEQ, to attend all of the TMDL meetings, and to participate in a dialogue with DEQ and its contractor regarding the details of this TMDL. DEQ staff has been very helpful as Richmond has attempted to unravel and understand this very complicated document. This reasonable grounds document provides support for the City’s view that such a UAA study is necessary, and formally requests that the State Water Control Board (“Board”) approve public notice of a UAA consistent with the Virginia Code.

#### 1.2 Purpose

Virginia Code § [62.1-44.19:7](#) provides a process for evaluating the attainability of designated uses. The code section reads as follows:

*If an aggrieved party presents to the Board reasonable grounds indicating that the attainment of the designated use for a water is not feasible, then the Board, after public notice and at least 30 days provided for public comment, may allow the aggrieved party to conduct a use attainability analysis according to criteria established pursuant to the Clean Water Act and a schedule established by the Board. If applicable, the schedule shall also address whether TMDL development or implementation for the water should be delayed.*

Virginia Code § [62.1-44.19:7](#) contemplates that the proponent of a UAA will offer justification to the Board to support an opportunity for public review. The Board will allow for a UAA where the statutory mandate for reasonable grounds is satisfied. The UAA must comply with relevant regulatory criteria. A UAA may support an amendment of designated uses and/or the criteria assigned to protect those uses.



## Reasonable Grounds Documentation

The City of Richmond, Virginia would appreciate the opportunity to conduct a UAA with regard to the recreational use of the paved channel portion of Gillies Creek. This document outlines the various factors that may prevent attainment of the designated Primary Contact Recreational use in the paved channel portion of Gillies Creek. The City respectfully submits that this document, with the factors listed herein, meets the “reasonable grounds” standard required by Virginia Code § 62.1-44.19:7. Thus, the Board may allow a UAA. The City would note that the UAA is only a study. This UAA study would be used to justify a new designated use, define a subcategory of a use or develop conditions for a temporary use removal within the paved channel portion of the Gillies Creek.

### 1.3 Background

Gillies Creek begins in Henrico County, Virginia and flows into the City of Richmond, Virginia as shown in **Figure 1**. Gillies Creek is tributary to the tidal portion of James River, which is approximately a half a mile downstream of the fall line. The portion of Gillies Creek within the City of Richmond is served by a combined sewer system. This is part of the original wastewater system, formed in the late 1800’s, which was comprised of combined sewer pipes that carry both sanitary sewage and runoff from storms to Gillies Creek. The City constructed an interceptor system, along the banks of the James River and its tributaries, to convey the sanitary sewage to the City of Richmond Wastewater Treatment Plant (“WWTP”).

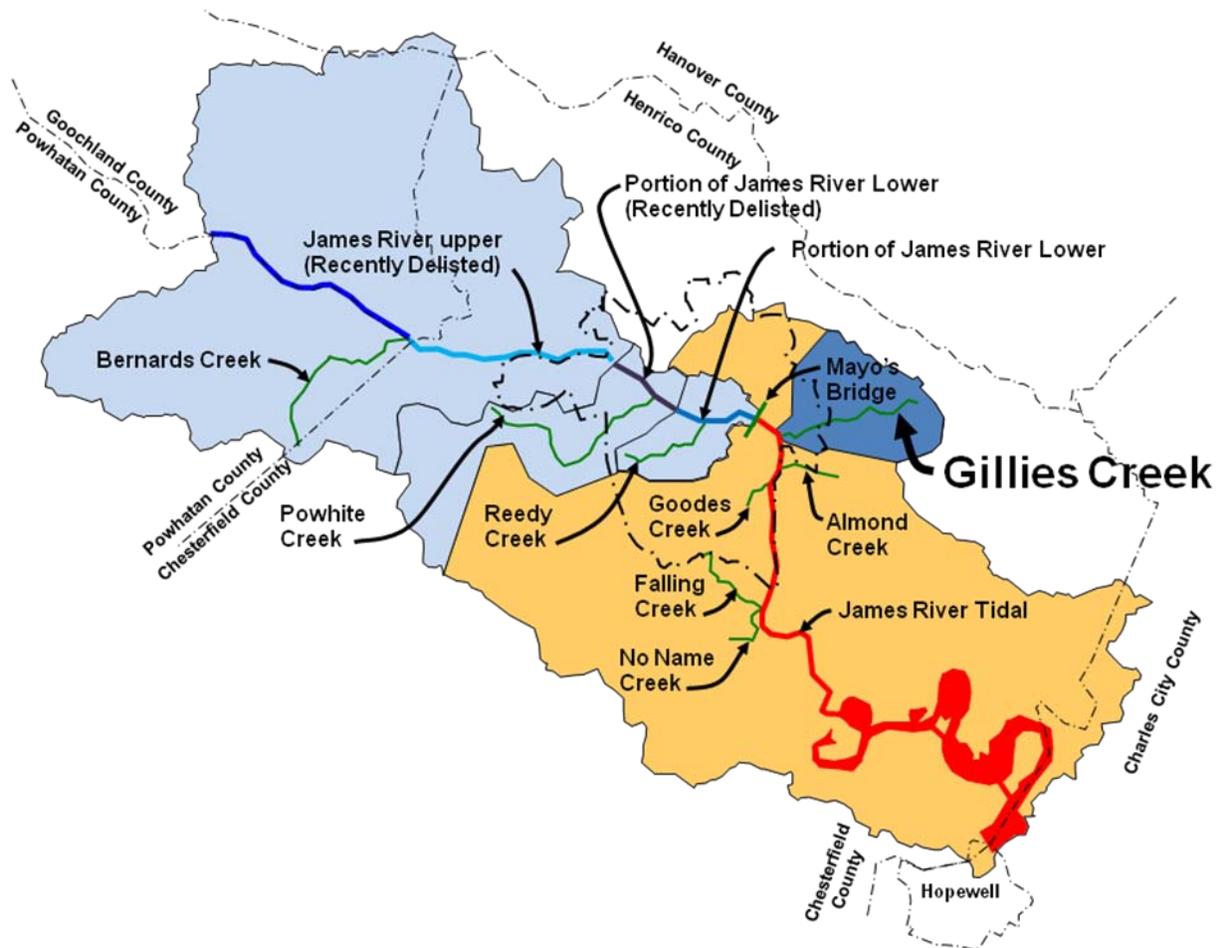
In contrast with other large cities served by combined sewer systems, Richmond has been proactively studying and alleviating combined sewer overflows (CSOs) for more than 40 years. The City’s first study on the Richmond CSO system was conducted in 1970. In 1988 the City completed a comprehensive CSO study defining the Long-Term Control Plan (“LTCP”) for CSOs that discharge into the James River and Gillies Creek. The City of Richmond has completed two phases of its CSO Control Plan, which have significantly improved James River water quality. To date, the City has made an investment of \$242 million dollars funded largely by its ratepayers, which has resulted in more than doubling the percentage of James River miles meeting bacteriological water quality standards (34% prior to CSO Control to 70% after Phase II CSO controls for the Richmond area and 20 miles downstream). The City has complied with all of the CSO Special Order requirements, including the last requirement to re-evaluate the last phase of its CSO Control Plan and to develop an LTCP after completion of the Phase II CSO controls.



## Reasonable Grounds Documentation

The City updated the CSO LTCP in January 2002, and identified a range of control alternatives. The selection of the preferred alternative was based on EPA’s knee-of-the-curve analysis, which is an “analysis to determine where the increment of pollution reduction achieved in the receiving water diminishes compared to the increased costs”. The CSO LTCP identified Alternative E as the knee-of-the-curve alternative as shown in **Figure 2**. The first inflection point at the Phase I and II CSO controls (Alternative B) represents the best and most cost effective CSO control improvements. Alternatives F and G are substantially more expensive than Alternative E and provide minimal additional benefit. Alternative E, shown in **Figure 3**, became the basis of the requirements in the City’s CSO Special Order by Consent.

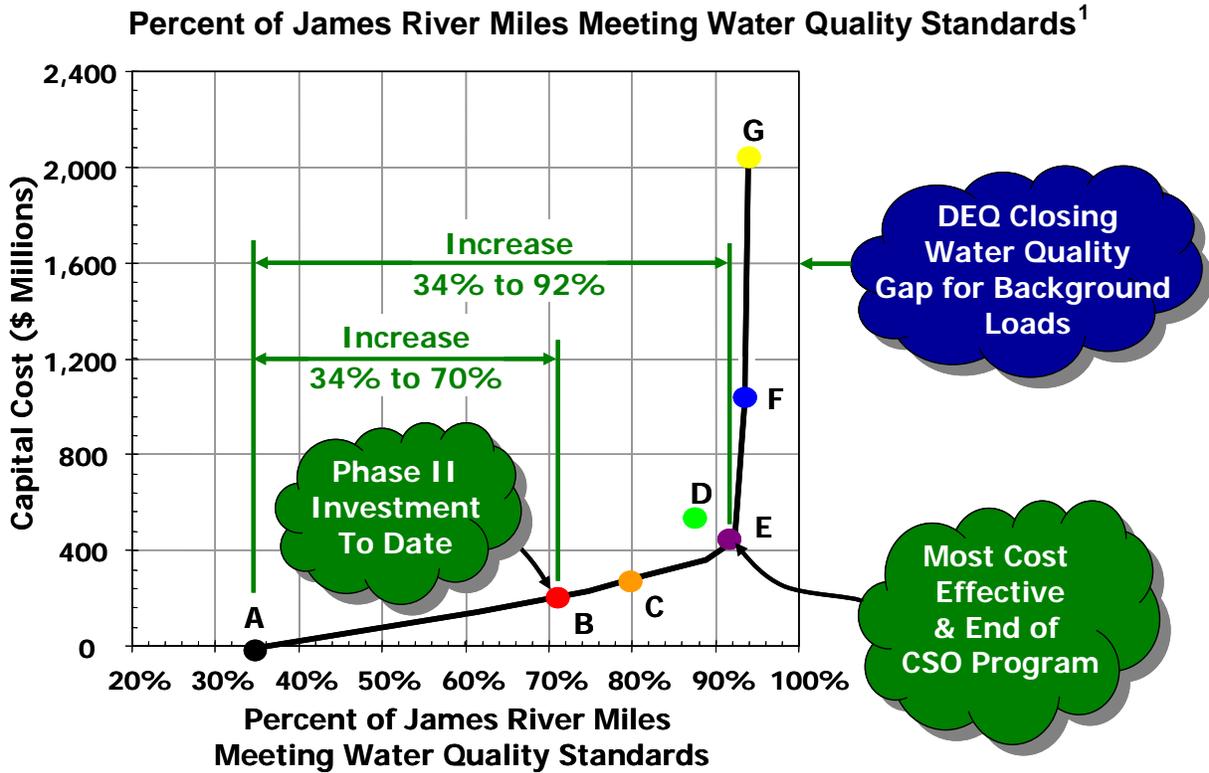
**Figure 1  
Gillies Creek Watershed**





# Reasonable Grounds Documentation

Figure 2

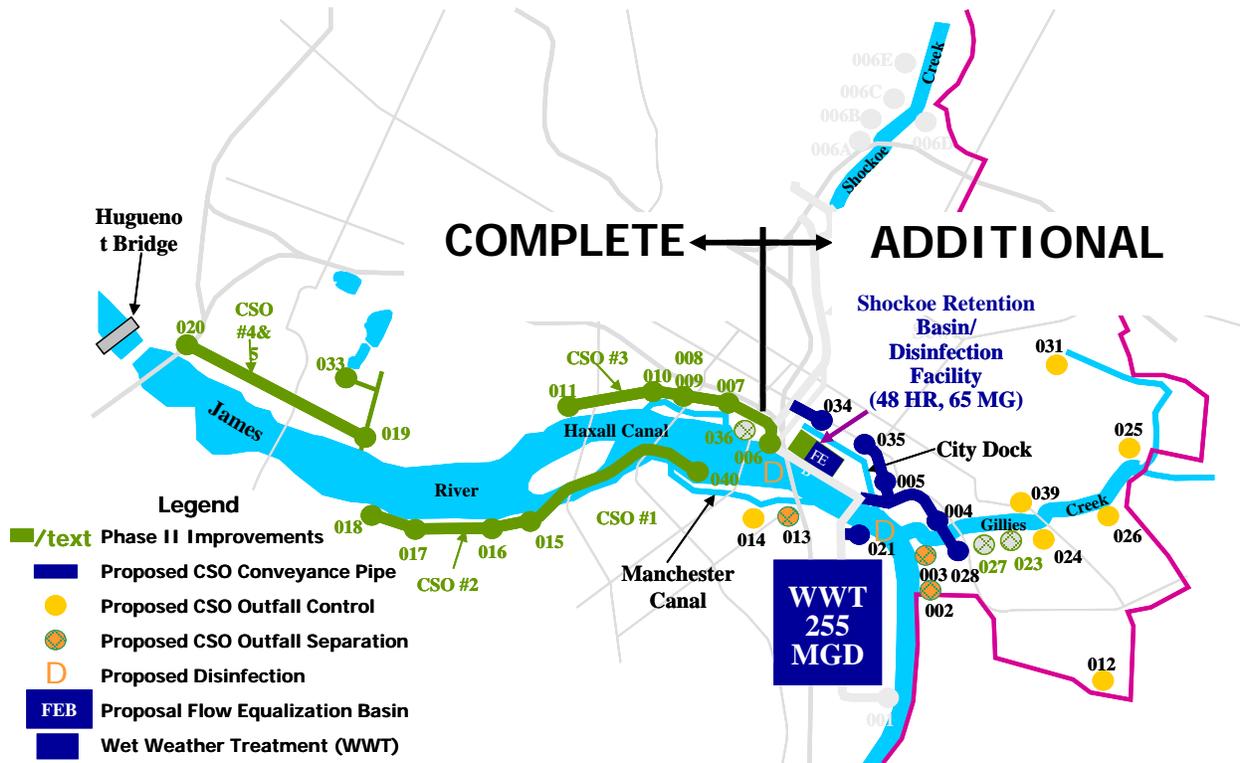


<sup>1</sup> Costs are presented in 2001 dollars. Compliance with water quality standards was based on a fecal coliform geometric mean of 200 cfu/100mL, which was the water quality standard at the time of the update to the City's LTCP.



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**Figure 3**  
**Alternative "E"**



Within the City limits, Gillies Creek is a trapezoid concrete channel. It was installed in 1974 as a part of the Fulton Bottom Urban Renewal Project. The base flow in the concrete channel is measured in inches and during rainfall events the flow tends to rise rapidly. **Figure 4** shows the extent of the Gillies Creek within the City limits. The normal dry weather flow in Gillies Creek is limited to the shallow "V" section of the concrete channel and is typically less than about 2" deep as shown in **Figures 5 through 7**.

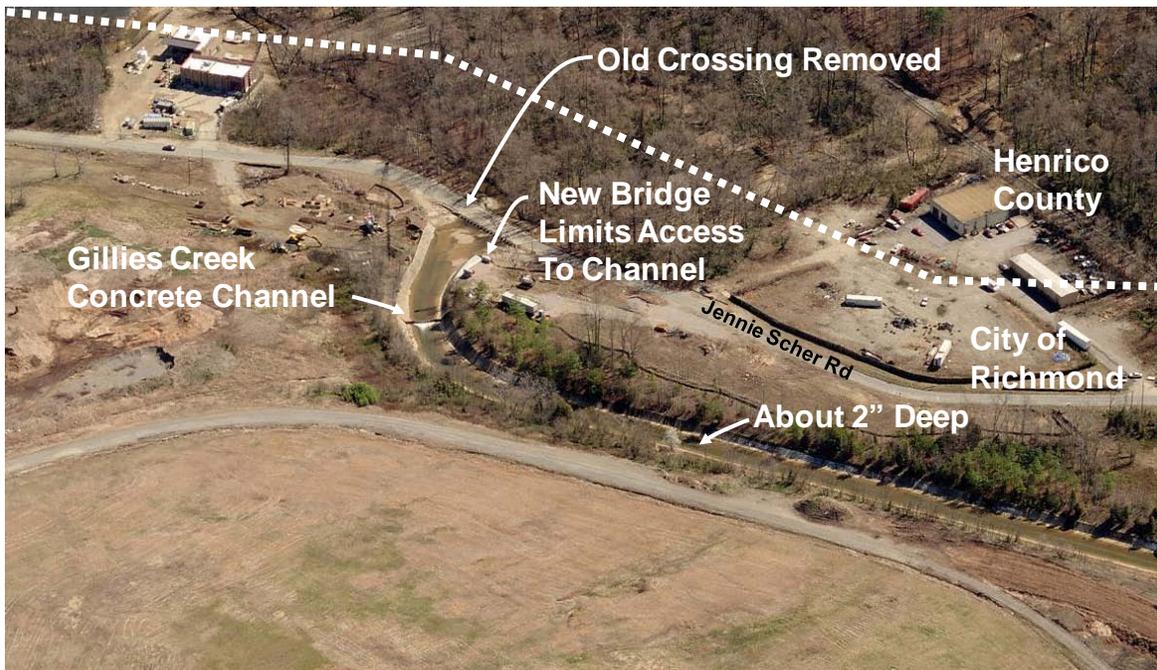


## Reasonable Grounds Documentation

**Figure 4**  
**Gillies Creek Concrete Channel**



**Figure 5**  
**Gillies Creek Concrete Channel at City Border**





## Reasonable Grounds Documentation

**Figure 6**  
**Gillies Creek Concrete Channel at Government Road**



**Figure 7**  
**Gillies Creek Concrete Channel at James River**





## Reasonable Grounds Documentation

### 1.4 Water Quality Standards Coordination Process

The 1994 CSO Policy (Policy) requires CSO communities to develop a Phase II CSO permit. The Policy requires that Phase II CSO permits be developed *“Once the permittee has completed development of the long-term CSO control plan and the selection of the controls necessary to meet CWA requirements that have been coordinated with the permitting and WQS authorities, the permitting authority should include, in an appropriate enforceable mechanism, requirements for implementation of the long-term CSO control plan as soon as practicable.”* Currently, the City has developed a CSO LTCP that identifies a range of control alternatives. It is important to note this work shows that not even a complete separation of the combined sewer system would result in compliance with the bacteriological water quality standards in the James River. The CSO LTCP identified Alternative E as the knee-of-the-curve alternative (**Figure 2** above), which became the basis of the requirements in the City’s CSO Special Order by Consent. 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<sup>2</sup>.

### 1.5 Project Statement

The EPA’s CSO Control Policy (CSO Policy) states that *“a primary objective of the long-term CSO control plan is to meet WQS”* (see CSO Policy at Section III.A). We understand that DEQ and the Board would normally prefer to wait until additional controls are implemented and monitored prior to initiating a Use Attainability Analysis study. However, the CSO Policy requires that the City develop and the Board approve a LTCP that demonstrates *“the planned control program is adequate to meet WQS and protect designated uses, unless WQS or uses cannot be met as a result of natural background conditions or pollution sources other than CSOs;”* and *“the CSO discharges remaining after implementation of the planned control program will not preclude the attainment of WQS or the receiving waters’ designated uses or contribute to their impairment. Where WQS and designated uses are not met in part because of natural background conditions or pollution sources other than CSOs, a total maximum daily load, including a wasteload allocation and a load allocation, or other means should be used to apportion pollutant loads”* (see CSO Policy at Section II.C.4.b.i and ii).

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<sup>2</sup> As defined in Section III of the CSO Policy.



## Reasonable Grounds Documentation

The bacteria TMDL for Gillies Creek indicates that additional CSO controls are required beyond those identified in Alternative “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*”. The CSO Policy states that “*the planned control program will provide the maximum pollution reduction benefits reasonably attainable*” (see CSO Policy at 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*” (see CSO Policy at Section II.C.4.b.iv). However, the CSO Policy does not allow a LTCP to be developed or approved that does not meet water quality standards.

The City is requesting that a Use Attainability Analysis be conducted by the City concurrent with the Implementation Plan development to provide the City the opportunity to determine the if Gillies Creek paved channel CSO waste load allocations in the TMDL are “*reasonably attainable*”. The CSO Policy provides ample direction and guidance to States regarding the coordination with the water quality standards as follows:

- *“Development of the long-term plan should be coordinated with the review and appropriate revision of WQS and implementation procedures on CSO-impacted waters to ensure that the long-term controls will be sufficient to meet water quality standards”* (see CSO Policy at Section III.A)
- *“EPA regulations and guidance provide States with the flexibility to adapt their WQS, and implementation procedures to reflect site-specific conditions including those related to CSOs.”* (see CSO Policy at Section III.B)
- *“In determining whether a use is attainable and prior to removing a designated use, States must conduct and submit to EPA a use attainability analysis. A use attainability analysis is a structured scientific assessment of the factors affecting the use, including the physical, chemical, biological, and economic factors described in 40 CFR Section 131.10(g). As part of the analysis, States should evaluate whether the designated use could be attained if CSO controls were implemented.”* (see CSO Policy at Section III.B)



## Reasonable Grounds Documentation

In addition to questioning if the Gillies Creek paved channel CSO waste load allocations in the TMDL are “*reasonably attainable*”, the City questions whether the Primary Contact Recreation<sup>3</sup> designated use is appropriate when during dry periods where there is not a “*high probability for total body immersion or ingestion of water*” in this channel where the water is only inches deep. Additionally, the combined system does not discharge to Gillies Creek during dry weather and therefore would not contribute to any bacteria water quality standard exceedances that may occur during dry weather. The City also questions whether Primary Contact Recreation use is attained during wet weather when the velocity in the paved channel and rapid increase in the water’s depth make swimming or wading infeasible (a water depth of about 1 foot could sweep someone downstream if they attempted to wade in the channel). There is also limited access to the paved channel. The concrete sides of the channel are approximately 10 feet in height, which inhibits entering and exiting the channel.

The City of Richmond respectfully submits that the range of scenarios for Gillies Creek paved channel in the TMDL report could be used in a Use Attainability Analysis. These scenarios include Primary Contact Recreation (Scenario 7), Secondary Contact Recreation (Scenario 9b), and controls ranging from Alternative E (Scenario 6) to Alternative E plus 5 MG of additional storage (Alternative 11). These scenarios provide a bracket of options that will be further analyzed for their feasibility in the Implementation Plan.

If this UAA request is approved, the City would conduct a structured scientific assessment of Gillies Creek paved channel and the confluence with the James to examine the factors affecting the attainability of the use in the Gillis Creek paved channel. Unlike traditional water quality management (which focuses on pollutants), the UAA process would consider all factors affecting the stream, both pollutant and non-pollutant (such as hydraulic modifications to the Creek that make attainment of the designated use impossible). The UAA should also consider the social and economic costs associated with various restoration efforts in the watershed. UAAs help to confirm that the existing designated use is appropriate or to show the Board, DEQ and interested stakeholders that changes to the use or underlying water quality criteria may be needed.

The UAA proposed for the paved channel portion of Gillies Creek will be relatively simple, as compared to other larger, more complex UAA studies. UAAs have been performed in other states such as Kansas, New York, Alaska, and the Los Angeles paved channels in California. Our UAA study would not presuppose the need for changes to the existing designated uses. It will, however, identify and assess non-pollutant factors that may prevent attainment.

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<sup>3</sup> “Primary contact recreation means any water-based form of recreation, the practice of which has a high probability for total body immersion or ingestion of water (examples include but are not limited to swimming, water skiing, canoeing and kayaking).” (9VAC25-260-5 with emphasis added)



## Reasonable Grounds Documentation

### 1.6 Use Attainability Analysis Process

Performing a UAA is only the first step in a more extensive process that must be undertaken before a designated use can be changed or refined. EPA's Water Quality Standards Handbook includes guidance on how and when a designated use may be removed or modified, which would be fully documented in the UAA. These steps are summarized as follows:

- **Step 1 – Is the Use Existing?:** An existing use “means those uses actually attained in the water body on or after November 28, 1975, whether or not they are included in the water quality standards.”
- **Step 2 – Is the Use Specified in the Clean Water Act?:** Section 101(a)(2) states that “it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983.”
- **Step 3 – Is the Use Attainable?:** EPA allows a state to adjust activities within a specified use category, but may not change a use that requires less stringent criteria, unless the state can demonstrate that the designated use cannot be attained using the factors in 40 CFR 131.10(g).
- **Step 4 – Is a Factor from 131.10(g) met?:** EPA indicates that “even after the previous steps have been considered, the designated use may be removed, or subcategories of a use established, only under the conditions given in section 131.10(g).”
- **Step 5 – Provide Public Notice:** The UAA is a formal process. Section 131.10(e) requires states to provide notice and the opportunity for a public meeting.

As a part of the UAA study, the City would identify existing uses, assess factors preventing use attainment, and determine the highest use attainable (use attainable after the implementation of all reasonable and cost-effective management practices). A use change may be permissible if the 40 CFR 131.10(g) factors indicate that the designated use cannot be attained.

### 1.7 Development of a Use Attainability Analysis and TMDL Implementation Plan

If the Board approves, the City would perform the UAA for the paved channel portion of Gillies Creek, which is proposed to be concurrent with the DEQ's development of the TMDL Implementation Plan. The City anticipates participating in the development of the TMDL Implementation Plan actively, and as a lead stakeholder. The UAA may be conducted independent of, yet parallel to, TMDL Implementation.



## Reasonable Grounds Documentation

### Section 2 - Legal Standards for Designated Use Changes (40 CFR 131.10 and 9 VAC 25-260-10)

#### 2.1 General

Virginia's regulations, specifically 9VAC25-260-10, explain how a designated use may be changed. Those regulations list the issues to be addressed if designated uses are created or modified. The City suggests that the following 9VAC25-260-10 issues will likely be most critical for purposes of our UAA.

#### 2.2 Downstream Uses: 40 CFR 131.10 (b) and 9 VAC 25-260-10 C.

The TMDL Implementation Plan will be needed to complete the evaluation of the James River at the confluence with Gillies Creek to continue to document that the downstream water quality standards are maintained. The UAA will need to document the influence of Gillies Creek on the James River. Based on the preliminary information provided in the TMDL report, the two preliminary models prepared by DEQ show that no additional CSO controls beyond Alternative E are required to meet the water quality standards in the James River. The City will continue to work with DEQ to evaluate the additional monitoring data being collected to verify the extent of the influence of Gillies Creek on the James River. The UAA will determine the relative impact of Gillies Creek on the James River recreational use and ensure that the designated use is protected.

#### 2.3 Attainable Uses Defined: 40 CFR 131.10 (d) and 9 VAC 25-260-10 E.

A designated use cannot be changed if the designated use is realistically attainable with pollution controls (effluent limits or cost-effective and reasonable BMPs for non-point sources). This will need to be evaluated in the UAA study.

#### 2.4 Existing Uses: 40 CFR 131.10 (g) & (h) and 9 VAC 25-260-10 H & I

A designated use cannot be changed if it is an existing use. As noted above, an existing use is any use that has actually been attained in a water body on or after November 28, 1975. The UAA for the paved channel portion of Gillies Creek will be designed to determine the existing uses, as well as the highest attainable uses. The UAA will also be designed to determine whether site-specific criteria may be necessary.



## Reasonable Grounds Documentation

### Section 3 - 9 VAC 25-260-10 H. Use Change Factors

#### 3.1 General

Virginia's regulations allows for a change in a designated use if attainment is not feasible because of one or more of the following six factors:

*“H. The board may remove a designated use which is not an existing use, or establish subcategories of a use, if the board can demonstrate that attaining the designated use is not feasible because:*

- 1. Naturally occurring pollutant concentrations prevent the attainment of the use;*
- 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;*
- 3. Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;*
- 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;*
- 5. Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or*
- 6. Controls more stringent than those required by § 301(b) and 306 of the Clean Water Act would result in substantial and widespread economic and social impact.”*

Richmond provides the following sections regarding the factors relevant to the paved channel portion of Gillies Creek and how our proposed UAA study will address each.



## Reasonable Grounds Documentation

### 3.2 Natural or Intermittent High Flow Conditions (Factor 2)

The City questions whether the Primary Contact Recreation<sup>4</sup> designated use is appropriate when during dry periods there is not a “*high probability for total body immersion or ingestion of water*” in this channel where the water is only inches deep. Additionally, the combined system does not discharge to Gillies Creek during dry weather and therefore would not contribute to any bacteria water quality standard exceedances that may occur during dry weather. The City also questions whether Primary Contact Recreation use is attained during wet weather when the velocity in the paved channel and rapid increase in the water’s depth make swimming or wading infeasible (a water depth of about 1 foot could sweep someone downstream if they attempted to wade in the channel). There is also limited access to the paved channel. The concrete sides of the channel are approximately 10 feet in height, which inhibits entering and exiting the channel.

### 3.3 Hydrologic Modifications (Factor 4)

Gillies Creek is a paved channel as shown in Error! Reference source not found., and is absolutely unique in the James River watershed. There is no other creek or waterway like it. Not only is the entire length that runs through the City concrete on the bottom and sides (no grass, no rocks), but the function is unlike any other creek in the watershed. Gillies Creek was designed in 1973 to efficiently convey floodwaters to the James River. The paved channel stopped the pre-existing stream from meandering, and was also designed to prevent stream erosion from carrying sediment downstream to the James River. Because it mitigates natural flooding, the channel protects public and private property, such as roads, railroad and buildings. The UAA will need to determine if the Gillies Creek trapezoid concrete channel precludes the attainment of the use, and if it is feasible to restore the waterbody to its original condition or to operate the modification in such a way that would result in the attainment of the use. The UAA would further investigate any uses of the Creek, and confirm any limitations on that use that are the result of the underlying construction and structure of the paved channel.

### 3.4 Substantial and Widespread Economic and Social Impacts (Factor 6)

Adding additional management structures to the Gillies Creek paved channel would be costly, and could, therefore, have significant economic and social impacts. The City has preliminary data that indicates the City would have to construct a storage facility (tunnel) large enough to reliably reduce the overflow volume by 95%. A 29.2 million gallon storage facility would be required to capture 95% of the overflow volume for the largest storm event in a typical 5 year period. This would translate into the capture 99.8% of all storms in 5 years. Only 2

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<sup>4</sup> “Primary contact recreation means any water-based form of recreation, the practice of which has a high probability for total body immersion or ingestion of water (examples include but are not limited to swimming, water skiing, canoeing and kayaking).” (9VAC25-260-5 with emphasis added)



## Reasonable Grounds Documentation

storms in the five year modeling period would result in an overflow of the storage tunnel. In other words, the storage tunnel would only be used to its full capacity once every 5 years (on average). This exceeds the level of control that was anticipated by EPA's CSO Control Policy. Additionally, WWTP facilities may be needed and new annual O&M cost will be required to empty the tunnel in a two day dewatering period consistent with the current VPDES permit.

The capital cost of the tunnel would be about **\$300 million**, which is beyond the improvements identified in the City's CSO LTCP. With the operation and maintenance costs included, the tunnel would add about \$25 per month to the average wastewater bill. The average wastewater bill is currently about \$45 per month, which would be increased to \$70 per month (a 55% increase). The City's customers already pay some of the highest wastewater bills in Virginia. The Gillies Creek tunnel would be added to the other environmental improvements that EPA and DEQ have indicated that are required to meet the water quality standards in the James River and the Chesapeake Bay, which include:

- Phase III CSO LTCP Improvements<sup>5</sup>: **\$500 million**
- Nutrient reductions from Richmond WWTP for Chesapeake Bay: **\$130 Million**
- Separate Stormwater Improvements: **\$500 million**

These dollar figures do not include the costs to renew the wastewater pipelines in the City, which include some sewers that were installed at the turn of the 20<sup>th</sup> century (1900s). Additionally, although the City objects strenuously to the suggestion, EPA has indicated as a part of the Chesapeake Bay TMDL that additional nutrient controls to the WWTP and from the separate stormwater areas may be required to meet the chlorophyll "a" water quality standard, which could add **\$30 million** and **\$250 million** to the nutrient reductions already required for the WWTP and Stormwater Utility, respectively. Therefore, an additional \$300 million of improvements to Gillies Creek beyond the City's CSO LTCP should be thoroughly studied in the UAA to determine the reasonableness of costs versus the benefit.

As a part of the UAA process, Richmond will investigate cost and cost-effectiveness for various scenarios for the Creek to determine whether these factors will impact attainment of the designated use. The Implementation Plan should also refine the assumptions used in the model to define the performance and costs for possible additional improvements for the various options.

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<sup>5</sup> The City has completed Phases I and II of the CSO LTCP, which cost approximately \$242 million. Thus the total cost of the CSO LTCP after Phase III would be about \$742 million.



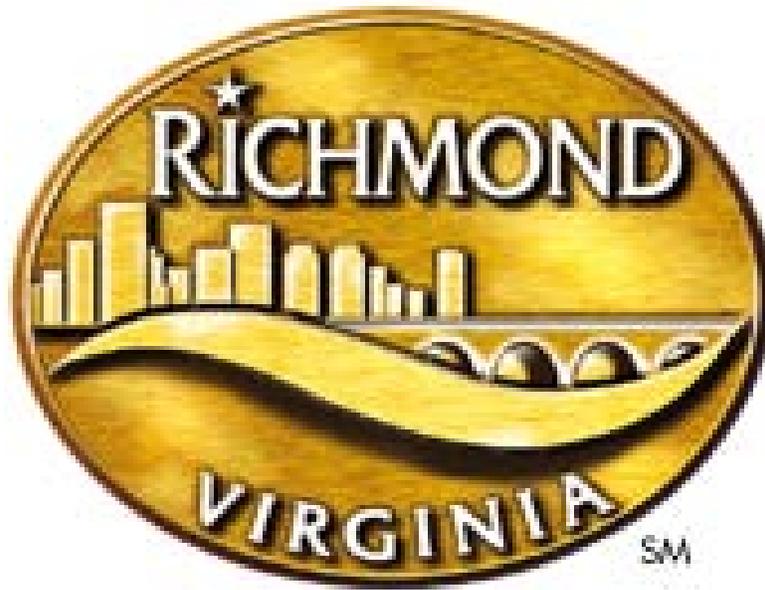
## Reasonable Grounds Documentation

### Section 4 - Next Steps

We understand that DEQ and the Board would normally prefer to wait until additional controls are implemented and monitored prior to initiating a Use Attainability Analysis study. However, the CSO Policy does not allow an LTCP to be developed or approved that does not meet water quality standards. The City is requesting that a Use Attainability Analysis be conducted by the City concurrent with DEQ's Implementation Plan development to provide the City the opportunity to determine if the Gillies Creek paved channel CSO waste load allocations in the TMDL are "*reasonably attainable*" in accordance with the Water Quality Standards coordination provisions in Section III of the CSO Policy. Note the EPA's CSO Control Policy and the Order requires the Board to complete the Water Quality Standards Coordination Process to show that the controls in the approved LTCP do not cause or contribute to the exceedance of the water quality standards.

The next step will be for DEQ to conduct the Bacteria TMDL Implementation Plan, to identify the performance of best management practices and provide cost-effectiveness data based on input from stakeholders. The TMDL Implementation Plan would support the development of the UAA for the paved channel portion of Gillies Creek. The City is truly trying to make the most appropriate investments to improve the water quality in our local waterways. Large CSO storage facilities do not lend themselves to phasing opportunities. 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.

Therefore, the City requests that the Board approve a 30-day notice-and-comment period to receive comments on a potential UAA for Gillies Creek. Once comments are received and answered, and the City will prepare a final version of this document for presentation at the December 2010 Board meeting. At that meeting, the City will formally request that the Board vote to authorize the City to proceed with the UAA. If the Board authorizes the UAA, the City will work with the DEQ to develop an appropriate process for developing the study that will be brought back to the Board.



**GREELEY AND HANSEN**