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# Implementing State and Federal Stormwater Mandates in a New Stormwater Utility and Old CSO Long Term Control Plan

Presented to the NACWA 2011 Winter Conference Panel:

*Stormwater, The New Regulatory Framework*

Bob Steidel, City of Richmond Virginia Department of Public Utilities

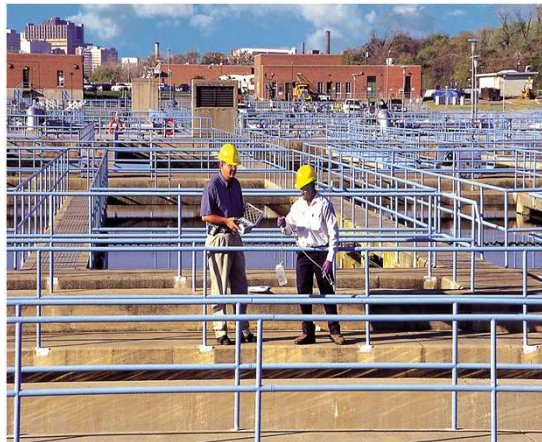
February 2 2011

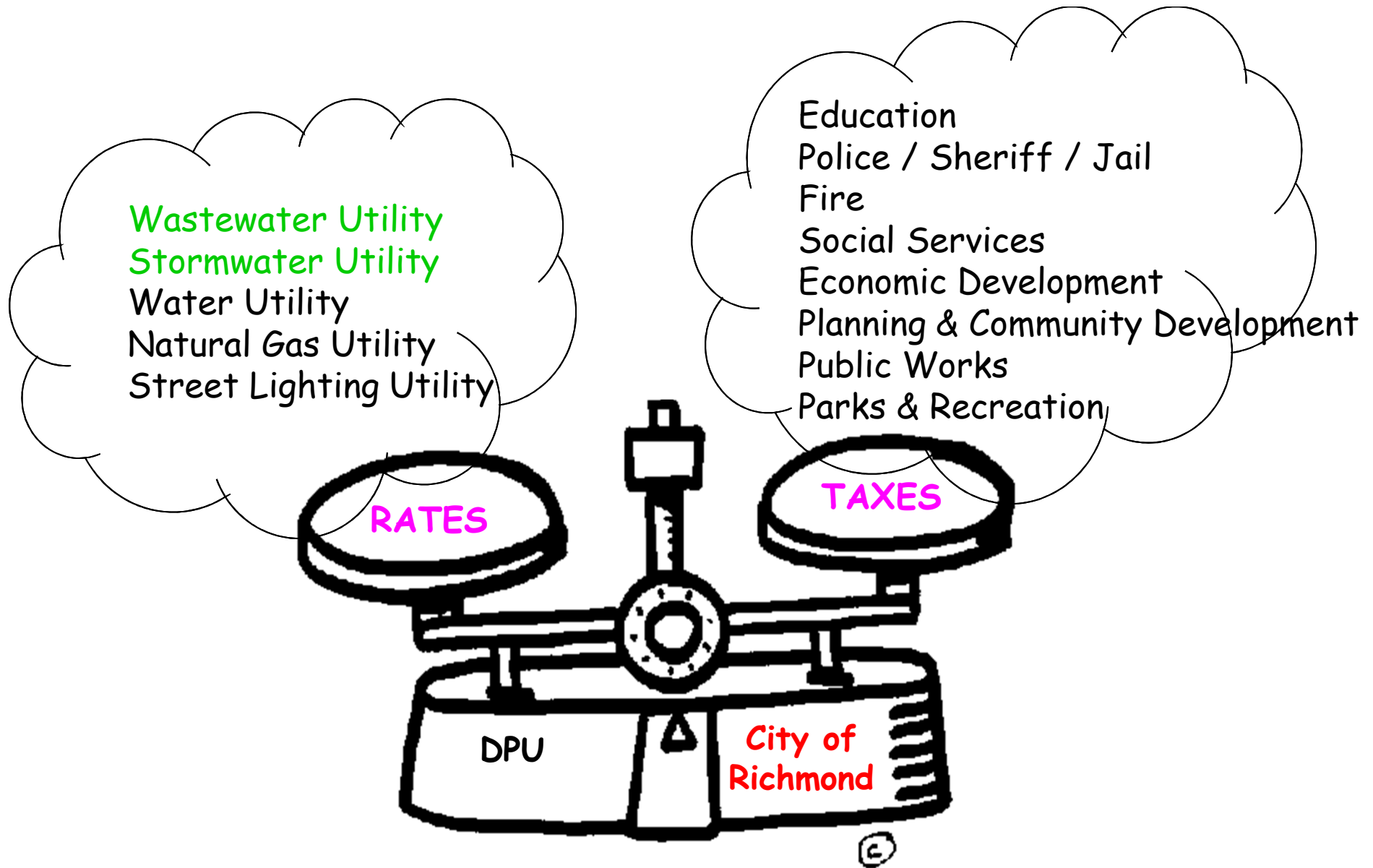
# City of Richmond

- Vision: ***Tier One City***
- Mission: ***Building a Better Richmond***
- Strategic planning focus:
  - Unique and inclusive communities and neighborhoods
  - Economic growth
  - Community safety and well-being
  - Transportation
  - Education and workforce development
  - Sustainability and the natural environment
  - Well-managed government



# Department of Public Utilities





Nitrogen  
Phosphorus  
Sediment

Combined Sewer System

Separate Sanitary Sewer System

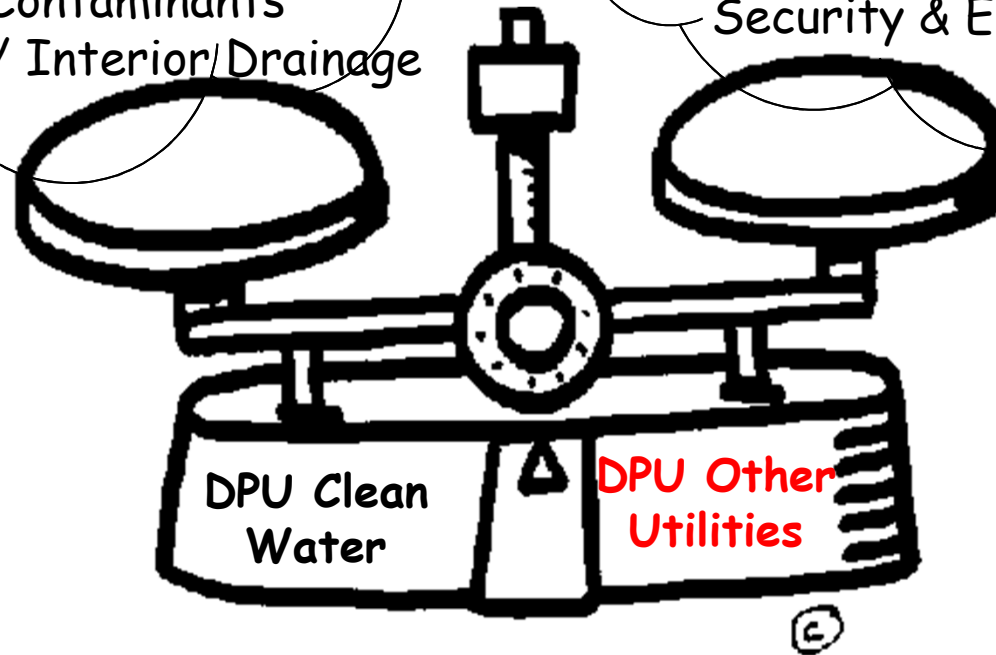
Separate Storm Sewer System

Sewage Sludge

Emerging Contaminants

Floodwall / Interior Drainage

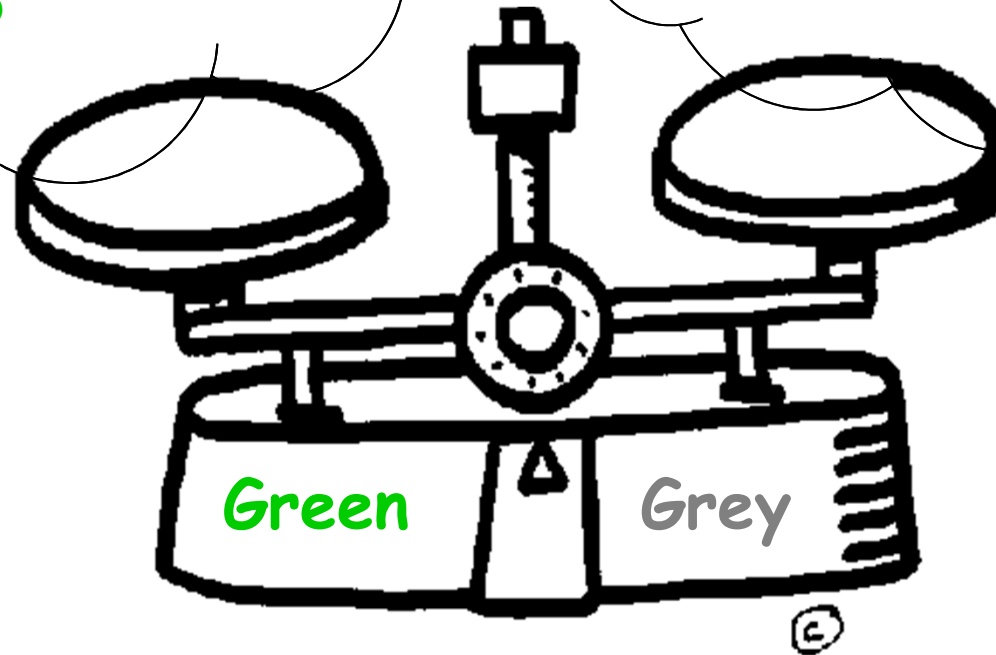
Drinking Water Source Protection  
Drinking Water Treatment and  
Distribution  
Water Supply  
Natural Gas  
Street Lighting  
Customer Service  
Security & Emergency Management



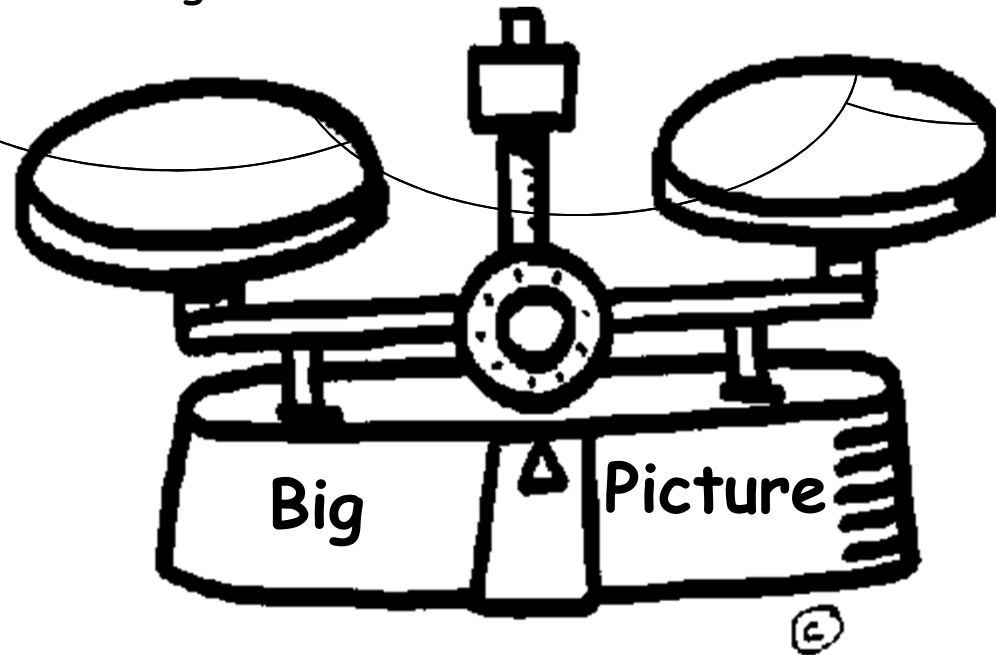


Rain garden, rain barrel, planter  
Filter strip  
Infiltration trench / basin  
Permeable pavement  
Bioretention  
Cisterns  
Filterra©  
Bacterra©

Inflow & infiltration reduction  
In-line storage  
Off-line storage  
Wet weather treatment  
Roof drain disconnection



Unique, Healthy and Inclusive Communities and Neighborhoods  
Economic Growth  
Community Safety and Well-Being  
Transportation  
Education and Workforce Development  
Sustainability and the Natural Environment  
Well-Managed Government



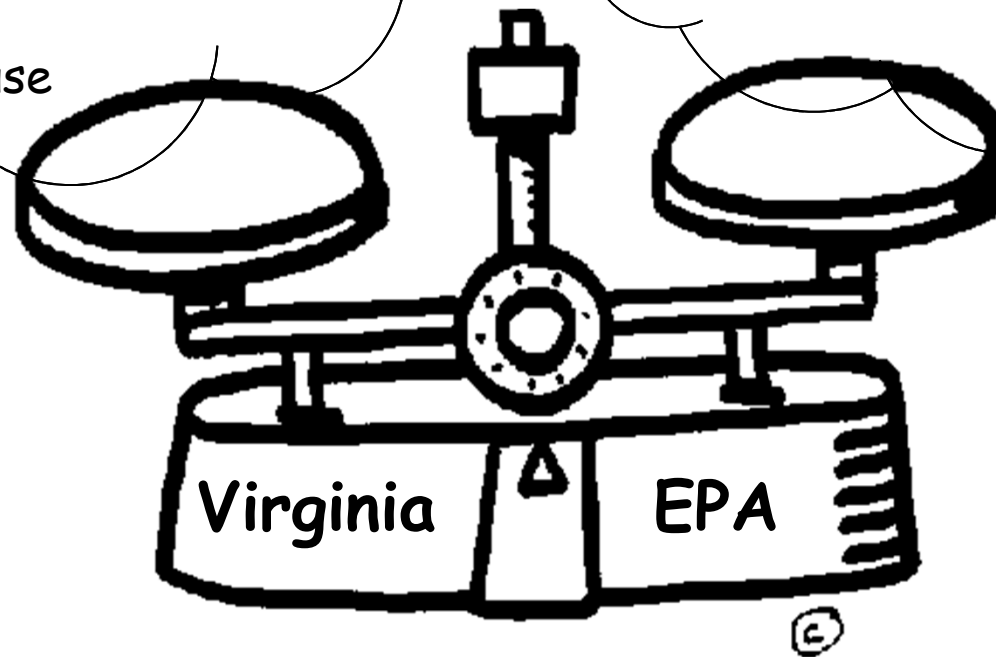
# City of Richmond Stormwater Utility

- Established July 2009
- Reduce quantity and increase quality
- CIP and O&M
- Drainage
- Erosion & sediment control
- Flooding and floodplain
- TMDLs: nitrogen, phosphorus, e coli, PCB
- Watershed master plan



MS4 permit / VSMP  
Erosion & Sediment Control  
Chesapeake Bay land disturbance  
Chesapeake Bay Watershed  
Implementation Plan (WIP)  
Industrial stormwater  
TMDLs  
Dams  
Water reuse

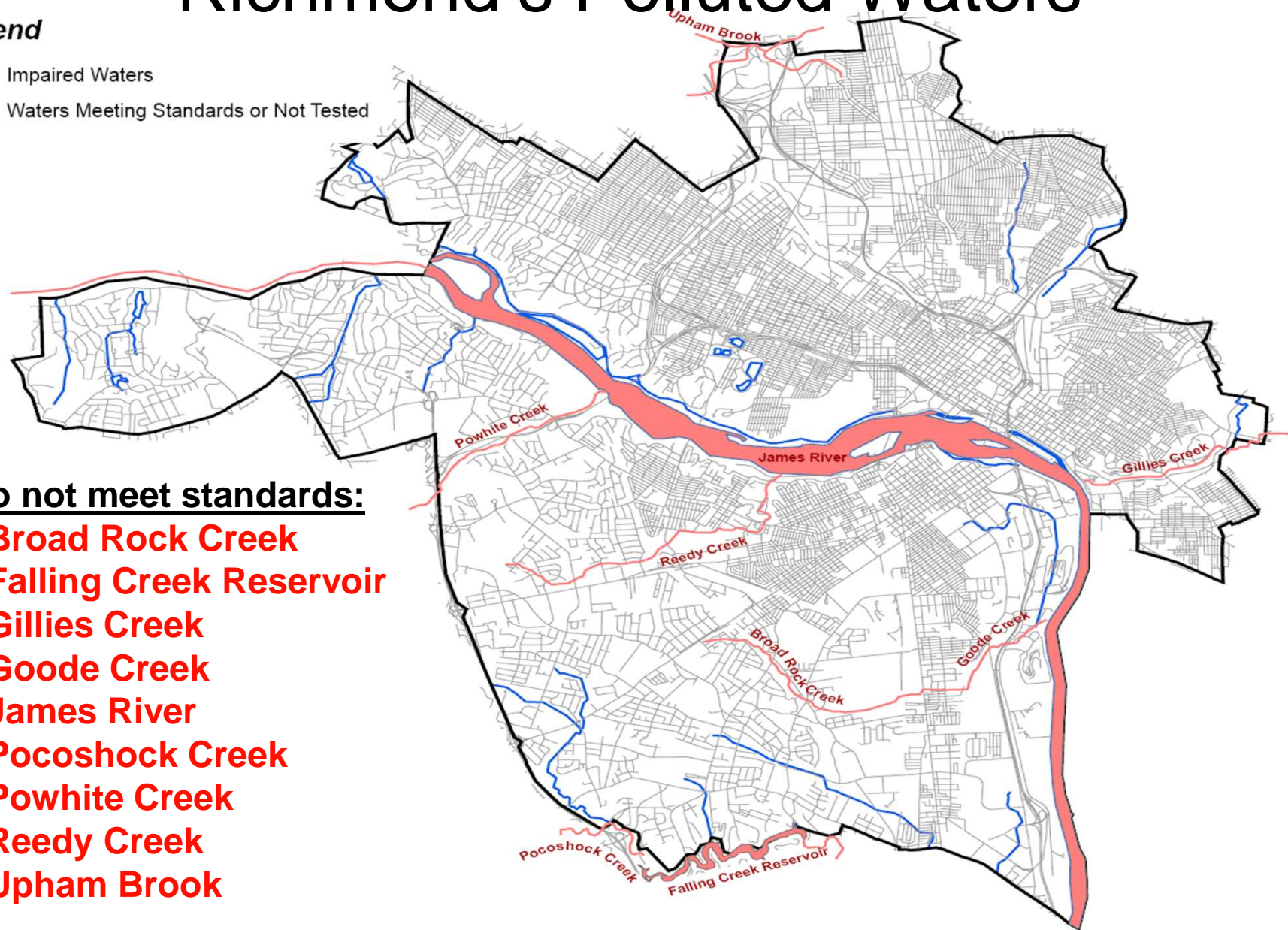
NPDES  
Stormwater guidance  
Stormwater construction  
Pretreatment program, stormwater  
illicit discharge detection and  
elimination  
TMDLs



# Understanding Stormwater Richmond's Polluted Waters

## Legend

- Impaired Waters
- Waters Meeting Standards or Not Tested

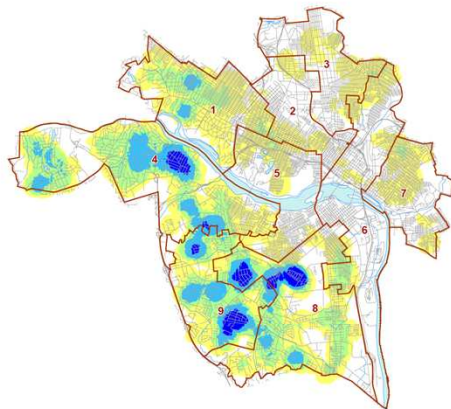


## Do not meet standards:

- Broad Rock Creek
- Falling Creek Reservoir
- Gillies Creek
- Goode Creek
- James River
- Pocoshock Creek
- Powwhite Creek
- Reedy Creek
- Upham Brook

# Richmond Times Dispatch Editorial

## Monday, July 6, 2009



### Legend

Drainage Complaint Intensity

- Low Intensity
- Low-Medium Intensity
- Medium Intensity
- Medium-High Intensity
- High Intensity
- Rivers & Streams

### UTILITIES

## Smart Billing

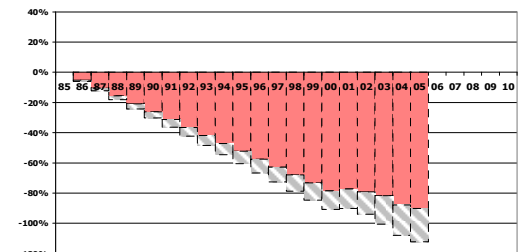
A little more than a year ago, the Wilder administration and the City Council backed off a proposed stormwater fee to underwrite infrastructure projects, many of which the council killed off for financial reasons. This year the council decided it could put matters off no longer, and adopted a budget that included a stormwater fee.

City residents have received brochures. In a few weeks, they'll receive the bills, which typically will run in the neighborhood of \$50 for the year. Businesses will have to shell out, too.

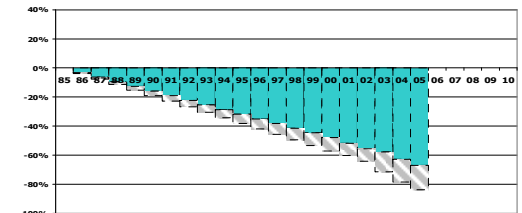
Although we're not in the habit of cheering taxes and fees, this one makes sense. The fee is based on the amount of impervious surface per property, and the money collected will go to the upkeep of stormwater drop inlets, ditches, catch basins, and so on. That marks an improvement over the practice of paying for these projects out of the general fund, under which the amount paid bore no relation to the amount of runoff from a property.

Like other localities, Richmond is under mandate to improve its stormwater system. The changes will help improve the health of the Chesapeake and forestall federal intervention in that regard. As the system matures, we'd like to see it incorporate incentives for owners who adopt measures — rain barrels, rain gardens, grassy swales, and so forth — that reduce runoff in environmentally friendly ways. Rewarding residents and businesses for taking such steps would make a smart system even smarter.

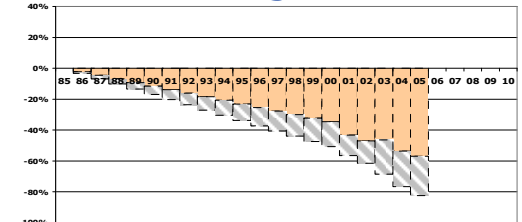
### Controlling Nitrogen



### Controlling Phosphorus



### Controlling Sediment



# Department of Public Utilities:

## New regulations estimated costs

Stormwater Utility	\$500 - \$800 million in new infrastructure \$300 - \$700 SWU fee / year for homeowner
Wastewater Utility	Additional \$30 million to the \$150 million in new infrastructure 4% rate increase WWU fee / year for 20 years for new infrastructure alone
Economic Development	Added cost to developers for Economic Development and Community Revitalization Economic impacts and competition for development between Richmond and surrounding counties as well as Virginia and non-Bay states



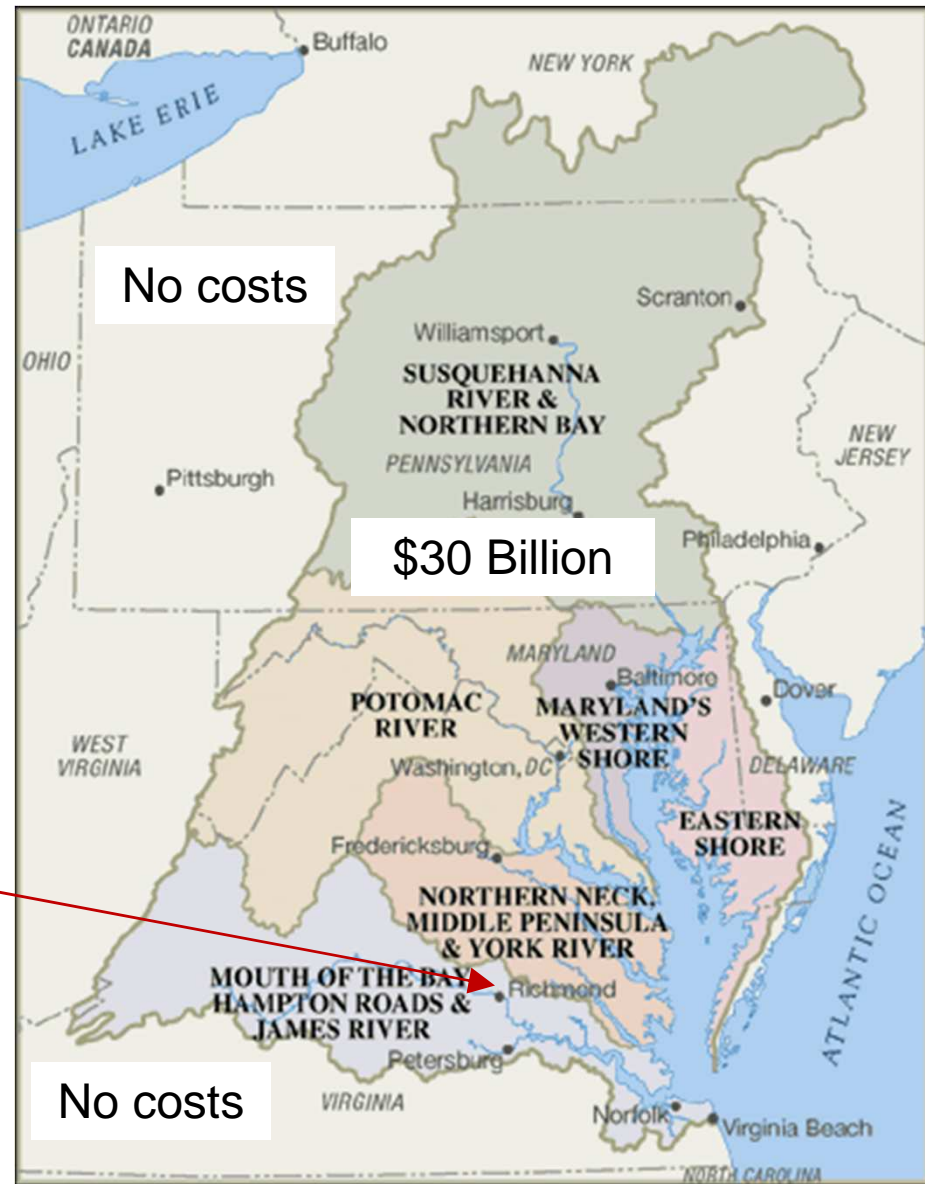
# Bay Pollution Cap Impact on Economic Development

- Wastewater: Disadvantage for economic development because plant output capped and the threat for unused design capacity to be taken away
- Stormwater: remove 50% of the rooftops, streets and sidewalks or pay for equivalent level of treatment in the City to meet E3 levels (everyone, everything, everywhere)
- Economic Development: Costs will result in financial disincentive to locate in Bay Watershed

The Chesapeake Bay Watershed includes 6 States and D.C.

EPA is Mandating a Cleaner Bay Through the Chesapeake Bay TMDL (Total Maximum Daily Load)

Richmond is on the tidal freshwater portion of the James River





# Trading between the City Wastewater and Stormwater Allocations

This red area represents the wastewater allocation for nutrients for Richmond

The wastewater technology at Richmond will achieve a TN concentration of 8 ppm and TP concentration of 0.5 ppm

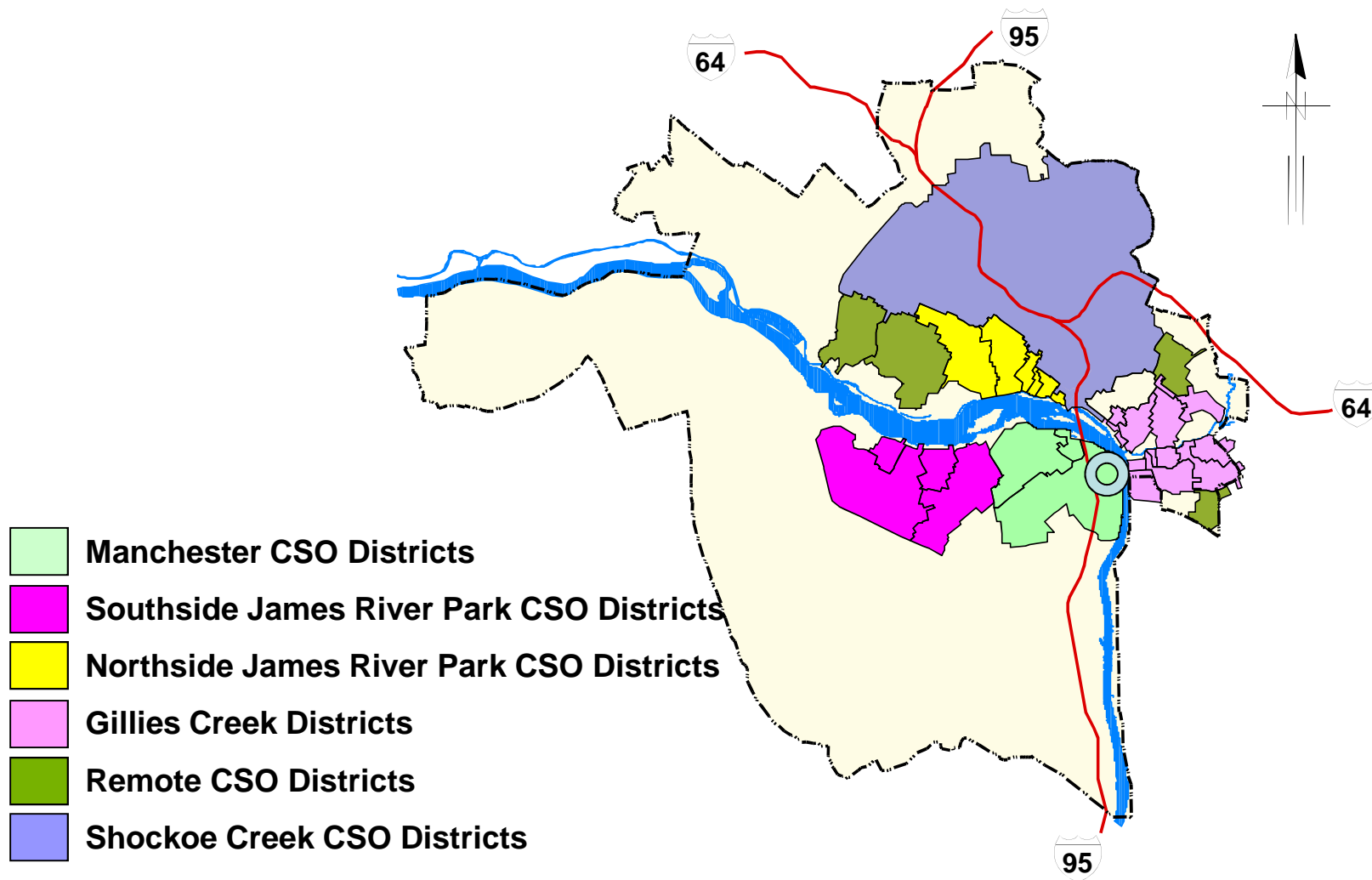
And now the WWTP must achieve a TN concentration of 6 ppm and TP concentration of 0.4 ppm

This red area represents an additional 2 ppm TN and 0.1 ppm TP that could be removed at the WWTP using more chemicals and power

This blue area represents the stormwater allocation for nutrients for Richmond

The stormwater technology at Richmond will achieve TN and TP pound reductions using technology that is more a management practice than a biological treatment process

# Location of CSO Areas



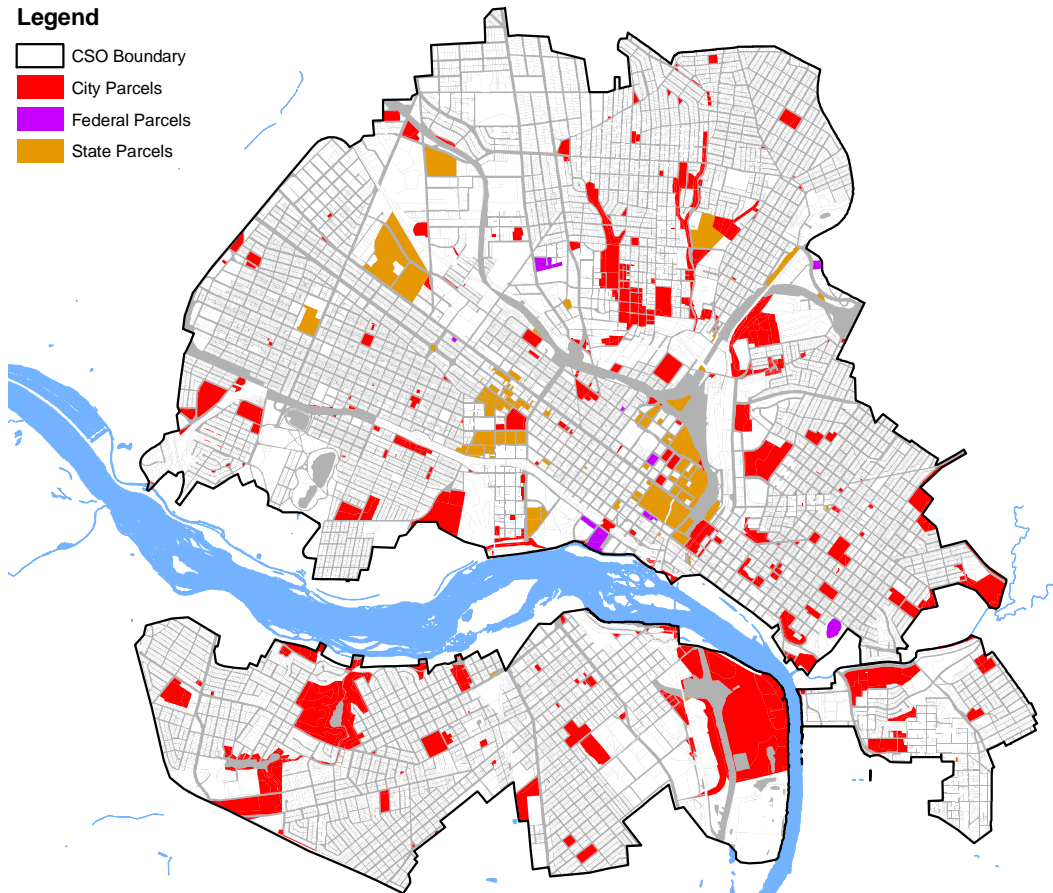
# CSO Phase III Program Project Plan

## Estimated Capital Cost & Schedule

Special Order Req't	Project Description	Preliminary Estimate of Construction Schedule		Preliminary Estimated Range of Capital Cost in 2006 dollars (in thousands)	
		Start	End		
1	Disinfection Pilot Study		Jun-05	\$700	\$700
2	Phase III - Program Project Plan		Dec-06	\$4,300	\$4,300
3	Solids and Floatable Control for CSO Outfall No. 024	Jul-07	Feb-09	\$1,600	\$2,000
4	Solids and Floatable Control for CSO Outfall No. 026	Jul-07	Feb-09	\$1,600	\$1,900
5	Solids and Floatable Control for CSO Outfall No. 025	Jul-07	Feb-09	\$1,500	\$1,800
6	Fulton Bottom Urban Renewal Separation Project	Jul-09	Feb-11	\$1,100	\$1,300
7	Maury Street Separation Project	Jul-10	Feb-12	\$800	\$1,000
8	Orleans & Nicholson Street Separation Project	Jul-11	Feb-13	\$1,000	\$1,200
9	Peripheral In-Line Flow Equalization at Oakwood	Jul-12	Feb-14	\$6,500	\$7,800
10	Solids and Floatable Control for CSO Outfall No. 012	Jul-13	Feb-15	\$4,000	\$4,800
11	Solids and Floatable Control for CSO Outfall No. 014	Jul-14	Feb-16	\$1,700	\$2,100
12	Solids and Floatable Control for CSO Outfall No. 039	Jul-15	Feb-17	\$1,600	\$1,900
13	Lower Gillies Creek Conveyance	*	*	\$30,100	\$36,100
14	WWF at the WWTP: WWF Treatment up to 140 mgd	*	*	\$10,500	\$12,600
15	WWF at the WWTP: Wet Weather Disinfection Facilities Project	*	*	\$100,600	\$120,700
16	WWF at the WWTP: Expand Secondary WWF Treatment Project	*	*	\$37,600	\$45,100
17	SRB: Adapt Existing Basin for Pass Through WWF Project	*	*	\$30,100	\$36,200
18	SRB: Shockoe Retention Basin 15 MG Expansion Project	*	*	\$85,500	\$102,600
19	SRB: Shockoe Wet Weather Disinfection Facility Project	*	*	\$31,600	\$38,000
PHASE III CSO CONTROL PLAN TOTAL				\$352,400	\$422,100

Note: (1) Based on December 2006 ENR Construction Cost Index of 7,888

# Richmond CSO Area Land Use

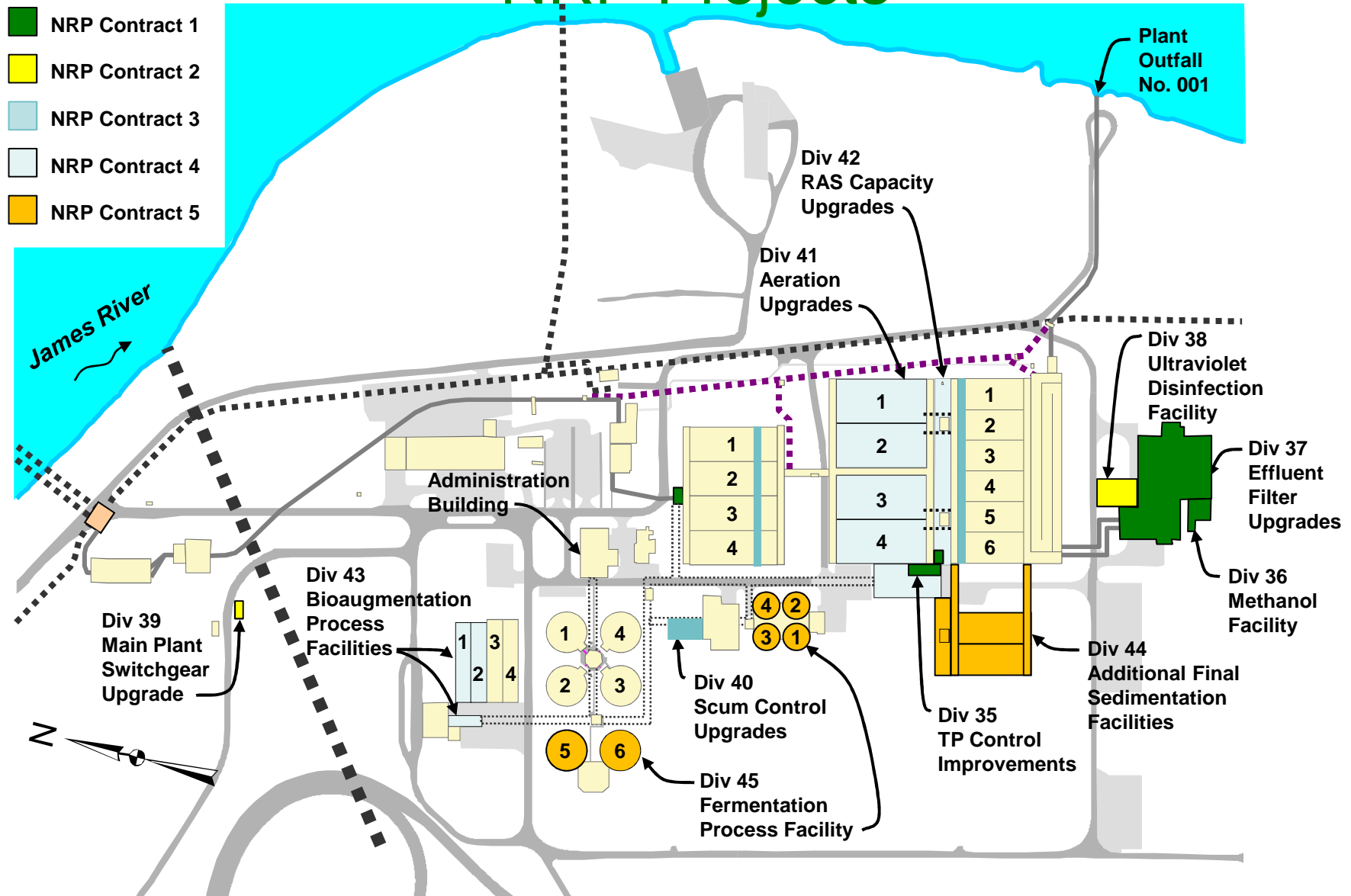


# Percent of Pollutant Reduction and Cost by BMPs for Richmond CSO Area

Land Category	Annual Average Reduction by BMPs				BMP Cost Estimate
	Total Phosphorus	Total Nitrogen	TSS	Runoff Volume Reduction	
CSO Area Overall	9%	9%	10%	6.5% (365 MG <sup>1</sup> )	\$75,700,000
Right-of-Way	17%	17%	19%	11% (215 MG <sup>1</sup> )	\$51,300,000
City Owned Land	30%	31%	33%	27% (75 MG <sup>1</sup> )	\$12,100,000
Federal Owned Land	42%	43%	45%	37% (6 MG <sup>1</sup> )	\$1,100,000
State Owned Land	43%	44%	45%	38% (60 MG <sup>1</sup> )	\$11,200,000
Private Owned Land	N/A	N/A	N/A	N/A	N/A

# Richmond WWTP

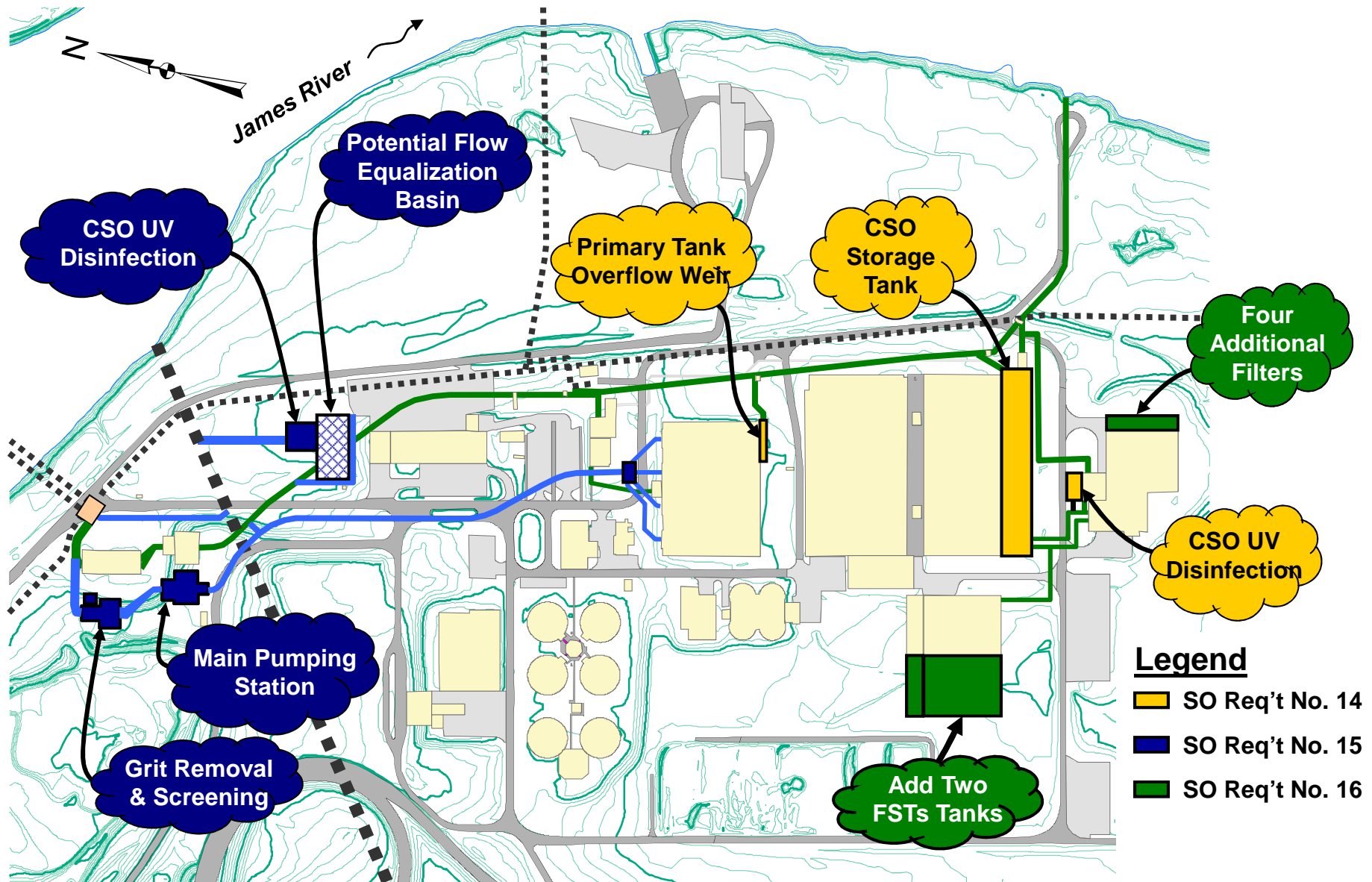
## NRP Projects





## Section 8: Wet Weather Flow Treatment at WWTP

### Requirement No. 16: Expand Secondary Treatment



*"There is but one entrance by sea into this country, and that is at the mouth of a very goodly bay, 18 or 20 miles broad. The cape on the south is called Cape Henry, in honor of our most noble Prince. The land, white hilly sands like unto the Downs, and all along the shores rest plenty of pines and firs ... Within is a country that may have the prerogative over the most pleasant places known, for large and pleasant navigable rivers, heaven and earth never agreed better to frame a place for man's habitation..."*

- Captain John Smith, 1612



# Discussion

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City of Richmond Department of Public Utilities –  
*“We Touch People’s Lives Every Day”*

*<http://www.richmondgov.com/departments/publicutilities/>*

Land Use	Percent of Area	Bioretention #2	Bioretention (Curbside Planters)	Dry Swale #2	Permeable Pavement #2	Infiltration Trench / Basin (For A&B Soil)	Filterra ®	Filter Strip	Rain Garden, Rain Barrel, Planter
Right of Way Impervious	18.0%	5%	10%	5%			5%		
Right of Way Pervious	7.7%	5%	10%	5%			5%		
Right of Way - Forest Cover	0.0%								
Municipal Owned Parking	0.7%	35%			5%				
Municipal Owned Driveway	0.4%	5%							
Municipal Owned Building	0.6%	20%							20%
Municipal Owned Pervious	5.4%	40%							
Municipal – Forest Cover	1.9%								
Federal Owned Parking	0.1%	45%			10%				
Federal Owned Driveway	0.0%	10%							
Federal Owned Building	0.0%	30%							30%
Federal Owned Pervious	0.1%	45%							
Federal – Forest Cover	0.0%								
State Owned Parking	0.5%	45%			10%				
State Owned Driveway	0.1%	10%							
State Owned Building	0.6%	30%							30%
State Owned Pervious	1.4%	45%							
State – Forest Cover	0.1%								
Townhouse, Apartment & Condominium Parking	1.4%								
Residential Driveway	1.0%								
Residential Building	8.2%								
Residential Pervious	28.3%								
Residential – Forest Cover	2.8%								
Commercial/Industrial Parking	5.9%								
Commercial/Industrial Driveway	0.9%								
Commercial/Industrial Building	5.8%								
Commercial/Industrial Pervious	6.3%								
Commercial/Industrial – Forest Cover	0.9%								

# Percent of Urban Land Treated by BMPs for Richmond CSO Area

Land Category	Bioretention #2	Urban Bioretention (Curbside Planters)	Dry Swale #2	Permeable Pavement #2	Infiltration Trench / Basin (For A&B Soil)	Filtterra ®	Filter Strip	Rain Garden, Rain Barrel, Planter	Total
CSO Area Overall	5.0%	2.6%	1.3%	0.1%	0.0%	1.3%	0.0%	0.3%	10.6%
Right-of-Way	5.0%	10.0%	5.0%	0.0%	0.0%	5.0%	0.0%	0.0%	25.0%
City Owned Land	28.3%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	1.2%	29.9%
Federal Owned Land	38.8%	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	5.4%	46.2%
State Owned Land	38.1%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	6.6%	46.5%
Private Owned Land	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A