Integrated Plan/ Regional Wet Weather Management Plan

Volume 1 - Integrated Plan
Volume 2 - Regional Wet Weather Management Plan

September 28, 2017

HRSD
Cleaning wastewater every day for a better Bay.

swift
Sustainable Water Initiative for Tomorrow

HRSD
Integrated Plan/Regional Wet Weather Management Plan

September 28, 2017

1434 Air Rail Avenue
Virginia Beach, VA 23455

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List of Acronyms and Abbreviations

AACE	Association for the Advancement of Cost Engineering
AAR	Alternatives Analysis Report
AB	Army Base Treatment Plant
ACS	American Community Survey
ADF	Average Daily Flow
ARP	Aquifer Replenishment Program
AT	Atlantic Treatment Plant
AWT	Advanced Water Treatment
BH	Boat Harbor Treatment Plant
CA/CI	Construction Administration and Inspection
CAP	Condition Assessment Plan
CCTV	Closed Circuit Television
CD	Consent Decree
CE	Chesapeake-Elizabeth
CHES	Chesapeake
CIP	Capital Improvement Program
CPH	costs per household
CWA	Clean Water Act
EA	each
EPA	Environmental Protection Agency
DEQ	Department of Environmental Quality
DSCR	Debt Service Coverage Ratio
DUC	Directors of Utilities
EOL	End of Line
eru	equivalent residential unit
FCA	Financial Capability Assessment
FCAR	Final Condition Assessment Report
FDP	Flow Documentation Point
FM	Force Main
FPR	Flow, Pressure and Rainfall
FPRM	Flow, Pressure and Rainfall Monitoring
fps	feet per second
FY	fiscal year
GIS	Geographic Information System
GM	Gravity Main
Gpad	gallon per acre per day
gpd	gallons per day
HAMP	Hampton
HGL	Hydraulic Grade Line
HHLD	Household
HHLDS	Households
HMA	Housing Market Area
HRPDC	Hampton Roads Planning District Commission
HRSD	Hampton Roads Sanitation District
HRTPO	Hampton Roads Transportation Planning Organization
HUD	Housing and Urban Development (Department of)
I/I	Infiltration/Inflow
ISI	Interim System Improvement
JCSA	James City Service Authority
JR	James River Treatment Plant
LF	Linear Feet
LHM	Locality Hydraulic Model
LOS	Level of Service
MACP	Manhole Assessment Certification Program
MG	million gallons
MGD	million gallons per day
MH	Manhole
MHI	Median Household Income
MOA	Memorandum of Agreement
MOM	Management, Operations, and Maintenance
MS4	Municipal Separate Storm Sewer System
MSA	Metropolitan Statistical Area
NA	Nansemond Treatment Plant
NASSCO	National Association of Sewer Service Companies
NEWP	Newport News
NORF	Norfolk
NS	North Shore
NSF	Non-Single Family
O&M	Operations and Maintenance
PACP	Pipeline Assessment Certification Program
PCAR	Preliminary Condition Assessment Report
PER	Preliminary Engineering Report

POQ	Poquoson
PORT	Portsmouth
PPFE	Preliminary Peak Flow Estimates
PRS	Pressure Reducing Station
PS	Pump Station
R/R	Rehabilitation/Replacement
RDII	Rainfall Derived Inflow/Infiltration
RHM	Regional Hydraulic Model
RI	residential indicator
RP	Rehabilitation Action Plan
RWWMP	Regional Wet Weather Management Plan
SA	Service Area
SCAT	Sewage Collection and Treatment
SDF	Spatial Distribution Factor
SOC	Special Order by Consent
SS	South Shore
SSES	Sanitary Sewer Evaluation Survey
SSO	Sanitary Sewer Overflow
SSORS	Sanitary Sewer Overflow Reporting System
STP	Sewage Treatment Plant
SUFF	Suffolk
SWIFT	Sustainable Water Initiative for Tomorrow
TDH	Total Dynamic Head
TMDL	Total Maximum Daily Load
TP	Treatment Plant
UIC	Underground Injection Control
UHM	Upstream Hydraulic Model
USGS	United States Geological Survey
VAB	Virginia Beach
VBMP	Virginia Base Mapping Program
VDEQ	Virginia Department of Environmental Quality
VDH	Virginia Department of Health
VIP	Virginia Initiative Treatment Plant
VPDES	Virginia Pollutant Discharge Elimination System
WB	Williamsburg Treatment Plant
WILL	Williamsburg
WIP	Watershed Implementation Plan
WWTP	Waste Water Treatment Plant
YR	York River Treatment Plant

Volume 1
Integrated Plan

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Section 1

Introduction

HRSD (the Hampton Roads Sanitation District) has prepared the following Integrated Plan that brings together the Sustainable Water Initiative for Tomorrow (SWIFT) and the Regional Wet Weather Management Plan (RWWMP). This volume (Volume 1) describes HRSD's SWIFT Program while Volume 2 covers the RWWMP. Volume 2 also includes an extensive background on the Consent Decree requiring the RWWMP and an overview of HRSD's system.

HRSD's plan is to prioritize SWIFT, along with a select list of High-Priority RWWMP Projects and a Pathogen Source Tracking Program, first because together they provide the greatest environmental and human health benefits. This approach of prioritizing Clean Water Act investments according environmental and human health benefits is at the heart of the US Environmental Protection Agency's (EPA) guidance on Integrated Planning.

EPA has encouraged the use of adaptive management approaches in a wide variety of settings. Adaptive management features iterative decision making to manage uncertainty in addressing municipal environmental challenges. This approach has been particularly necessary with long-term community sewer rehabilitation and related programs. Almost every such program has needed multiple major modifications. In addition to responding to changing community circumstances, adaptive management also allows communities to continually prioritize the greatest public health and community benefits for the next public dollar invested. Given the scope, cost, complexity, and evolving nature of the challenges which HRSD and the Hampton Roads region face, the RWWMP necessarily features an adaptive management approach.

There are a number of other adaptive management factors that create significant uncertainties (and opportunities) about any infrastructure investment plan that spans more than a decade. These uncertainties/opportunities include:

- The impact of sea level rise and recurrent flooding on the region's infrastructure, land use patterns and economy;
- Understanding the system response to almost $700 million in wet weather capacity-related investments and evaluation over the past ten years;
- Magnitude and spatial patterns of community growth and redevelopment;
- Future of the extensive Department of Defense (DoD) facilities in the Hampton Roads Region and HRSD priorities regarding these ubiquitous facilities throughout the service area;
- How effectively Locality and HRSD Management, Operations, and Maintenance (MOM) programs will address sewer system degradation and infiltration/inflow (I/I) levels;
- Regional economic vitality and household income and employment levels;
- Changing regional environmental and public health priorities, including post-implementation evaluation of the Chesapeake Bay TMDL (Total Maximum Daily Load) after the 2025 completion;
- Changing technologies and opportunities to achieve multiple benefits for public sewer-related investments; and,
- Levels of federal and State financial support for unfunded environmental mandates.

These uncertainties will have a profound effect on the location, volume, significance and priority of future wet weather capacity-related overflows. This will particularly be the case for the capacity-related investment currently projected for the 2030-2053 program implementation period.

As part of HRSD's Integrated Plan, six High-Priority RWWMP Projects will be constructed through 2030. These projects were selected based on their ability to provide the greatest environmental and human health benefits. Further, this $208 million investment will reduce SSO volume at the 5-year level of service by 47% - a significant reduction.

The economic stress on the residents of the region, coupled with ever-changing environmental priorities, necessitate an adaptive management approach to allow the region to make wise future investments through understanding and responding to the conditions as they exist in that future timeframe.

Accordingly, HRSD's plan features an Adaptive Regional Plan comprising four phases as follows:

Table 1-1. Four Phases of the Adaptive Regional Plan

Phase	Description	Timeframe	Cost
1	Planning, Interim System Improvements, Condition Assessment and Repairs, Rehabilitation Action Plan	2008 – 2025	$700,000,000
2	SWIFT Implementation, Pathogen Source Tracking and High-Priority Projects	2020 - 2030	$1,318,000,000
3	Re-evaluation and Preparation of a Final Remedial Measures Plan	2028 - 2030	$2,000,000
4	Implementation of the Final Remedial Measures Plan	2030 -	To be determined

Phase 1 includes the $700 million that HRSD will spend by 2025 in Interim System Improvements, Rehab Action Plan projects, Condition Assessment and repairs, and planning associated with the RWWMP. Then Phase 2 consists of the $1.1 billion SWIFT Program, the $208 million in High-Priority Projects, and $10 million in the Pathogen Source Tracking Program.

Following that work, Phase 3 is a re-evaluation assessment and preparation of a Final Remedial Measure Plan for the review and approval of EPA and the Virginia Department of Environmental Quality (DEQ). This phase will take place between 2028 and 2030 and will culminate in submittal of a Final Remedial Measures Plan by December 31, 2030. This will provide the critical adaptive management review period while the investments in Phase 2 are ongoing.

The Final Remedial Measures Plan may include implementation of the full suite of wet weather projects identified in Volume 2, identification and implementation of a more limited sub-set of projects providing the greatest environmental benefits, abandoning further wet weather work and redirecting all resources to other regional environmental priorities or some combination of these potential outcomes.

Phase 4 will consist of implementing the Final Remedial Measures Plan as approved by EPA and DEQ in accordance with the schedule contained in the Plan.

This Adaptive Regional Plan is an environmental and economic necessity and is consistent with EPA policy and guidance on adaptive management and integrated planning. HRSD will spend $2 billion by 2030 addressing the most pressing and important environmental challenges that the region faces. This spending will place a heavy burden on regional ratepayers. It is necessary to re-evaluate the needs and circumstances in 2030 to better identify the highest regional environmental priorities at that time as well as an expeditious implementation schedule for additional sewer system investments.

Section 2

EPA's Integrated Planning Framework

2.1 Clean Water Act Obligations Facing Hampton Roads

HRSD and the region have faced multiple Clean Water Act obligations over the past few years and have additional obligations in the near-term future. HRSD has spent more than $800 million in recent years to address system reliability, capacity, and to upgrade many of their treatment plants to meet nutrients requirements associated with the Chesapeake Bay TMDL. It is anticipated that additional spending for nutrient reductions in the next round of discharge permits will be required.

Localities in the region also face CWA obligations through their stormwater (MS4) permit requirements. Estimates for compliance with these requirements vary widely with the most definitive published estimate putting a $2 billion capital price tag for nutrient reductions over the next 10 years with the accompanying operations and maintenance costs that could dwarf the upfront capital costs over the service life of the MS4 improvements. The report entitled "Cost Estimates for the Chesapeake Bay TMDL" (Hampton Roads Planning District Commission, August 2011) bracketed costs between $1.8 billion and $2.2 billion.

These obligations have had and will continue to cause utility rates to increase over time. It is important to note that the same ratepayers must fund both the Locality and HRSD obligations.

2.2 EPA's Integrated Planning Framework

EPA initiated their Integrated Planning framework in October 2011. This framework recognizes that communities face multiple Clean Water Act obligations and that when these obligations are addressed individually "*this approach may have the unintended consequence of constraining a municipality from implementing the most cost effective solutions in a sequence that addresses the most serious water quality issues first*" and "*A comprehensive and integrated planning approach … offers the greatest opportunity for identifying cost effective and protective solutions and implementing the most important projects first*"(memorandum from Nancy Stoner and Cynthia Giles dated October 27, 2011). This framework focuses primarily on prioritizing and sequencing CWA investments rather than choosing between obligations. In essence, the Integrated Planning Framework allows communities to identify cost-effective and protective solutions and implement the most beneficial projects first.

Section 3

Sustainable Water Initiative for Tomorrow (SWIFT)

3.1 Objectives

The overarching objective of SWIFT is to utilize the water used by customers of HRSD as a valuable resource. Annually, HRSD manages approximately 56 billion gallons of water per year. Rather than discharge this valuable resource into rivers, the Chesapeake Bay and ultimately the Atlantic Ocean, SWIFT will reuse this water for productive purposes.

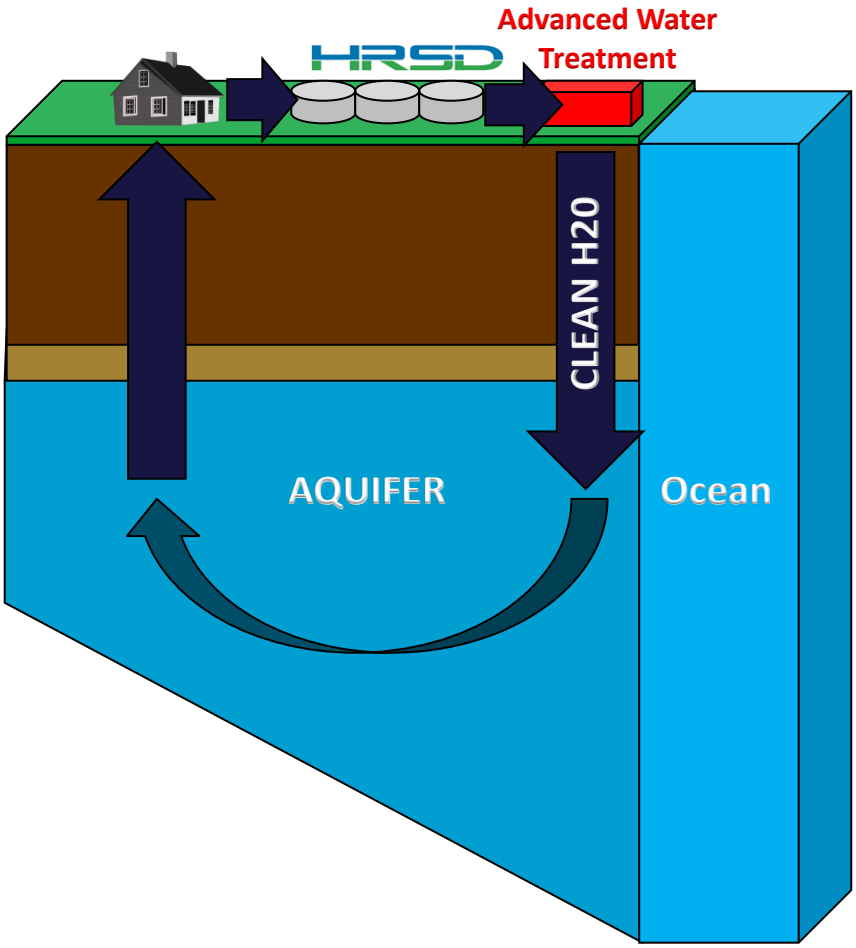


Figure 3-1. SWIFT

3.2 Human Health, Environmental and Other Benefits

The benefits provided by SWIFT include:

- Substantial reductions in nutrients and sediment discharged to rivers and the Chesapeake Bay
- Groundwater aquifer resource restoration through aquifer replenishment
- Reducing the rate of ground level subsidence thereby reducing the impact of sea level rise
- Groundwater quality protection through saltwater intrusion barrier
- Reduced bacteriological risk to shellfish grounds through reduced treatment plant discharges to surface waters

3.2.1 Unprecedented Nutrient and Sediment Reductions for the Chesapeake Bay

HRSD has estimated the reduction in nitrogen, phosphorous and sediments. Table 3-1 below displays those estimated reductions.

Table 3-1. Estimated Reductions in Nitrogen, Phosphorous and Sediments due to SWIFT

	HRSD Bay TMDL Allocations	HRSD Post SWIFT Loads (2030)	SWIFT Generated Reduction Available for other needs	Stormwater Reduction Needs
Nitrogen				
James	3,553,500	500,000	3,053,500	63,039
York	275,927	25,000	250,927	19,114
Phosphorus				
James	318,435	50,000	268,435	13,088
York	18,395	2,000	16,395	3,887
Sediment				
James	14,000,000	700,000	13,300,000	5,269,142
York	1,400,000	98,000	1,302,000	1,413,762

3.2.2 Groundwater Aquifer Resource Restoration

The Potomac aquifer, which underlies the region, has been seriously depleted over decades due to over-pumping. The aquifer has been dewatered to the extent that the DEQ has significantly reduced permitted withdrawals for the 14 largest groundwater users in eastern Virginia. The Virginia General Assembly formed the Eastern Virginia Groundwater Management Advisory Committee to study the situation and propose solutions. Their report was issued in August 2017 and the number one recommendation was that SWIFT and similar projects be supported by the Commonwealth to improve groundwater sustainability. Unless steps are taken soon, irreparable damage to the aquifer may occur diminishing the yield of this precious resource forever.

HRSD utilized the most recently developed version of Virginia Coastal Plain groundwater flow model, VA Hydro Groundwater (developed by the USGS in 2009 and modified by VDEQ for permitting

purposes in 2015) to evaluate the benefits of HRSD's proposed injection program. The groundwater modeling indicates that injecting 120 MGD of treated water into the aquifer will eliminate the areas of most significant impact within 50 years, with significant recovery noticed in as early as 10 years. Model results indicate that pressure head increases will be realized throughout eastern Virginia and into Maryland and North Carolina as well.

3.2.3 Reducing the Rate of Ground Subsidence Thereby Slowing the Impact of Sea Level Rise

Southeastern Virginia is highly vulnerable to the effects of sea level rise. This vulnerability is compounded by the effect of ground subsidence. USGS has estimated that ground levels in southeastern Virginia are subsiding at a rate of approximately 4 millimeters per year.

A significant underlying cause of ground subsidence is aquifer compression due to dewatering from over-pumping. The USGS attributes approximately one half of the observed sea level rise to land subsidence and attributes approximately one half of the regional land subsidence specifically to this overuse of the aquifer. HRSD estimates that injection of water from SWIFT will recharge the aquifer and abate ground subsidence. Based on preliminary modeling, HRSD estimates that SWIFT could arrest aquifer compression and in areas promote rebound, thus reducing the net impact of sea level rise by 25% over the next 50 years.

Recurrent Flooding in Hampton Roads is Worsening with the Effects of Sea Level Rise

3.2.4 Groundwater Quality Protection via Salt Water Intrusion Barrier

Another concern in southeastern Virginia is salt water intrusion into drinking water aquifers. This concern is heightened in the Potomac aquifer due to over-pumping. The natural pressure gradient in the deep aquifer system is from the west, where the fresh portions of the aquifer are, to east, where the aquifer is brackish to saline. Over-pumping of the aquifer has caused a reversal of the pressure gradient, encouraging groundwater to flow from the east to the west and setting up an increased potential for salt water encroachment. Recharge of the aquifer through injection will increase aquifer head pressures, providing a pressure barrier and reduce the potential for salt water intrusion. Unless saltwater intrusion is abated, aquifer use may be curtailed, putting even greater stress on limited surface water resources.

3.3 Nutrient Trading with Localities

In 2005, Virginia established a nutrient trading program in recognition that such a program would among other benefits, assist point source dischargers in meeting capped allocations that were established as part of the Chesapeake Bay 2000 agreement in a cost-effective manner and as expeditiously as possible (§62.1-44.19:12). As of 2010, further reductions were mandated as part of EPA's restoration plan for the Chesapeake Bay ("TMDL"). The General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia ("Watershed General Permit", 9VAC25-820) establishes nutrient wasteload allocations for each of the point source dischargers in the Chesapeake Bay watershed subject to the Watershed General Permit. Sediment allocations for municipal wastewater agencies in the Bay watershed are identified within the framework of the Chesapeake Bay TMDL.

HRSD's allocations on the James and York Rivers as prescribed in the most recent version of the Watershed General Permit (effective date, February 8, 2017) are identified in Table 3-1 along with the regional load reduction goals required of the stormwater Localities (Phase I and Phase II MS4 permittees). The reduction of nutrient and sediment loads as a result of full SWIFT implementation allows HRSD to provide the Hampton Roads regional MS4 localities with nutrient and sediment credits sufficient to meet the balance of their Chesapeake Bay TMDL reduction goals. Such trading is authorized within the Virginia Stormwater Management Act (§62.1-44.19:21 and §62.1-44.19:21.1) which allows MS4 permittees to use nutrient and sediment trading to meet permit requirements using annual, term, or perpetual credits. As originally contemplated by the Virginia General Assembly in 2005, this opportunity for trading significantly reduces the Locality investment needed for stormwater controls at this time and provides certain and absolute reductions well in advance of the MS4 reduction schedule outlined in Virginia's Watershed Implementation Plan (WIP).

Prior to full scale implementation of SWIFT, HRSD has agreed to provide Localities with the annual credits needed to meet their reduction goals on an annual basis through 2036 with these temporary offsets converting to permanent offsets. Should HRSD encounter any obstacles to full SWIFT implementation, these temporary credits provide assurance to the Localities that their permit reductions will be met over the short-term and allow time for developing new stormwater management plans. Trading agreements have been finalized with all eleven MS4 Localities within the HRSD service area. These agreements are included in Appendix B.

The MS4 nutrient and sediment reduction goals that have been estimated for the region are identified in Table 3-1. Each locality is responsible for calculating its individual credit needs as part of its permit-required TMDL Action Plan. As part of the Agreement, HRSD's annual credit provision will be the lesser of the Locality's initial estimate of credit needs or 95% of the total calculated reduction. The Agreements preserve measures to protect local water quality by requiring that the

Localities continue with the initial 5% reduction requirements associated with the first permit cycle and also acknowledges the Locality's requirement to achieve additional stormwater quality improvements through a normal redevelopment cycle. Not only does SWIFT provide the Localities with the opportunity to meet their TMDL reduction goals in the most cost-effective manner possible, preserving scarce resources for use in addressing other significant stormwater challenges, but it also achieves greater long-term reductions in pollutant loadings as cities progress through their natural cycles of redevelopment.

3.4 Planned Facilities

SWIFT facilities will include Advanced Water Treatment (AWT) plants, pumping and piping for distribution of purified water and wellfields for replenishment of the aquifer. SWIFT is currently in the planning and piloting phase of development. HRSD has piloted two different treatment trains at the York River Treatment Plant – one membrane based and the other carbon based. Based on costs, treatment objectives and injectate water quality, HRSD has selected the carbon-based treatment process as shown in the figure on the following page.

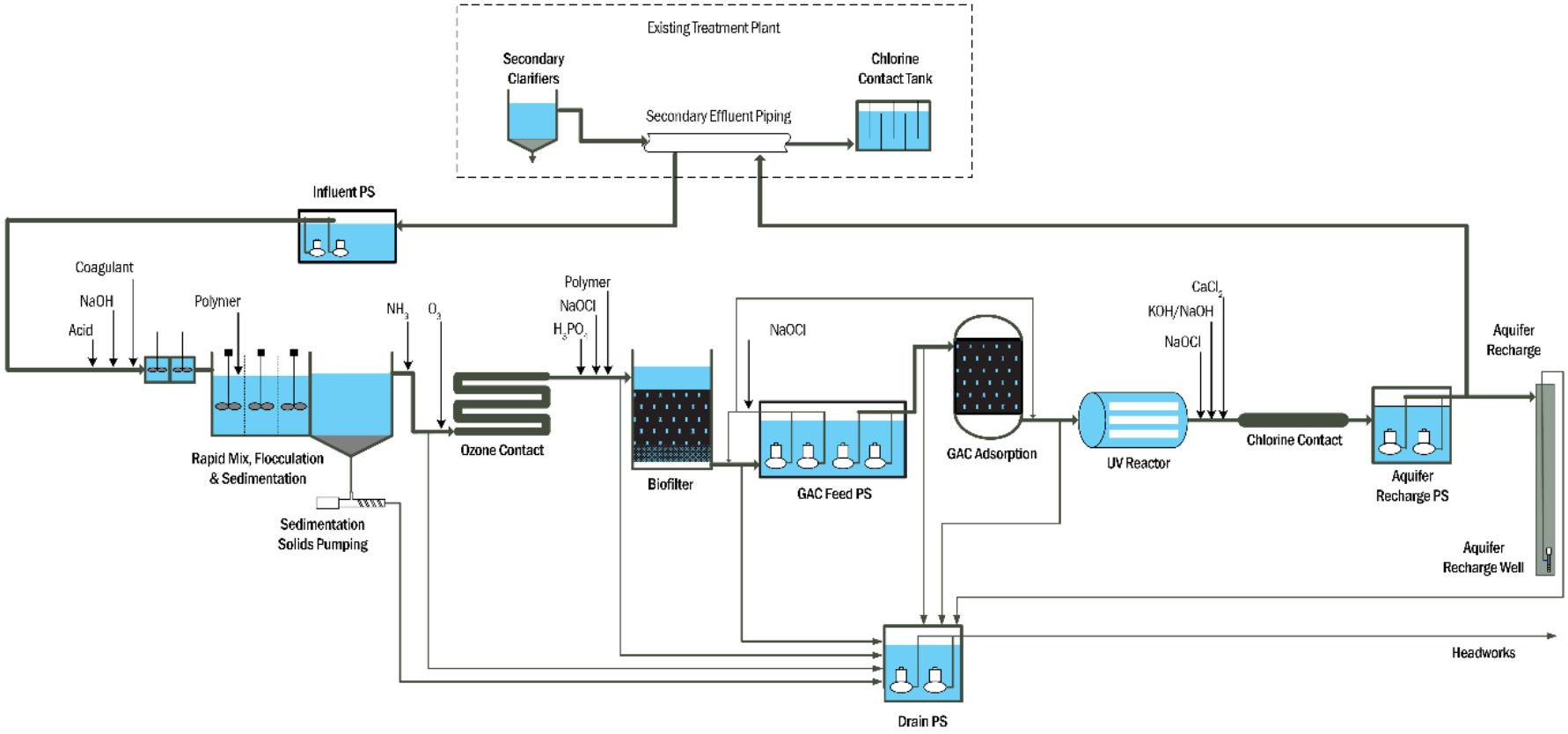


Figure 3-2. Typical SWIFT Process Flow Diagram

HRSD is also currently constructing a demonstration/research facility with a 1 MGD capacity at the Nansemond Treatment Plant. This facility will allow HRSD to validate the treatment train, treatment objectives, finished water quality, costs, operational modes, recharge hydrogeology and overall performance at a scale that will inform design of the full-scale facilities. This facility is scheduled to be operational in the first quarter of 2018.

HRSD is planning to build AWT facilities for the full SWIFT Program to treat dry weather flow from seven treatment plants. Consolidation of plant flows may be an option when it is determined to be the most cost effective solution for SWIFT.

At this stage of planning, HRSD has preliminarily established an overall sequence of AWT facility implementation to construct AWT and injection facilities with the capacity to handle average daily flows from these plants as follows:

1. Williamsburg
2. James River
3. York River
4. VIP
5. Nansemond
6. Army Base
7. Boat Harbor

Because the program is still in the planning and demonstration phase and the many complexities of combining flow from various plants, this sequence is subject to change.

3.5 Estimated Costs

As part of the planning process, HRSD has developed conceptual capital cost estimates for the SWIFT facilities. These estimated capital costs are shown in Table 3-2.

Table 3-2. Estimated Capital Costs for SWIFT Facilities

Facility	Estimated Capital Cost, 2017 $
Army Base	$100,540.000
Boat Harbor	$129,250,000
James River	$122,980,000
Nansemond	$236,280,000
VIP	$283,910,000
Williamsburg	$107,250,000
York River	$121,440,000
TOTAL	**$1,101,650,000**

These costs are at a AACE Class 4 level estimate. This level of estimate carries a band of uncertainty of +50% and -30%.

3.6 Implementation Schedule

SWIFT will be implemented through 2030, as currently planned. This is a very aggressive schedule and is dependent on getting the required approvals from EPA, Virginia Department of Health (VDH), DEQ and Locality authorities in a timely manner. Other potential critical path activities that could impact the schedule include land and easement acquisition. Several of the sites may need additional land for facilities. Most sites will need easements for piping and land for siting wellfields.

3.7 Unknowns and Uncertainties

SWIFT is breaking new ground in Virginia for recycling and recharge. HRSD is in the planning and demonstration phase and there are unknowns and uncertainties that could impact HRSD's ability to complete the program as currently envisioned. The most prominent of these are discussed in the remainder of this section. HRSD's plan includes annual reports/briefings to EPA and DEQ with notification given for adverse developments. The Fourth Amendment to the Consent Decree requires HRSD to accelerate spending on the RWWMP if any of these or other unknowns comes to pass and causes HRSD to truncate or abandon part of or all of SWIFT prior to 2030.

Aquifer Recharge Performance

Fundamental to the success of SWIFT is the ability to recharge the Potomac aquifer and reverse the historical depletion. This is largely dependent on aquifer hydraulic properties and geochemistry. HRSD will investigate each wellfield to identify the appropriate stratigraphic layers to screen the recharge wells to achieve the required recharge rates. Operations and maintenance practices are necessary to sustain recharge over the life of the wells. These activities include backflushing and periodic cleaning.

Well spacing is another variable that must be considered in the design and operation of the wellfields. This could vary from site to site and requires judgement and testing.

The risk to the program is that the recharge does not take the full amount of desired flow or the performance of the wells degrades over time.

Capital and Operations and Maintenance (O&M) Costs

HRSD has estimated capital and operations and maintenance costs for the SWIFT facilities and built a financial plan to cover these expenses; however, HRSD has not yet built or operated a facility like SWIFT and there are a limited number of facilities like these nationally. Therefore, the capital and O&M costs are uncertain. SWIFT facilities will require concrete, steel and specialized process equipment to build and labor to operate and maintain, chemicals for the treatment system and power for the process – especially the UV system and ozone. If capital or O&M costs are much more expensive than planned, HRSD may not build all the facilities because of excessive impacts to ratepayers.

Opposition to SWIFT

Although HRSD has executed a thorough outreach program to stakeholders, including elected officials, regulators, the public, environmental groups, etc., there could be some future opposition to implementing SWIFT that affects the implementation timing and/or scope of the program.

Failure to Acquire Required Approvals

SWIFT will require federal, state and local approvals and permits. At the federal level, EPA has primacy in Virginia for underground injection and will issue the Underground Injection Control (UIC) permit.

DEQ will review the facility plans and issue state permits to construct. VDH will be involved in both state and federal permitting and must be assured that public health and groundwater quality will be adequately protected.

Local permits include site plan approvals, stormwater permits, erosion and sediment control permits and building permits.

Any of these permits and approvals could present challenges. Failure to acquire these permits could cause delay or abandonment of that facility. However, coordination to date has not identified any non-starters.

Future Changes to Finished Water Standards

HRSD is in the process of establishing finished water standards that are protective of public health and the environment. Because reuse standards have not been previously established in Virginia for this type of activity, there is some possibility that additional or more stringent standards could be promulgated in the future. These could necessitate process and/or O&M changes that could be costly or difficult technically.

Section 4

Locality Consultation, Public Outreach and Agency Coordination

HRSD initiated the SWIFT study with a conservative desktop analysis to determine if an aquifer recharge project of this size was feasible and if it would provide benefit for the Potomac aquifer system and eastern Virginia. Once it was clear that SWIFT could have a positive impact on groundwater supplies along with providing numerous additional benefits for the region and the state, HRSD reached out to the key state officials and regulatory agencies to begin discussions on the path forward. Concurrently, HRSD formed a committee of stakeholders and interested parties for the purposes of sharing the program's initial feasibility study and solicit feedback on next steps while gaining insight on the various stakeholder perspectives. This group included representatives from local government, state and federal agencies, environmental advocacy groups, academia and consulting agencies.

Since mid-2015, HRSD has conducted an exhaustive schedule of outreach in all sectors: local, state and federal government; special interest groups; environmental advocacy groups; academia; industry professionals; and citizens' groups. Table 4-1 identifies the Virginia-specific outreach. Additionally, SWIFT articles are included in Appendix A. Early on, HRSD engaged a public outreach firm, Outreach Strategies, to develop a communications strategy including an on-line presence for the effective dissemination of information about SWIFT (www.swiftva.com).

From the outset of the initial feasibility study in 2014, HRSD collaborated closely with the DEQ, working together to leverage the technical resources necessary for modeling the Potomac aquifer system's response to the SWIFT proposal. Once feasibility was established, HRSD engaged the VDH in a key advisory role. One or more VDH staff members have been involved directly in the development of SWIFT pilot-scale research and data review as well as design for the SWIFT Research Center which will house a 1 MGD demonstration treatment facility and aquifer injection well. Moving forward with full-scale SWIFT implementation, both state agencies will be directly involved as members of a SWIFT oversight and monitoring committee. Though the specific details of the make-up and responsibilities of this group are still evolving, HRSD, the state and key stakeholders all agree that such an oversight committee is necessary to provide public confidence in the process and ensure the preservation and restoration of the Potomac aquifer for the residents of Virginia.

Federal agency partners were also included in SWIFT development. HRSD coordinated closely with the USGS in the installation of an extensometer for the measurement of land subsidence at HRSD's Nansemond Treatment Plant. USGS has been a key technical resource throughout the project. In addition, HRSD engaged early with EPA's Underground Injection Control program in Region 3 in the fall of 2016 to discuss permitting options for the SWIFT 1 MGD demonstration project and for full-scale SWIFT implementation.

Communication with the Localities on the integrated plan proposal including SWIFT benefits for MS4 programs and its relationship to the RWWMP began in earnest in 2015 (Table 4-1) culminating in signed nutrient and sediment trading agreements with all eleven MS4 Localities. The trading agreements are included in Appendix B.

Table 4-1. Virginia-specific SWIFT Outreach		
Outreach Group	**Date**	**Notes**
Elected Officials/State Regulatory Agencies/Commissions		
Senator Mark Warner	8/18/2016	
Governor Terry McAuliffe	2/9/2016	
Secretary of Natural Resources	12/29/2015	
Virginia Department of Health (VDH), Commissioner	11/30/2016; 6/7/2017	
Virginia Department of Environmental Quality (DEQ), Director	9/14/2015; 11/30/2016	
VDH, Office of Drinking Water	9/14/2015	
VDH - Local Health Districts and Division of Shellfish Sanitation	10/13/2015	
VDH, Office of Drinking Water and Local Health Districts	4/21/2016	Pilot tours
DEQ - Tidewater Regional Office	1/25/2016	
Rappahannock River Basin Commission	12/2/2015; 12/7/2016	
Interstate Commission for the Potomac River Basin	6/6/2016	
State Water Commission	12/8/2015; 4/4/2017	
Local Government/Agencies		
Middle Peninsula Stakeholder Group	10/26/2015	Included area current and retired state delegates, representatives of Middlesex's Water Commission
Hampton Roads Planning District Commission - Chief Administrative Officers Committee	1/4/2017; 2/3/2016; 1/17/2013	City Managers and County Administrators from all Hampton Roads localities. Discussed SWIFT/Trading and Regionalization.
The Hampton Roads Planning District Commission	1/16/2014; 1/17/2013	Elected and appointed officials from all HR localities. Discussed Hybrid Regionalization Plan and Regionalization.
HRPDC Regional Environmental Committee	12/3/2015	SWIFT
Middle Peninsula Planning District Commission	5/25/2016	SWIFT
Gloucester County Board of Supervisors	11/17/2015	SWIFT
Middlesex County Board of Supervisors	1/11/2017	SWIFT
James City County Board of Supervisors	3/22/2016	SWIFT/Trading
	10/28/2014	RWWMP Update
	2/25/2014	Regionalization
York County Board of Supervisors	7/18/2017	SWIFT/Trading
	1/18/2014	Regionalization
Isle of Wight County Board of Supervisors	8/18/2016	SWIFT
	2/20/2014	Regionalization
City of Norfolk City Council	8/23/2016	SWIFT

Table 4-1. Virginia-specific SWIFT Outreach		
Outreach Group	**Date**	**Notes**
City of Chesapeake City Council	7/18/2017	SWIFT/Trading
	7/28/2015	SWIFT
City of Poquoson City Council	6/26/2017	SWIFT/Trading
	3/28/2016	SWIFT
City of Suffolk City Council	4/19/2017	SWIFT/Trading
	4/20/2016	SWIFT
City of Hampton City Council	3/8/2017	SWIFT/Trading
	5/25/2016	SWIFT
City of Virginia Beach City Council	8/15/2017	SWIFT/Trading
	6/7/2016	SWIFT
City of Williamsburg City Council	8/10/2017	SWIFT/Trading
City of Portsmouth City Council	8/22/2017	SWIFT/Trading
Central Virginia Utility Departments	3/15/2017	
Bayfront Advisory Committee (Virginia Beach)	7/20/2017	
Hampton Roads Public Utility Directors	Monthly	
HRSD-convened Stakeholder Group		**Representatives of DEQ; VDH; Cities of Newport News, Chesapeake and Suffolk; Virginia Tech; Virginia Institute of Marine Science; USGS; Hampton Roads Planning District Commission**
Face-to-face meetings	12/11/2015	
	4/29/2016	Added Elizabeth River Project to stakeholder team
	12/14/2016	Added Chesapeake Bay Foundation to stakeholder team
Educational Webinar Series	4/19/2016	Topic: General SWIFT update
	5/5/2016	Topic: Water Reuse
	5/13/2016	Topic: Occoquan Watershed
	6/22/2016	Topic: National Water Research Institute overview, water reuse projects
	7/12/2016	Topic: Aquifer Storage and Recovery (ASR)
	7/27/2016	Topic: City of Chesapeake's experience with ASR
	10/26/2016	Topic: SWIFT pilot update
Advocacy Groups		
Elizabeth River Project - Technical Workgroup	12/9/2015	
	7/5/2017	
Elizabeth River Project - Intern Education Program	9/11/2017	

Table 4-1. Virginia-specific SWIFT Outreach		
Outreach Group	**Date**	**Notes**
Chesapeake Bay Foundation	12/15/2015	
	11/2/2016	
James River Association	5/4/2016	
Alliance for the Chesapeake Bay	12/7/2016	
Virginia Farm Bureau	11/14/2016	
Local Universities		
Norfolk State University	3/17/2016	
Old Dominion University	4/15/2016	
Virginia Institute of Marine Science	2/13/2016	
Community Groups		
Sunray Farmers' Association	6/5/2016	
HRSD Pollution Prevention Awards Luncheon	4/20/2016	Representatives of local businesses and industries
Norfolk Cosmopolitan Club	1/19/2017	
Little Neck Cove Civic League	3/13/2017	
Isle of Wight Citizens' Association	3/13/2017	
Virginia Master Naturalists - Tidewater Chapter	5/3/2017	
Wards Corner Civic League	5/15/2017	
Yorktown Rotary	4/10/2017	
Newport News Rotary	7/18/2017	
Fort Monroe Campfire Talk Series	7/14/2017	
Local Engagement through Media		
Daily Press (Virginia Peninsula, Hampton Roads)	9/15/2016	"From waste to wells: An idea for Hampton Roads' water woes"
	3/19/2017	"Water Plan A Win-Win?"
	7/15/2017	"HRSD program will save Newport News money, but it's already spent"
Gloucester-Mathews Gazette Journal	11/16/2016	"HRSD pilot program may hold answer to future water shortages"
Southside Sentinel (Virginia's Middle Peninsula)	11/18/2015	"HRSD proposes refilling aquifer"
	11/18/2015	"A positive proposal toward saving our drinking water"
Suffolk News Herald	3/18/2017	"Project to remedy falling ground levels"
	3/31/2017	"HRSD introduces two projects"
Virginia Gazette (Williamsburg, James City County, York County)	3/25/2016	"HRSD pitches plan to replenish groundwater aquifer"
	7/18/2017	"DEQ requests public input on Chickahominy River water withdrawal"

Table 4-1. Virginia-specific SWIFT Outreach		
Outreach Group	**Date**	**Notes**
Virginian Pilot (Hampton Roads)	1/31/2016	"Can your sinks and toilets fight sea-level rise"
	2/19/2016	"Aquifer replenishment touted as a cheaper way to clean bay"
	5/22/2016	"Bryan Plumlee: A solution to many of our woes"
	7/22/2016	"HRSD doesn't want to waste wastewater"
	9/15/2016	"Sip shape"
	9/23/2016	"Future Drinking"
	12/4/2016	"Digging Deep for A Sea-Rise Solution"
	12/24/2016	"18 million fewer pounds of pollutants in Chesapeake Bay"
	3/9/2017	"Localities, led by Hampton, line up for $2B windfall"
	3/31/2017	"HRSD project could be a jobs-making machine, McAuliffe says"
Washington Post	10/20/2016	"Hampton Roads' solution to stop the land from sinking? Wastewater."
WTKR-TV (Hampton Roads)	9/15/2016	"Hampton Roads Sanitation Dept. makes wastewater safe to drink"
WAVY-TV (Hampton Roads)	9/15/2016	"Treatment process turns wastewater into drinking water"
	1/25/2017	"Sanitation Department's clean water project could help fight sea level rise"
General		
SWIFT Pilot Public Event	9/15/2016	Attendees including but not limited to: Virginia's Secretary of Natural Resources; local elected officials; and representatives from VDH, DEQ, Chesapeake Bay Foundation, Elizabeth River Project, Sunray Farmers' Assn, Hampton Roads Planning District Commission
SWIFT Research Center Groundbreaking	3/31/2017	Attendees including but not limited to: Governor of Virginia; Virginia's Secretary of Natural Resources; local elected officials; and representatives from VDH, DEQ, Chesapeake Bay Foundation, Elizabeth River Project, Sunray Farmers' Assn, Hampton Roads Planning District Commission
Virginia Coastal Policy Conference; William and Mary Law School - Virginia Coastal Policy Center	12/2/2016	
Resilient Virginia Conference; Richmond VA	8/1/2017	
Hampton Roads Resilience Forum; Norfolk	8/22/2017	

Section 5

Pathogen Source Tracking Program – Targeted Monitoring to Benefit Public Health

Restoring waterways impacted by bacteriological impairments requires a thorough understanding of the sources of bacteria contributing to the impairment. Several water bodies in the Hampton Roads region remain impaired by bacteria with elevated levels found in dry weather in areas that have no record of sewer overflow and in some cases, in areas without any public sewer infrastructure. Dry weather, ongoing, sources almost always present a greater impact to water quality than isolated wet weather-related sewer overflows. Surface water monitoring data following SSOs has indicated that the impacts of a transient SSO on the long-term impairment of a waterway are minimal, supporting the conclusion that waterway impairments in the Hampton Roads area are driven by chronic and persistent sources. Given that the regional sanitary sewer system has no chronic capacity-related overflow locations, the most effective approach toward achieving a higher degree of public health protection is to identify and eliminate the sources of bacterial contamination, specifically those that are known to represent the greatest risk to public health – human sources. To this end, HRSD has implemented its Pathogen Source Tracking Program. This focused water quality monitoring effort, in partnership with local governments and the Virginia Department of Health, has been successfully used to identify, locate, and eliminate chronic and persistent non-SSO-related sources of human-sourced bacteria. This program was instrumental in getting one local waterway, the Lafayette River, delisted for bacteria with work continuing on other bacteriologically impaired waterways in the region.

HRSD's Pathogen Source Tracking Program represents a significant investment in the development of novel molecular technologies for microbial source tracking. The human-specific molecular analyses conducted within HRSD's laboratory have a high degree of sensitivity and specificity allowing for the detection of human sources of bacteria in stormwater, surface water and sewer infrastructure samples. These molecular tools, when coupled with a thorough understanding of the wastewater and stormwater infrastructure, have successfully aided in identifying compromised infrastructure or in narrowing the human fecal contamination signal to a smaller, well defined area. Informed, adaptive results-based decisions used in tandem with local knowledge of sanitary sewer and storm water maps allow HRSD to back trace a human fecal signal to a point of origin.

Once the point of origin for the fecal signal is identified, corrective action measures are implemented, and subsequent monitoring is used to confirm successful elimination of the source. A tailored, adaptive program such as this represents a more cost-effective means of improving water quality and reducing risk to public health as opposed to broad brush approaches that fail to consider the unique characteristics of each waterway. For example, identifying and resolving a (1) residential connection to a storm sewer (instead of the sanitary sewer), (2) broken sewer line (public or private) near a stream, (3) failing septic facility, or (4) other continuous sources (straight pipe connection from private property to local waterway) will yield far greater water quality and public health benefits that reducing large sewer overflows from major storms.

The program allows all stakeholders to target priority resources to address human-sourced bacteria. That said, other sources of bacteria to area waters (e.g., wildlife, dogs, etc.) are identified and can be targeted for reduction as well through programs such as providing dog waste bags in targeted public areas.

HRSD intends to continue to implement its Pathogen Source Tracking Program through 2030 and has estimated $10 million for these activities.

Table 5-1. HRSD Pathogen Source Tracking Projects

Waterbody	Partner(s)	Watershed/Municipality	Status	Fecal Contamination Source	Corrective Action	Comments
Wayne Creek	City of Norfolk, Elizabeth River Project	Norfolk	Completed	Compromised Force Main	Immediate Repair	
Newport News Channel	Southeast Care Coalition, City of Newport News	SE Newport News	Completed	Compromised Gravity Sewer affecting Newport News Creek	Immediate temporary fix, then permanent bypass of this area of collection system	
Shingle Creek	City of Suffolk	Suffolk	Completed	Illicit connection to stormwater collection system	Plugged connection after identification of waste sources	
Hilton Beach	City of Newport News, Virginia Department of Health, Greater Hilton Citizen Group	Hilton Neighborhood	On-going	Identification of multiple compromised private side laterals	Immediate Repair	Currently Investigating any remaining sources
Indian River	Elizbeth River Project, City of Chesapeake	Chesapeake	Completed	No human source identified; Identification of dog, goose, and environmental sources of bacteria	Public education regarding domestic pet waste	
Nansemond River	City of Suffolk; Virginia Department of Health--Shellfish Sanitation; Nansemond River Preservation Alliance	Nansemond River Watershed; Suffolk	On-going	Already identified multiple collapsed or compromised gravity sewer pipes that caused sewage infiltration in the SW collection system; Several failing septic systems also identified	Gravity sewer system repairs/replacement. Local health departments working with residents to repair failing septic systems	Large scale sampling still underway. Multiyear project.

Table 5-1. HRSD Pathogen Source Tracking Projects

Waterbody	Partner(s)	Watershed/Municipality	Status	Fecal Contamination Source	Corrective Action	Comments
Knitting Mill Creek	City of Norfolk, Lafayette Wetlands Partnership	Colonial Place and Ghent Norfolk	On-going	No apparent human fecal contamination identified; evidence of sporadic SSOs		Phase II being initiated
Broad Creek	City of Norfolk, Elizabeth River Project	Norfolk	Planning			
Lucas Creek	City of Newport News, USGS, Hampton Roads Planning District Commission	Newport News	On-going			Evidence of human fecal signal

Section 6

Integration of SWIFT and the Regional Wet Weather Management Plan

SWIFT, the Pathogen Source Tracking Program, and the High-Priority RWWMP Projects are being implemented concurrently during the period of 2018 through 2030 as HRSD's Integrated Plan. HRSD's Financial Plan is built to support this $1.3 billion endeavor and annual rate increases will be necessary to provide the required revenue. After 2030, HRSD plans an adaptive management approach to re-evaluate environmental and public health priorities in the 2028-2030 timeframe (see Section 17 of Volume 2 for the Adaptive Regional Plan). Among other uncertainties, recurrent flooding and sea level rise will have profound effects on the Hampton Roads region and will impact the regional sanitary sewer system. These factors, along with others, create substantial uncertainty as to what future environmental priorities will be in the Hampton Roads region. This adaptive management approach allows the region and regulators to address the most pressing challenges first and gain the highest benefit to the environment and human health from SWIFT, the Pathogen Source Tracking Program, and the High-Priority RWWMP Projects. Then, in 2030, the region will execute the priorities identified in the agency-approved Final Remedial Measures Plan that provide the highest environmental and human health benefits.

Appendix A: SWIFT in the News

New panel looks at why underground water is disappearing east of Interstate 95

By REX SPRINGSTON Richmond Times-Dispatch | Posted: Tuesday, August 18, 2015 11:45 pm

Underground water is disappearing east of Interstate 95, and problems could start showing up in a few years in parts of the Richmond area, an expert said Tuesday.

Details about the decades-old groundwater decline emerged at the first meeting of a new panel that's looking for ways to address the problem.

The General Assembly created the panel, the Eastern Virginia Groundwater Management Advisory Committee, this past winter. The group will meet well into 2017 and will present recommendations to the 2018 General Assembly.

"Solutions take time," said Scott Kudlas, the state Department of Environmental Quality's water-supply director, after the meeting. "We've started the conversation that needs to happen."

Groundwater is the main source of water east of I-95, and most of that water comes from the Potomac aquifer. That's a huge reservoir of water that slowly moves, generally to the east, in a layer of sand and gravel that begins near I-95 and lies between layers of clay. The aquifer is shallowest near I-95 and becomes deeper as it nears the coast.

Because the aquifer is relatively shallow in the Richmond area, problems — such as wells running dry or industries finding insufficient water for future needs — could start surfacing within the next few years in places just east of I-95, such as eastern Hanover and Henrico counties, Kudlas said.

The groundwater panel will be looking at potential ways to reduce some of the demand for the water, including building desalinization plants, reusing treated water from sewage plants and increasing conservation efforts.

"We've got to figure out how we are going to manage water differently," said DEQ Director David Paylor.

Users such as industries, local governments and big farms withdraw about 90 million gallons of groundwater a day east of I-95 — an area known as the coastal plain — because the water there has historically been plentiful and cheap, requiring little purification.

Homeowners' wells use about an additional 38 million gallons a day.

Virginia is using groundwater in that area faster than it is being replaced, and groundwater levels are dropping.

“It’s a chronic issue. It’s something that needs to be addressed,” said panel member Dennis H. Treacy, a Smithfield Foods executive. Addressing it now is “better than waiting until there’s a crisis.”

East of I-95, you need a DEQ permit to take more than 300,000 gallons a month. The agency has been working with some water users in recent years to decrease the amount of water they are allowed.

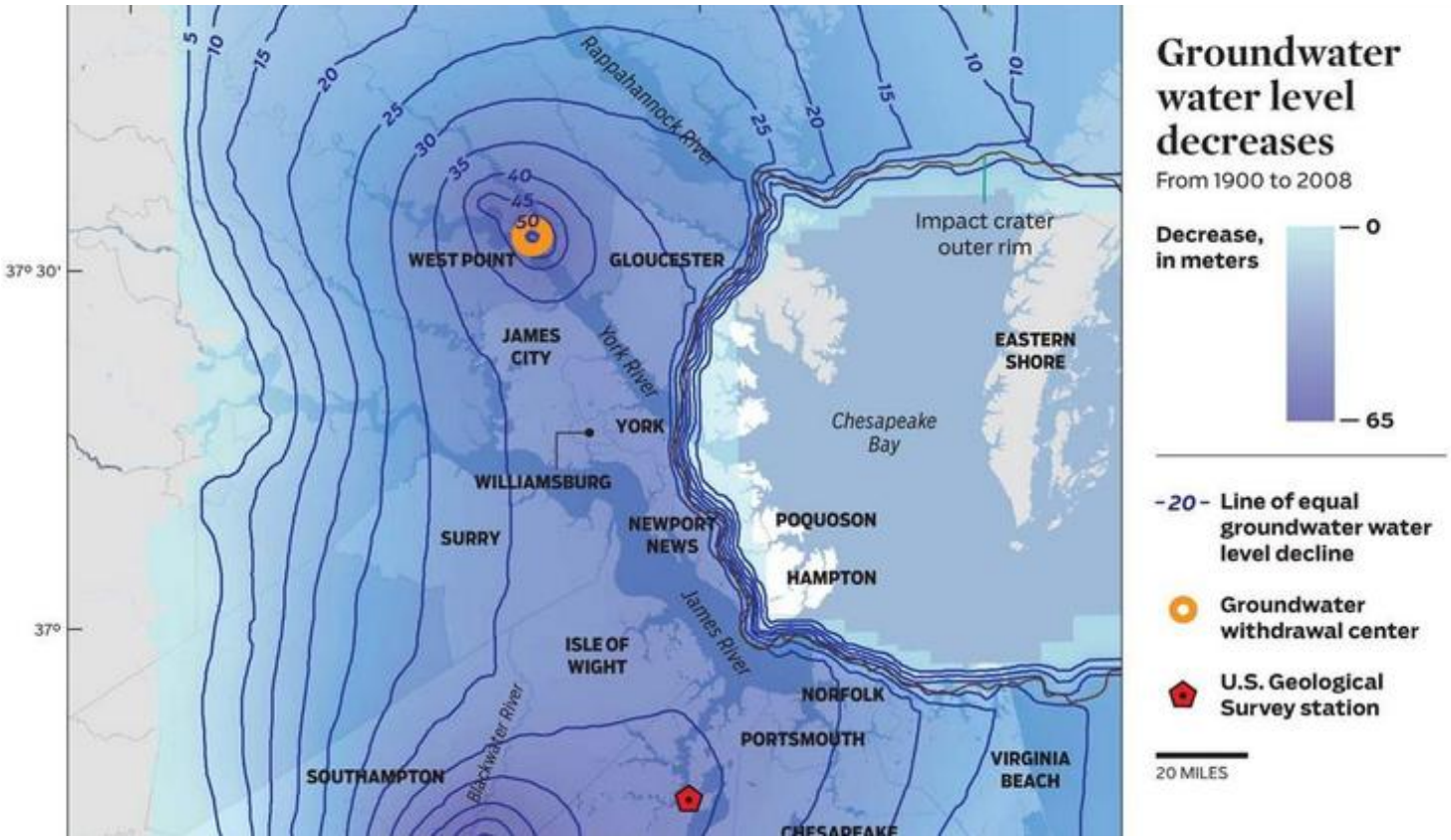
In most localities, water won’t run out anytime soon, but withdrawals are pulling water from the Chesapeake Bay, making groundwater salty in parts of eastern Virginia, experts say.

The 24-member groundwater panel met at the DEQ’s regional office in Glen Allen.

The panel includes representatives from business, home building, farming, conservation interests, academia and local, state and federal governments.

News / Science

Groundwater drain a big-dollar dilemma



Daily Press illustration

By **Dave Ress and Austin Bogues · Contact Reporters**

OCTOBER 10, 2015, 5:55 PM

Some of the water that tens of thousands of people in Hampton Roads drink is 40,000 years old — and it is running low.

Coping with that is going to cost hundreds of millions of dollars.

And it could set the stage for some intense political battles over water and money — with the first rumblings already sounding in James City and Isle of Wight counties.

The trigger was a move by the obscure state office that monitors groundwater — basically, the rain that soaks deep into the Earth — to begin cutting the amounts that the region's biggest water users can pull from their wells.

Virginia averages more than 40 inches of rain a year, but only somewhere between 1/10th of an inch to one inch soaks into a huge wedge of sand that supplies all of the water for 21,000 homes and businesses in James City City. That same sediment is where everyone in Smithfield, Franklin and West Point gets

their water, and is a major source for Gloucester County. It supplies thousands of private wells in the region. And it is what the rest of the Peninsula relies on in case of drought.

"If you are thinking about 100 million gallons per day coming out of the aquifer and about a tenth of an inch coming in every year, it doesn't balance out," said Scott Kudlas, director of the state Department of Environmental Quality's office of water supply.

Groundwater levels in some parts of eastern Virginia have dropped 200 feet or more over the past century. If they fall much farther — the critical point is a layer of clay that lies about 300 feet below the Peninsula — parts of the Potomac aquifer that feed wells in the region could start running dry.

And it's not really a question of "if."

"It's a question of when," said Kurt Stephenson, a water resources specialist at Virginia Tech.

That's why DEQ wants to cut big users' permits, some of them by huge amounts. The proposal for James City's water utility, for instance, would cut the draw from its wells to an amount far below what county residents and businesses use now.

That means the county has to find water — something on the order of 1.5 million gallons a day now and more in the future — somewhere else.

That's where the big money and the big politics come in.

Politics ... and money

For James City County, the choices are pretty much to buy from Newport News Waterworks and spend the tens of millions of dollars necessary to build pipes and pumps to connect with the waterworks system, or find river water to tap, treat and pipe into the county.

Either way, the county is talking about a $120 million bill that comes due in about five years.

That's the money.

The politics could come in as the county nails down rights to water.

One path might be to draw water from either the Chickahominy or York rivers. But that could open the door to arguments about water rights that Newport News already has to the Chickahominy. It also raises concerns about the effect on sport fishing — concerns that so far have killed the notion of letting the region's biggest single groundwater user, the West Point paper mill, tap water from the Pamunkey just upstream from where it flows into the York.

Another path could be to renegotiate a 2008 agreement under which the county has paid Newport News Waterworks $25 million for the right to buy water and would have to pay another $25 million in 2019 to continue to have that right — a right to buy water at a price nearly 50 percent more than the county's groundwater now costs.

That's not easy politically, since a hefty chunk of the waterworks' revenue goes into Newport News' own coffers. The $87 million-a-year waterworks operation, which serves Hampton, Poquoson, much of York and parts of southern James City County in addition to the city, is scheduled to pay $12.4 million into the city's general fund this fiscal year.

"We don't do that," said James City Supervisor Jim Kennedy. "That is a way for them to fund their city. For us to be one of their customers, it's awfully difficult for me to say to James City taxpayers, 'We want for you to pay Newport News' bills.'"

South of the James

Water has been a political sore point south of the James River, too.

The $2.75 million that Isle of Wight County will have spent by the end of this fiscal year under a 40-year contract with Norfolk that has yet to deliver a single drop of water has angered many county residents, especially after the county raised real estate taxes and water and sewer fees in large part to cover the cost of the deal.

The squabble between the Isle of Wight Board of Supervisors and Smithfield's Town Council over who will supply water to the pricey Gatling Pointe subdivision puts at stake nearly a quarter of the town's water revenue — more than $260,000 a year.

"Losing that revenue would hurt," Smithfield Vice Mayor Andrew Gregory said. "But I understand. Everybody's got to look out for their constituents."

For the county, which now buys town water and resells it to Gatling Pointe residents, a new pipeline means it can tap a less expensive source of water, opening the possibility of a bigger markup and more revenue.

Smithfield, like James City County, is completely dependent on groundwater. It invested $5 million in a new water treatment plant in 2010, not long after Isle of Wight signed the Norfolk deal — or after the county quoted a price for supplying its surplus water to the town that was 90 percent higher than the town's own charge to its customers.

Smithfield was one of the first water systems to see its permit cut by the DEQ, a move that reduced the

amount it is allowed to draw from 1.8 million gallons a day to 1.27 million.

That's well above the 850,000 gallons a day Smithfield now uses, but depending on how fast the town grows and whether its recent successes in cutting residents' average water use stick, it could face a squeeze in a couple of decades. If the town bounces back up to using the water the way it did a decade ago, that squeeze could come as early as 2020, a consultant's report to the DEQ says.

"We know there's going to come a time where we will have to purchase a good part of the water we use. Groundwater isn't going to last forever, we get that," Gregory said. "But to say, 'Well after you've invested $5 million, you can't use your groundwater' — that'd be a tough pill to swallow."

The deepest cuts

DEQ isn't saying exactly that to Smithfield, but it has told James City County that it may cut the county's permit to between 3.8 million and 4 million gallons a day, which is below current consumption of 5.6 million.

When losses from treatment are considered, a cut that deep means the James City supply of drinkable water could be as low as 3 million to 3.2 million gallons a day, County Administrator Bryan Hill said.

He figures the county needs to nail down a secure source for 12 million gallons a day to cover its needs through the end of the century.

Whether that will come in part from Newport News Waterworks, the biggest water utility on the Peninsula, or entirely from facilities the county itself would build is where the hard bargaining will come — and Hill isn't saying which way he is leaning.

How much of James City's future water needs Newport News Waterworks can cover is another issue.

The Newport News utility gets almost all its water from five reservoirs that drain the creeks and streams from 80 square miles and hold nearly 13.5 billion gallons, as well as from the Chickahominy River. An average of 180 million gallons a day flow down the Chickahominy.

But it also invested $16 million in a plant that can treat 7 million gallons of groundwater a day, basically a backstop in case of drought. Waterworks now processes about 1.5 million gallons a day of groundwater, mostly to keep the plant in readiness, since idling and restarting it is costlier than keeping it chugging along.

"We have plenty of water," director Kofi Boateng said.

But a study prepared for DEQ by Virginia Tech's Stephenson and the consulting firm Abt Associates says

cutting the DEQ permit that currently allows Waterworks to tap 3.4 million gallons of groundwater a day could make it hard for the utility to meet future demand, including its commitments to James City County and the city of Williamsburg.

Based on per capita water consumption since 2008 and projections of population growth in its territory, the waterworks would have to supply 47 million to 49.7 million gallons of water a day by 2040.

That could mean a challenge, the Stephenson/Abt study suggests. Taking its estimates for the waterworks' ability to deliver treated water, and adjusting for the cut in the waterworks' groundwater permit means the utility would be able to deliver less than 49 million gallons a day.

The study also assumes that the sharp drop in consumption that began during the Great Recession will continue. Going back to pre-recession water use could leave the waterworks unable to meet its 6 million-gallon-a-day commitment to James City and Williamsburg as early as 2030, the study says.

"You always want to have some extra — what if a computer chip maker or somebody else that uses a lot of water wants to come?" Stephenson said. "Industrial use is the real wild card."

The paper mill

DEQ is also telling the region's biggest groundwater user, WestRock Co.'s West Point mill, to expect a big cut in its permit.

The mill uses 20 million gallons a day, almost four times the amount that James City County uses. That heavy draw on the aquifer, plus a similarly large draw formerly made by the old International Paper mill in Franklin, have created miles-wide, 200-plus-foot-deep, cone-shaped valleys in water levels.

DEQ has proposed cutting the mill's permit to between 9 million and 10 million gallons a day.

Would that threaten the viability of a plant that employs more than 500 people?

Nina Butler, WestRock's chief sustainability officer, said the mill is a critically important asset to the giant packaging firm.

Thanks to the company's efforts to conserve and recycle water, it already uses less water per ton than most paper mills, Butler said, and its continuing efforts should mean more reductions.

She said she's confident that working with DEQ and a new Eastern Virginia Groundwater Management Advisory Committee will result in the right mix of a permitted groundwater draw and use of alternative sources of water to meet the plant's needs.

Alternatives?

Alternatives to groundwater aren't just the rivers that James City's Hill is eyeing or the reservoirs that Newport News Waterworks locked up by 1978 when it set up its newest one, at Little Creek, located in a in a steep valley in northern James City County.

One key could be conservation. In addition to the West Point paper mill's efforts, Anheuser Busch cut its use from 5 million gallons a day to 2 million, which had a major effect on reducing the total amount of water Newport News Waterworks treats and delivers.

The Hampton Roads Sanitation District has been studying a project to treat the region's wastewater so that it meets drinking water heath standards, then pumping it back into the ground, general manager Ted Henifin said.

There's more research to do, but the work the district and its consultants have done so far show that recycling could reverse the drop in water levels and ensure that the aquifer doesn't start an irreversible decline, he said.

Henifin estimates the cost at $1 billion for the wastewater treatment facilities and injection wells required, and a running cost in the $20 million to $40 million a year range. The benefits, he said, would be felt across eastern Virginia.

Going that way, and deciding who pays, would involve a different kind of politics. The actors include the district, a group that serves the region with a board appointed by the governor, as well as the localities it serves and the Environmental Protection Agency.

To make the idea work, people who aren't already customers of the sanitary district might have to pay some of the cost, Henifin notes.

If the district can convince the EPA that recycling wastewater is worth doing sooner rather than later — which would reduce the flow of pollutants into the Chesapeake Bay and help address the regional problem of land subsidence — it could give the sanitary district and the localities it serves some breathing room to meet tough federal regulations on stormwater runoff and sewer overflows.

Proposals to recycle water in order to ease demand on limited drinking-water supplies usually focus on using treated wastewater for irrigation or industrial processes. But Virginia is a leader in reusing wastewater: The Upper Occuquan Service Authority has a three-decade-plus track record of treating wastewater so that it is safe enough to put back into the Occuquan Reservoir, which provides drinking water to Fairfax County.

"Supply is not so much the issue as storage. You can store water in the aquifer or you can store it in a reservoir," Stephenson said. "But you have to store it somewhere."

Ress can be reached by phone at 757-247-4535; Bogues at 757-345-2346.

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This article is related to: James River

Southside Sentinel

News

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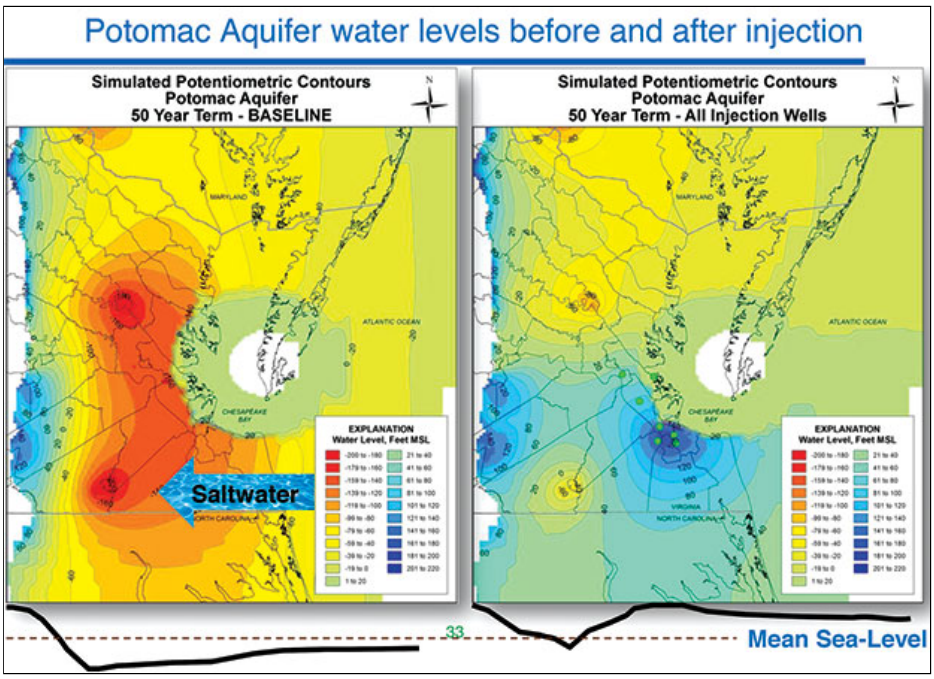
A positive proposal toward saving our drinking water



(Graphic courtesy of Hampton Roads Sanitation District)

by Pete Mansfield

On October 26 the Hampton Roads Sanitation District (HRSD) invited Middlesex County to a presentation representing a possible fix for saving the Potomac Aquifer. I will state without exception that this was by far the best researched and most complete answer to the multiple water-related problems facing eastern Virginia that it has been my privilege to consider. The HRSD graphic at the right, titled "Potomac Aquifer water levels before and after injection," should remove any doubt that this solution will answer the first three of the following four major problems facing eastern Virginia. The fourth problem, Total Maximum Daily Load (TMDL) will be solved as a resultant of the actions taken on the other three.

1. Running out of potable (drinkable) water in the Potomac Aquifer.
Answer: This plan along with some sensible conservation methods that have already been proposed will not only stop the drain of water from the aquifer, but will actually result in a net positive flow. (Note the change in colors between the "before" and "after injection" from red, indicating a 200-foot depression below sea level, to a green and even blue color on the graphic.)

2. Contamination of what good water is left in the aquifer by saltwater intrusion from the Chesapeake Bay.
Answer: By injection of an estimated 120 million gallons per day between the Impact Crater fractures of the Chesapeake Bay and the Cones of Depression, we will create a positive pressure gradient which will act as a freshwater barrier to stop further salt intrusion. (Note: the solid black lines shown below the colored potentiometric contours before and after graphs indicate the aquifer head pressure has risen above the mean sea-level, thereby eliminating the saltwater intrusion into the aquifer.)

3. Virginia is experiencing twice the sea level rise of any other east coast state.
Answer: The problem is coastal Virginia is sinking, a phenomenon known as "land subsidence" that occurs as the level of supporting water in the aquifer drops. Land subsidence is responsible for one

half of the apparent sea level rise. This is a multi-billion dollar problem that is causing our coastal cities to flood more frequently. We cannot reverse land subsidence, but we can at least stop depleting the Potomac Aquifer that is the cause.

4. The ability to meet EPA's 2025 TMDL of nutrients entering the Chesapeake Bay.
Answer: At this time, we are not on track to meet this federal mandate, but with this plan in place our discharge of nutrients into our bay waters will be reduced by an amount equal to 25 tons per day of 6-2-0 fertilizer. This is a reduction that will make the very controversial storm-water runoff program look like peanuts—perhaps it might be reconsidered.

What is the cost of a program that answers so many of Virginia's pressing problems? HRSD suggests at most a cost of 50 cents per 1,000 gallons used—a cost for an average family of about $2.50 per month.

Are there other plans being considered? Of course, but none even approach the answer to the four requirements and appear to be more of a delaying tactic than trying to answer real, tangible problems. For example, DEQ has considered mandated withdrawal reductions, but only to the tune of about 10% of current withdrawals, and these reductions don't even equal the future withdrawal commitments DEQ has pledged to honor. Most importantly, if all withdraws were stopped today, saltwater intrusion would continue to contaminate the remaining good water in the aquifer at the present rate. Yes, I do believe it is a delaying tactic. DEQ's select committee to study the problem will not even have a report until 2018.

I believe that Middlesex County must as expediently as possible make it known that we don't want more committees or ridiculous ideas standing in the way of the most obvious solution—a solution that has been successful not only in Northern Virginia since the 1970s, but in other states, including California, which has the strictest environmental laws in the country.

Pete Mansfield is the Saluda District representative on the Middlesex County Board of Supervisors and has been at the forefront in finding ways to save the Potomac Aquifer, which supplies drinking water to Middlesex and much of eastern Virginia.

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Southside Sentinel

HRSD proposes refilling aquifer

by Tom Chillemi

Using water once is not enough.

The Hampton Roads Sanitation District (HRSD) is proposing to inject wastewater, which has been treated to drinking water quality, back into the Potomac Aquifer from which it came.

The aquifer provides the drinking water for Middlesex County and the majority of eastern Virginia.

Direct injection will "recharge" the Potomac Aquifer, which has no natural water source to refill it, explained HRSD general manager Ted Henifin during a detailed presentation to the Middlesex Board of Supervisors during its retreat meeting on Monday, November 16, at the Deltaville Maritime Museum.

The idea of injecting treated wastewater back into the ground is nothing new. Groundwater recharging with direct injection has been done in El Paso, Texas, since 1985, in California since 1993, and in Scottsdale, Arizona, since 1999, states HRSD's report. HRSD's proposal would be the first time direct injection of water would be done in Virginia, said Henifin.

Water levels in the Potomac Aquifer have been sinking for decades. Geologic maps show "cones of depression" that radiate around two large water users in the Tidewater area—one is the RockTenn paper mill in West Point, the other is International Paper's mill in Franklin. The aquifer around these paper mills sank more than 150 feet in the last 100 years.

Added to this withdrawal is population growth that has increased water usage.

"Total permitted withdrawals are unsustainable," stated the HRSD presentation.

Saltwater intrusion

As the aquifer water level drops, saltwater from the Chesapeake Bay flows "downhill" into the aquifer. Saltwater intrusion is one reason some properties in eastern Middlesex have poor drinking water. Refilling the aquifer would provide pressure to keep saltwater out.

Sinking land

As the aquifer level drops, the land above it is not supported and sinks. Just as a boat floats on water, so does the earth.

By injecting 120 million gallons of water per day into the aquifer, land subsidence will be slowed, said Henifin.

He said when the paper mill in Franklin reduced its water use between 2002 and 2015, the land actually raised measurably, according to the nearby U.S. Geologic Survey monitoring station.

Containing nutrients

Another major benefit of injecting water back into the aquifer is that the treated wastewater will not go into bodies of water that flow into the bay. Nutrients are extremely hard to remove from wastewater. These nutrients feed algae that "bloom" in summer and block sunlight from reaching underwater grasses. When the algae die, their decomposition uses oxygen to the detriment of aquatic life.

Henifin said HRSD has spent $750 million trying to remove nutrients from wastewater to meet state regulations. HRSD may have to spend $1 billion more to meet further regulations, he added.

To emphasize how difficult it is to clean water to meet current state regulations, Jim Pyne, who has retired from HRSD, explained more than a year ago that if a copper penny is dipped into a glass of water, that water would contain too much copper to be discharged legally.
Many houses, especially older ones, have copper pipes.

Schedule

Henifin said HRSD's water injection plan will seek the endorsement of the Department of Environmental Quality (DEQ) and the Virginia Health Department.

HRSD's aggressive schedule calls for a one million gallons per day demonstration pilot system by 2018.

By 2021, HRSD hopes to inject 20 million gallons per day back into the aquifer.

If all goes well, HRSD could be injecting 120 million gallons per day of clean water back into the aquifer by 2030.

The cost to build six treatment plants to treat water until it is "drinking water quality" is estimated at $1 billion—about the same as costs to develop stricter nutrient removal.

More than once

Reusing water is the norm, said Henifin. He explained that people withdraw water from a river, use it, treat it, and put it back into the river, where someone downstream withdraws it to use again. "Almost no water is new water," he said.

See related article by Middlesex supervisor Pete Mansfield.

posted 11.18.2015

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the sunday break

TASTE TEST: CHICKEN WINGS

Ahead of Super Bowl 50 — between the Carolina Panthers and the Denver Broncos — an important local contest: Which Hampton Roads restaurant is king of the wing?

business

You might be rich

Well, rich might be overstating it, but if you have $3,210 or more in net assets, you're doing better than half the world. **BUSINESS, PAGE 4**

The Virginian-Pilot

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BILL TIERNAN | THE VIRGINIAN-PILOT

Ted Henifin, general manager of the Hampton Roads Sanitation District, was tired of watching treated water flow uselessly into rivers and the bay. Then the idea hit him.

Can your sinks and toilets fight sea-level rise?

SINKING LAND is part of the problem, as society guzzles groundwater. One solution is to pump treated wastewater back in.

recycling water

A Hampton Roads Sanitation District plan to pump treated wastewater more than a thousand feet below into the region's aquifer could slow the sinking of land – known as subsidence – and help meet a federal mandate to clean up the Chesapeake Bay.

obstacles

Besides convincing residents that water going into the ground is clean enough to drink, there's the cost. Including design and construction, it is projected to be $1 billion over 15 years.

By Dave Mayfield
The Virginian-Pilot

ON A clear December morning, a roaring stream rushed from the Hampton Roads Sanitation District's Suffolk treatment plant. Hundreds of thousands of sinks, showers and toilets had fed the torrent, now headed for the James River.

Looking down at the cascade, Ted Henifin tried to recall when he got the idea that maybe, just maybe, all that water needn't go to waste.

"I remember sending an email to our planning guy, saying, 'Can we figure out how to do this?' " said Henifin, HRSD's general manager.

That message a couple of years ago marked the humble beginning of what's shaping up as one of the boldest public works proposals in recent Virginia history.

What Henifin has in mind is turning the treated wastewater into something useful. He wants to make it so clean that you and I could safely drink it, and then he wants to inject it more than a thousand feet underground into

See **WASTEWATER, PAGE 12**

Virginia GOP asks state to cancel "loyalty oath"

Republican party cites "bad publicity" as cause for reversal

By Bill Bartel
The Virginian-Pilot

State Republican Party leaders voted in Richmond on Saturday to ask the state to cancel a required party loyalty pledge in the March 1 GOP presidential primary.

Roger Miles, a GOP state central committee member, said shortly after the unanimous voice vote that the party leaders are halting their plans because of "bad publicity."

At the party's request, the State Board of Elections had been requiring all voters in the GOP primary to sign and print their name on a statement affirming "I am a Republican" before being allowed to cast a ballot.

A statement from the Republican Party of Virginia on Saturday afternoon criticized edits made to the pledge

See **OATH, PAGE 13**

STEVE EARLEY | VIRGINIAN-PILOT FILE PHOTO

Norfolk Treasurer Anthony Burfoot, who served on the City Council for more than a decade, has a trial set for May 3.

On the field and in Norfolk council chambers, Burfoot came ready to strike hard

City treasurer accused of corruption gathered help from mentors to rise to political prominence

By Tim Eberly
The Virginian-Pilot

NORFOLK

Anthony Burfoot played with a fire in his belly on the football field at Norfolk's Lake Taylor High School. He laid stinging hits on opponents and didn't back down from a fight – even with his coach.

Burfoot traded his football pads for bow ties and snappy suits when he landed on the City Council in 2002, but he never lost that pugnacity – whether he was dealing with fellow council members, the city administration or community members.

"He came in guns a-blasting," Councilman Barclay Winn said. "He was not a wallflower."

News of Burfoot's indictment on political corruption charges this month saddened some who worked with the man who grew up in the poverty-stricken Berkley neighborhood, played football for Virginia State University and later linked up with political mentors who helped him pull off an upset to seize a

See **BURFOOT, PAGE 14**

mild with plenty of sun

High: upper 60s. Low: mid-40s.

Details on the back page of Sports

Marketing agency RocketBike takes off in Portsmouth

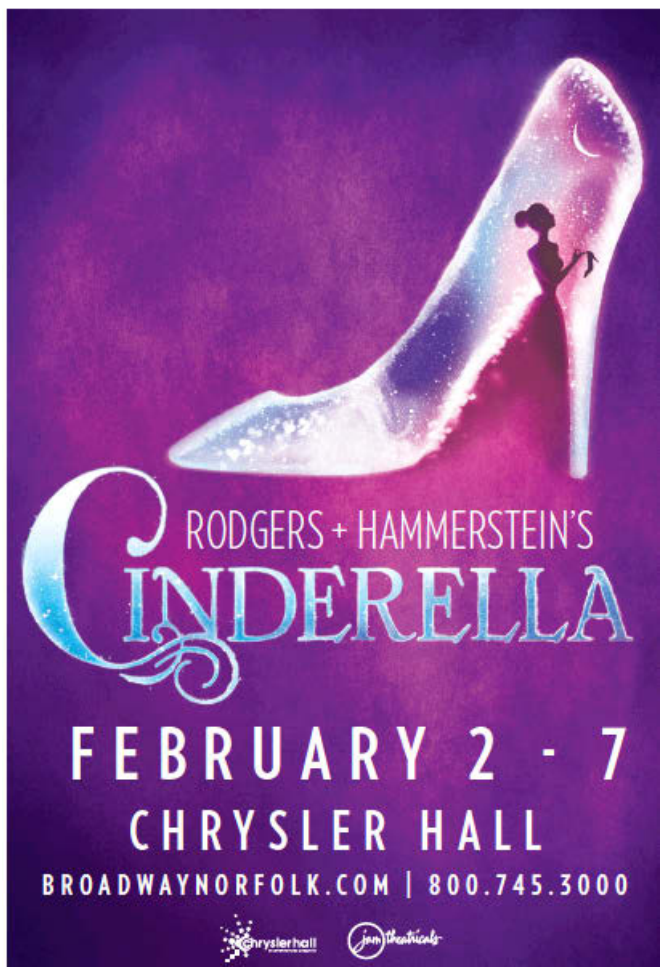
Business

ODU women's hoops heroes return to celebrate the school's 1,000th victory.

Sports

Relative speaks at candlelight vigil for the six relatives who died in Chesapeake murder-suicide.

Page 3



BILL TIERNAN PHOTOS | THE VIRGINIAN-PILOT

Tim Scott, the Nansemond Treatment Plant's lead operator, gives a tour of the facility on Armstead Road in Suffolk, where the first injection well would probably be drilled.

WASTEWATER

ICK FACTOR IS A CHALLENGE, BUT THIS WORKED ELSEWHERE

Continued from Page 1

an aquifer that's being rapidly depleted.

In doing so, he hopes to address a bunch of problems vexing coastal Virginia.

Geologists say that recharging the aquifer would help slow the sinking of our land – a problem known as subsidence. That would help make the region less vulnerable to rising seas.

The replenishment could allow Virginia to ease growing pressure on large groundwater users to reduce their withdrawals from the aquifer. And it could help development officials more aggressively market the region, whose economy has been struggling, to manufacturers or other employers with big water needs.

With HRSD's discharges into the Elizabeth, James and York rivers cut dramatically, Hampton Roads also would leap ahead in its progress toward a federal mandate to clean up the Chesapeake Bay. That could spare localities from having to invest hundreds of millions of dollars in stormwater management projects.

The HRSD project won't be cheap, easy or without controversy.

Its design and construction cost is estimated at $1 billion over 15 years.

The agency will have to prove during extensive tests that the project is ready to go full-scale at the seven treatment plants being considered for it.

HRSD may run into pushback against its idea to charge groundwater users for aquifer withdrawals. In Virginia, that water is now free.

And then there's the "ick" factor.

"The thing that they're going to have to overcome and that's going to be the most difficult is public perception," said Robert Burnley, a former director of Virginia's Department of Environmental Quality.

Tens of thousands of homeowners in rural parts of coastal Virginia draw their drinking water directly from wells drilled into the aquifer that HRSD proposes to inject. Some towns, like Smithfield, depend on wells, too. Even some cities, like Portsmouth and Newport News, rely in part on groundwater.

"It's going to take a little selling to get people to accept that they'll essentially be drinking treated wastewater," Burnley said. "People don't want to think about drinking what they had been flushing."

He's sold, however: "That water is a very valuable resource, and a lot of money already goes into treating it. It just seems terrible to throw it all away."

This is what the water looks like in the treatment process at one of the Suffolk plant's seven aeration tanks.

> "The thing that they're going to have to overcome and that's going to be the most difficult is public perception."
>
> *Robert Burnley, a former director of Virginia's Department of Environmental Quality*

One of the first things that Henifin stresses when he talks about HRSD's proposal, known officially as the "sustainable water recycling initiative," is that his agency isn't exactly going out on a limb.

Other U.S. communities already are reusing wastewater.

In Northern Virginia, the Upper Occoquan Service Authority has for 38 years been discharging water from its treatment plant into a reservoir. That same reservoir is tapped by another authority that further treats the water and sends it to Fairfax County residents.

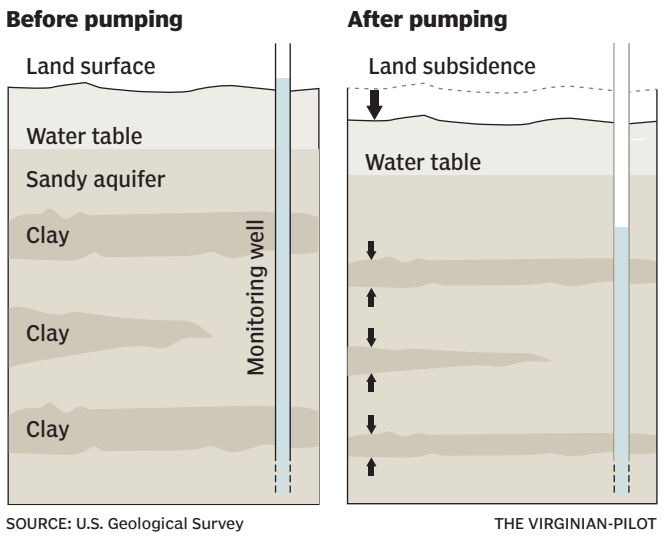
Orange County, Calif., cleans wastewater to even higher standards and mixes it in underground basins with water imported from rivers. The blend is then piped to customers' homes.

At the far extreme is what's known as direct, or "pipe-to-pipe," reuse – with no reservoir or aquifer in between. What comes in as sewage goes back treated to drinking-water standards. Two drought-plagued Texas communities – Big Spring and Wichita Falls – use that method now.

The water needs are not so desperate to warrant that approach in coastal Virginia, Henifin said. A pipeline from Lake Gaston provides South Hampton Roads' municipal systems with an abundance of fresh water. Reservoirs collect a lot as well.

AQUIFER SYSTEM COMPACTION

The clay layers in an aquifer system are the most susceptible to groundwater withdrawals. Their compaction is a major factor in land subsidence, or sinking.



SOURCE: U.S. Geological Survey THE VIRGINIAN-PILOT

Plus, pipe-to-pipe reuse "doesn't achieve all of the other environmental benefits" that aquifer replenishment would, he said.

When HRSD consultants produced computer models that showed recharging would pump up groundwater levels across a wide swath of coastal Virginia, he and others thought, "We're on to something here," Henifin said.

Geologists have for decades theorized that the main reason the land in Hampton Roads is sinking faster than in many other coastal areas is aquifer withdrawals.

To understand the theory, it first helps to know a little about aquifers. Basically, they're layers of rock, sand or other sediment that are saturated with water. From countless rains and snowfalls, trillions and trillions of gallons have trickled into the sand beds of the Potomac aquifer, the deepest of several under coastal Virginia and the one into which HRSD proposes to inject. Water samples from deep in the aquifer have been estimated as old as 40,000 years.

State officials have calculated that roughly 150 million gallons a day are being drawn in Virginia from the aquifer, which stretches from New Jersey to the North Carolina-South Carolina line.

The heaviest withdrawals in Virginia are in West Point and Franklin, where paper mills have long operated. Combined, the plants take roughly 30 million gallons a day, and on U.S. Geological Survey maps of groundwater decreases, they stand out as red centers in a sea of blue.

Though most of the water is pulled from porous layers of sand and shell fragments, the aquifer system's more dense clay layers are affected most because they compress much more easily as water pressure drops. That compaction is the biggest factor in subsidence across the southern Chesapeake Bay region, according to a Geological Survey report in 2013. It showed the land sinking at rates ranging from 1.1 to 4.8 millimeters a year over a seven-decade stretch ending in 2011.

When the subsidence is combined with rising ocean waters, the region's relative sea-level rise has been adding up to an average of about 4 millimeters a year, the report said. Extended over a century, that works out to nearly 16 inches. Global warming could accelerate the pace, some scientists have warned.

All this puts Hampton Roads behind only one other U.S. coastal community, New Orleans, when it comes to waterfront investments at risk. No wonder the Navy and other big landowners in the region have been raising concerns.

How much HRSD's proposal can help with the subsidence piece of the problem is unclear. For one thing, it's planning to inject between 100 million and 120 million gallons a day into the aquifer – less than the current rate of withdrawals in Virginia.

While some surface water makes its way naturally into the aquifer, it may not be enough to close the gap. Plus, studies indicate that subsidence has a momentum that can continue long after the withdrawals that caused it end. And part of this region's subsidence is attributed to the last ice age, which ended more than 10,000 years ago. The effects of those glacial movements likely will linger for millennia.

The best-case scenario for HRSD's proposal may be to slow the sinking of the land, said Jack Eggleston, the lead author of the Geological Sur-

AN AQUIFER REFRESHED?

The Hampton Roads Sanitation District has proposed treating wastewater to drinking-water standards at as many as seven of its plants and then injecting it into the region's deepest groundwater source, the Potomac aquifer. HRSD says the proposal would reduce the rapid depletion of the aquifer and, by doing so, help slow land subsidence.

The agency says a computer model shows a dramatic effect on water pressures and levels within the aquifer. Here's how that change would play out across the region.

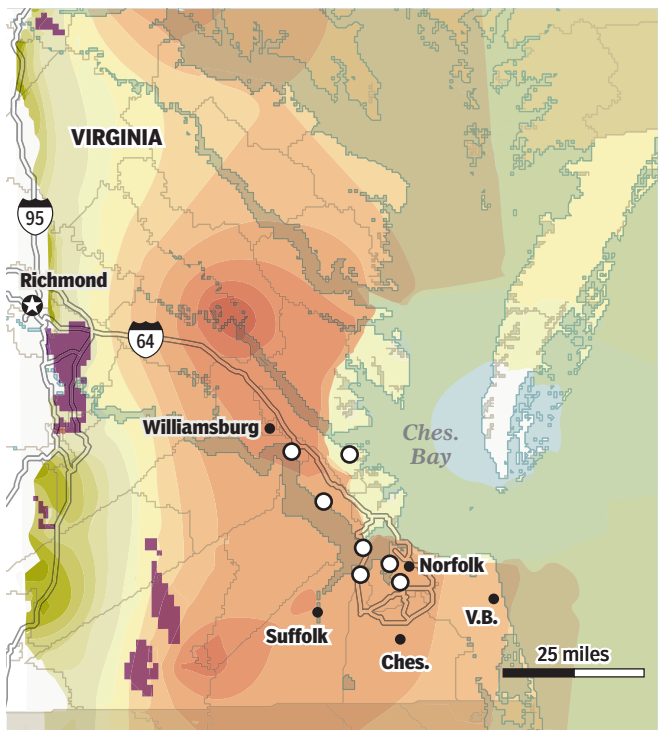
Water pressure/level

Lowest – Highest

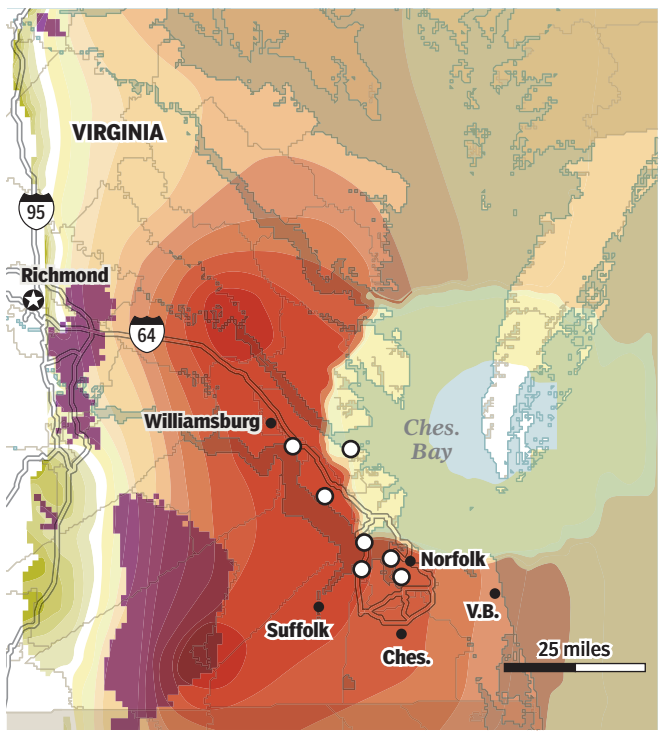
○ **Hampton Roads Sanitation District plants** where treated wastewater would be injected into aquifer

■ **Areas with critically depleted groundwater**

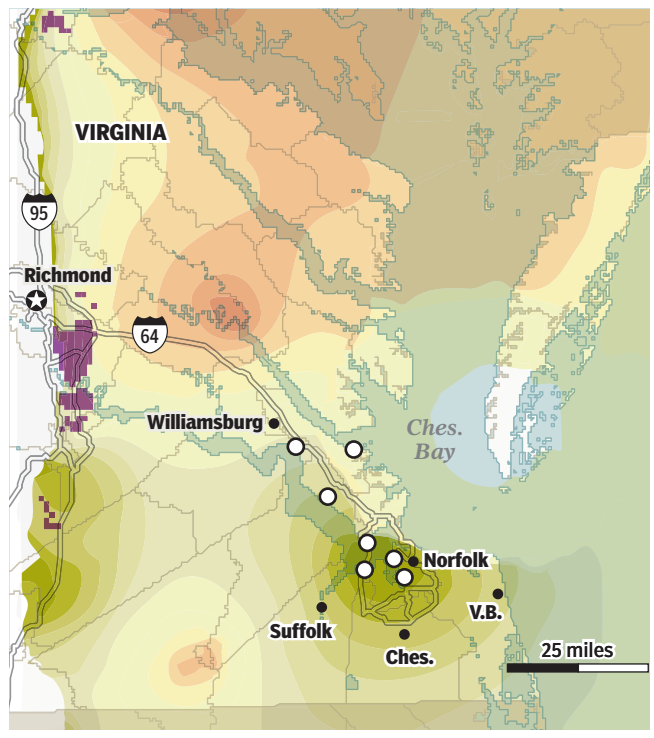
Water pressures/levels within the Potomac aquifer, 2014



Projected water pressures/levels in 50 years without aquifer replenishment*



Projected water pressures/levels in 50 years with aquifer replenishment*



* Scenario assumes current withdrawals will continue unchanged.

SOURCES: Aquaveo LLC, Virginia Department of Environmental Quality, Hampton Roads Sanitation District

LISA MERKLIN | THE VIRGINIAN-PILOT

vey report. Still, he said, with subsidence accounting for more than half of the region's relative sea-level rise, that could be a significant benefit.

Other benefits would be easier to measure.

If they can accept where the treated water came from, current groundwater users would see plenty of gains.

Many of them, including rural homeowners, face the prospects of having to deepen wells or drill new ones if groundwater levels continue to drop.

And the largest users – the roughly 175 that need state permits because they pull more than 300,000 gallons a month – have been told by state regulators in the past year to brace for reductions. Already, two of them – James City County and the WestRock Co. paper plant in West Point – face limits below the amounts they're now taking. Government officials have said the limitations could thwart residential development in some areas and are making it harder for industries to expand or locate in the region.

The sanitation agency wants to assess groundwater users fees to recover the $20 million to $40 million a year it would cost to operate and maintain the new equipment that would be required. There's no provision under state law for charging those users. And some are sure to object to changing that.

There's also concern that as the aquifer is drawn down, it's becoming more vulnerable to saltwater wedging in from the sea. That's happened in other coastal areas where groundwater was heavily tapped, ruining wells and forcing communities to turn elsewhere for fresh water.

The HRSD proposal promises to help lift many of those clouds, and Henifin said the agency believes it's only fair that groundwater users chip in. He wants to assess them fees to recover the $20 million to $40 million a year it would cost to operate and maintain the new equipment that would be required.

There's no provision under state law for charging groundwater users. And some are sure to object to changing that.

Still, Andrea Wortzel, a Richmond lawyer who coordinates a group of large users called Mission H2O, said they'd welcome an invitation to discuss how to perpetuate the groundwater supply: "Our members are very interested in looking for solutions."

Environmental groups also see the potential.

The HRSD proposal could cause "quite a dramatic improvement" in the water quality of rivers, said Marjorie Mayfield Jackson, executive director of the Elizabeth River Project. She said the cuts in surface discharges from HRSD treatment plants could strengthen the case for opening parts of the watershed, including sections of the Lafayette River in Norfolk, to oyster harvesting. Oyster populations have been rebounding, but the state Health Department bans their harvest throughout that watershed.

Taking away the river discharges would mean much less nitrogen and phosphorus going into the lower Chesapeake Bay. So localities facing expensive federal requirements to cut runoff of those pollutants might be able to gain a reprieve, said Whitney Katchmark, who oversees water resources issues for the Hampton Roads Planning District Commission.

With so much at stake, Henifin said, HRSD is going to great lengths to get things right.

Over the past several months, he and other staffers at the state-chartered agency have held briefings with scores of elected officials, regulators, planners, environmentalists and large water users. They've spent about $400,000 on a study and computer modeling of the aquifer and gathered information on every wastewater-reuse and aquifer-injection system they could find.

They didn't have to go far, in some cases.

Chesapeake has put a net 2.8 billion gallons of fresh surface water into the Potomac aquifer since 1989. "We're essentially using it as a really large underground storage tank" that's tapped in times of extraordinary demand, said David Jurgens, the city's utilities director. This "aquifer storage and recovery" facility is the largest of its kind in the mid-Atlantic.

Jurgens said the only significant hiccups came early on, when the water that Chesapeake put in didn't closely enough match the water already in the aquifer at the injection site. That caused a chemical reaction that resulted in elevated levels of manganese in water being drawn back out. A pH adjustment in the injected water corrected that.

"Getting the chemistry right" in the water it injects will be crucial, Henifin said. Salt levels in the aquifer will vary, for example, depending upon how deep and where the injection wells are drilled. A mismatch between the water that goes in and the water already around the injection well could cause it to clog irreparably.

With as many as 10 injection wells per treatment plant, it could become an expensive problem to manage.

That's one of the reasons why HRSD is taking a "stair-step" approach, Henifin said.

The next significant step, beginning as early as May, will be "room-sized" pilot tests at its York County plant of the two processes the agency is considering adding to its treatment chain. One is known as reverse osmosis. The other relies on activated carbon. Both processes will employ ultraviolet light in their cleansing arsenals.

"We'll run parallel processes to prove that they can reliably and effectively exceed drinking-water standards," Henifin said.

> We'll ... prove that they can reliably and effectively exceed drinking-water standards. I'll be drinking it."
>
> *Ted Henifin, general manager of HRSD*

"I'll be drinking it," he insisted.

Assuming those tests go well, the next step would be the drilling in 2017 or 2018 of a single injection well, likely at the plant in northern Suffolk. As many as 3 million gallons a day of wastewater would then be treated to drinking-water standards and pumped deep into the ground.

If that demonstration succeeds and it gets the necessary state and federal OKs, the agency then would phase in either six or seven plants over about a decade ending in 2030.

The $1 billion price tag that HRSD estimates for the entire project has raised eyebrows, Henifin conceded. But the agency already had forecast that toughening environmental standards would require it to spend $4.4 billion for capital improvements over the next 20 years. So "it just takes a little creative rearranging of things to absorb a billion dollars and figure out the right place to put it."

Whether it goes forward with the project or not, Henifin said, HRSD's 460,000 ratepayers in 17 cities and counties will face higher bills. He predicts residential rates will go from an average of about $30 a month to $70 a month by 2030.

HRSD envisions the aquifer-replenishment project becoming its solution for the bay cleanup mandate, which requires it to sharply cut nitrogen and phosphorus discharges and which Henifin suspects could be toughened further. He said that if it moves forward with the proposal, HRSD likely will ask federal officials to push back deadlines for another expensive mandate – to eliminate occasional sewer overflows during periods of heavy rain. Correcting that problem will have a negligible environmental benefit, he said.

Persuading regulators to show some flexibility may be the easy part. Convincing everyday folks that the time has come for a radical solution to water problems could be much harder.

HRSD tentatively is planning meetings across the region in 2017 at which the public will be invited to comment on its proposal. Other comment periods likely will follow.

An outcry from groundwater users could get politicians' backs up and put HRSD's proposal in jeopardy.

Henifin is optimistic it won't come to that:

"The technology and the plan we've got is great. It would be just a shame to lose this opportunity to do the right thing."

Dave Mayfield, 757-446-2341, dave.mayfield@pilotonline.com

OATH | *An "X" or a squiggle in place of a signature meets requirements, state election officials say*

Continued from Page 1

originally written by the GOP.

Saturday's development comes after The Pilot learned late last week that there was a loophole.

The form must be filled out to get a GOP ballot – no exceptions. But scribbling something as simple as a jagged line or an "X" in place of the signature and printed name on the half-page form can be enough to meet the requirements, state election officials said.

Virginia does not register voters by party and allows anyone to participate in any primary election. Republican officials had previously said the oath was intended to prevent Democrats from crossing over and helping to select their preferred nominee.

Democrats have no such requirement.

The pledges have already been included in absentee ballots sent in advance of the primary. However, the statements are not part of the ballot itself and could be discarded.

Martin Mash, spokesman for the state Board of Election, said Saturday the agency has been alerted to the party's action and "we are in the process of determining the most appropriate way to do this."

Opponents of the oath, including supporters of GOP front-runner Donald Trump, unsuccessfully tried to block the pledge in federal court. They argued it would keep away black Trump supporters who traditionally vote Democratic and wouldn't want to risk being ostracized by publicly signing a statement declaring they're Republicans.

However, what is acceptable self-identification – considering that a voter's penmanship can range from clear to indecipherable – can't be judged by a person's ability to write legibly, officials said.

When asked last week if it's acceptable to draw a simple line for a signature and jot "XX" for a printed name, without protesting the oath form itself, both Mash and Virginia Department of Elections attorney Martha Brissette agreed it was.

"If you had an X and a squiggle, there's no way you could determine the intent," Mash said.

Republican officials had previously said the oath was intended to prevent Democrats from crossing over and helping to select their preferred nominee.

"So you have to assume that the voter was being sincere in what they were doing. As opposed to if the voter wrote in there a profane message – you know what I mean? I think those are the instances that might call attention. But if you're a voter and you don't ask for assistance. And you put an X on there and a straight line ... and it appears it's the best you can do and there's no way to know either way, then that shouldn't be a barrier to counting the ballot."

Mash said denying such a form at the polls would be a problem.

"What's so difficult about this is a lot of this goes to intent," he said. "It's so hard to crawl in somebody's head and figure out whether they were doing the best they could by signing an 'X' or whether they were intentionally trying to obstruct the purpose of the document."

Brissette noted there's "accepted principle" in state law that an "X" is sufficient for a signature.

John Findlay, executive director of the state GOP, said Friday he had not known the election officials would accept an "X" or drawn line for the printed name.

The Rev. Stephen Parson, one of three black ministers who unsuccessfully sued the Election Board in an attempt to quash the party loyalty statement, said many people would be willing to participate in the primary if the looser identification is allowed.

"If people know about this, it would at least be a solution when they can go and vote," he said. "We need this can of worms opened up."

Several South Hampton Roads city voter registrars said last week they hadn't considered what standards would be required when checking signatures on the Republican oath.

Chesapeake registrar Mary Lynn Pinkerman said she would likely accept whatever a voter wrote. "We try to help people vote, not prevent them from voting," she said.

Bill Bartel, 757-446-2398, bill.bartel@pilotonline.com

crime and courts

SEARCH WARRANTS SEALED IN CASE OF VIRGINIA GIRL, 13, WHO WAS STABBED TO DEATH

The Associated Press

BLACKSBURG

Search warrants in the death of a 13-year-old girl who police say was slain by a Virginia Tech student have been sealed by a judge as the investigation continues.

The Roanoke Times reports that documents that may contain key details of the prosecution's evidence against the two people charged in Nicole Lovell's death were sealed several weeks ago.

David Eisenhauer, 18, is charged with abduction and first-degree murder in the death of Lovell, who vanished Jan. 27.

Another Virginia Tech student, Natalie Keepers, 19, is charged with accessory before and after the fact and with illegally dumping Nicole's body just across the state line in North Carolina. Authorities say Nicole was stabbed.

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Aquifer replenishment touted as a cheaper way to clean bay

Project would treat wastewater, reduce pollution

By Dave Mayfield
The Virginian-Pilot

CHESAPEAKE

Among those who crunch the numbers for city and county budgets, a big wild card in the decade ahead is the Chesapeake Bay cleanup.

Localities have been told they need to sharply cut pollution running into the bay and its tributaries from streets and parking lots. Collectively, the mandate could cost them $1 billion or more. And what makes it harder to swallow is that proving how much nitrogen, phosphorus and sediments would be kept out of waterways from all that spending will be difficult at best.

On Thursday, representatives of the cities and counties were offered a potential way around the stormwater problem. It came via a presentation by Ted Henifin, general manager of the Hampton Roads Sanitation District, the region's wastewater treatment authority.

He outlined an HRSD proposal that would cut nutrient runoff into the bay by so much that the localities could be spared from the stormwater cleanup requirements.

The HRSD has proposed eliminating almost entirely discharges from its treatment plants into the Elizabeth, James and York rivers. Instead, it would add steps to bring the wastewater to drinking-water standards, then inject it into the deepest aquifer in the region.

The "sustainable water recycling" proposal has been touted as a way to address coastal Virginia's growing concerns about sea level rise. The Potomac aquifer has been heavily depleted by withdrawals, and that's accelerated the pace at which land is sinking – a process known as subsidence. This makes the region even more vulnerable to rising seas.

Computer models indicate pumping 120 million gallons a day back into the aquifer, as the HRSD proposes, would increase water levels and pressures within it. Geologists say that should slow subsidence.

While Henifin covered that territory in his talk Thursday, he put more emphasis on how the HRSD's proposal might spare local governments from big investments in the bay cleanup. It wasn't surprising, given his audience: the executive committee of the Hampton Roads Planning District Commission, a group of city and county managers and local elected officials.

Henifin ran through slides that showed how the HRSD proposal would cut pollution. In the James, its annual discharge of nitrogen would be sliced by about 90 percent, to an annual total of 500,000 pounds. That would be well below the most drastic limit of 1.6 million pounds the agency projects it could face for the James under guidelines for the federally mandated cleanup.

That over-compliance would more than cover the amounts of nitrogen localities face having to cut in their stormwater runoff, Henifin said. The same trend generally applies to phosphorus and sediment in the James and in other rivers, he said.

The state Department of Environmental Quality must OK such a reallocation of what's known as the Total Maximum Daily Load of pollutants, or TMDL. Henifin said he's optimistic the agency would go along. He said he met with Gov. Terry McAuliffe on Feb. 9, and the governor is "all in, at this point" in encouraging the HRSD to move forward.

Whitney Katchmark, who oversees water resources issues for the Planning District Commission, said alleviation of the stormwater requirement wouldn't mean an end to projects that would reduce pollutant runoff. She said that localities are taking steps to limit damage from tidal flooding, and that those projects generally result in less pollution.

The HRSD has estimated its project would cost $1 billion – which would be recovered from ratepayers – but Henifin has said much of what it plans would have been required eventually anyway under toughening federal guidelines for water treatment. The agency has proposed charging groundwater users to recover its operating and maintenance cost for the new technology, which it estimates at $20 million to $40 million a year. Such a fee may require a change in state law.

Federal regulators also must approve the HRSD's proposal.

Members of the planning committee Thursday asked Henifin a few questions but didn't vote on the HRSD proposal. Henifin said that it was too early to seek an endorsement, and that the HRSD likely will ask for one next year, after it completes tests to prove the concept's viability.

Dave Mayfield, 757-446-2341, dave.mayfield@pilotonline.com

Commission says it has feasible plan for roads

All phases of water crossing wouldn't be done until 2060s

By Jordan Pascale
The Virginian-Pilot

The group in charge of creating a transportation funding plan for the next six years has almost finished its work, but under current assumptions, there's not enough to pay for all the region's priority projects by 2040.

Most notably, only one part of a water crossing could be completed by 2028; the rest is set for 2061 or 2066.

Just exactly what those water crossings are – the Patriots Crossing with Craney Island Connector and expanded Monitor-Merrimac and Hampton Roads bridge-tunnels, or a combination – is still being identified in a two-year environmental study.

So planners have put a placeholder dollar amount, $4 billion, for one of those projects to be built by 2028.

The Hampton Roads Transportation Accountability Commission, created by 2013 legislation to oversee newly created regional tax revenue for transportation, first started meeting in July 2014.

HRTAC Chairman and Virginia Beach Mayor Will Sessoms said he feels the group is starting to get something done.

"This is one of the most encouraging things we've seen since the beginning of HRTAC," Sessoms said. "Does it get everything we want? No, it does not do that, and we must be honest about that."

But it's come a long way from where it was in November.

HRTAC hired a consultant to come up with a plan to pay for nine priority projects by 2040.

The consultant came back with six scenarios that looked at tolling nearly every water crossing and implementing High Occupancy Toll lanes on some interstates. Tolls ranged from $1 to $3.

Despite the heavy tolling, none of the plans was able to be fully funded with current revenue.

"In the end, we did what we were asked to do," HRTAC head Kevin Page said.

None was suitable to the HRTAC board, so HRTAC financial gurus pruned those plans to a realistic one. The plan includes no new tolls or tax increases. Under the plan, projects would be paid for as they are built:

- Finish the Hampton Roads Crossing study by 2018.
- Phase I expansion of the High-Rise Bridge by 2020, Phase II by 2029
- Interstate 64/264 interchange done by 2021
- Phase I & 2 of I-64 expansion on the Peninsula finished by 2019, Phase III finished by 2022, Fort Eustis interchange by 2031
- Phase I of the water crossing by 2028
- U.S. 460/58/13 connector by 2032

Beyond 2040, the second phase of the water crossing plan is set for 2061, and the third is to be completed in 2066. This is the best they can do with what they know, Page said.

A bill in the legislature (SB742) would bring in more gas tax revenue if it passes, but its future is uncertain.

"We are finding the best path, without waiting around for something to happen," Page said. "A lot will unfold in 24 months."

Sessoms urged residents to contact their HRTAC representative in the next 30 days to comment or attend a public hearing during its March 14 meeting at its office at 723 Woodlake Drive in Chesapeake.

This funding proposal will guide planners and help give state officials an idea about project construction readiness, and it will help in the development of the Hampton Roads Transportation Planning Organization's long-term transportation plan, set to be approved in July.

Jordan Pascale, 757-446-2276, jordan.pascale@pilotonline.com
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COMMITMENTS TO ACTION ON BUILDING A SUSTAINABLE WATER FUTURE

The Executive Office of the President

March 22, 2016

Water challenges are facing communities and regions across the United States, impacting millions of lives and costing billions of dollars in damages. Recent events, including record-breaking drought in the West, severe flooding in the Southeast, and the water-quality crisis in Flint, MI, have elevated a national dialogue on the state of our Nation's water resources and infrastructure. This dialogue is increasingly important as a growing population and changing climate continue to exacerbate water challenges. On March 22, 2016—World Water Day—the Obama Administration hosted the first-ever White House Water Summit to shine a spotlight on the importance of cross-cutting, creative solutions to solving the water problems of today, as well as to highlight the innovative strategies that will catalyze change across the ways in which we use, conserve, protect, and think about water in the years to come. As part of the Summit, the Administration called on institutions and organizations from all sectors to make new commitments to build a sustainable water future in the United States. In response, institutions and organizations made the following commitments, as reported and described by respondents.

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New Steps Being Taken by the Administration

Today, the White House is announcing new steps to help build a sustainable water future in the United States. These steps include:

- **Building national capabilities for long-term drought resilience.** Drought routinely affects millions of Americans and poses a serious and growing threat to the security of communities nationwide. While drought has recently been particularly detrimental to Western states, serious drought issues can affect nearly every region of the country; in 2012, drought covered more than 65% of the United States. Drought presents risks to the security of the U.S. food supply and integrity of critical infrastructures, causes extensive economic impacts, increases energy costs, and adversely impacts health in many ways. The impacts of climate change are expected to increase the frequency, intensity, and duration of droughts in many regions. That's why today, President Obama is issuing a Presidential Memorandum on Building National Capabilities for Long-Term Drought Resilience. The Memorandum lays out six drought-resilience goals and corresponding actions, and permanently establishes the National Drought Resilience Partnership (NDRP) as an interagency task force responsible for coordinating execution of these actions. In addition, building on previous drought-response efforts, the Administration is releasing the NDRP's Long-Term Drought Resilience Federal Action Plan. The Action Plan describes specific activities that Federal agencies will take—within existing resources and authorities and working with State, regional, tribal, and local partners—to build national drought-resilience capabilities in accordance with the goals and actions of the Presidential Memorandum. These actions build on previous efforts of the Administration in responding to drought and are responsive to input received during engagement with drought stakeholders, which called for shifting focus from responding to the effects of drought toward supporting coordinated, community-level resilience and preparedness to adapt to drought impacts.

  In conjunction with today's Presidential Memorandum and NDRP Action Plan, Federal agencies are announcing new efforts to enhance long-term drought resilience:
  - Improving drought monitoring and forecasting. In 2016, as part of the NDRP Action Plan, the **U.S. Department of Agriculture** (**USDA)** and **NOAA** will expand the U.S. Drought Monitor—a vital tool for guiding response to drought emergencies—to include the U.S. Virgin Islands and the U.S. Affiliated Pacific Islands.
  - Improving rural access to drinking water. As part of the NDRP Action Plan, **USDA** will work with States and tribes to identify rural communities most at risk for compromised drinking-water supplies as a result of drought. Additionally, USDA will make inclusion of drought impacts in emergency-response plans a condition of funding for new water and waste infrastructure projects, and will train technical-assistance providers as needed to support communities in meeting this requirement.
  - Improving the coordination and integration of Federal programs. In 2016, as part of the NDRP Action Plan, **USDA** and the **U.S. Bureau of Reclamation (USBR)** will extend the successful practices of cross-program coordination for USBR WaterSMART and USDA Environmental Quality Incentives Program (EQIP) water-efficiency grants currently underway in California to other basins suffering from or at risk for drought.

- Announcing a new public-private collaboration around drought research. The **U.S. Geological Survey (USGS)** National Climate Change and Wildlife Science Center is announcing a new partnership with the **Wildlife Conservation Society** and **The Nature Conservancy** to synthesize current understanding of the ecological impacts of drought and examine sets of management options that are relevant at the national, regional, and local levels.

- **Supporting cutting-edge research.** The Administration is announcing a number of efforts to support cutting-edge water-research projects, including:
  - Awarding nearly $35 million in grants:
    - The **National Science Foundation (NSF)** is providing $20 million through its Experimental Program to Stimulate Competitive Research (EPSCoR) to research teams who will apply a systems-based, highly integrated approach to examine impacts of extreme events. An integrated model of the watershed will be used to test management scenarios and identify strategies for maintaining infrastructure, environmental health, and drinking-water quality in the face of extreme-weather events. NSF is also providing $2 million through its Advanced Technology Education program to educate technicians for water-related and other high-technology fields that drive our Nation's economy.
    - **USDA** is awarding $8.5 million to ten institutions and organizations through its National Institute of Food and Agriculture's Water for Agriculture program, to support research into critical water problems in rural and agricultural watersheds across the United States. These grants further research and education projects focusing on sustainability, allocation, and management of water resources, as well as the treatment and safety of water sources.
    - The **Environmental Protection Agency (EPA)** is awarding $3.3 million to five institutions—the Water Environment Research Foundation; the University of Illinois at Urbana-Champaign; Utah State University; the University of Nevada, Las Vegas; and the University of California, Riverside—to fund research on the health and ecological impacts of water-conservation practices. EPA will also hold a kick-off event for $4 million recently awarded to four institutions—Public Policy Institute of California, Water Research Foundation-University of Colorado Boulder, University of Utah, and Clemson University—to fund research on potential impacts of drought and forest fire on water quality.
  - The **National Aeronautics and Space Administration (NASA)** is announcing the formation of a new, agency-wide Western Water Applications Office (WWAO), based at its Jet Propulsion Laboratory (JPL) at the California Institute of Technology in Pasadena. The WWAO will support the strategic development of key applications from satellite observations and airborne technologies to maximize their use in order to better meet the challenges of drought, flooding, declining snowpacks, and falling groundwater levels across the west. NASA is launching this effort in summer 2016.
  - The Federal agencies participating in the **National Nanotechnology Initiative** are announcing a new Nanotechnology Signature Initiative (NSI), *Water Sustainability through Nanotechnology*. The new NSI will focus on applying the unique properties of

materials—including increased surface area and reactivity—that occur at the nanoscale to increase water availability, improve water delivery and use efficiency, and enable next-generation water-monitoring systems. Participating agencies include the **Department of Energy (DOE), EPA, NASA, the National Institute of Standards and Technology (NIST), NSF,** and **USDA**.

- **Piloting promising solutions.** Testing and demonstration of new approaches to water sustainability is an essential precursor to large-scale implementation. Today, the Administration is announcing pilots of several such approaches:
    - Improving weather forecasts for water-management operations. This year, **NOAA**, **USGS**, and the **U.S. Army Corps of Engineers (Army Corps),** along with the **Sonoma County Water Agency** and other local and state partners, will launch the Lake Mendocino Forecast Informed Reservoir Operations pilot project in California's Russian River. This pilot will demonstrate ways in which improved weather forecasts can aid the decisions made by Army Corps and other water-resource managers as they balance flood and drought risks, maximize reservoir-storage potential, and minimize conflict among competing water users.
    - Improving identification and monitoring of harmful algal blooms. In August 2016, **NOAA,** the **University of Michigan,** and the **Monterey Bay Aquarium Research Institute** will deploy the Environmental Sample Processor (ESP) in Lake Erie for the first time. The ESP "lab-in-a-can" will be deployed autonomously to collect water samples, run molecular diagnostics, and provide water managers with data on harmful-algal toxicity in near real-time before the water reaches municipal water intakes.
    - Enhancing water sensing. The NOAA-funded **Alliance for Coastal Technologies, EPA, USGS** and other partners are collaborating with **XPRIZE** to create pilot opportunities to demonstrate uses of sensors from the Nutrient Sensor Challenge and the Wendy Schmidt Ocean Health pH XPRIZE in a wider variety of "real-world" conditions and settings. In 2016, these innovations will be tested and verified as components of existing operational environmental monitoring and observing systems and networks.
    - Reducing water use in power plants. The **DOE** Office of Fossil Energy is issuing a competitive funding opportunity for development of a 10 MW scale test facility for validating the performance of power cycles that use supercritical carbon dioxide instead of water as the working fluid—an approach with the potential to considerably reduce the water requirements of power generation.

- **Supporting water-innovation networks.** Building on the Nation's historical reputation for ingenuity, the Administration is announcing new efforts to connect researchers, technologists, and innovators across the country to accelerate solutions to priority water challenges.
    - Recovering resources from wastewater. **DOE, EPA, NSF,** and **USDA,** in collaboration with the **Water Environment Research Foundation,** are developing a National Water Resource Recovery Test Bed Facility network and directory, to connect those working on approaches for recovering energy and other valuable resources from wastewater with test facilities appropriate for their needs. Today, the collaboration is announcing the next step in this effort: two NSF-sponsored

workshops in May and June of this year to develop metrics and structure for the network.

- Supporting innovation clusters. **EPA** is committing to provide $200,000 in funding this year for its recently established Environmental Technology Innovation Clusters Program. The Cluster Program supports a network of 15 regional groupings of businesses, government, research institutions, and other organizations focused on development and deployment of technologies for addressing the Nation's water and other environmental challenges. In addition, the Cluster Program is releasing a statement from Cluster leaders recommending core actions to advance water innovation in the United States.

- **Expanding monitoring and forecasting capabilities.** Accurate, timely, and sufficient data, information, and predictions about our Nation's watersheds and water cycles are critical to informing planning and decision making at all levels. That's why the Administration is announcing new steps to expand these capabilities:
  - Releasing a new National Water Model. In June 2016, **NOAA** will release a new National Water Model that will dramatically enhance the nation's river-forecasting capabilities. The model—which relies on data from EPA and USGS and was developed by the National Center for Atmospheric Research (NCAR), funded by NOAA and NSF—will deliver forecasts for approximately 2.7 million locations, up from 4,000 locations today—a 700-fold increase in forecast density. Other institutions are already launching their own workstreams to build on the new model, including:
    - The NSF-funded **Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI)** and the **University Consortium for Geographic Information Science (UCGIS)** will work with **NOAA** and other Federal agencies to analyze the Nation's land-surface elevation—an important step in being able to add real-time flood-inundation mapping to the National Water Model. This project will be supported by computation at the CyberGIS facility at the **University of Illinois at Urbana-Champaign,** and by a seven-week Summer Institute for graduate students at NOAA's National Water Center in Alabama.
    - **Esri** and **KISTERS North America, Inc.,** in collaboration with the academic community and **NOAA**, will build on the National Water Model and the recent success of the National Flood Interoperability Experiment to develop a National Flood Model that enhances flood forecasting for the Nation. KISTERS will work with the Center for Research in Water Resources of the **University of Texas at Austin** to integrate flood-relevant data from local agencies and other sources into the National Flood Model, with a goal of launching a pilot version of the National Flood Model later this year. Esri will develop data-processing and spatial-analysis workflows to advance research into streamflow and flood-inundation forecasting, and will make the forecasts from the National Flood Model freely available online. In addition, Esri will help visualize this data through interactive online-mapping applications that will combine the forecasts with other data to identify at-risk populations and help inform decision making.
  - Advancing western water data. **NASA**'s JPL is committing to treating western water issues with the same urgency and rigor as its spaceflight projects. By integrating

hydrological observations from NASA's flagship satellite and aircraft platforms, JPL's new Western States Water Mission will provide a high-resolution picture of western water availability (snow, surface water in rivers and reservoirs, soil moisture, and groundwater) that has not been previously possible. The data will be widely accessible on the same advanced visualization platform that NASA uses for its Mars missions.

- Enabling early identification of algal blooms. **EPA, NOAA, NASA,** and **USGS** are collaborating to develop an early-warning indicator system using historical and current satellite data to detect algal blooms, which can severely impact drinking-water quality, in U.S. freshwater systems. As part of this effort, in 2015 the collaborating agencies launched the Cyanobacteria Assessment Network (CyAN) project, which will create a standard and uniform approach for early identification of algal blooms, with an initial focus on high-priority states. Today, the project is announcing that it will expand to continental coverage by 2017.

- **Improving information and tools.** The following new Federal resources and actions will help inform planning and decision-making with respect to our Nation's water resources:
  - Memorandum to enhance Federal coordination. **Army Corps, USGS, NOAA** and **FEMA** are today renewing a Memorandum of Understanding (MOU) for Collaborative Science, Services and Tools to Support Integrated and Adaptive Water Resources Management. The MOU will increase collaboration and partnership in areas of mutual interest to address challenges, streamline processes, and share data and information (both within the Federal government and with non-Federal institutions) in order to increase efficiency and enhance service delivery. Important efforts where progress has been made include national flood inundation mapping, systems operability and data synchronization, as well as coastal and climate-related activities. An action plan will be developed this year to guide activities for the next five years under the MOU.
  - SECURE Water Act: Report to Congress and Visualization Tool. **USBR** is releasing a new Report to Congress—as mandated by the SECURE Water Act of 2009—that provides a basin-by-basin overview of impacts to U.S. water supplies from climate change, and includes numerous potential adaptation strategies relevant to each basin. USBR will also release an interactive SECURE Water Act Visualization Tool—a web-based companion product to the Report to Congress that allows the public to interact with the data presented in the Report, and to better understand the risks that the data indicate.
  - Hydrologic Engineering Center River Analysis System (HEC-RAS) Update. The **Army Corps** is releasing an update to its HEC-RAS engineering software, allowing the software to perform two-dimensional hydrodynamics along with integrated one- and two-dimensional modeling, and unsteady flow computations. The two-dimensional capabilities allow users to determine the timing and direction of river flow, important for evaluating environmental and stream stability issues, and for studying consequences associated with possible dam- and levee-failure scenarios. The update also includes new capabilities for modeling surface water–groundwater seepage, as well as water-quality and sediment-transport modeling enhancements.
  - Water-resources dashboard. **NOAA** and several outside organizations are launching a shared water-resources dashboard as part of the U.S. Climate Resilience Toolkit.

This dashboard will serve as a common resource for urban planners and local officials to easily access many of the flood and drought data sets needed to support climate-adaptation planning. To connect users around the dashboard, NOAA will run a series of web sessions to explain the data on the dashboard and demonstrate how these data can be incorporated into decision making.

- Flood flow-change detection tool. The **Army Corps** is releasing a web tool that will enable users to detect nonstationarities, or significant changes, in the statistics of annual maximum daily streamflow at any USGS gage site. The tool will improve understanding of climate variability, which will in turn allow water-resources planners and engineers to better understand and project how streamflow is, and will continue to be, affected by climate change.
- Nearshore processes research. The **Army Corps** is announcing that this fall, it will release an implementation plan for addressing the research needs identified in the 2014 *Future of Nearshore Processes Research* report. The plan, which was cosponsored by the American Shore and Beach Preservation Association and is being developed by a collaboration among 30 institutions and eight Federal agencies, will integrate research from the Federal government, academia, industry, and NGOs to inform recommendations for managing water quality and other important factors in the often highly developed yet vulnerable nearshore environment.
- Report to Congress on Upper Mississippi River Restoration. This year, the **Army Corps** will release the fourth in a series of reports to Congress on the status of the Upper Mississippi River Restoration, an effort that includes five States (IA, IL, MI, MN, and WI) as well as the EPA, USGS, the USDA Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, and numerous other partners and stakeholders. The report will include information on partnership among Federal and state agencies and other organizations; construction of high-performing habitat restoration, rehabilitation projects; and increased understanding through monitoring, research, and assessment, and engagement with other organizations.

- **Raising public awareness and engagement.** To give more individuals and communities across the country the opportunity to learn more about and share their thoughts on water, the Federal government will:
  - Create a new video series. In a new video series produced by **NBC Learn,** the educational arm of NBCUniversal News Group, **NSF** will explore how cutting-edge science and engineering research can transform how the country understands, designs, and uses water resources and technologies. The four-part series, which will be made freely available for public and classroom use across a variety of platforms in fall 2016, will promote public awareness of water infrastructure designs and needs, water conservation in rural and urban settings, water-treatment techniques, and water-quality issues.
  - Host a National Climate Game Jam—Water! From April 15–24, 2016, **NOAA** will host a National Climate Game Jam—Water!, bringing together youth, climate scientists, and educators at sites around the country to create new virtual and physical game prototypes that allow players to learn about climate change and water through science-based, interactive experiences. The winners of the Jam, along with the full list of game ideas and videos, will be posted online. This

Game Jam follows on an initial commitment through the Climate Education and Literacy Initiative.

Advancing Water Sustainability on All Fronts

Across the country, stakeholders in all sectors have responded to the Administration's call to action for an all-hands-on-deck effort to build a sustainable water future, including with new actions being announced today.

Managing Water for the Long Term

To reduce and mitigate the incidence and impact of water stresses on U.S. communities, it is essential to develop, implement, and normalize sustainable, integrated, long-term water-management strategies. Today, states and localities are making new commitments to lead on this front.

- The **Colorado River Basin States (CO, WY, NM, UT, CA, NV, AZ),** the **Southern Nevada Water Authority,** the **Metropolitan Water District of Southern California,** the **Central Arizona Water Conservation District, Denver Water,** the **Upper Colorado River Commission,** and **USBR**—are committed to addressing water scarcity on the Colorado River, a critical source of water for 40 million people, businesses, and the environment in the United States and Mexico. Based on the success of first Pilot agreements, today, the coalition is announcing the launch of Phase II of a program that brings together farmers, ranchers, and tribes with municipalities and policymakers to conserve water for the long term. The program compensates water users for implementing voluntary water-conservation projects that decrease use, improving critical water-storage levels at Lakes Powell and Mead for the benefit of the entire Colorado River Basin.

- The **State of Oklahoma** is launching its Water for 2060 Initiative, a unified approach for achieving the goal set by Oklahoma Governor Fallin and the State Legislature of using education and incentives to ensure that Oklahoma's freshwater use in 2060 is at or below 2012 levels, while supporting Oklahoma's continued population growth and economic prosperity. The initiative establishes a unified approach across each major water-use sector for increased water conservation, recycling, and reuse. By establishing a plan with a 50-year outlook, the Initiative hopes to ensure that all current and future Oklahomans have access to a readily available supply of clean, safe water for many more decades to come.

- The **City of Los Angeles** is committing to capture an additional 12 billion gallons per year of stormwater for infiltration and reuse by 2025, on top of the more than 8.8 billion gallons the City captures today. Stormwater capture is a key component of the City's goal to source 50% of its water locally by 2035 and helps fulfill multiple objectives in the City's Sustainable City pLAn.

- The **City of Tucson** and the **City of Phoenix** are announcing the next step in their exchange agreement, signed in 2014, that allows Phoenix to store water allocated under the Central Arizona Project in Tucson's underground recharge facilities, which simultaneously decreases both pumping costs for Tucson and construction costs for Phoenix. Today, the Cities are announcing that over the next year, they will work together to achieve a more than five-fold increase of water stored under this agreement, resulting in storage of more than 1.6 million gallons of water, or enough to serve over 17,000 homes for a year.

- The **Santa Ana Watershed Project Authority (SAWPA)** is implementing its "One Water One Watershed" integrated regional water management 2.0 plan with a $100 million watershed program to deal with long-term drought through water-use efficiency and conjunctive-use storage of water within the groundwater basins of the Santa Ana watershed. SAWPA will share lessons learned from this program with other drought-stricken regions across the western United States.

Investing in Water Solutions

The availability of private capital is an essential component of ensuring long-term solutions to complex environmental and social challenges. Recognizing this, the Administration has launched numerous efforts and institutions—including the Clean Energy Investment Initiative, the Department of the Interior (DOI)'s Natural Resources Investment Center, EPA's Water Infrastructure and Resiliency Finance Center, and USDA's Rural Opportunity Investment Initiative—to encourage creative financing opportunities that help address these challenges while advancing economic development goals. The following private companies responded to the Administration's call to action and today are announcing new steps to invest in the Nation's water future, including nearly $4 billion in financing for water-infrastructure projects.

- The **Baton Rouge Water Company (BRWC)** recently constructed a "scavenger well couple" to achieve *in situ* separation of brackish and fresh water in an underground drinking-water aquifer. Today, BRWC is announcing that it will invest an additional $40,000 this year into a redesign of the couple's pumping equipment, to enable the Company to remove chlorides at a higher rate and extend the usefulness of the aquifer years into the future. In addition, BRWC is announcing that in 2016 and 2017, it will invest resources in another saltwater-intrusion prevention project, focusing on a different and deeper chloride-threatened groundwater drinking-water source in the local area. As part of this project, which involves **USGS,** the **Capital Area Groundwater Conservation Commission,** and **Louisiana State University,** BRWC will temporarily dedicate two of its groundwater drinking-water aquifers for development and testing of new saltwater-intrusion prevention techniques.

- **CDP** is introducing water security into its supply-chain program, supporting U.S. businesses in reducing water impacts and enhancing water security across their vast supply chains. Through CDP's supply-chain program, companies will use water data from more than 1,500 suppliers to shift $218 billion worth of corporate procurement spending to support sustainable water use.

- To help foster investment in resilient and sustainable water infrastructure, **Ceres,** the **Climate Bonds Initiative,** the **Alliance for Global Water Adaptation, CDP,** and the **World Resources Institute** are launching a Water Climate Bonds Standard to provide investors with verifiable, science-based criteria for evaluating water-related bonds and to assist issuers in the global corporate, municipal, sovereign, and supra-sovereign markets in differentiating their green-bond offerings. The **San Francisco Public Utilities Commission** expects to be the first issuer to align a forthcoming bond sale with the standard in order to finance sustainable stormwater management and wastewater projects.

- The **Municipality of Anchorage** is announcing major infrastructure improvements to advance water and energy efficiency at its new $300 million Sullivan Plant 2A power-generation facility in northeast Anchorage. Two city-owned utilities, Municipal Light & Power (ML&P) and Anchorage Water & Wastewater Utility (AWWU), are partnering to capture waste heat to apply to water, reducing water-heating energy requirements in homes and buildings. ML&P's new technology will reduce water consumption by as much as 75 million gallons of water annually, while AWWU's adjoining $11 million energy-recovery project is expected to save the community $1–2 million annually in energy costs.

- The **North Bay Water Reuse Authority** is committing to develop a $250 million portfolio of recycled-water and water-management infrastructure projects that will deliver a new water supply for agricultural irrigation, environmental restoration, and municipal purposes. The projects seek to capture and put to beneficial use up to 8 million gallons per year of recycled water as new supply through a diverse portfolio of projects designed to meet the needs of urban, agricultural, and environmental water users. These include water treatment using advanced filtration and UV processes, small-scale reservoirs, storage tanks, distribution systems, and groundwater-management facilities.

- **Renovate America**'s PACE (Property Assessed Clean Energy) program, HERO (Home Energy Renovation Opportunity), has facilitated $1.3 billion in financing for energy efficiency, renewable energy, and water efficiency home improvement projects in California. Today, Renovate America is setting a goal to enable $1.4 billion in new financing for an estimated 111,000 water-efficiency improvements over the next 10 years, which will help create an additional 12,000 jobs and $2.4 billion in economic impact. Through this new private investment and the projects already completed through HERO, 34.1 billion gallons of water will potentially be saved over the next 10 years.

- The **San Bernardino Municipal Water Department (SBMWD)** is announcing that in 2017, it will begin construction on Phase I of its Clean Water Factory, a $300 million recycled-water facility that will provide water for irrigation and treated water for recharging the groundwater basin that supplies the SBMWD. When the facility is completed (targeted for 2025), it will treat 6.5 billion gallons of water per year, helping to drought-proof water supplies for more than a million people.

- **Sustainable Water** is committing to deploy $500 million in capital to develop 50 eco-engineered decentralized reclamation and reuse systems requiring no upfront costs under a Water Purchase Agreement. Modeled after a campus-wide water-reclamation system used at Emory University, these systems will yield 7.5 billion gallons of recycled water annually for beneficial reuse while potentially reducing risks associated with water availability, aging infrastructure, and rising rates. The systems, which Sustainable Water will deploy in collaboration with local authorities, are designed to serve as a platform for community outreach and research while helping enable bulk water users improve resiliency and reduce their burden on existing resources.

- **Ultra Capital** will invest $1.5 billion over the next decade to support financing of decentralized and scalable water-management systems, including reclaimed water treatment, wastewater management, stormwater capture and storage, water-distribution

systems, natural or biomimetic wastewater treatment, and energy converting bio-digesters. This commitment has the potential to support conservation and treatment of over 10 billion gallons of water over the next decade.

- **XPV Water Partners** is committing to invest an additional $250 million to help emerging water companies bring new solutions to the marketplace. This commitment builds on the more than $100 million to date that XPV has invested in water-technology companies.

Accelerating Development, Demonstration, and Deployment of Innovative Technologies

This past December, the Administration underscored the importance of boosting water sustainability through the greater utilization of water-efficient and water-reuse technologies; and promoting and investing in breakthrough R&D that reduces the price and energy costs of new water-supply technology. Individuals and institutions across the country responded to the Administration's call to action and are taking new steps to support these goals.

- The **Alabama Center for Rural Enterprise (ACRE)** is launching a challenge to design decentralized, on-site wastewater technologies that are sustainable, affordable, and will work with the "black belt" soils. These innovations may alleviate chronic problems of failing septic systems in rural Alabama. Nationally, over 270,000 households have experienced failures in their residential sewage-disposal systems over the last three months. The result is direct exposure of vulnerable populations to hazardous raw sewage in their home.

- The **Austin Technology Incubator (ATI),** part of the IC^2 Institute at the **University of Texas at Austin,** is launching a Water Technology Incubator (ATI Water) to accelerate the development of innovative water startups. ATI Water will build a Texas-wide network of entrepreneurs and university-based water researchers to source significant engineering and scientific breakthroughs and prove them across commercial pilot facilities. In the next five years, expects through this network to help create 500 new water-technology jobs.

- This year, **AccelerateH2O**, in partnership with **ATI Water** and **elequa,** will launch three of a planned seven regional hubs in Texas for demonstrating innovative approaches for water reuse, brackish desalination and aquifer recharge in rural communities, optimization of water systems, and smart irrigation. AccelerateH2O will work through these hubs to engage 500 youth and student "water innovators" in open-source projects, expedite commercialization of 35 early-stage breakthrough water technologies, and launch four competitions focused on addressing critical water challenges. These efforts will support AccelerateH2O's goals of increasing the recovery of "lost" water by 15–22% annually, reducing overall water use by 7.5–10% annually in drought-prone areas, and increasing sources of "new" water by 28–30% annually by 2020 across all of Texas.

- **BREW** (Business. Research. Entrepreneurship. In Wisconsin.), a water-technology accelerator program of **The Water Council,** is committing to help 75 new water-technology start-ups get their ideas launched into successful businesses over the next five years through a mentorship and intensive 6-month, strategic training program. In addition, The Water Council is announcing an expansion of its BREW Corporate Accelerator Program, with **A.**

O. Smith Corporation and **Rexnord** joining **Veolia** in the program to support start-ups in water technology.

- Led by the **City of Chicago,** the **Metropolitan Water Reclamation District of Greater Chicago,** and **World Business Chicago,** a group of prominent water entities in the Chicago region is launching Current, a new water platform connecting local public utilities, private industries, research institutions, and entrepreneurs. At launch, Current will focus on three programs: (1) a public-private research consortium; (2) a network of diverse demonstration sites for new water technologies; and (3) a circular economy/business-model innovation program to encourage public and private entities to reuse resources from wastewater and water streams. These programs are expected to support over 400 businesses and create more than $250 million in economic value over 10 years.

- The **City of Milwaukee** is announcing that the **International Water Association (IWA)—** will be establishing its first North American Regional Office in Milwaukee. In addition, the City is announcing a new formalized partnership with **The Water Council,** the **University of Wisconsin-Milwaukee,** and **Marquette University.** Together, these institutions will:
    - Build and/or attract over 75 water-focused entrepreneurs and small businesses to Milwaukee over the next five years.
    - Train up to 400 students annually with water-focused education qualifications through Milwaukee-area universities.
    - Implement the Alliance for Water Stewardship International Water Stewardship Standard at 10% of the businesses in the Milwaukee region by working with the local private sector.
    - Collaborate on practical water research, using the MetroLab framework, to address municipal and global water challenges.

- The **Clean Water Innovation Initiative**, along with its 17 founding business, government, non-profit, and research partners, is launching an EPA Water Innovation Cluster to serve the Puget Sound region in Washington. The Cluster will include three major components: (1) a physical technology-development accelerator; (2) an early (seed) stage grant/loan/equity fund to finance entrepreneurial start-ups; and (3) a national virtual network of water-industry incubators and clusters. Today, the Initiative is announcing that it will, over the next three years, work with its 30 vertically and horizontally integrated water-industry partners to support 10 companies through the accelerator and provide $2 million in seed funding.

- **Cleantech Open** is announcing the launch of its CTO-H2O water-innovation accelerator program. Through CTO-H2O, Cleantech Open and its partners will deliver commercialization training, access to capital, peer-to-peer connections, talent acquisition, water-industry expertise, and mentorship for innovative water startups. The six-month program, which expects to support approximately 30 water startups during its first year, seeks to provide national and global visibility to water technologies focused on efficiency, re-use, data, and infrastructure monitoring in the water space.

- The **Cleveland Water Alliance**, in partnership with the **Great Lakes Biomimicry Institute** and the **University of Akron,** is announcing the Water Innovation Biomimicry Program.

The program will: (1) develop and bring to market biomimicry-inspired solutions (solutions based on natural patterns and strategies) to improve water quality in watersheds; (2) prepare design guidelines, protocols, and policy frameworks to support integration of these solutions; and (3) conduct workshops on these solutions for interested private- and public-sector groups. The program's first project will utilize 3D-printing technology to bring biomimicry-inspired green bulkheads to the Cuyahoga River.

- This year, **Confluence**, a water-technology innovation cluster serving the Ohio River Valley, will hold a Technology Showcase connecting utilities with the technologists, developers, and manufacturers that can help enable specific solutions to 21 urgent water challenges identified by utilities at a conference in November 2015. Confluence will announce the Confluence "W" Prize prior to the Showcase, recognizing innovative use of technologies that address water challenges and protect public health. EPA's Environmental Technology Innovation Clusters Program works closely with EPA researchers in Cincinnati to support Confluence.

- The **Everglades Foundation** is announcing its international partnership with the **Ontario Ministry of Environment and Climate Change** on its $10 million George Barley Water Prize, a freshwater innovation challenge that seeks to find a cost-effective solution to the phosphorus-pollution problem threatening the Everglades and water bodies across the globe. This partnership aligns with recent targets made by the United States and Canada to reduce algae-feeding phosphorus entering Lake Erie by 40%. The Ontario Ministry of Environment and Climate Change has agreed to participate in the design of the challenge and in the development of cold climate parameters for testing technologies in conditions similar to the Great Lakes. Additionally, the Ministry is exploring sites and facilities to potentially host one stage of the Prize on an impacted water body in Ontario.

- **H2OTECH**, a water-technology innovation cluster headquartered at **Georgia State University** and supported by EPA's Environmental Technology Innovation Clusters Program, is announcing two efforts to grow the water-innovation economy in this area. H2OTECH, which serves 60 million people in the southeast United States, will:
    - Leverage $2.5 million per year by 2020 to support startup companies and academics for water-technology development and commercialization.
    - Expand the regional water economy job base from 30,000 to 35,000 jobs by 2020 by focusing on the emerging water-resource strategy of indirect potable water reuse in the region.

- **Imagine H2O,** a water-innovation accelerator, has launched a multiyear initiative to develop data solutions in the water industry. Today, the non-profit organization is announcing that it will expand its portfolio to source, launch, and scale 30 new water-data businesses, from monitoring and sensing to software and analytics. Imagine H2O will also double its existing partner network of utilities and companies, which provide water supply to 30 million residents across the country.

- The **International Desalination Association (IDA)** is committing to host an Energy and Environment Symposium in the United States in early 2017, bringing together approximately 250 leaders in the global desalination community to explore desalination and

water-reuse issues and facilitate discussions to shape a path to a sustainable water supply for future generations.

- The **Israel-California Green-Tech Partnership** builds on California and Israel's March 2014 Memorandum of Understanding to cooperate on developing water and green technology solutions. Today, the partnership is announcing a new joint venture with the city of **Los Angeles' Cleantech Incubator (LACI)** that will culminate in the introduction of 10 Israeli companies in water, energy, and agricultural technologies to the California market. These companies will help accelerate the shift to a greener economy, with a particular focus on benefiting drought-stricken populations across the state, including the nearly 123,000 farmers in California.

- The **Massachusetts Institute of Technology (MIT) Climate CoLab**, an online crowdsourcing platform, is launching a new Energy-Water Nexus contest, soliciting high-impact proposals on the interrelated challenges of climate change, water, and energy. The challenge seeks to harness the power of collective problem-solving to catalyze innovative solutions at the water-energy nexus to build a sustainable water future.

- The **National Water Research Institute** (**NWRI)** is establishing a consistent validation program for innovative water-treatment technologies. Through the program, teams of experts will review the technical merits and provide a site audit of a new technology, and produce a freely accessible validation report of the technology. By providing data on the performance of new water-treatment technologies to purchasers, permitters, vendors, and the public, this program aims to significantly reduce the cost and time it takes to bring a new technology to the marketplace. In addition, later this year, NWRI—in partnership with the **WateReuse Research Foundation** (USA) and **National Centre of Excellence in Desalination** (Australia), will hold a workshop for approximately 50 delegates from the Pacific Rim nations to facilitate breakthroughs in advanced water-treatment technologies. NWRI will produce a publicly available workshop report providing a framework for funding and collaboration on advanced water-treatment technology R&D.

- **Pentair** will establish two centers over the next three years to help accelerate innovation in industrial water reuse in manufacturing, and water stewardship in food and beverage processing. Pentair expects that these centers will reach an audience of more than 100,000 stakeholders by engaging Pentair's customers and third-party organizations to innovate, validate, and collaborate. The centers will also serve to share best practices to help municipal, industrial, and commercial companies reduce their water footprint.

- The **State of Colorado** is working with private, public, and philanthropic partners to create new institutions that will help drive water innovation and infrastructure. These institutions are:
    - A Water Data and Innovation Hub in Denver to serve as a laboratory for innovation and data analytics specifically focused on water. This "Hub" is the product of a two-and-a-half day summit of private and community foundations that Colorado Governor John Hickenlooper convened in February 2016.
    - A Center of Excellence and an Intermountain Infrastructure Exchange in Colorado to (1) help leverage Federal and state funds for public-infrastructure projects with

private capital; (2) assist project proponents in considering how up-front capital can be supplied from private-sector partners; and (3) assess how project risk can be transferred to private-sector capital partners and away from the public.

- **Toray** is announcing plans to develop an R&D center in the United States to further water treatment and membrane research efforts. The center will develop research collaborations with universities and U.S. National Laboratories to further reduce the cost and energy use of desalination technologies.

- The **Toro Company** is announcing three new grants to help drive water sustainability: (1) $24,000 to support the **Wyland Foundation**'s 2016 National Mayor's Challenge for Water Conservation; (2) $6,000 per year for the next three years to support the **Western Growers Association**'s new Technology and Innovation Center and business incubator in Salinas, CA; and (3) $5,000 in training support and $3,000 in school garden drip kits as part of an educational initiative to teach children the value of water and growing food.

- The **US Water Alliance** and the **San Francisco Public Utilities Commission** are committing to convene a national commission to accelerate the adoption of urban on-site water reuse. The Commission will bring together stakeholders to develop concrete, actionable policy and regulatory recommendations for establishing standards and practices to dramatically increase the adoption of on-site water reuse in communities across America.

- **WaterNow Alliance** will recruit 100 public utilities to join the Alliance and sign on to its Statement of Principles, committing to implement sustainable-water solutions to address drought and climate change in their communities. The Alliance will work with these member utilities to substantially increase their portfolios of innovative and sustainable water solutions, with a goal of reaching at least 10 million people by the end of 2016. In addition, the Alliance is committing to work with two to three municipalities to implement sustainable water-use projects on the ground in order to demonstrate the feasibility and benefits of the projects.

- **WaterStart** (founded as Nevada's Water Center of Excellence) is a public-private partnership that has raised more than $2 million to help address the biggest technical challenges to managing water in Nevada. Today, WaterStart is announcing that **MGM Resorts** is joining the partnership to recruit, evaluate, and demonstrate new water technologies.

A key component of ensuring the adoption of groundbreaking water solutions is demonstrating that solutions are successful beyond the laboratory. Today, institutions are announcing new efforts to pilot such solutions at scale.

- **Hampton Roads Sanitation District** and its project partner **CH2M** are committing to pilot test this summer two process concepts for advanced water treatment for indirect potable reuse and several emerging technologies for mainstream wastewater treatment and nitrogen removal. These pilot studies are part of a $1 billion sustainable water-recycling initiative that will pump up to 120 million gallons of water into a coastal plain aquifer to provide a sustainable source of groundwater, inhibit saltwater intrusion, slow the rate of land

subsidence in Eastern Virginia, and significantly reduce surface-water discharges from HRSD facilities into Chesapeake Bay tributaries.

- The **Iowa Department of Agriculture and Land Stewardship** and **Iowa Agriculture Water Alliance** are co-leading the Midwest Agriculture Water Quality Partnership (MAWQP), a $47M public-private partnership that leverages a $9.5M Regional Conservation Partnership Program (RCPP) award from USDA. Today, MAWQP is announcing its first major effort: the launch of a new Platform Integration Pilot, which will combine conservation and business-planning tools and environmental metrics to help agribusinesses implement conservation practices and more efficiently use resources like fertilizer, reducing nutrient loss and improving water quality and farm profitability. The partnership estimates that this pilot will reach 10,000 farmers and improve resource management on at least 50,000 acres of farmland.

- The **MIT** and the **University of Hawaii** are announcing the formation of an international team—comprised of researchers from the **Arava Institute, Jordanian German University, MIT, Technion, Tel Aviv University,** the **University of Hawaii,** and the **Weizmann Institute**—to launch a pilot study in the Red Sea region of an Advanced Pumped Hydro and Reverse Osmosis (APHRO) system to provide renewable-based energy storage and fresh water through sustainable desalination. Based on the success of the pilot, the team will explore opportunities to establish APHRO plants in other water-scarce regions, including Southern California and Hawaii.

- **Natel Energy, Inc.**, and the **University of California, Berkeley**'s Renewable and Appropriate Energy Lab are partnering to select, deploy, and assess a 1–5 megawatt project in California that will deliver 1.6 to 3.2 million gallons of groundwater recharge annually. This pilot project will help inform approaches to deliver cost-effective renewable energy while simultaneously increasing groundwater recharge, improving flood mitigation, and restoring wetland habitat.

- **River Islands,** a planned community located in the San Francisco Bay Area, is announcing a new partnership among **Nexus eWater**, local reclamation and irrigation districts, the River Islands developer, area builders, and the **City of Lathrop** to implement a system to provide River Islands with on-site water and energy recycling. By allowing homeowners to directly treat approximately two-thirds of the home's water to a quality suitable for outside irrigation, the system will reduce the intake of fresh potable water to the home.

- The **Sonoma County Water Agency**, which provides drinking water to more than 600,000 residents north of the Golden Gate, is collaborating with Federal and non-Federal partners on the Lake Mendocino Forecast Informed Reservoir Operations research and demonstration project. Working with **Army Corps,** this project will use new technologies and better weather forecasting to improve management of the Lake Mendocino Reservoir, potentially leading to water savings of roughly 10–25%.

Supporting Critical Research

Addressing water challenges requires understanding of the cause, scope, and impact of such challenges, as well as investigation into possible solutions. That's why today, institutions are announcing new funding and initiatives to support critical water research.

- **American Water** will invest $3 million in new research projects in 2016 to help improve water service and quality. This announcement builds on American Water's commitment to invest $5.5 billion over the next five years into needed infrastructure renewal. In addition, American Water is announcing two new collaborations: (1) with **General Electric**, to identify and explore advances in the Internet of Things to help solve pressing challenges within the water industry; and (2) with **ComEd**, to pilot an Advanced Metering Infrastructure (AMI) project that will harness new information technologies to better manage water usage and quality.

- **Arizona State University (ASU)** is launching FutureH2O, a new, five-year research initiative focused on identifying opportunities for domestic and global water security. The effort will connect ASU researchers with private- and public-sector partners to drive solutions to the most difficult water problems facing society. Specific commitments of this initiative include funding an urban landscape design and renovation campaign that reduces residential outdoor water use in at least one Phoenix metro service area by one-third by 2025; training 1,000 undergraduate and professional leaders across the U.S. Sunbelt in the next ten years to find solutions to challenges at the food-energy-water nexus; and building a food-energy-water technology test bed on the ASU campus to test innovative approaches to agriculture in the arid Southwest.

- Three universities in the Los Angeles area—the **University of Southern California,** the **University of California, Los Angeles,** and the **University of California, Riverside**—are forming a consortium to partner with the **Los Angeles Conservation Corps** and local water utilities at the SEA Lab facility in Redondo Beach, CA. The consortium will take advantage of the Lab's access to ocean water to run bench and small pilot testing on desalination, and to carry out ocean and marine studies separate from desalination. The consortium is exploring potential partnerships with the West Basin Municipal Water District and other local water agencies that are looking at ocean desalination as a water supply. The test area will be accessible to tour groups, with SEA Lab corps members demonstrating testing procedures and outcomes.

- The **Chicago Council on Global Affairs** is launching a new Global Water Policy Initiative (GWPI) to study and make recommendations on leading themes in international water policy—especially those of particular relevance to Chicago and the Midwestern United States. With quarterly workshops, in-depth research, and coordination with other major institutions involved in global water policy, the GWPI aims to engage a growing number of academics, experts, and policymakers on these issues, ranging from dozens initially to hundreds by the second year of the GWPI.

- The **City of Oceanside, CA** is launching a comprehensive pathogen study to support potable water reuse. By examining the effectiveness of upstream processes in removing and

inactivating pathogens from treated wastewater, the study will provide critical data for health departments seeking to assess the safety of potable water reuse, and will help determine the level of additional treatment that reused water must undergo after passing through natural systems. The results of this study will support the City's goal of putting more than 1.6 billion gallons of recycled water annually to beneficial use.

- The **Cleveland Water Alliance,** with support from the **Coca-Cola Foundation,** is launching the second phase of its Value of Water Study. The study explores the link between clean and reliable water to regional economic growth and business, including industry, jobs/workforce development, and gross regional product. The study will tie direct, indirect, and induced economic impacts directly to regional commitments to clean water.

- This spring, the **Colorado School of Mines (Mines)** will synergistically integrate multiple water-focused research centers into the Colorado School of Mines Water Resources Institute. Through this new Institute, over 100 faculty and associated researchers will work to explore, develop, and deploy engineering and science solutions, across scales, to address water scarcity and sustainable future water supplies for people, environment, industry, and agriculture. The Institute will also help educate future water scientists, engineers, and practitioners, and help connect communities and other stakeholders to address challenges related to water and other limited resources.

- The **Electric Power Research Institute, Inc. (EPRI)** is planning to invest approximately $200 million in research and development (R&D) over the next decade to minimize the environmental impacts of water withdrawal and consumption in the electricity sector; address issues concerning the availability and cost-effectiveness of plant water-treatment options; and provide more energy-efficient and demand-responsive options for the transportation, treatment, and storage of water. In addition, EPRI is building industrywide R&D collaboratives, with participation from **DOE, NSF,** and **ARPA-E,** to evaluate the performance of a number of new, early-stage technologies that have the potential to reduce power-plant water use by 15% to nearly 100%.

- **GE** is announcing that over the next decade, it will (1) invest over $500 million into research and development to fuel innovation, expertise, and global capabilities in advanced water, wastewater, and reuse technologies; and (2) increase its customers' daily water-treatment capacity to more than seven billion gallons of water per day, up from three billion today. In addition, the **GE Foundation** is announcing that over the same time, and in partnership with **Emory University, Assist International, GE Water,** and **UNICEF,** it will support the design, installation, and training of small-scale water-purification units to produce over three billion gallons of treated water at select health facilities in developing countries. This commitment builds on the $4.7 million that the GE Foundation has already invested in this space.

- In 2014, **Georgetown University** launched coursed dedicated to helping business and diplomatic leaders understand how they can reduce the water-related risks they face and contribute to water stewardship. Today, Georgetown is announcing it will expand this training to current and future diplomats and global leaders studying in its Business School and School of Foreign Service. The university will train at least 500 additional leaders in

water stewardship by 2021, and will share its educational approaches and lessons with others.

- **Kansas State University** is committing approximately $200,000 to support teams of researchers, educators, and outreach specialists working to advance scientific understanding and technology development that will minimize water use and maximize water quality in agricultural settings and at the rural/urban water interface. The teams will include 20 dedicated and 80 auxiliary researchers.

- The network of 54 **National Institutes for Water Resources (NIWR),** in partnership with USGS, is announcing that over the next five years, approximately $18 million will be invested annually in more than 200 new, locally identified water projects. In addition, over the next five years, NIWR institutes pledge to increase strategic state, regional, and national partnerships that enhance their student-training activities, work with public and private sectors, and research addressing pertinent national and regional water issues.

- The **National Renewable Energy Laboratory (NREL)** is launching a $50,000 project to explore linked energy-water microgrids. The project, funded by NREL's Laboratory Directed Research and Development Program and conducted in collaboration with the **University of Arizona,** will explore how to improve co-management of distributed water and energy systems, with applications for remote locations around the world.

- The **Oklahoma State University (OSU)**, in collaboration with **Texas A&M University, Kansas State University,** and **USDA,** recently initiated a new project promoting the use of advanced sensor-based technologies to improve agricultural water management and minimize irrigation losses, thereby helping conserve declining agricultural water resources in the southern High Plains. Today, the collaboration is announcing that the universities and USDA will each provide over $770,000 over the next three years to develop three research sites and ten demonstration sites in collaboration with growers. In addition, the collaboration will develop new mobile apps and an online video series to assist agricultural producers, crop consultants, and government personnel in using modern sensors to increase irrigation efficiency. Finally, OSU is announcing a new research initiative on sustainable methods of augmenting limited freshwater resources for crop irrigation with produced water from oil and natural-gas exploration.

- This year, the **Pacific Institute** will address the world's pressing water challenges by: (1) working with the Business Alliance for Water and Climate Change to improve the resilience of the private sector to the greatest risks to water systems from unavoidable climate change; (2) conducting a comprehensive assessment, which will be made publicly available, of the impacts of California's severe drought on the economy and environment; and (3) expanding the efforts of the CEO Water Mandate—a corporate water-stewardship initiative administered in partnership with the UN Global Compact—to tackle water challenges facing industrial and agricultural businesses.

- **Texas A&M University**'s Water-Energy-Food (WEF) Nexus Initiative is announcing three efforts to advance awareness and understanding of, and solutions at, the WEF Nexus. The Initiative will (1) launch a community of practice that will identify and respond to national

and global opportunities to assist the development of effective WEF management practices, and to develop a set of common, integrated metrics to better understand the WEF system; (2) develop an educational framework to teach stakeholders about the Nexus, through which the Initiative expects to develop 100 WEF leaders over the next five years; and (3) release comprehensive, multi-scale tools to define and quantify the interconnectivity between WEF and infrastructure. The tools will be initially deployed in the rapidly developing San Antonio, TX area and will ultimately be tested, adapted, and applied nationally.

- Researchers at the **University of California, Berkeley** and the **University of Colorado, Boulder** are launching a project to quantify the influence of vegetation and terrain snowmelt-driven runoff, which provides over half of the water supply in the western United States. By analyzing high-resolution snowpack data from the Tuolumne River Basin, the project will learn more about how this influence varies from one year to the next and from one point in the watershed to another, helping scientists to develop a new generation of predictive snowpack models and understand how climate-driven changes in vegetation may affect snowpack.

- The **University of California, Los Angeles (UCLA)** is announcing nearly $3.5 million in funding for new water-related research in alignment with the Sustainable LA Grand Challenge, a multisector research collaboration that aspires to transition Los Angeles County to 100% locally sourced water by 2050. UCLA's Water Technology Research (WaTeR) Center is announcing two new efforts to support water sustainability and security. First, the WaTeR Center will develop and test technologies for remotely monitored and controlled autonomous water-treatment and purification systems designed to serve communities and small towns, and will deploy three to four distributed water systems in remote and disadvantaged communities in California within the first two years of this project, with plans to ultimately expand to rural areas across the United States. Second, the WaTeR Center will launch new research initiatives focused on reducing the operational and energy cost of water desalination. These research projects complement UCLA's collaboration with the City of Los Angeles to construct a satellite wastewater treatment plant that is expected to provide UCLA with at least 360 million gallons per year of recycled water—supporting the university's goal to reduce potable water use per capita on campus by 36% by 2025.

- The **Prairie Research Institute** at the University of Illinois at Urbana-Champaign, in cooperation with the **National Great Rivers Research and Education Center** in Alton, IL, is launching the Resilient Watersheds Initiative, an interdisciplinary research project focused on developing coupled models to inform decision making related to water in the Illinois River Drainage Basin. The initiative will also deliver science-based education and extension services to the people living in the floodplains of the Illinois River and its major tributaries who are managing these issues. The Prairie Research Institute is planning to provide $300,000 annually to support this Initiative.

- The **University of Notre Dame's** Environmental Change Initiative and **Indiana University** are improving water quality in the Nation's heartland through the Indiana Watershed Initiative, using watershed-scale conservation to reduce nutrient runoff from farms. Today,

the project team, with collaborators at **Iowa State University,** and funding from the **USDA** Natural Resources Conservation Service, **USGS, The Nature Conservancy, Walton Family Foundation, Indiana Soybean Alliance,** and **Indiana Corn Marketing Council,** is announcing the expansion of the project to include economic valuation. With farmer cooperation, the team will quantify the economic and environmental benefits of on-farm conservation to facilitate implementation of these practices across the 11 million corn and soybean acres in Indiana.

- The newly established interdisciplinary undergraduate-degree program in Water: Resources, Policy, and Management at **Virginia Tech** is designed to prepare students for rapidly expanding employment opportunities to address complex water-resources challenges for a sustainable and secure water future. Today, Virginia Tech is committing to expand this program by reaching enrollment exceeding 100 undergraduate students, increasing the program's endowment to $2 million, and expanding by 2018 to include a graduate program offering M.S. and Ph.D. degrees for students seeking advanced interdisciplinary training.

- The Leaders Innovation Forum for Technology (LIFT) is a joint initiative by the **Water Environment Research Foundation (WERF)** and the **Water Environment Federation (WEF)** to accelerate innovation in the water industry. Today, WERF/WEF are announcing the launch of a new LIFT Technology Focus Area on Water Reuse, which will establish a new network of water users identifying, evaluating, and demonstrating innovative technologies to help improve the effectiveness and reduce the costs of water reuse. WERF and WEF will collaborate with **WateReuse** on implementing the new Focus Area. In addition, in September, WEF will release a Water Reuse Roadmap to encourage resource recovery from wastewater.

- **Xylem** will help drive innovation with an intention to invest at least $300 million in water-focused research and development activities through 2018. In addition, in collaboration with the **U.S. Water Partnership** and with technical advice and input from other public and private partners, Xylem will issue a new national water-innovation challenge with funding of $50,000, focused on themes including meeting growing demand for water, protecting cities from flood and drought, and protecting the Nation's water resources. Finally, Xylem will support the efforts of the **Everglades Foundation** and the George Barley Water Prize by providing Xylem instrumentation as well as technical expertise to support field evaluations of nutrient-sensing and removal technologies.

Enhancing Data Collection, Access, and Usability

Recognizing that "you can't manage what you can't measure," institutions are announcing new efforts to enhance water-data collection, access, and usability.

- **10.10.10** is will support creation of a global center for water-data innovation. In addition, 10.10.10 is committing to launch a water-focused iteration of its "10.10.10" convenings, which will challenge entrepreneurs over the course of 10 days to solve 10 "wicked problems" in a water policy area.

- The **California Data Collaborative** is a joint effort of six California agencies to establish and accelerate the development of smart conservation targets by collectively leveraging water-use data from the 3.7 million people the agencies serve. The Collaborative is announcing that over the next six months, it will use its more than 1.8 billion records to develop a new, statewide water-conservation framework, customized to the unique needs of California's diverse communities, which these agencies will strive to implement.

- The **Community Collaborative Rain, Hail and Snow (CoCoRaHS)** network, a nationwide, volunteer precipitation-monitoring program, is announcing that later this spring, it will launch a citizen-science soil-moisture monitoring program. In collaboration with the National Integrated Drought Information System, measurements gathered through this program will be used to help validate and calibrate the increasing volumes of soil-moisture data being collected by terrestrial and satellite instrumentation worldwide.

- **Corona Environmental Consulting**'s WaterSuite™ enables real-time monitoring and management of water systems and facilitates collaboration within the water community. Today, Corona is announcing expansion of two WaterSuite™ applications. First, by the end of 2016, the Monitoring Plan Portal application, which was developed in partnership with the **State of Louisiana Department of Health and Hospitals** Drinking Water Program, will integrate more than 100,000 crowd-sourced field-sample results collected by water operators using internet-connected mobile devices. These data, and other data on the Portal, will be freely available to all 1,343 Community Water Systems in Louisiana. Second, by the end of 2016, coverage of the Source Water Protection Application will extend to 25 states and include data from more than 700 Federal, state, local, and user-specific sources; up from 13 states and more than 300 sources today. This commitment will extend active assessment and protection of watersheds supplying drinking water to more than 13.5 million customers.

- The **Desert Research Institute (DRI)** and **University of Idaho (UI)**, motivated by the White House Climate Data Initiative and in partnership with **Google,** developed ClimateEngine.org, a web application that enables users to quickly process and visualize satellite earth observations and gridded weather data for environmental monitoring and to improve early warning of drought, wildfire, and crop-failure risk. Today, DRI and UI commit to expanding ClimateEngine.org to include new drought and water-demand monitoring metrics and over 30,000 place-based averaging domains relevant for Federal and local agency rangeland, agricultural, and water-resource management in the western United States.

- The **Earth Genome** is committing $1 million over the next 12 months to build out a public data set on viable wetland-restoration opportunities in the continental United States. Wetlands are a critical component of green infrastructure to modulate freshwater supply for industry, agriculture, and municipalities. This commitment will extend a pilot developed with the **World Business Council for Sustainable Development** and in collaboration with **Dow** to assess the financial value of wetland restoration in the Brazos River Basin in Texas.

- **Los Alamos National Laboratory (LANL)** is announcing that in May, it will release new data on the impact of climate-driven heat-stress and forest mortality on Colorado River flow. The data will include basin-wide flows for multiple climate and disturbance scenarios

out to the year 2100. LANL is working with multiple DOE national laboratories, Federal agencies, and large power utilities to examine these impacts on the energy-water nexus and to develop strategies for response.

- Today, **OmniEarth**, which provides technology that combines and analyzes data to determine how much water homes and businesses need, is announcing that it will expand its efforts to promote residential water conservation in California by launching commercial and agricultural water-efficiency analysis on a national scale. As part of this effort, OmniEarth will make its land-cover data available through the **California Data Collaborative.**

- **SciStarter**, a research affiliate of Arizona State University's Center for Engagement and Training in Science and Society (ASU CENTSS), is committing to advance citizen science to build a sustainable water future by:
    - Expanding the network and impact of citizen science. SciStarter has trained over 40 citizen-science teams (representing over 1,700 individuals) nationwide to take soil-moisture measurements validating data captured by NASA's Soil Moisture Active Passive satellite. Today, SciStarter is committing to train an additional 60 teams over the next 18 months—including at least one team in every U.S. state—as well as at least one trained "citizen-science ambassador" per state. SciStarter will also work with **EPA, USGS,** and **USDA** to make this citizen-science data easily discoverable and available online, and will work with **USGS t**o launch a data analysis and visualization challenge based on soil-moisture data.
    - Establishing a "Lending Library" of monitoring equipment. This year, SciStarter will launch a program in four cities—Atlanta, Philadelphia, Research Triangle Park, NC, and Tempe/Phoenix—to partner with local science museums and libraries to provide training and lend out equipment to support volunteer soil-moisture monitoring. These cities will serve as pilots for a planned collaboration among SciStarter, **ASU CENTSS,** and the **National Informal STEM Education Network (NISE Network)** to establish regional networks of lending libraries anchored in science museums across the country.

- Researchers at **Stanford University** and **Aqua Geo Frameworks** have been using a helicopter equipped with geophysical sensors to collect data on buried patches of sand, gravel, clay and water in California's drought-stricken Central Valley, down to a depth of 1,600 feet. Stanford and Aqua Geo are announcing that in April, lithologic maps based on these data of the hidden aquifers and water pathways that make up the region's poorly understood groundwater system will be made freely available for the first time. Farmers and resource managers will be able to use these lithologic maps to inform decisions about where and when to pump water or refill depleted aquifers, thus helping to ensure the long-term viability of their water supplies for domestic and agricultural uses.

- The **Gulf of Mexico Coastal Ocean Observing System,** one of eleven regional programs of the U.S. Integrated Ocean Observing System, is announcing the launch of two open data portals to monitor the health of Gulf coastal ecosystems. The Hypoxia-Nutrient Data Portal, developed in partnership with the **Gulf of Mexico Alliance,** aggregates information from multiple sources to support informed strategies needed to reduce nutrient inputs and

hypoxia impacts to Gulf coastal ecosystems, extending from the inshore waters of estuaries to the continental-shelf break of the five U.S. Gulf states. The Citizen Science Data Portal aggregates data gathered by hundreds of students and citizens Gulf-wide who are monitoring environmental conditions in their local areas, allowing State, Federal, and academic programs to supplement their datasets with much more granular, localized information.

- **The Water Council,** working with the Innovation Exchange, has launched the Global Water Port, an online research tool which enables access to thousands of real-time water-data sources. Today, the Water Council is partnering with the **Federal Lab Consortium (FLC)** and the **U.S. Water Partnership** to make data from Federal labs more accessible through the Global Water Port.

- The **University of Alaska Anchorage,** as part of the EPA-funded **DeRisk Center,** is developing a GIS application that makes the data housed within the EPA Safe Drinking Water Information System database usable for a water-plant operator. The app's goal will be to allow an operator to easily determine where else in their state a particular water-treatment process is being used, thus reducing the steps and cost required in seeking process assistance. Today, UAA is committing to complete the app and make it publicly available through the Center's website by summer 2017, and to share the app at state, national, and international conferences throughout its development.

- The **University of California Water Security and Sustainability Research Initiative** is committing to develop, by 2018, an integrated water-accounting system. The system will include a new basis for managing groundwater by using a novel combination of conventional groundwater-level data and modeling tools that will be disseminated to hundreds of water managers by 2017, including those in 127 California state-defined groundwater basins.

- Over the next 18 months, **Water Canary** will launch a water-quality data collection service, offering real-time nutrient data collected from sensors the company installs and maintains to make it affordable for businesses, farmers, scientists, and government agencies to use water more efficiently and eliminate the waste of excess fertilizer in agriculture. The company has set the goal of bringing all major river systems in the continental United States online by 2020, increasing the total number of publicly available real-time data points from under 5 million a year today to over 10 billion.

- The **Water Funder Initiative** is launching Project Water Data. Project Water Data is an effort to work with Federal, state, and local governments, as well as private- and social-sector partners, to modernize data systems that support healthy communities, thriving agricultural systems, and clean waterways for our wildlife. With seed funding provided by philanthropic partners in the Water Funder Initiative, and support from the **Association of California Water Agencies,** the **City of Los Angeles,** the **Colorado Water Conservation Board, Environmental Defense Fund, DC Water,** the **Metropolitan Water District of Southern California, Milwaukee Metropolitan Sewerage District, Northern California Water Association,** the **State and Federal Contractors Water Association, The Nature Conservancy, Trout Unlimited,** and others like the **Aspen Institute,** Project Water Data

will: (1) mobilize a coalition to highlight the value of open, integrated water data in supporting better decision-making and citizen engagement; (2) develop a core set of principles for open and integrated water-data systems; and (3) unlock water data from all sectors and develop products that increase the discoverability, usability, and interoperability of data.

- **WaterSmart Software** will, over the next ten years, expand its utility partnership community to reach more than 45 states and over 5,000 water utilities with its digital customer-engagement technologies. The company estimates that as a result of this expansion, more than 128 billion gallons of water (the equivalent annual water use of 1.2 million households) will be saved, and carbon-equivalent emissions will be reduced by more than 1 million metric tons. In an effort to advance understanding of water use and related energy consumption and impact on greenhouse-gas output and global climate change, WaterSmart is committing to make newly available aggregated and anonymized water-consumption and demographic data from its operations freely available in a standardized format for public-research purposes.

Conserving Water and Watersheds

Reducing water use and maintaining the integrity of our Nation's natural systems are two important parts of ensuring that everyone—humans, animals, plants, and ecosystems—have access to sufficient water when and where they need it. Individuals and institutions responded to the White House call to action with new steps to conserve water and water basins across the United States.

- The **Alliance for Water Stewardship (AWS)-North America**, a program of **The Water Council,** is promoting corporate water stewardship in the United States through implementation of the AWS International Water Stewardship Standard (AWS Standard) across U.S. industrial and agricultural sectors. Today, AWS is committing to working with 200 large industrial and agricultural water-using sites to implement the AWS Standard, to provide a framework to help sites use water more strategically and identify and mitigate internal and external water-related risks. AWS expects this effort to save more than one billion gallons of freshwater over the next decade.

- At the **Society of Freshwater Science** annual meeting in May 2016, **American Rivers** will host a special session entitled "Rivers at Risk," at which distinguished scientists in the field will assess threats to rivers in the 21st century and launch a series of papers and a special journal issue leading up to the 50th anniversary of the Wild and Scenic Rivers Act on October 18, 2018.

- The **Beverage Industry Environmental Roundtable (BIER)** will this year launch a "Project Cost Curve Database" that will collect information on projects related to energy and water conservation at BIER's 20 global beverage-company members and their 1800 facilitates. BIER members and facilities will be able to use this information to inform the development of their own resource-conservation projects. In addition, BIER is launching "Future Scenarios 2025", an integrated effort to explore how access to water and other resources is

likely to change over the next decade, and to introduce business leaders and other stakeholders in the beverage industry to practices that could increase water sustainability.

- Under the leadership of the **Bonneville Environmental Foundation**, the business water-stewardship networks **Change the Course** and **Protect the Flows** are merging. The new organization is announcing that over the next 18 months, it will work to educate and engage 500,000 Americans in water-conservation practices, and will provide an award to a network business member for innovation and water conservation in the West.

- **Coca-Cola** will work to establish 10 corporate partnerships by 2017 to expand its efforts to engage with local communities, government, and business partners to support the sustainability of local watersheds.

- **Cox Enterprises** has set goals of becoming water- and carbon-neutral and sending zero waste to landfill by 2044. As part of these goals, Cox is committing to reduce its water use by 6.5% annually through four parallel efforts: (1) reclaim approximately 10 million gallons of water annually through Water Conservation Centers; (2) partner with American Rivers and Ocean Conservancy for water cleanups in Cox locations across the Nation; (3) deploy new technology and water-efficient fixtures throughout Cox facilities; and (4) use xeriscaping at locations with large land footprints to save more than 42 million gallons of water annually.

- In response to the ongoing western drought, the **East Bay Regional Park District** in California, the largest regional park system in the United States, has established a goal to save 250 million gallons of water over the next five years. As part of this effort, the Park District is announcing that it will (1) eliminate standard grass in some high-use areas (replacing with drought-tolerant grasses), and partner with local sod growers and seed companies to make drought-tolerant grasses available to the general public; and (2) convert a number of grass areas into native plant gardens for water-efficiency and public-education purposes. These two initiatives will potentially cut water use by 30%–50%.

- **Ecolab** is committing to improve water-productivity intensity by 30% in its United State facilities by 2020 (from a 2015 baseline). This will conserve approximately 100 million gallons of water over five years.

- The **Environmental Defense Fund (EDF)** is announcing a partnership with **Pecan Street, Inc.** to gather data and conduct analysis to help 50 households in Houston and Austin understand the connection between their water and energy use. Results of this analysis will help Houston and Austin reduce the water and energy footprint of the more than 3 million utility customers in the two cities. In addition, EDF will work with the **University of Texas at Austin,** the **University of Texas at San Antonio,** and the **University of California, Davis** to help water providers of three to five major Texas cities better manage the energy use embedded in their water systems, with an additional one or two states to be announced later this year.

- **General Mills** is committing to champion development of stewardship plans by 2025 for high-risk watersheds in its global supply chain. As part of this commitment, General Mills

will work to develop the science and tools necessary to achieve sustainable groundwater management in relevant California watersheds, working in partnership with stakeholders in each watershed, **The Nature Conservancy,** and **Sustainable Conservation.**

- To minimize water use in apparel manufacturing, **Levi Strauss & Co.** has created Water<Less™ finishing techniques, which save up to 96% of the water typically used in the denim-finishing process. Today, Levi Strauss & Co. is committing to produce 80% of its products using its Water<Less™ techniques by 2020, and to make its Water<Less™ methods, along with other water-conservation approaches and tools, publicly available to others within and outside the apparel industry. In addition, Levi Strauss & Co. is committing to, by 2020, use 100% sustainable cotton from sources such as Better Cotton and recycled cotton that use less water and fewer pesticides.

- **Nestlé** is announcing that it will implement the Alliance for Water Stewardship standard in its California operations. Additionally, by 2017, Nestlé will put in place operational plans that will save 144 million gallons of water annually in Nestlé's California factories, building on its commitment to transform one of its nine California factories into a "zero water" facility.

- The **Sonoran Institute**, in partnership with **the Central Arizona Conservation Alliance,** is announcing an initiative to develop a collaborative conservation plan for the Phoenix metropolitan area. The plan will help the 24 cities and towns in Maricopa County protect local watersheds and encourage sustainable recharge of aquifers, and thereby fulfill state requirements for water availability needed to permit future growth. Wide-spread adoption of this plan will support the long-term supply of groundwater needed to sustain the economic vitality of the region while ensuring the conservation of the region's ecology.

- The **Texas Environmental Flows Initiative**, a joint effort of the **Meadows Center for Water and the Environment, Harte Research Institute, National Wildlife Federation, The Nature Conservancy, Ducks Unlimited,** and the **National Fish and Wildlife Foundation** is committing to the development of the foundational science and market analysis to launch a water-transaction market in Texas for the benefit of bays and estuaries. Over the next two years, the Initiative will execute at least one significant water transaction with demonstrable benefit to ecological resources injured by the Deepwater Horizon oil spill, and lay the groundwork for market development in three bay systems whose ecological health and commercial fishing productivity are imperiled by declining freshwater inflows.

- **Trout Unlimited (TU)** is announcing two new efforts to improve drought resilience in two river basins in the western United States. First, in the upper Green River flowing through Wyoming, TU will work with Wyoming cattle ranchers to identify workable approaches for ranchers to share water with downstream municipalities. This effort will potentially save approximately 1.5 million gallons of consumptive water use per year. Second, TU will finish work in 2016 with the **Methow Valley Irrigation District** in eastern Washington State, investing in aging water infrastructure in a way that increases the reliability of their irrigation-water delivery, sends water to the town of Twisp, and increases flows for imperiled salmon and steelhead.

- With support from the **William Penn Foundation,** the **University of Delaware** and **Nature Conservancy of Delaware** are announcing the formation of the Brandywine Christina Healthy Watershed Fund in Delaware and Pennsylvania. The water fund is designed to provide up to $5 million per year from public-private water utilities and other public-private sources for agricultural conservation programs upstream in the regional watershed that provides drinking water to over a half million people in both Delaware and Pennsylvania.

- **Water Quality Indiana (WQI)** is launching a three-year river-restoration and conservation initiative that will engage more than 50 high-school seniors and undergraduates from private and public universities in east-central Indiana. With 2016 funding of $28,000 from the Virginia B. Ball Center for Creative Inquiry at **Ball State University,** this inter-institutional partnership will develop a virtual space for student-contributed water quality data and scholarship shared through learning modules and multimedia. Core aspects of this initiative will be disseminated to over 250 educators through national-level workshops and replicated within a growing network of partner institutions.

- The **World Wildlife Fund**, together with bi-national partners including **The Coca-Cola Company, Tecnológico de Monterrey, Desert Landscape Conservation Cooperative,** and **South Central Climate Science Center,** is announcing a Rio Grande/Rio Bravo Forum to be held in February 2017 to share successes and identify innovative solutions to address the region's mounting water stress. The Forum will bring together over 100 diverse water users from the United States—building towards a Binational Forum including both the United States and Mexico—to cooperate on ensuring the long-term integrity of the Rio Grande/Rio Bravo basin, which provides fresh water for over 13 million people.

Helping Communities in Need

Access to clean, safe drinking water is often a particular problem for predominantly poor, minority, or rural communities. Today's announcements include responses to the White House call to action that will target water assistance to those in need.

- The **Dow Chemical Company** is partnering with **Genesee County Habitat for Humanity** to offer free water-filtration systems to 150 Habitat for Humanity homes in Flint, MI. Through this partnership, Dow will provide the reverse osmosis (RO) technology for the the water-filtration systems that will be installed in residents' homes.

- **Evoqua** will donate 10 Sky Hydrant water-filtration units—each with the capacity to meet the daily water needs of more than 6,000 people—to underserved, emergency, and disaster-relief efforts in the United States. In addition, Evoqua is committing to (1) invest an additional $50 million in research and development to further expand water reuse and reclamation efforts across municipal and industrial applications in the United States; and (2) to, by 2021, increase the amount of water the company treats for reuse and reclamation to 5 billion gallons of water a day—double Evoqua's current capacity.

- **Micronic Technologies** is announcing that it will provide its MicroDesal™ technology at reduced cost to small community water/wastewater facilities to moderate deteriorating

infrastructure. Micronic is also committing to developing this technology through partner collaborations—in particular, with the **University of Virginia**'s College at Wise—to provide secure, safe, potable water to small, remote communities throughout the United States and the world.

- In response to extreme drought in the State of California, the **San Francisco Foundation** is investing $150,000 in partner organizations to address social vulnerability and build community resilience to water scarcity in low-income communities and communities of color. The grants will help community groups engage in the implementation of California's new drought measure and ensure that the associated public revenues build sustainable water projects in disadvantaged communities, among other activities.

- **Triple Clear Water Solutions, Inc.,** a company that provides plug-and-play water-purification technologies, is committing 1% of its sales—which is expected to be more than $1 million over the next several years—to fund clean-water initiatives in communities in need of help.

- **WaterFX** and **Partners in Health** have teamed up to form OpenWATER, a non-profit organization dedicated to accelerating the deployment of innovative water technologies for enhancing water security in resource-poor and underrepresented communities such as rural communities, tribal nations, and island territories. OpenWATER will draw on WaterFX's experience in sustainable water treatment—to deliver water technologies in tens of communities over the next two to three years.

Raising Public Awareness

With water often traveling hundreds of miles before flowing out of a tap, many Americans don't know where their water comes from, the underlying stresses facing their water supply, or approaches that can be adopted to help ensure long-term water security. Individuals and institutions are today announcing new efforts in response to our call to action to raise awareness and improve knowledge of water in the United States.

- This year, **America's Watershed Initiative (AWI)** will launch a #raisethegrade communications campaign on the importance of the Mississippi River watershed, which received a D+ in the most recent AWI Report Card. The campaign will focus outreach to key private- and public-sector leaders in the watershed, including representatives of 400 institutions that participated in the Report Card process. AWI will pair this leader outreach with a mass-media strategy targeting all five basins of the Mississippi River watershed.

- **Blue Legacy, Global Water Challenge,** the **U.S. Water Partnership, Veolia** and partners are launching SOURCE, a new, freely accessible water-storytelling platform that will educate the public about the importance of water and offer recommended water-management practices.

- A diverse coalition of global businesses with significant supply chains or operations in California are announcing their commitment to join *Connect the Drops*, a campaign urging policy measures by decision-makers to maximize California's local and state water

resources. Launched by **Ceres**, a nonprofit sustainability advocacy organization, the campaign has 23 signatories from the private sector. The signatories joining the campaign today—Anheuser-Busch InBev, Annie's, Eileen Fisher, Kellogg Company, and Xylem—have collectively committed to saving nearly 1 billion gallons of water through 2020 through current efforts and new goals.

- This spring, **GRACE Communications Foundation** is releasing a Spanish version of its Water Footprint Calculator, a free, nationally used tool that illustrates how everyday actions impact water use. The new release will allow the tool to help an even wider audience understand their water use and reduce their water footprint.

- For the past eight years, **Green Schools** has been honoring environmental excellence, innovation, and stewardship across the United States through its Annual Green Difference Awards program, which is sponsored this year by the **Walmart Foundation.** This year, Green Schools will add a category for Best Practices in Water Innovation. In addition, Green Schools is announcing a new Water Innovation Challenge. K-12 students will compete in three areas—Best Green Schools Water Practices, Best Student-led Water Practices in our Community, and Best Innovative Water Business Idea—and will have the opportunity to pitch their ideas to leading businesses and government officials at the 9th Annual Green Schools Summit.

- The **Interstate Council on Water Policy (ICWP)** is announcing that over the next 24 months, it will engage over 100 partners—including State water-management agencies, interstate basin commissions, and NGOs—in (1) communicating the importance of water data and science in informing water resources policy and planning; and (2) identifying and promoting opportunities to enhance State and regional water-resource planning efforts. As part of this effort, ICWP will convene at least two national stakeholder workshops focused on water-data collection and water use, and at least two workshops highlighting successful practices from State and interstate water-plan development.

- The **Irrigation Association** and the **National Ground Water Association** are partnering to launch a new educational campaign aimed at helping the Nation's 121,000 farms enhance water efficiency and reduce energy consumption of their 476,000 irrigation wells. The campaign will include an online resources portal; a national series of presentations, seminars, and webinars; and collaborations with USDA's Natural Resources Conservation Service and extension office.

- **Itron** has partnered with Professor Michael Webber at the **University of Texas at Austin** to create and distribute an interactive curriculum that teaches key concepts about water and energy for K-12 students, colleges, industry, and the general public. This curriculum will combine traditional content with multimedia components such as audio and video, along with dozens of interactive exercises, maps, and games in order to improve water and energy literacy, encourage conservation and resourcefulness, and inspire the next generation of innovators. Working with its community partners nationwide, Itron will make the app-based curriculum available free of charge, with a goal of reaching at least 10,000 students in 2016 and expanding globally in 2017.

- **Levi Strauss & Co.** will expand its partnership with the **Project WET Foundation** to train Levi Strauss & Co. employees to become water-conservation ambassadors, empowered to educate their local communities about the importance of saving water. Together, Levi Strauss & Co. and Project WET have developed a training curriculum to teach employees and local communities about the impact their clothing has on the planet, and changes individuals can make in their daily lives to conserve water. Levi Strauss & Co. is committing to provide this water-education training to 100% of the company's corporate employees by 2020.

- The **National Environmental Health Association (NEHA)** is announcing an initiative to increase awareness of (1) the effect of the environment on water supplies and the role environmental-health professionals play in keeping water safe; and (2) approaches to ensure that water reuse systems do not negatively impact public health. Under this initiative, NEHA will work with its members and 50 affiliate organizations to compile information on these topics, and share the information collected with partner organizations, environmental-education programs, and local health departments.

- **The Smithsonian**'s Museum on Main Street program will initiate a traveling educational exhibition, *Water/Ways*, which explores the centrality of water in our lives as an environmental necessity and an important cultural element. Beginning in May 2016, the Smithsonian, in partnership with state humanities councils, will launch the exhibition on simultaneous year-long tours of five states—Florida, Idaho, Illinois, Minnesota, and Wyoming—and will also support the exhibition traveling to more than 180 towns across 30 states over the next six years. The exhibition will be accompanied by the launch in June 2016 of a website that will serve as a gateway to share resources and collect stories on water.

- Over 1.6 million people in the United States still lack basic plumbing facilities such as a toilet, a shower or bathtub, and running water. **Southeast Rural Community Assistance Project, Inc. (SERCAP),** working with the **National RCAP,** is committed to reducing this number by 10% over the next ten years. Through a combination of social-media campaigning, crowd-funding, and its "A Day Without Indoor Plumbing Challenge", SERCAP will bring awareness of this problem to the general public, in addition to the private and government sectors.

- The **Theodore Roosevelt Conservation Partnership (TRCP)** is announcing that more than 800 sportsmen and women have signed a petition recognizing serious risks to the American water supply, including fish and wildlife habitat, and calling for action to reduce the risks of water shortages, create flexibility in water management, and improve the reliability of water systems on a basin scale.

- **ThinkWater** is a national campaign supported by **USDA**'s National Institute of Food and Agriculture and led by the **University of Wisconsin-Extension** and **Cabrera Research Lab** to help people think differently, and care more deeply, about water. Today, ThinkWater is committing to work over the next two years to build a national coalition of at least six state-based networks to engage water researchers, educators, and extension agents in solving water-related problems through better systems thinking. This effort will begin this spring with the Wisconsin Water Thinkers Network. ThinkWater expects to directly engage

approximately 200 experts and practitioners directly involved with water issues through the Wisconsin network, and approximately 1200 once all networks in the coalition have been established. In addition, ThinkWater is announcing that this spring it will launch "Systems Thinking Made Simple," a free, interactive online course designed to introduce systems-thinking concepts, tools, and resources to water researchers, educators, extension agents, and citizens across the country.

- **Water Education of Latino Leaders (WELL)** is launching WELL 2.0, a new effort to provide basic education about water infrastructure and finance to municipal officials in California. WELL 2.0 is a series of fully-funded conferences, roundtables, and gatherings that bring special-district elected directors into contact with municipal elected leaders to enable local communities to overcome water challenges and ensure that safe, sufficient, and affordable drinking water is available to poor and underrepresented minority communities.

- Through their water-focused corporate citizenship initiative Watermark, **Xylem** has set a goal of logging 100,000 hours of employee volunteer time over the next three years in projects to include presentations and hands-on water-monitoring activities at local schools and community centers, water source clean-up activities to protect local water resources, and charity "Walks for Water" to raise funds and awareness of water issues.

- **Zurn Industries LLC** will provide water-efficiency training to 1,000 municipal agencies and utilities as well as 10,000 building owners, architects, engineers, and contractors. The training will be focused on reducing water use through water-efficient products and practices with the goal of saving 114 billion gallons of water over the next decade.

Delivering Tools and Resources

Today's announcements include the release of a broad range of tools and resources to support individuals, communities, and governments of all levels in developing and implementing solutions to key water challenges in the United States.

- This year, the **Alliance for Global Water Adaptation (AGWA)** is publishing the Climate Risk Informed Decision Analysis (CRIDA) methodology, a guidance document that seeks to enable water managers to plan for and manage water resources sustainably over decades and centuries despite deep future climate uncertainty. Also this year, AGWA will launch a global community of practice based on the publication, along with a series of graduate and post-professional courses offered initially through universities in the United States and Europe.

- The **American Water Works Association** is releasing Water Loss Audit Software version 5.0, a free tool that has been updated to support audits for water systems of all sizes. AWWA is challenging 1,000 water utilities to complete a water audit using AWWA's newest software in the next two years and report their findings on AWWA's website.

- **The Association of Metropolitan Water Agencies (AMWA),** together with **EPA,** the **Association of Clean Water Administrators,** the **American Public Works Association,** the **Association of State Drinking Water Administrators,** the **American Water Works**

Association, the **National Association of Clean Water Agencies,** the **National Association of Water Companies,** and the **Water Environment Federation,** is releasing important updates to the Effective Utility Management (EUM) and the Keys to Management Success, a framework for sustainable water-utility management. The updates incorporate new science and approaches in water-utility management, such as performance monitoring and expanded use of data from automated and smart systems to optimize operations and minimize water loss.

- This spring, the **Climate Registry** will begin a pilot of the Water-Energy Greenhouse Gas (GHG) Guidance with water agencies located in Southern California Edison's territory. This pilot will serve to operationalize the Guidance as a resource for water agencies to potentially improve their water-, energy-, and GHG-reduction abilities with better data.

- **DC Water** and the **Water Environment Federation** are developing a National Green Infrastructure Certification Program to promote a skilled green infrastructure (GI)-workforce and help support community-based job creation in U.S. cities. The Program will provide certifications to individuals performing the installation, inspection, and maintenance of GI as having the required knowledge, skills, and abilities to support long-term performance and sustainability of GI systems, which can help reduce combined sewer overflows and provide triple-bottom-line benefits. The **Milwaukee Metropolitan Sewerage District** is joining with **WEF** to help advance the certification.

- The NSF-funded **Engineering Research Center for Re-inventing the Nation's Urban Water Infrastructure (ReNUWIt)**, a research partnership among **University of California, Berkeley, Colorado School of Mines, New Mexico State University,** and **Stanford University,** will seek to advance urban water governance by releasing a set of decision-support tools this year that will allow utilities to quantify regional urban water resiliency and sustainability; promote the diversification of urban water-supply portfolios by enabling virtual trading in regions with shared water resources; and support integrated management of water-reuse and stormwater-recharge systems. These tools are being developed in collaboration and partnership with water and wastewater utilities in California and Colorado, and will be tested by utilities and regional planning agencies.

- The **Family Farm Alliance** is releasing a report compiling case studies in several states (CA, CO, NM, OR, WA, and WY) that highlight real-world examples of water conservation, water transfers and markets, aging infrastructure problems, watershed restoration, and ecosystem enhancement on farms and ranches. The report will describe unique complications facing local water users and creative solutions, helping to scale efforts that support better management of water for both economic purposes and environmental uses.

- The **Global Lake Ecological Observatory Network (GLEON)** and the **North American Lake Management Society (NALMS)** are announcing new resources to allow broader participation in lake- and water-quality monitoring. In partnership with the U.S. Geological Survey, Esri, and other institutions, GLEON will further develop the Lake Observer mobile application with new mapping and data-visualization features to help researchers and citizen-scientists record lake and water-quality observations. GLEON and NALMS will also make the app available for use in the annual Secchi Dip-in event and partner with the

EPA to make collected data publicly available for the first time via the Water Quality Portal. In addition, NALMS is working with graduate students to develop online video tutorials to help interested students participate in water-quality monitoring and lake management. The tutorials will be posted online this summer.

- The **International Association of Plumbing and Mechanical Officials** is releasing *The Drought Toolkit: A Community Guide to Achieving Water Efficiency Today.* The freely available toolkit will help diverse stakeholders—including city councils, local planning and development departments, code-enforcement officials, state construction boards, and state legislatures—realize more than 20% in water savings in the built environment.

- **Mammoth Trading** is launching two new trading markets for water leasing in over 500,000 acres of irrigated farmland: (1) for groundwater trading in western Nebraska; and (2) for surface-water trading in central Washington State. These markets, which will be set up for municipalities and communities for free, will seek to leverage the power of computer optimization to automate the process of checking complex regulatory rules for trading and to generate economic gains among participants. By monetizing the value of conserved water, water leases generate a potential new revenue for water users and reward innovation in water use at the farm level. Mammoth Trading grew out of NSF- and USDA-funded research, which was commercialized through the NSF Innovation Corps.

- In 2017, the **MIT Center for Advanced Urbanism (CAU),** with funding from the MIT Abdul Latif Jameel World Water and Food Security Lab, will release new design guidelines for building constructed wetlands to enhance urban water resiliency and flood protection through stormwater capture in cities. These guidelines incorporate a unique combination of engineering, design, and ecological systems to rethink how the natural landscape, water infrastructure, resiliency, and urbanism come together. This effort builds on CAU's New Meadowlands proposal to address flooding in New Jersey.

- In 2016, the **NELAC Institute** will release a new standard to improve the competency of laboratories that conduct testing on drinking, wastewater, and surface water. This standard will build upon existing standards regarding how laboratories measure and report contaminants in water at low concentrations.

- The **North American Lake Management Society (NALMS)** is announcing the addition of a new track to its Certified Lake Manager (CLM) and Certified Lake Professional (CLP) programs, allowing the participation of undergraduate and graduate students. This new track will help grow the water workforce by (1) giving students an opportunity to gain skills needed to become proficient water-quality professionals; (2) increasing the number of certified CLMs and CLPs; and (3) expanding the network of people with the knowledge of basic freshwater science, ecology, and other areas needed for informed lake management.

- In July 2015, **Rancho California Water District (Rancho)** launched MyWaterTracker, a digital platform that enables water users to visually see and track their water use on a day-by-day basis and compare current water consumption to individual household water budgets. To date, Rancho reports that use of the tool has resulted in District-wide water savings of 30% over 2013, or enough to serve approximately 20,000 households. Today,

Rancho is announcing that it will launch a mobile-app version of this tool in summer 2016, which will include additional hourly water-use data and leak alerts and is expected to reach over 33,000 residential and agricultural customers.

- **Texas A&M University (TAMU)** will develop and implement a web-based technology that provides real-time water-usage information directly to water-utility customers, empowering them to make more informed decisions about their water consumption. TAMU is partnering with the Texas cities of Arlington and Round Rock to expand use of the technology, and will continue to partner with other water utilities to test and refine the system.

- **The Nature Conservancy**, in partnership with the **American Planning Association**, the **Association of State Floodplain Managers**, the **National Association of Counties**, and **Sasaki Associates**, will develop a free, publicly available online siting guide that communities can use to identify a suite of potential nature-based solutions to flooding challenges. The guide will serve as a helpful tool to support municipalities in investing in natural systems and nature-based solutions to address their flooding challenges.

- The **Water-Culture Institute**, in collaboration with **University of Arizona** and the **Southwest Water Technology Cluster,** is developing an "Ethics-Based Decision Support Tool" (EBDST) for guiding technology, policy, and investment decisions in the water sector. Each EBDST shares a common framework, which is tailored to specific users through community engagement to set value priorities for water decision-making. The resulting decision tool can be incorporated into existing water-governance arrangements. The EBDST will be piloted in Santa Fe, NM and three other cities in 2016 and 2017, and scaled nationwide beginning in 2018.

Cleaning wastewater every day for a better Bay.

News Release

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White House Water Summit calls attention to HRSD's sustainable water recycling initiative

—Initiative would solve several significant environmental issues with a single program —

HRSD's sustainable water recycling initiative was among the water issue solutions featured during the March 22, 2016, White House Water Summit in Washington, D.C. The event was held in conjunction with the United Nations World Water Day to catalyze ideas and actions to help build a sustainable and secure water future through innovative science and technology.

"We are proud that our initiative, which is a unique opportunity to solve several significant environmental issues with a single program, was among those recognized during the White House Water Summit," said HRSD General Manager Ted Henifin. Representatives of HRSD and its project partner CH2M attended the summit, which included panel discussions and invited speakers from the public and private sectors.

HRSD has committed to begin pilot tests in the summer of 2016 as part of a $1 billion sustainable water recycling initiative that would pump up to 120 million gallons of clean water that exceeds drinking water standards into a coastal plain aquifer. This would provide a sustainable source of groundwater, inhibit salt water intrusion, slow the rate of land subsidence in Eastern Virginia and significantly reduce surface water discharges from HRSD facilities into Chesapeake Bay tributaries.

"The treated water HRSD produces today is very clean and with the addition of advanced treatment processes, HRSD can produce water that exceeds drinking water standards," Henifin said. HRSD will test two types of advanced treatment processes at its York River Treatment in Seaford, Virginia, during its pilot studies.

Before final decisions are made regarding the sustainable water recycling initiative, all processes must be proven reliable, dependable and affordable; all local, state and federal regulatory requirements must be met; and a comprehensive public input process will be conducted with all comments thoroughly addressed.

More information about HRSD's sustainable water recycling initiative can be found at www.hrsd.com/SWR.

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HRSD, a political subdivision of the Commonwealth of Virginia, was created by public referendum in 1940 and currently serves 17 cities and counties in southeast Virginia, an area with a population of 1.6 million.
Our Mission: We protect public health and the waters of Hampton Roads by treating wastewater effectively.

News

HRSD pitches plan to replenish groundwater aquifer

By **Austin Bogues · Contact Reporter**
abogues@vagazette.com

MARCH 25, 2016, 4:55 PM

JAMES CITY — The water that goes down the drain usually ends up in the ocean, but if the Hampton Roads Sanitation District gets its way, some of it may end up underground.

Doing so may help replenish the aquifer officials at the Virginia Department of Environmental Quality say has been depleted, and HRSD's idea may ease some of the regulatory water-use restrictions looming for localities like James City County that use groundwater.

But the project will be expensive.

In a presentation to the Board of Supervisors on Tuesday, HRSD General Manager Ted Henifin told county officials the initiative would help combat depletion of the aquifer.

"We're all concerned from a groundwater supply standpoint. Water level continues to fall," Henifin said.

The groundwater pulled up from the aquifer used by James City County and many localities and businesses across Eastern Virginia has not replenished adequately, according to DEQ studies. Henefin likens the aquifer to a "great lake" sitting beneath the ground.

James City County draws nearly 5 million gallons per day from the aquifer for county residents, and other industries use even more, like the paper mill in West Point which at times pumps more than 20 million gallons per day from the aquifer. The aquifer, which is refreshed by rainwater, has seen its water levels drop significantly in recent years, according to DEQ.

In his presentation Tuesday, Henifin said in the early part of the the 20th century water would automatically come out of the ground as high as 32 feet above sea level, but now the water level has dropped on average to nearly 200 feet below sea level.

Now, sewage from James City County is treated by the sanitation district and released into local rivers and the Chesapeake Bay as effluent, which is just below potable standards. Henifin said under the new initiative, which is still being explored in a pilot stage, the effluent would be treated to drinkable water standards and then injected back into the aquifer.

"We'll take our effluent, which is very high quality, treat it to drinkable standards and put it in the ground. We have to do that because too many people pull that water directly out of that aquifer and drink it untreated. It's something that can easily be done from a technology standpoint," Henifin said.

To start, the sanitation district wants to build a demonstration project, that would pump between 1 to 4 million gallons per day back into the aquifer.

The eventual goal will be to pump 120 million gallons per day into the aquifer by 2030. It would take six or seven plants to conduct the operation, and the project would cost an estimated $1 billion, with $20 million to $30 million in annual operating costs.

The project costs would be offset in part, with localities paying what HRSD calls a "reasonable groundwater withdrawal fee."

HRSD would have to seek approval from three agencies, the Department of Environmental Quality, the Virginia Department of Health and the EPA.

James City County Board of Supervisors Chairman Michael Hipple said he is receptive to the idea, although he has concerns.

"I think we need look at replenishing the aquifer," Hipple said.

"It worries me at times just to make sure what we're putting in there is right and it doesn't damage our natural water source," Hipple said. "That's my only concern. But trying to replenish the aquifer with water we have, I think it's going to give us more of what we need for the future."

The proposal from HRSD comes as the Board of Supervisors is considering a range of options to deal with cuts the DEQ wants it to implement to allow the aquifer to recharge.

Right now, the county is permitted to draw as much as 8 million gallons per day, but DEQ wants to cut that number in half.

That reduction would require the county to look elsewhere to meet its water needs. Supervisors are looking at the possibility of drawing surface water from the Chickahominy River – which would also have to get DEQ approval. The cost of a desalination plant to treat that water would total around $120 million.

Bogues can be reached by phone at 757-345-2346.

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A solution to many of our woes

HRSD's plan to recharge the aquifer may ultimately make permitting less restrictive and allow significant future residential and industrial growth.

BRYAN PLUMLEE

The Hampton Roads Sanitation District wants to save the Chesapeake Bay — and a lot more, if that's not enough.

An idea floated by HRSD to recharge aquifers with treated water is new locally, but it is a known and reliable technology. For Hampton Roads, it is a salve for intractable problems including the quality of the Chesapeake Bay; the lack of a sufficient and safe water inventory; land subsidence; flooding; economic stagnation; and failing infrastructure.

Instead of continuing to pump millions of gallons a day of treated water into the bay, HRSD Director Ted Henifin has proposed storing the water by redirecting it into our aquifer for later use. The water is cleaned and treated, so before we become troubled by the idea of drinking recirculated water, consider that the storage of treated water in our aquifer protects the supply from greater threats than tainted imaginations.

Our perception is that our water comes to us in a relatively pure form in need of only minor treatment before consumption. The truth is more complex for our primary source of water.

The system of lakes and rivers from which we draw most of our water is compromised by pollution. Cities routinely spend millions drawing, testing and treating water for potential and actual pollution. Recently, we were forced to monitor our supply following the spill of tainted pond water from a retired coal-fired electric power facility along the Dan River. What is our backup plan for future threats?

Recharging the aquifer is a hedge against a human failure or natural disaster — including those of a political nature. Recall that since the early 1980s, Virginia has maintained a moratorium on uranium mining.

But each time a new administration arrives in Richmond, uranium interests renew their effort to unearth this potential fortune. The cities of South Hampton Roads have consistently opposed the uranium interests because of the potential for radiation to find its way to Lake Gaston in the event of an engineering failure, weather or natural disaster.

Economic growth and financial savings should get everyone's attention. At this moment, the cost to construct the proposed seven recharging stations is estimated by HRSD to be $1 billion.

So where is the savings?

Consider this: Several pending and costly federal mandates could be avoided or delayed by HRSD's project. For instance, HRSD is under a federal order to spend $3.5 billion to beef up its network of pipes to reduce infiltration of stormwater into the wastewater system during unusually large storms.

This is an important upgrade of its infrastructure. However, infiltration is a relatively rare event and can wait. We currently pump into the bay millions of gallons of water which if redirected to the aquifer could slow or stop land subsidence, which could, in turn, reduce flooding and combat rising sea levels, a problem for which there are few effective tools.

Our region is under a mandate to comply with a pollution diet for the bay, otherwise called the total maximum daily load. This mandate may cost billions of dollars and limit growth with increased demand for stormwater treatment to reduce nitrogen, phosphorous and sediment. HRSD's project is part of an integrated water plan to reduce costly treatment efforts or eliminate them for some locations.

On the Peninsula, cities have drawn down aquifer levels to historic lows.

This has caused the state Department of Environmental Quality to restrict and cut back groundwater permits for 14 large water users.

Localities and businesses have seen their groundwater permits dramatically restricted. When a city or business water supply is restricted, so is the potential for economic growth.

HRSD's plan to recharge the aquifer may ultimately make the permitting process less restrictive and allow significant future residential and industrial growth. Finally, the experts of HRSD are ready to move. They are seeking the buy-in of the member cities, the DEQ and the EPA.

Last year the legislature created the Eastern Virginia Groundwater Management Advisory Committee to develop a strategy for affected areas. This committee is comprised of local stakeholders and officials.

While their report is not due until Aug. 1, 2017, my review of their minutes suggests the HRSD project is receiving serious consideration.

We don't have time to waste. The seas are rising and the land is sinking.

Homeowners are paying high stormwater fees and high insurance premiums while not getting a solution from the state. HRSD has proposed an answer — if only a start — to a long-term problem. Grab onto this line and hang on — as always, our future and the bay are in the same boat.

J. Bryan Plumlee is a land attorney with the firm of Poole Brooke Plumlee, PC. He has served as a member of the Virginia Marine Resource Commission and as chairman of the Virginia Beach Wetlands Board.

HRSD doesn't want to waste wastewater

By Dave Mayfield
The Virginian-Pilot

SEAFORD

Ted Henifin crouched next to a floor drain at the Hampton Roads Sanitation District's York County treatment plant. Into his palm ran a soft stream of clear water – clean enough, probably, to drink. But the lab results aren't back to confirm that. So, Henifin will hold off before he sips.

Waiting isn't exactly Henifin's style these days. He has dived into a project to prove that HRSD can turn what Hampton Roads flushes down

See **WASTE, PAGE 10**

recycled

The sanitation district wants to launch a $1 billion, decadelong project that would refill the region's aquifers with treated wastewater.

WASTE

PLAN COULD SAVE CITIES MILLIONS, SLOW SEA LEVEL RISE

Continued from Page 1

its toilets and rinses down its sinks into water that's drinkable. Once that's accomplished, he wants to inject 120 million gallons a day into the main aquifer that underlies the region.

The idea has excited local environmentalists, business leaders and elected officials. They hope adding so much water underground would slow the sinking of land throughout coastal Virginia. Geologists have attributed that subsidence to wells sucking water from the aquifer and estimate it accounts for more than half of the region's relative sea level rise over the past century.

With HRSD cutting its discharges of treated, but still-polluted, water into local rivers, Hampton Roads localities also could leap into compliance with the federal Chesapeake Bay cleanup mandate.

"There's so much happening so fast," said Henifin, HRSD's general manager. "But we really feel motivated that we have to have some answers early. It's critically important to the region and the Chesapeake Bay in so many ways that it seems like it's the right thing to do."

Much of the focus of HRSD's effort right now is the York County facility, where it is pilot testing the drinking-water-treatment options most likely to be used at the seven plants it is considering for the aquifer-replenishment project. The water already is extensively treated as part of HRSD's normal process. The agency added equipment to further cleanse it during the pilots.

One test involves reverse osmosis, in which water is streamed through a series of pressurized membranes. The other relies on activated carbon. Both employ ultraviolet light as a final cleansing weapon.

Charles Bott, HRSD's director of water technology and research, said the carbon-based pilot has been running for about a week, and the reverse-osmosis pilot for three.

Already, he said, the latter system is showing disadvantages. It uses 12 times as much electricity. It also typically removes all salt, so HRSD likely would have to add a significant amount back to the treated water before injecting it into the aquifer. That's because water going in should match as closely as possible the water already underground – and the aquifer contains salt, more so near the coast.

HRSD plans to demonstrate the drinkability of the test water at a Sept. 15 event at the York County plant; politicians and other "decision-makers" will be invited.

Henifin said he'll take the first gulp.

As for the others? He's hoping the "yuck factor" will be overcome by the novelty of being able to claim that they'd dared to imbibe.

By the time of the event, HRSD also may know if it will be able to inject water underground at the York County plant. It is atop or near the edge of the Chesapeake Bay crater, formed by the impact of a space object about 35 million years ago. It's not known where at this spot the Potomac aquifer lies beneath.

A rig was set up this week to begin drilling. If it doesn't find the aquifer, HRSD will consider piping water to a site where it could be injected – an option that might drive the cost of including the York County plant too high. The agency estimates the total project cost at about $1 billion, when all the plants it is considering are included.

HRSD is more certain that what's beneath the six other candidate plants is suitable for aquifer injection.

The agency recently drilled at its Nansemond plant in northern Suffolk and hit the aquifer's top at about 400 feet down. Cuttings taken as the drilling continued 1,000 feet deeper will be analyzed to design a demonstration scheduled to begin by early 2018.

The injection well will have screens to release the water at various levels where the ground is deemed most permeable, Henifin said. The plan is to pump 1 million gallons a day for a year, using the results to guide full-scale injection systems for Nansemond and the other plants – two in Norfolk, and the rest on the Peninsula.

Assuming it gets the federal and state approvals it needs, HRSD aims to roll out the project over a decade ending around 2030.

Among agencies that have taken interest is the U.S. Geological Survey. It tracks subsidence, and the HRSD project has energized an initiative to improve monitoring in the area.

Henifin said HRSD agreed to foot the $1 million needed for an instrument known as an extensometer that will be installed by the Geological Survey at the Nansemond plant beginning in August. A research team from the survey agency will drill a borehole until it reaches bedrock, which at this location is estimated to be about 2,000 feet down. Inside that well, it will lower a metal pipe adorned with electronic equipment that will continuously monitor for changes in the distance between the bottom of the borehole and the surface.

There are only two other such instruments in southeastern Virginia – one in Suffolk and another in Franklin, both of which were recently activated after being largely unmonitored for more than 20 years. The Hampton Roads Planning District Commission said in a March report that at least two more should be installed in the region. So far, only HRSD has stepped up to pay for one.

Henifin conceded it's in his agency's interest to improve monitoring, and he's optimistic that the measurements will show the aquifer injections slowing the sinking of land, perhaps even modestly reversing it.

"There's a lot of interest along the mid-Atlantic and southeast coast" in what happens, said Jack Eggelston, a Geological Survey hydrologist who has provided research assistance to HRSD.

Henifin said the HRSD project's potential for contributing to the Chesapeake Bay cleanup also is significant.

His agency estimates that its discharges of nitrogen and phosphorus into the watershed's rivers would be cut 90 to 95 percent, were it to inject its treated wastewater into the aquifer instead.

The federal pollution credits that HRSD would earn under the bay cleanup plan are widely anticipated to be enough to relieve local cities and counties from required major improvements in stormwater management systems. Some local officials have said savings could run into the hundreds of millions of dollars – perhaps more than $1 billion – over the next few decades.

Henifin said HRSD and its ratepayers can't foot the cost of the aquifer replenishment, however, while simultaneously paying an estimated $2 billion to comply with a 2010 federal consent decree requiring it to reduce sewer-system overflows during heavy rains.

He said HRSD soon will formally ask the U.S. Environmental Protection Agency to put off most steps required under that "wet weather" decree until after the replenishment project is completed. HRSD reported 18 such overflows totaling about 414,000 gallons in 2015.

Even if the federal agency agrees, Henifin said, HRSD would track overflows and strive to minimize leaks. He said it's in HRSD's interest, for example, to find places where saltwater is intruding into pipes. That's because elevated levels of salt in the water coming into its treatment plants might make it harder to match what's in the aquifer.

Some environmental activists have expressed concern about a potential delay in sewer-overflow fixes. But Henifin said the benefits pale to those possible in the water-recycling initiative. He's optimistic the EPA will grant a reprieve: "They've been agreeable to at least entertain a look at that."

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Bay Journal

DONATE

Chesapeake Notebook

Study: Sea level rise poses threat to military bases in Bay

July 27, 2016

2

Much of Naval Station Norfolk in Hampton Roads, the largest such installation in the world, lies less than 10 feet above sea level. (Jeff Day)

The giant Naval Station Norfolk and other military facilities on the Chesapeake Bay have long been prepared for defense, but now face a threat unlike any seen before: sea level rise of as much as seven feet by 2100.

A new Union of Concerned Scientists study evaluated the risks of climate-induced inundation at a sample of 18 military bases on the East and Gulf of Mexico coasts. Five are in the Bay's tidal regions.

Naval Station Norfolk, the largest such base in the world, faces not only rising seas but subsiding land. A nearby air and army installation, Joint Base Langley-Eustis, is also slowly sinking.

Between shifts in land and sea, the naval base at Hampton Roads could experience rising waters of as

much as two feet by 2050 and 6.9 feet by 2100, the union projects. And in a category 1 hurricane, the weakest, the storm surge could wash over a quarter of the base by 2050, up from roughly a tenth today, according to the study.

UCS used the mid-range and highest sea level rise projections of the 2014 National Climate Assessment and projected the impact of storm surge using a National Oceanic and Atmospheric Administration computer model.

The report suggests that the Pentagon ought to be preparing its installations to deal with the highest sea level rise projections because risk reduction is a top priority for military assets.

A Navy official said the service is responding. Brian Ballard, Navy Region Mid-Atlantic community plans liaison, said Naval Station Norfolk is raising the height of existing piers and retrofitting them with double decks, to make it easier to access utilities and reduce damage inflicted during "heavy weather."
The Navy is incorporating climate change impacts in all its installation master plans, Ballard said, and the Defense Department is updating its building codes for new construction and renovation to reflect the risks.

However, the Pentagon's sea level rise projections are significantly lower than those in the UCS study. The DoD forecasts rising seas ranging between one-quarter inch and one inch by 2050 at Naval Station Norfolk. Ballard declined to comment on the UCS projection that sea level could rise 1.4 feet to 2.0 feet by 2050.

That difference notwithstanding, Naval Station Norfolk does have tidal gates and other protections against storms that UCS did not factor into its study. For the longer term, Ballard said the Navy is not planning to install massive sea walls and gates akin to those used in the Netherlands, but has not ruled out any protective measure. The potential cost of adaptations cannot be estimated today, but whatever the enormous investment, it could be spread over time as infrastructure is repaired and rebuilt, Ballard noted.

The Navy official stressed that the service is collaborating on climate change adaption with local, state, and federal government entities in the Hampton Roads region.

"We must work hand in hand to start proactively addressing the potential impacts of flooding and sea level rise," Ballard said.

Not far from Norfolk, significant portions of Joint Base Langley-Eustis stand to be flooded at normal high tides by 2050. Up to a third of the Army's Fort Eustis could be under water twice daily, according to the UCS study. At Langley Air Force Base, a fifth of the acreage could be inundated at every high tide.

Air Force Technical Sgt. Katie Gar Ward, spokeswoman for the 633rd Air Base Wing, said that to adapt to rising seas, Langley plans infrastructure changes, such as placing electrical equipment on raised platforms, shoreline stabilization efforts and having 50,000 sandbags on hand at all times. Langley also has a pumping station that can funnel7.4 million gallons of water per hour into the Bay. Eustis has similar safeguards, minus the pump and sandbag stockpile, she added.

Other Bay military sites facing threats from rising seas include the Naval Academy, the Washington Navy

Yard, and Joint Base Anacostia-Bolling.

By 2100, flooding at high tide could cover as much as two-thirds of Naval Base Anacostia, one-third of the Annapolis military school and about 30 percent of the Washington Navy Yard, USC projected. Only Bolling Air Force would get off relatively unscathed, with less than 5 percent submerged by high tide. Storm surges could be far worse, the UCS warned.

The 18 bases along the East and Gulf coasts examined by UCS are far from the only U.S. bases facing climate problems. A roughly 3-foot increase in sea level would threaten 128 coastal DoD installations across the United States, according to a 2011 National Academy of Sciences study.

Category: Climate Change

About Jeff Day

Jeff Day covered government policy developments for more than 20 years at Bloomberg BNA, including Chesapeake Bay restoration efforts since 2009. Send Jeff an e-mail.

Read more articles by Jeff Day

Comments

By submitting a comment, you are consenting to these Rules of Conduct. Thank you for your civil participation. Please note: reader comments do not represent the position of Chesapeake Media Service.

Skip Bazinet on July 27, 2016:

The sea level rising will have an adverse effect on naval installations. Wow, what an astute observation. I'm impressed.

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dagnabit on July 27, 2016:

I noticed that this propaganda piece did not mention Al Gore who said the ice caps would be gone by now

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Post A Comment:

From waste to wells: An idea for Hampton Roads' water woes

Hampton Roads Sanitation District general manager Ted Henifin discusses a pilot project that treats wastewater to a purified state.

By **Dave Ress . Contact Reporter**
dress@dailypress.com

SEPTEMBER 15, 2016, 9:12 PM

SEAFORD — With a sip of specially treated wastewater, Hampton Roads Sanitation District general manager Ted Henifin put his mouth where his money is — what could be a $1 billion effort to replenish eastern Virginia's rapidly shrinking pool of groundwater.

A pilot program at the agency's York River Treatment Plant shows it is possible to clean the water Hampton Roads residents flush out of their homes and businesses so that it is safe to drink, he told a gathering of state and local officials.

Not that he expects anyone will be drinking it any time soon. The plan is to eventually inject 130 million gallons a day of treated water deep underground, to begin replenishing the wedge of waterlogged sand tapped by wells that serve hundreds of thousands of people and businesses.

They're currently drawing about 100 million gallons a day from those wells, with the result that groundwater levels in parts of eastern Virginia have dropped 200 feet over the past century.

At the York River plant, HRSD engineers crossed a first hurdle: seeing if they really could clean Hampton Roads wastewater to the point where it is safe to drink. They got official word that they had done so just this week.

Water and wastewater agencies elsewhere have already done so. About 1.3 million people in Northern Virginia drink from a reservoir that the Upper Occoquan Service Authority tops up with treated wastewater. People in Orange County, Calif., and El Paso, Texas, drink treated wastewater as well.

"It was absolutely delicious," said Molly Joseph Ward, Virginia's secretary of natural resources, after trying the treated water.

She thinks the HRSD project could address critical environmental and economic challenges beyond halting the steady draining of a major source of water. It could also stop saltwater from seeping into the aquifer.

Pumping the specially treated water into the ground, instead of the current practice of discharging wastewater into the Hampton Roads rivers that flow into the Chesapeake, could help the state reach the tough new pollution standards set by the U.S. Environmental Protection Agency, Ward said.

It would also help HRSD and the cities and counties that belong to it reach the EPA's tight standards for runoff after storms, by slashing virtually all the nitrogen and phosphorus — two key pollutants — that HRSD now discharges, she added.

"These are really some game-changing concepts," said Ann Jennings, Virginia director at the Chesapeake Bay Commission.

The next step, Henifin said, is a bigger pilot plant in Suffolk.

The district will ramp up one of the two treatment options it tested at the York River plant to see if it can produce 1 million gallons a day and inject it into the aquifer. The injection well will be circled by monitoring wells to track how water moves once it is underground.

Computer models suggest the pace will be about 2 miles in 50 years. For those who worry about drinking something that was once wastewater, but that was treated to drinking water standards, Henifin notes that the HRSD plants where he expects to be injecting the used water are generally surrounded by homes and businesses that receive water from Newport News Waterworks and its counterparts in South Hampton Roads.

HRSD will do that 1 million gallon a day test at its Nansemond Treatment plant in Suffolk, beginning in 2018, after it finishes a $15 million investment in the pilot plant, Henifin said.

After about a year of running the pilot plant, he hopes to have enough experience — and enough proof that the system works — to apply for state permits to go ahead with systems at seven plants.

Henifin hopes to have the first running in 2022 and to bring the seventh online in 2030.

That's where the big bucks — the bulk of the $1 billion effort — come in.

Henifin says HRSD can fit it into its $4 billion-plus, long-term investment plan. That means no rate increases beyond what are already planned, he said.

One key could be how the EPA feels. The plan would work more easily if the federal agency would let HRSD slow its place a bit on building facilities to reduce the amount of sewer overflows that hit the bay when heavy rainfall backs up the system, Henifin said.

Freeing up some of the money committed to that effort into the 2020s for use in the groundwater replenishment effort could yield far larger reductions in pollutants by cutting HRSD's routine discharges to almost nothing. Spreading out work to contain storm-related overflows over more years would make that costly effort easier to manage.

Ress can be reached by phone at 757-247-4535.

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The treatment

The Hampton Roads Sanitation District treats wastewater so that it is safe to discharge into the region's rivers and the Chesapeake Bay. That means removing trash, sediment, organic waste from people, animals and plants, and nitrogen and phosphorus. In practice, HRSD's discharges run at about 25 percent of what state regulators allow. To get that water to drinking water standard, HRSD plans to:

•Pump in two chemicals to make any remaining particles clump together, then...

•Run that water through a tank where propeller-shaped fans drive the clumps down, so that they settle into a basin, before....

•Bubbling ozone through the clump-free water, setting off reactions that break down any organic compounds into simple sugars and acids that...

•Are digested by bacteria trapped in filters made of carbon granules (in the York River plant those filters were more than 10 feet tall). From there, the water ...

•Flows through equally large stacks of carbon granules to absorb any remaining chemicals, and the water ...

•Is zapped with ultraviolet light to remove any bacteria or viruses that may have made it that far.

The process is similar to the way water companies treat drinking water.

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This article is related to: U.S. Environmental Protection Agency

Hampton Roads Sanitation Dept. makes wastewater safe

Staff , WVEC *4:46 PM. EDT September 15, 2016*

(Photo: Thinkstock Photos, patanasak)

Could this be what we'll drink in the future?

The Hampton Roads Sanitation Department is giving purified wastewater a try

It's part of HRSD's "Sustainable Water Initiative for Tomorrow" (SWIFT). The multi-year inititiative is designed to ensure a sustainable source of groundwater while addressing environmental challenges such as Chesapeake Bay restoration, sea level rise and saltwater intrusion.

HRSD says SWIFT will take already highly treated wastewater that would otherwise be discharged into the Elizabeth, James or York rivers and purify it through additional rounds of advanced water treatment to produce drinking-quality water.

The purified water will then be treated to match the existing groundwater chemistry and added to the Potomac Aquifer, the primary source of groundwater throughout eastern Virginia.

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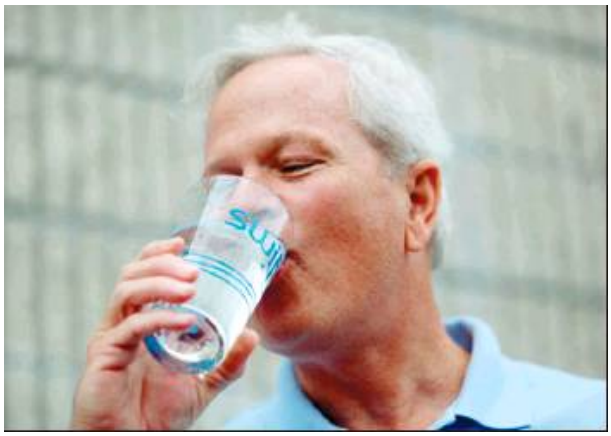
Sip shape

Hampton Roads Sanitation District's treated sewage water tastes great, say officials, and could shore up the area's sea level rise and bay cleanup issues

By Dave Mayfield

The Virginian-Pilot



STEVE EARLEY | THE VIRGINIAN-PILOT

Ted Henifin, Hampton Roads Sanitation District general manager, vowed to take the first gulp of HRSD's treated wastewater. He made good on his promise Thursday.

YORK COUNTY

Earlier this year, as the Hampton Roads Sanitation District ramped up plans to make its wastewater clean enough to drink, general manager Ted Henifin vowed he'd take the first gulp.

On Thursday at the HRSD's York County treatment plant, Henifin made good on the promise, leading dozens of employees and invited guests in downing glasses of water that came from a sewage stream fed by sinks and toilets.

"Great!" he proclaimed after his first sip. "Ahhh."

To Henifin, it was no mere stunt. It was an early demonstration of the potential for an ambitious initiative to turn what goes down Hampton Roads' drains into a resource that could help fight sea level rise.

The HRSD's plan is to eventually treat as much as 120 million gallons a day to drinking-water standards, then inject it into the Potomac aquifer, the main groundwater source for coastal Virginia.

The project's backers, including Gov. Terry McAuliffe, are hoping it will slow the sinking of land throughout the region. That subsidence has been blamed on wells sucking too much water from the aquifer, and geologists say it accounts for more than half of Hampton Roads' relative sea level rise over the past century.

The HRSD first has to prove that it can turn sewage into water that's clean enough to put into the aquifer. It began pilot-testing drinking-water treatment options at its York plant in June.

Henifin said the Virginia Department of Health gave the treated water an "OK" to drink on Wednesday, but the two systems there are producing only 35 gallons per minute combined.

The next step will be a demonstration project at the HRSD's Nansemond plant in northern Suffolk, where it aims to crank out 20 times that rate – about 1 million gallons a day. If it pulls that off, the agency then plans within the next few years to begin injecting the water through a well at the plant.

STEVE EARLEY PHOTOS | THE VIRGINIAN-PILOT

Visitors get a tour of the treatment systems at Hampton Roads Sanitation District's York County plant on Thursday. HRSD plans to pump the treated water into the main aquifer underlying southeastern Virginia, in hopes it will slow subsidence.

Wastewater flows through the HRSD treatment system. So far, the plant's two systems produce only 35 gallons per minute combined. By 2030, the HRSD hopes to be pumping water underground at seven of its facilities.

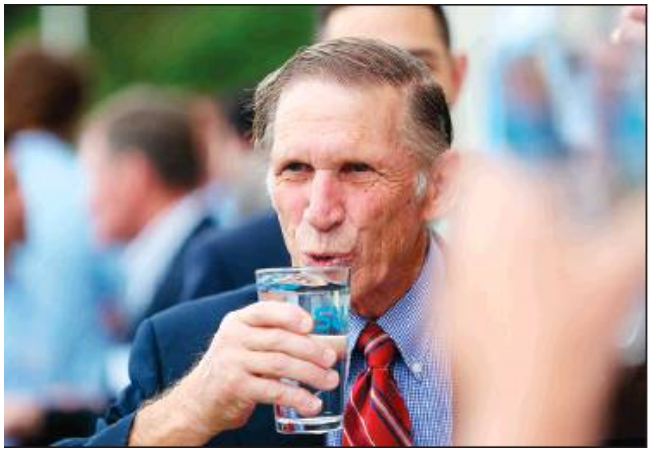
By 2030, the HRSD hopes to be pumping water underground at seven of its treatment facilities.

Total estimated cost of the project: $1 billion.

Robert Burnley, former director of the Virginia Department of Environmental Quality, said at Thursday's ceremony that he's been involved in water resource issues for more than 40 years, and, "I've never seen a bolder, more creative, more courageous project than this one."

There are other potential benefits.

The recharging of the aquifer could head off what otherwise might eventually be drastic limits on groundwater withdrawals while providing sources of water for new industries. And with discharges of treated, but still polluted, wastewater into local rivers all but eliminated, the region's cities and counties could leap into compliance with the federal Chesapeake Bay cleanup mandate and avoid hundreds of millions of dollars in cleanup costs.



Pete Mansfield of the Middlesex County Board of Supervisors takes a drink of what was once wastewater. It was approved as drinkable Wednesday by the Virginia Department of Health.

With so much potential, Burnley asked the crowd of about 100 people, "Can we all resolve today to stop calling it wastewater? It's a really precious resource. … Perhaps if we stopped thinking and talking about it in pejorative terms, we might find it easier to embrace its value."

Henifin said a few times on Thursday that even he has wondered whether the HRSD was on to something "too good to be true."

He said that the agency wants more public comment and suggestions, and will hold forums and open houses as well as set up a public viewing stage at the Nansemond plant. To vet the science behind the project, he said, the HRSD has gone through the National Water Research Institute to convene an "independent review panel" of experts. It will be led by Glen Daigger, a professor of engineering practice at the University of Michigan.

Henifin said one of the reasons why the HRSD is pursuing the project is increasing concern among federal health regulators about concentrations of prescription drugs in wastewater.

Anticipating that treatment authorities will be required to install technologies to remove more pharmaceuticals from effluent, HRSD officials came to the conclusion that they eventually would have to meet drinking-water standards anyway. Better to get ahead of the requirement than react to it, Henifin said.

Daigger, who has made a career of studying water treatment, said he had no concerns about drinking what the HRSD offered Thursday. Because it's using a variety of processes that go well beyond the norm for drinking-water plants, "it actually is of better quality" than what comes out of most taps, he said.

Molly Ward, Virginia's secretary of natural resources, was the first to follow Henifin at the hand pump where he cranked out glassfuls.

She pronounced her sample "delicious" and said it tasted like bottled water.

Ward, a former Hampton mayor, first met Henifin when he was the city's public works director.

She called him an innovator then and now, and said the McAuliffe administration and state lawmakers from both parties are "uniformly excited" about the HRSD initiative.

"The opportunities for restoring the aquifer, for managing our groundwater usage, for the health of the bay, for possibly reducing and/or reversing subsidence, the opportunity for future economic development all make it a very promising project," Ward said.

Treatment process turns wastewater into drinking water

By Matt Gregory (http://wavy.com/author/mattgregorywavy/)
Published: September 15, 2016, 2:51 pm | Updated: September 15, 2016, 7:33 pm

VIRGINIA BEACH, Va. (WAVY) — The Hampton Roads Sanitation District opened the doors on its pilot-scale water treatment process.

The process takes wastewater from the treatment plant and further filters it down.

Photos: HRSD Wastewater Recycling (http://interactives.wavy.com/photomojo/gallery/42488/)

HRSD's engineers said the final process removes any potential contaminants from the water and make it possible for human consumption; drinking water.

Ted Henifin, general manager of HRSD, took the first sip of the purified water outside of the pilot plant. Henifin said the Health Department tested and approved the water on Wednesday, just in time for the official launch.

He said the plan is to move to a bigger plant in Suffolk and produce roughly one million gallons of drinkable water a day for groundwater supply.

"We found that there is a huge need for the ground water replenishment in this region," Henifin said. "So the people have been pulling water out Eastern Virginia a hundred years and it just doesn't replenish naturally."

Henefin said there's another effect as well. Right now the treated water goes back to rivers and the Chesapeake Bay. If this project succeeds that will stop.

"By not doing that, we're going to not put millions of pounds of phosphorus and nitrogen into the bay every year."

Matt Gregory
@WAVY10MATT

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11:49 AM - Sep 15, 2016

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Top News

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Water Desalination Report

The international weekly for desalination and advanced water treatment since 1965

Volume 52, Number 35 19 September 2016

Singapore

Bid results for PUBs 4th desal plant

On 8 September, seven bidders submitted proposals for PUB's Marina East Desalination Project. The project, which will produce 136,380 m^3/d (36 MGD) of potable water from two different sources, seawater from the Singapore Strait and relatively fresh water from the Marina Reservoir, will be delivered under a 25-year DBOO contract.

The base bid results, excluding alternate offers, are:

Bidder	S$/$m^3$	$/$m^3$ ($/kgal)
Shanghai Safbon Water Service / Yongnam Development / UE NEWater	0.76	0.56 (2.12)
Hyflux / Daelim Industrial	1.09	0.80 (3.03)
Keppel Infrastructure Holdings	1.18	0.87 (3.29)
MCC Land / IDE Technologies	1.22	0.89 (3.37)
Singapore Technologies Marine / Acciona Agua /Lum Chang Building Contractors	1.22	0.89 (3.37)
Tedagua	1.40	1.03 (3.90)
Sembcorp Utilities	1.43	1.05 (3.97)

The above are considered 'first year" tariffs, which *WDR* understands reflect the price at which the contractor will agree to sell water to PUB during the first year at full capacity. After the first year, several indices come into play and the cost will be adjusted accordingly.

The plant includes some requirements that are unique among Singapore's desal projects. Besides the ability to deal with varying salinities from two very different feedwater sources, it must have a minimum 98 percent availability with no outage affecting the entire plant for more than five hours, and no more than one outage occurring in any 168-hour period.

Because it will be located on an unfenced, 3ha (7.4 acre) site in a public park with open access to the plant's green roof, it will also face some unique architectural and security challenges.

The bid evaluation, now underway, will consider the technical qualifications and anticpated costs over the life of the project to develop a levelized cost that will determine the successful bidder.

Black & Veatch is serving as the PUB's technical advisor on the project, and it is expected to come online in 2019.

Texas

BWRO bid results announced

Four offers were submitted in response to an RFP called by Fort Bend County's Cinco Municipal Utility District #1 for a 2 MGD (7,570 m^3/d) BWRO treatment system. The results of the bid opening held this past Friday, 16 September, are as follows:

Bidder	Total Price
H_2O Innovation	$2,976,850
Doosan Hydro Technology	$3,200,680
United Water Services	$3,747,345
Aerex Industries	$4,579,673

The scope of work includes an operational RO system including chemical feed units, RO process controls, a degasifier and the transfer pump station pumps.

The project is to be delivered under a traditional design-bid-build delivery model, and an award could be made as early as the end of this week. The plant is expected to be operational within 16 months of an award.

Brown & Gay is the District's engineer and NorrisLeal is the plant designer and project construction manager.

Virginia

Aquifer replenishment project launched

Last week's national *Imagine a Day Without Water* event—organized in the US by a coalition of public and private water agencies, business/community leaders and national organizations—served as a stage for announcing new water programs across the country. One such program was the Sustainable Water Initiative for Tomorrow (SWIFT) launched by southeast Virginia's Hampton Roads Sanitation District (HRSD).

HRSD operates 13 wastewater treatment plants with a combined capacity of 249 MGD (942,500 m^3/d) in a service area that includes 1.7 million people living in over 2,800 mi^2 (7,252km^2) of southeast Virginia. SWIFT is designed

Next Week: Texas Desal 2016

The Texas Desal Association will hold its annual conference next week, on 29-30 September, in Austin, Texas. For more information, visit www.texasdesal.com/events/2016-conference/.

GWI

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to establish a secure groundwater supply while improving water quality in local rivers and the Chesapeake Bay. To accomplish this, plans call for wastewater effluent that would otherwise be discharged into area waterways to undergo advanced treatment to meet drinking-quality standards. The purified water would then be treated to match the existing groundwater chemistry before being used to replenish the Potomac Aquifer, the area's primary water supply.

As part of its *Imagine a Day Without Water* observance, the HRSD celebrated the preliminary success of its SWIFT pilot project at its York River Treatment Plant with a taste test. According to Dr Charles Bott, the District's director of water technology and research, "The pilot project is evaluating two different drinking water treatment schemes that are treating denitrified secondary effluent from the York Plant. The first treatment arrangement consists of UF/RO and advanced oxidation, while the second employs flocculation/sedimentation, ozonation, biofiltration, granular activated carbon and UV disinfection. The two systems produce a combined 20 gpm [1.3 L/s]."

The results of this pilot project will be used to select an appropriate technology to be used in a larger, 1 MGD (3,785 m^3/d) demonstration project planned for the HRSD Nansemond Treatment Plant in Suffolk, Virginia. The facility will then treat the water to match the existing groundwater quality before testing its ability to pump water into the aquifer. The results of groundwater replenishment will be monitored for year.

Wigen Water Technologies' RO pilot unit

HRSD expects to begin construction of the first full-scale facility in 2020. It estimates a 10-year construction schedule to reach build-out of the full-scale $1 billion project to produce approximately120 MGD (454,200 m^3/d) of purified water by 2030.

CH2M is serving as the District's consultant on the project.

Caribbean

Point Lisas back on-line

Since it was commissioned in early 2002, Desalcott's Point Lisas SWRO plant in Trinidad has been expanded six times, with its production capacity increased from 26.4 MGD (22 MIGD) to 50.4 MGD (42 MIGD). Because the plant produces 20 percent of the island's water supply, there is very limited storage capacity at the national level and as the area is currently experiencing an extended drought, any plant shutdown garners a lot of attention.

Desalcott general manager John Thompson told *WDR*, "The plant is now 14 years old and there is an ongoing program to inspect our many large underground pipes. Our last video and sensor checks showed some signs of aging, and although we scheduled repairs, there didn't appear to be any immediate problem, However, last Sunday [11 September], a deeply buried section of the 48-inch [1.2m] diameter distribution pipe unexpectedly collapsed.

"The plant was shut down for emergency repairs on Monday afternoon and the public was promptly notified of the situation. We were able to finish the repairs and get the plant back on line by Wednesday evening, and by Thursday morning, it was ramped up to full ordered capacity."

Technology

The law of diminishing returns

Promises of desalination energy reductions of 100X or more seem to have started in 2006 with early work involving the use of carbon nanotubes as a super- or ultrapermeable membrane (UPM). Subsequent research in membrane coatings, nanocomposites, aquaporins and graphene have resulted in advertised promises that flux increases of 1000X are possible, with one company claiming to have developed a shoebox-sized desalination module that could desalt 100,000 gpd (378 m^3/d) at one-third the energy of a conventional RO.

A 2014 MIT paper entitled *"Quantifying the potential of ultra-permeable membranes for water desalination"* threw some cold water on the most outlandish claims by showing that the benefits of UPMs for reducing energy consumption are limited to 15 percent in the case of SWRO.

Now, a new MIT paper—*"On the asymptotic flux of ultra-permeable seawater RO membranes due to concentration polarization"*, by Ronan McGovern and John Lienhard, and published online in Elsevier's *Journal of Membrane Science* in July 2016—shows that, even with infinitely permeable membranes, there are finite limits on the flux that can be achieved.

According to the paper, increasing membrane permeability (at fixed pressure) results in increased flux, which in turn results in an increased concentration of salt at the membrane's surface, a phenomenon known as concentration polarization. As membrane permeability continues to increase, flux becomes limited because the osmotic pressure at the membrane surface eventually reaches the applied hydraulic pressure. The paper goes on to illustrate where limits on flux

lie relative to typical values seen in seawater and brackish water systems today.

"While there's little room for improvement in energy consumption, there is still substantial room for flux improvement," Dr McGovern told *WDR*. "For a single stage SWRO system operating at a typical pressure, recovery ratio and mass transfer coefficient, the flux asymptote is roughly four times where average flux currently stands. The most significant benefit of a system operating at the higher flux would be its smaller footprint and lower CapEx, although implications for fouling and scaling would also have to be assessed."

UPMs will not result in 100X less energy or 100X higher flux, however, of the two, there is greater hope for a significant increase in average flux, than a decrease in energy consumption.

Company News

Electro-desal firm closes funding round

Netherlands-based Voltea, the developer of the CapDI© membrane capacitive deionization technology, has announced that it has completed a €6 million ($6.7 million) capitalization round. For this latest round, Anterra Capital has joined a consortium of previous investors that includes Rabobank, ETF and Unilever.

Besides helping to accelerate commercialization of the CapDI technology, the investment will be used to hire key personnel and develop an automated, robotic module assembly facility. CEO Bryan Brister told *WDR* that the new engineering and sales associates will be located in North America to complement its strong Netherlands-based team.

"We will continue to build on markets where CapDI has already gained commercial traction. These include TDS control/polishing in wastewater treatment and recycling applications in commercial laundry, food and beverage and automotive industries, as well as novel TDS control systems we are deploying for irrigation water in horticulture applications," said Brister.

"Our global team will continue to execute our go-to-market strategy, which includes a mix of sales through distributors as well as direct sales to end-use customers. We have been fortunate to add some great, forward-thinking distributors that are bringing CapDI to the market for consideration versus traditional desal technologies."

The company is expected to announce details of the new assembly plant in the near future.

Editor's note: Voltea's CapDI technology was the winner of GWI/*WDR's* 2010 Technology Idol event in Paris.

Technology

Where's the oldest operating RO plant?

Eight years ago, *WDR* covered the decommissioning of Qatar's Ras Abu Aboud MSF plant. The plant had been in continuous service since it was built and commissioned by Weir in 1963. In checking on other long-lived thermal desal plants, *WDR* found another Weir installation in Qusair, Egypt that had been installed in 1936 and was still seeing intermittent service until at least 1986. A third Weir plant installed in Yemen's Aden Refinery in 1955 was still making water when that January 2008 story was written.

Although this newspaper has written about the first commercial, BWRO plant (Coalinga, California, 1965) and the first SWRO plant (Bermuda Aviation, 1974), and has covered some long-running membrane plants, it has not yet identified the longest running RO plant still in commercial operation.

Last week, *WDR* reached out to several veteran desalters in hopes of finding the oldest operating RO plant. While several worthy contenders have been identified, the search is still on to confirm the details of the following plants:

- *Malta* – The Ghar Lapsi plant, which was the first SWRO plant on Malta and a gift from Saudi Arabia, was commissioned on 31 December 1982. The plant has been refurbished several times and remains in service.
- *Saudi Arabia* – The Al Birk SWRO plant was installed in 1983 and, after having been refurbished, remains in operation.
- *Florida Keys Aqueduct Authority* – This SWRO plant was commissioned in January 1981 on Stock Island. After 18 months of operation, the plant was placed in standby operation and part of the plant was eventually relocated to Marathon, Florida. Both plants are available for emergency operation. In 2007, water produced from the Stock Island plant won a statewide taste test.

Readers are invited to submit confirmed information on any other plants that were commissioned in 1986, or earlier, that are still in service.

The results will be profiled in more detail in a future issue.

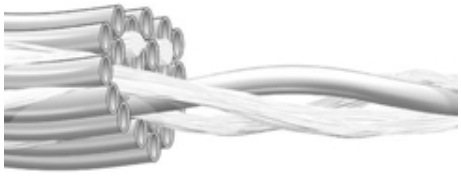
In brief

Ten companies are understood to be eligible to participate in the tender process for Econssa's 38,880 m^3/d (10.3 MGD) **Aguas Chañar SWRO plant** on Chile's central coast. The project will include 11 new pumping stations and 75km (47 mi) of pipelines. The companies are Abengoa/Abeima,

Acciona Agua/Acciona Infraestructuras, Besalco/Aqualia, Degrémont (Suez), Dragados/Tedagua, Ferrovial/Cadagua, GS Inima/Claro Vicuña, IDE Technologies, Técnicas Reunidas/INTEC and Valoriza/Sadyt. The tender process is expected to commence this December.

Water Standard is adding another dimension to offering. Lisa Henthorne, the chief technology officer for the Houston-based water treatment technology provider, told *WDR*, "Given the work that our personnel have delivered—ranging from large-scale desalination systems to innovative, low salinity injection water systems for the oil and gas industry—we are uniquely positioned to offer specialized consulting and product development services." She said interested parties are welcome to contact her for more information.

3M Membrane Business Unit will introduce its new Liqui-Flex UF membrane module at next week's WEFTEC in New Orleans, Louisiana. The new module will have 96m^2 (1,033 ft^2) of membrane surface area in a single module versus the 91m^2 (980 ft^2) in the largest module currently available. The module incorporates the same 0.8mm diameter inside-out polyethersulfone (PES) hollow fibers, groups of which are interlaced with PET yarn that acts as a spacer between the small fiber bundles to improve backwash hydrodynamics. 3M Membrane Business Unit was formerly known as Membrana GmbH, and was acquired by 3M in August 2015.



STW Resources, an oilfield services company and ersatz water treatment equipment supplier based in Midland, Texas, has filed for Chapter 11 of the Bankruptcy Code, said Alan Murphy, the company's president and CEO. The company was founded by Stanley Wiener, who stepped down as president and CEO in October 2015. It had been an OTC stock that traded under the symbol STWS.

Saudi Arabia has acknowledged that it will return to private finance for greenfield desalination projects. In mid-2015, seven bidders were prequalified by SWCC to participate in the 400,000 m^3/d (105.7 MGD) **Jeddah 4 SWRO project** on an EPC basis, and an RFP was issued in October 2015, however, the project was put on hold earlier this year as the water sector underwent major restructuring. The on-again, off-again project appears to be on again, and will move forward as an independent water project (IWP), necessitating a new tender process. The bidders prequalified in 2015 were Acciona, Aqualia, Cadagua, Doosan, Hyflux, Valoriza and Veolia. Black & Veatch served as SWCC's project engineer. The country's last IWP/IWPP contract was awarded in 2007.

Three suppliers have been shortlisted by the UAE's **Sharjah Electricity and Water Authority** (SEWA) to supply a 22,730 m^3/d (6 MGD) SWRO at its Layyah Plant. The shortlist is understood to include Aqua Engineering/Tecton, Aqualyng/Acwa Emirates and Metito. This project will double the size of the Layyah's SWRO capacity. CH2M installed and commissioned an identically sized system at the facility in August 2008.

Prequalification submissions for developers interested in participating in PUB's **Jurong Island desalination project** are due on 29 September. The 136,380 m^3/d (36 MGD) SWRO project will be delivered under a 25-year DBOO contract, and it will be Singapore's fifth large-scale desal plant. The plant is expected to be operational in 2020, and CH2M has been selected as PUB's consultant.

People

Aadel Ben Brahim has joined Danfoss High Pressure Pumps, where he will be the global service and application specialist for the company's high-pressure pump and energy recovery products. Formerly a service engineer at Energy Recovery Inc, he is located in Spain and may be contacted at U326815@danfoss.com.

Bechtel Corporation has appointed **Felipe Suarez** as the business development manager for water sales. He was formerly the head of global sales for Siemens Water. He will be based in Houston, Texas, and may be contacted at fjsuarez@bechtel.com.

Shil Basu has joined Water Planet as global director of sales for its PolyCera membrane products. He had formerly held technical, commercial and leadership roles for Siemens Water (now Evoqua), Nalco Champion and, most recently, Hydranautics. He is based in Los Angeles, California, and may be contacted at sbasu@waterplanet.com.

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Future drinking

Re "Sip shape" (front page, Sept. 16): Now that I've gotten over the "ick factor" of drinking treated sewage water, I can predict a couple of things: I will retrain my gag reflexes, and I might need to send Ted Henifin, the general manager of the Hampton Roads Sanitation District, a year's supply of probiotics.

Joking aside, I thank Henifin for his exemplary leadership. He deserves kudos for taking the first gulp and for taking the initiative to lead this "opportunity for future economic development."

Cary J. Woodbury
Virginia Beach

The Washington Post

Health & Science

Hampton Roads' solution to stop the land from sinking? Wastewater.

By Darryl Fears October 20 at 6:18 PM

SEAFORD, VA. — It looks like a mad scientist's lab, something straight out of a sci-fi novel. Valves turn in every direction. Tubes are stacked halfway to the ceiling. Tiny bubbles dance in large vats of water.

But what's happening in a hangar of the York River Treatment Plant is real, part of a grand experiment that could help keep this coastal region from continuing to subside and eventually be claimed by the rising sea. Over the next 15 months, tests will determine whether millions of gallons of wastewater can be purified to drinking water quality and injected into the ground.

If successful, the project of the Hampton Roads Sanitation District could start to replenish a giant aquifer that thousands of industries and half a million households in the area are sucking dry. Over the past five decades, they've collectively pumped out so much water that land here is falling 4 millimeters a year — or more than 1½ inches by 2026.

Ted Henifin's jaw-dropping, eyebrow-raising idea was first proposed in 2015, and last month the sanitation district general manager kicked off its pilot phase to stop what some scientists have called a nightmare in super slow motion.

Aquifers big and small exist under Hampton Roads in muddy pockets between thick layers of earth. Pressure is relieved as water is pumped out, causing the layers, and then the land, to sink. As that geological drama played out for nearly a century, sea levels influenced by global warming crept up, to the point today where schools, homes and other property are threatened with sometimes catastrophic flooding.

Although Henifin's project still faces a multitude of regulatory challenges from the federal Environmental Protection Agency and the Department of Justice, Henifin bills it as the best plan yet to rescue the aquifer and halt land subsidence.

"The project will be full scale between 2020 and 2030," he said. "It will be the biggest aquifer recharge in the country, more than 100 million gallons per day."

The unsustainable use of groundwater is often thought to be a concern only out West, where farmers in California's San Joaquin Valley have pulled so much water from aquifers since the 1920s that land has sunk by as much as 28 feet.

Yet what's happening in Norfolk, Virginia Beach, Portsmouth and the other cities that make up Hampton Roads is eerily similar. Wells are pumping about 100 million gallons of water a day out of local aquifers.

"If we continue to remove the amount of water that we're removing now, in the future those aquifers won't be very useful," said Greg Hancock, a hydrology professor at the College of William and Mary. He thinks that irreversible damage could take only a few decades — or a few years. "They'll never be able to hold as much water as they used to."

As the water table falls, so does the ground. Rising seas tied to human-caused warming are causing the Atlantic Ocean and Chesapeake Bay, along with big rivers such as the York, James and Elizabeth, to creep up and flood communities even when rainfall is light.

In fact, besides New Orleans, Hampton Roads' population is more threatened by sea-level rise than any other in the nation.

With the Sustainable Water Initiative for Tomorrow, or SWIFT, Hampton Roads would follow California, as well as arid Saudi Arabia and Australia, in pumping purified wastewater into aquifers to counterbalance massive withdrawals of groundwater.

The lab at the York treatment plant is what Henifin calls a "pipe gallery." It hums as wastewater flows through two different processes — reverse osmosis and carbon filtering — to determine which can remove the most nutrients and unmentionable stuff more efficiently.

"I see it as a complex scientific and technical process all lined up to remove everything that can be removed from water," Henifin said.

The project boils down to punching about 30 holes about 500 feet down, deep enough to reach the level where Hampton Roads wells pump water, and injecting treated water.

Groundwater in Hampton Roads is mostly pumped from the Potomac Aquifer, the deepest part of the North Atlantic aquifer system that starts in northern North Carolina and stretches to New York's Long Island.

The system is among the smallest of 66 principal aquifer systems in the United States but one of the most heavily used. It ranks 13th for the amount of water that's pumped and seventh for the number of people it serves.

Although 500,000 households in and around Hampton Roads rely on the aquifer, 60 percent of the water is taken by a few businesses and municipalities. They include the West Point and Franklin paper mills, the Colonial Williamsburg Foundation and James City Service Authority.

Over the past 100 years, artesian wells have gone from pumping water from 31 feet above sea level to 200 feet below it. With concerns about sinking groundwater and land, the state Department of Environmental Quality moved to dramatically cut

water-withdrawal permits last year.

That, in turn, has threatened to stifle commercial development in more rural areas that are cut off from surface water. “We’re going to abandon growth in this part of the state,” Henifin said.

The sanitation district is proposing to use wastewater created by all of its 1.7 million customers, the majority of whom don’t use groundwater, to recharge the aquifer.

In his pitch to federal regulatory officials, Henifin stressed that purifying wastewater has benefits beyond saving the aquifer and arresting land subsidence, such as reducing the polluted sewage that enters Chesapeake Bay tributaries. He moved ahead with the pilot even without a go-ahead from EPA Region 3.

Nor does the district yet have Justice Department permission for switching how it will comply with a consent decree to reduce polluted wastewater in the Bay — by cleaning shower and toilet water instead of improving underground pipes.

When two scientists at the U.S. Geological Survey learned about SWIFT, they were not convinced that the sanitation district could match the chemistry of its purified water with the land subsidence related to the aquifer.

Hydrologists Jack Eggleston and Jason Pope learned that the Hampton Roads sanitation district had the same concerns. For decades, the USGS had wanted to build a device to measure land subsidence but couldn’t afford it. Eggleston and Pope discovered the Hampton Roads sanitation district would be willing to pay $1.3 million for a new extensometer.

USGS allowed them to leave their respective stations in Richmond and Indiana to monitor SWIFT. The deep well drilled for the extensometer can also be used to study the aquifer’s water chemistry.

“There will be some chance factors,” Eggleston said. “When they inject water at wells, it will move away from there in all directions,” traveling south beneath Elizabeth City, N.C., and north toward Richmond. “As it moves, the chemistry will change.”

On a recent weekday, both men were wearing hard hats and smiles as they watched a giant well being constructed at the district's water treatment plant in Suffolk.

"Are we excited? Yes," said Eggleston, who had been pushing for this since 2009. "Groundwater is fabulous, because it's fresh almost everywhere, drinkable everywhere," he said. But extracting it can cause major problems. "Measuring it is really important. You want to know what's happening so you can take action."

Darryl Fears has worked at The Washington Post for more than a decade, mostly as a reporter on the National staff. He currently covers the environment, focusing on the Chesapeake Bay and issues affecting wildlife.
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WaterNews

Virginia Officials Recognize Groundwater Pumping Allows Sea To Rush In

October 21, 2016 / in Groundwater, United States, Water Management, Water News / by Brett Walton

Reversing aquifer decline will test state oversight and local response.

The Elizabeth River passes by Portsmouth, Virginia, before draining into the Chesapeake Bay. Portsmouth has one of the highest rates of sea level rise on the East Coast. Photo via Wikimedia Commons

By Brett Walton, Circle of Blue

The Tidewater region of eastern Virginia, swayed daily by the ebb and flow of the Chesapeake Bay, is a wet region with a serious water problem. Due to heavy pumping water levels in the Potomac aquifer, the area's principal groundwater source, have dropped by 100 to 200 feet in the last century. The consequences of removing so much water are profound. The land, like a sponge wrung dry, is sinking and the waters at the south end of the bay are rising at the fastest rate of any site on the U.S. Atlantic Coast.

The region's collection of economic, urban, and military assets raises the stakes of inaction. Tidewater is home to one of the largest ports on the East Coast, four of the five largest cities in the state, and the world's largest naval base, Naval Station Norfolk. The city of Norfolk, the state's second most populous urban area, has seen the number of high-tide floods increase more than four-fold since the 1960s. Rising seas are one factor in the flooding, but sinking land due to groundwater withdrawals worsens the inundation.

Recognizing the problem is the first step to recovery, and Virginia officials have done that. Like farmers in northwest Kansas [http://www.circleofblue.org/cpx/ogallala-aquifer/texas-and-kansas-farmers-take-different-paths-to-saving-water/] , seaside water agencies in California [http://www.circleofblue.org/2015/world/here-comes-the-sea-the-struggle-to-keep-the-ocean-out-of-californias-coastal-aquifers/] , states in the lower Colorado River Basin [http://www.circleofblue.org/2016/world/colorado-rivers-tale-two-basins/] , and others across the United States, they are responding to a manmade threat by changing the business-as-usual attitude that created it. The shift is slow in some cases but the reshuffling of priorities is evident.

One of the first big moves in Virginia happened four years ago, when state regulators began cutting groundwater withdrawal permits for industrial and municipal customers and prohibited new permits in most of the region. Then last year, lawmakers convened an advisory panel

[http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQua with representatives from industry, agriculture, utilities, universities, and federal agencies to recommend new management actions for the long-term sustainability of the aquifer. Today, the region's largest wastewater utility is testing a $US 1 billion system that, if approved, will inject purified wastewater into the aquifer to slow or halt its decline, prevent further compaction of clay soil layers, and stabilize the land surface.

"Planners, managers, and scientists realize that where you have two millimeters per year of sea level rise, another one to three millimeters per year from compaction is pretty substantial," Jason Pope, a U.S. Geological Survey hydrologist based in Virginia, told Circle of Blue.

Even lawmakers see the need to act. A legislative commission report [http://jlarc.virginia.gov/pdfs/reports/Rpt486.pdf] published this month and written by fourteen members of the Virginia House of Delegates and Senate acknowledged recent progress on reducing permitted withdrawals. But the report also noted significant inadequacies in the state's legal authority, water supply planning process, and knowledge base.

"Sustainability is tenuous, and can easily be tipped out of balance," the Joint Legislative Audit and Review Commission (JLARC) concluded.

Steps to Stabilizing the Land

Tidewater is an appropriate name. The James, Rappahannock, Potomac, and York rivers divide the state's bayside lowlands into peninsular "necks" that thrust into the Chesapeake, where salt water mixes with fresh. The daily push and pull of the bay's waters, charging through salt

marshes, pocosin wetlands, and swamps, then out again gives the region its liminal moniker.

Groundwater use has been relatively constant since 1986. But because groundwater moves slowly the effects of the recent pumping — on river flows, land subsidence and the inland penetration of saltwater — still are not fully known. John Masterson, a U.S. Geological Survey hydrologist who studies the Potomac aquifer told Circle of Blue that, because of the slow underground movement of water, at current rates of use the aquifer will continue to decline. “The system is going to take decades to reach equilibrium,” he said.

Where groundwater levels have dropped most is near Franklin, about 40 miles southwest of Norfolk. A paper mill there was the largest groundwater user in the region and caused water-level declines that extended into North Carolina. Closed in 2010, the mill has reopened.

The reliance on groundwater has far-reaching consequences. The most notable is the sinking of the land. According to the U.S. Geological Survey, half of the observed sea level rise in Tidewater [http://pubs.usgs.gov/circ/1392/pdf/circ1392.pdf] is due to land subsidence, which is why the region is a hotspot for tidal flooding. Most of the subsidence is due to groundwater pumping, and the rest is related to a reshaping of the earth’s crust because of glacial melt.

One solution to subsidence is to cut withdrawals. The Virginia Department of Environmental Quality is negotiating new permits for 14 of the largest consumers. Five new permits have been completed so far, and the state cut permitted withdrawals by 62 percent. Users were not necessarily withdrawing the entire permitted amount, but it is a necessary first step, according to Scott Kudlas, director of the Department of Environmental Quality’s Office of Water Supply. One permit under negotiation would have the James

City Service Authority reduce actual withdrawals by 30 percent. The utility plans a $US 128 million surface water project as a replacement.

The inability for the state to authorize new withdrawals is a roadblock for industries wanting to relocate to the region. The JLARC report notes that three potential developments in the last three years did not materialize because of uncertainty about acquiring a permit.

Another remedy: put water back into the ground. That is the goal of the Hampton Roads Sanitation District, which serves 1.7 million people in the Tidewater region and is routinely lauded for its progressive thinking. Its leadership is championing a $US 1 billion project that will, at full buildout, purify 120 million gallons of wastewater per day and inject it into the Potomac aquifer. It is similar in concept to an award-winning water recycling facility in Orange County, California [http://www.circleofblue.org/2014/world/orange-county-recycled-water-system-shows-importance-collaboration/] .

“Cutting subsidence is a huge positive for southeastern Virginia,” Ted Henifin, the district general manager, told Circle of Blue.

The project has other benefits too. It will reduce nutrient discharges into the Chesapeake Bay, which contribute to toxic algal blooms and harm the bay ecosystem.

The district is in the trial phase. It drilled two test wells to gauge the capacity of the aquifer to absorb the injected water. Last month, state officials approved the quality of water produced from a pilot site at the York treatment plant. Next year, the district will build a one-million-gallon-per-day test facility at its Nansemond plant. If that goes well and all state and federal permits are acquired, Henifin hopes to have treatment and injection facilities at seven of the district’s facilities by 2030.

Lack of Data

Despite its prominent role in Virginia's public policy, land subsidence data is scarce. The rise and fall of the land surface is directly measured in only two locations in Tidewater — neither near the coast — and no data has been collected since 1995, when funding for the extensometers ran out.

"There was no interest in subsidence because it hadn't been connected to sea level rise," Pope, the hydrologist, explained.

Current managers such as Kudlas of the DEQ say that they have enough information on subsidence and water levels to make decisions but perhaps not the most efficient decisions.

Henifin, the utility director, echoed that response. "I wouldn't say that we're data rich," he told Circle of Blue.

More tools, however, are on the way. The U.S. Geological Survey is installing a new extensometer at the Hampton Roads Sanitation District wastewater plant in Nansemond, where the district's aquifer storage project will be located. The utility is paying the $US 1.3 million cost. The USGS is also rehabilitating the two instruments that were mothballed in 1995.

The JLARC report also noted the lack of subsidence data. The commission recommended that the DEQ identify the highest priority monitoring sites and the General Assembly consider spending the $US 500,000 to $US 1 million needed for new instruments.

It was one of 22 recommendations the commission made for revamping Virginia's water supply planning and permitting program that the General Assembly could consider in its next session. Other ideas will come from the groundwater

management advisory committee, whose report is due August 1, 2017.

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Brett Walton [http://circleofblue.org/author/brett]

Brett writes about agriculture, energy, infrastructure, and the politics and economics of water in the United States. He also writes the Federal Water Tap [http://www.circleofblue.org/water-tap/] , Circle of Blue's weekly digest of U.S. government water news. He is the winner of two Society of Environmental Journalists reporting awards, one of the top honors in American environmental journalism: first place for explanatory reporting for a series on septic system pollution in the United States (2016) and third place for beat reporting in a small market (2014). Brett lives in Seattle, where he hikes the mountains and bakes pies. Contact Brett Walton [http://www.circleofblue.org/contactbrettwalto

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GLOUCESTER-MATHEWS GAZETTE-JOURNAL

HRSD pilot program may hold answer to future water shortages

by Sherry Hamilton - Posted on Nov 16, 2016 - 11:51 AM

Drinking wastewater might not seem like the smart thing to do, but if properly treated, it quenches the thirst as readily as rain. Recently, this reporter visited the Hampton Roads Sanitation District facility in Seaford and quaffed a glass of recycled wastewater. It was clear and clean. It had no unpleasant odor or taste. And it just might be the answer to future water shortages.

Hampton Roads Sanitation District is in the pilot phase of a project aimed at eventually producing purified water from wastewater at nine of its 13 sewage treatment facilities. Once treated, the water would be pumped back into the underground aquifer that supplies most of Eastern Virginia and used for drinking and other purposes.

One small corner of one building at the Yorktown sewage treatment plant currently houses the pilot project, known as SWIFT (Sustainable Water Initiative for Tomorrow), but if fully implemented, the process will require a facility 2,000 times larger, said HRSD general manager Ted Henifin. The ultimate cost of the project is expected to be in the range of $1 billion.

The pilot project is using two different methods for purifying the water—one carbon-based and the other membrane-based, said Charles Bott, HRSD's Director of Water Technology and Research. Early results show that the carbon-based method is the more promising, he said, since it is both more compatible with the aquifer and is less expensive to institute.

The purification process for the water begins where HRSD's current process ends. The carbon-based system cleans the already-treated water still further by adding larger particles back in to help sweep out much smaller particles that can't be seen. It continues with ozonation to destroy dissolved contaminants, followed by a filtering process to remove particles and pathogens such as pharmaceuticals and hormones. The final step in treatment is ultraviolet light to destroy any remaining bacteria and microorganisms. Before putting water back into the aquifer, said Bott, it would be treated to match the chemistry that already exists in the aquifer.

Bott said that all the technologies have been used before, including reinserting the treated water into an aquifer. However, he said, none of the current systems are being used for the same primary purpose as HRSD—nutrient reduction.

Henifin said that the driving force behind the project is HRSD's requirement to reduce nutrient discharge into the Chesapeake Bay, but it will have the added benefits of conserving water and reducing land subsidence caused by the extraction by all users combined of millions of gallons of water per day from the Potomac Aquifer.

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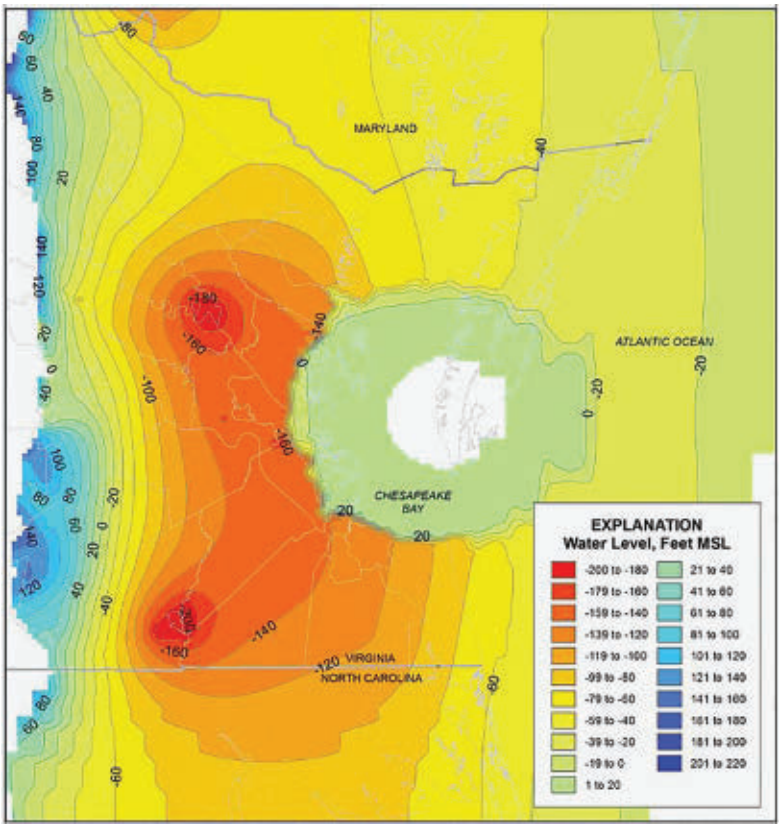
WASTEWATER

Virginia Utility Aims to Eliminate Most Discharges To Surface Waters

IN AN AMBITIOUS MOVE intended to achieve multiple environmental benefits, the Hampton Roads Sanitation District (HRSD), in southeastern Virginia, is pursuing the goal of treating most of its wastewater to essentially drinking water standards and then injecting the treated flows underground. Known as the Sustainable Water Initiative for Tomorrow (SWIFT), the approach would enable the HRSD to stop discharging most of its treated effluent to surface waters, ensure compliance with future discharge requirements, augment groundwater supplies, and address local problems pertaining to subsidence and saltwater intrusion. Currently undergoing pilot testing, the SWIFT program is expected to cost $1 billion by the time it is completed, in 2030.

Like other point sources engaged in wastewater treatment in the vast watershed of the Chesapeake Bay, the HRSD faces the prospect of having to comply with increasingly stringent discharge limits as part of the total maximum daily load established for the bay by the U.S. Environmental Protection Agency. Both point and nonpoint sources are required to reduce loadings of nitrogen, phosphorus, and sediment. However, if anticipated reductions in these constituents from the agriculture and stormwater sectors do not materialize, wastewater treatment facilities can expect to shoulder more of the regulatory burden associated with the total maximum daily load. At the same time, potential future regulations pertaining to such items as viruses, contaminants of emerging concern, or pharmaceuticals could necessitate additional upgrades by the HRSD at its wastewater treatment facilities.

Against this backdrop, the HRSD "took a long-term look at where we're going to be in 20, 30 years," says Ted Henifin, P.E., the district's general manager. Concluding that the HRSD will continue to have to make major improvements to its facilities, the



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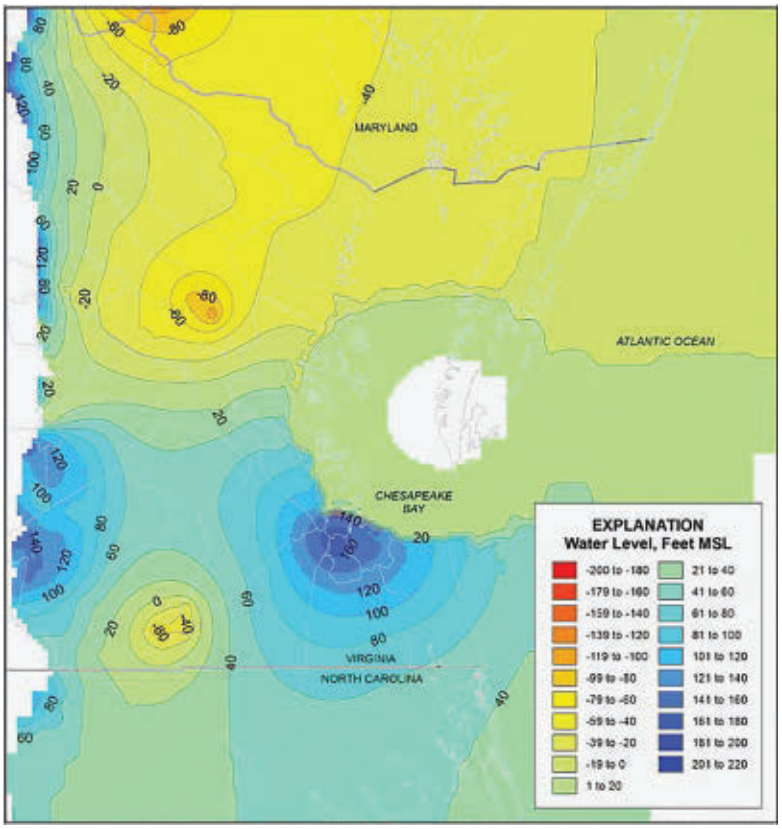

PREDICTED PRESSURES IN POTOMAC AQUIFER IN 50 YEARS WITH GROUNDWATER REPLENISHMENT

HRSD, BOTH

district's leadership decided to pursue the idea of taking wastewater "all the way to drinking water," as Henifin puts it. Such a move would effectively insulate the HRSD from future regulatory changes while creating a final product with even more value than treated wastewater. The purified water could then be injected belowground, boosting groundwater supplies and helping replenish the Potomac Aquifer.

A massive source of groundwater along the Virginia coast, the Potomac Aquifer covers the state's entire coastal plain and varies significantly in depth depending on location. Along its western edge, the aquifer extends to the ground surface, while at the coast, in the area of the HRSD's facilities, the aquifer is confined and extends downward from roughly 400 to 500 ft belowground to approximately 2,000 ft. Despite its size, the aquifer has declined in pressure in recent years, the result of extensive withdrawals of groundwater. The lower pressure has caused the aquifer to compact, contributing to land subsidence that, in turn, has increased the risk associated with sea level rise in the Hampton Roads region. "We are sinking," Henifin says. Although saltwater intrusion has not occurred to any significant degree, concerns have arisen regarding that possibility in the future.

THE LOWER PRESSURE has caused the aquifer to compact, contributing to land subsidence that, in turn, has increased the risk associated with sea level rise in the Hampton Roads region.

Regional and localized groundwater modeling shows that injecting the treated water will benefit the aquifer system, says Daniel Holloway, P.G., a senior project manager and hydrogeologist for CH2M, of Englewood, Colorado. As the prime consultant for the SWIFT project, CH2M worked with the HRSD to conduct groundwater modeling, coordinate test well drilling, and design the treatment units for the ongoing pilot test. Injecting the treated water "will provide a mound, which will reduce the potential for saltwater intrusion," Holloway notes. At the same time, adding the treated effluent to the aquifer could help address the problem of land subsidence. "It looks as though this project has the potential to arrest that compaction and maybe even reverse it some," he says. Although any increase in elevation would be fairly minor, it would prove to be a "big deal" in the relatively flat Hampton Roads area that is near sea level, he says.

Announced by the HRSD in mid-September, the pilot test of the advanced water treatment processes conducted as part of the SWIFT program was begun in late June with the start-up of a 30 gpm membrane-based system at the district's York River Treatment Plant, in Seaford, Virginia. The membrane-based system employs microfiltration and reverse-osmosis membranes, followed by ultraviolet disinfection and advanced oxidation. The rejected brine from the system is returned to the head of the York River facility for treatment.

In early July the HRSD began pilot testing an approximately 5 gpm carbon-based system at the same facility. Within the carbon-based system, water passes through a flocculation and sedimentation unit before undergoing ozonation and then treatment first by biological activated carbon and then by granular activated carbon. The treated water next undergoes ultraviolet disinfection.

Although both approaches have performed well, the HRSD plans to

MIR/SNØHETTA

CUTOUT SPACES and verdant terraces define the new, block-like headquarters building for Banque Libano-Française in Beyrouth (Beirut), Lebanon. Designed by Snøhetta, of Oslo, Norway, the project is intended to align with three principles: economic sustainability, social sustainability, and environmental sustainability. To address the first, the architecture firm will ensure that the entire project is fundamentally viable economically. To conform to the second, the tower will include many public spaces in addition to spaces intended for bank employees. The offices will be located strategically around the multilevel terraces, and the plaza around the base of the structure will serve as a public square that will engage the neighborhood. To address the environmental goals, the terraces will be vegetated, and the entire project will be designed to conserve energy both in the materials and methods chosen for its construction and in its operation once completed.

expand its efforts to test the carbon-based system, Henifin says, because this system confers certain advantages. Compared with the membrane-based system, the carbon-based approach costs less to construct and operate, and its effluent has water quality characteristics that are "much closer to what exists in situ in the groundwater where we're going to be pumping," Henifin notes. "We think [the carbon-based system] is really the direction that's going to work for us."

Ensuring the "geocompatibility" of the finished water with the native groundwater is a key factor in achieving success on the overall project, Holloway says. After undergoing treatment in the membrane system, the water has extremely low levels of total dissolved solids, giving it a different ionic strength than that of the more brackish native groundwater. Although the Potomac Aquifer consists mainly of sand, a "small clay fraction" present in the aquifer could be mobilized by the membrane-treated water and "cause problems right around the well," impairing pumping operations, Holloway says. By contrast, injecting water treated by the carbon-based system would greatly minimize the potential for such problems.

The HRSD plans to begin operating a 1 mgd demonstration project featuring the carbon-based scheme in early 2018 at its Nansemond Treatment Plant, in Suffolk, Virginia. Over the summer, the district issued a request for proposals from design/build teams interested in developing the demonstration facility. The HRSD is engaged in the selection process and aims to award a contract soon, Henifin says. Construction of the pilot facility is expected to be complete in early 2018. A test well has been completed at the Nansemond facility, while a test well at the York River plant remains under construction. The wells will be used to obtain detailed information about the aquifer in these locations. The district is also working with Region 3 of the U.S. Environmental Protection Agency to obtain the necessary regulatory approval to inject the treated water on-site at the Nansemond facility.

The HRSD intends to add advanced purification measures and inject treated effluent on-site at seven of its nine large facilities by 2030, Henifin says. Once all such systems are in place, the HRSD will have the capability to purify and inject approximately 120 mgd, essentially eliminating its discharges to surface waters except in the event of peak flows after wet-weather events. All told, the district aims to eliminate approximately 90 percent of its discharges to surface water.

"Rarely do you get to do something that reduces your discharges significantly," Henifin says. Such a major reduction in discharges is expected to improve water quality conditions in local waterways as well as in the Chesapeake Bay. "We're figuring if we can reduce our discharges by 90 percent, there will be a positive benefit," he says. —JAY LANDERS

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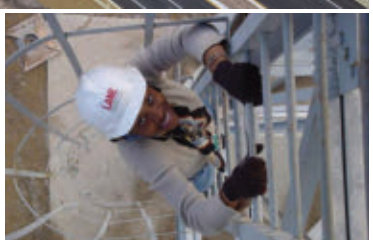

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Managing Wastewater with Reuse in Mind

BY SARAH FISTER GALE

Water scarcity issues, which now affect every continent in the world, are spurring utilities to think more strategically about the way they treat and manage wastewater. While many facilities are making incremental improvements that focus on regulatory requirements, forward thinking utility leaders are looking for more innovative solutions that exceed standards while addressing broader water accessibility issues.

"It is time to start thinking about wastewater as a resource and how we can benefit from it, rather than just treating it," said David Jassby, assistant professor of chemical and environmental engineering at the University of California – Riverside. The challenge is finding projects that meet the unique needs of the climate and the community. Jassby recently co-authored a report on how treatment facilities could tailor wastewater treatment for high-value crops, like citrus and wine, by balancing the saline, nitrogen and phosphorus. "With a little additional treatment we can engineer the water to suit agricultural needs," he said. This may be an innovative solution to California's water crisis, but it isn't cutting-edge technology, Jassby said. "It's about building the right treatment train to meet needs."

As wastewater reuse and recycling becomes more mainstream, many utilities across the country are following this approach, seeking new ways to use existing technology to address local water issues. According to a 2016 report from Bluefield Research, the U.S. wastewater reuse sector now has an installed capacity of 18.5 million cubic meters per day, with another US$12 billion worth of projects in the pipeline. According to Erin Bonney Casey, senior analyst for Bluefield Research, the company has seen the reuse project pipeline more than double in the last six months due in large part to "growing municipal utility concerns about long-term water supply risks."[1]

TREAT IT YOURSELF

Many of these projects involve the reuse of treated "gray water" for non-potable uses, like irrigation and cooling towers, as a way to reduce

Aerial photo of the Upper Occoquan reservoir.

stress on local water sources. San Francisco, for example, has launched several water recycling projects in the past five years, including construction of infrastructure to irrigate Sharp Park Golf Course in Pacifica with gray water in 2014, and the opening of a truck fill station that dispenses recycled water to contractors, street cleaners, landscapers and city departments. It is all part of a broader citywide plan to harness the benefits of wastewater reuse to reduce the use of potable water, said Paula Kehoe, director of water resources for the San Francisco Public Utilities Commission (SFPUC). "Our local water program starts with conservation, then we focus on recycling where we can."

Though recently city leaders have come to the conclusion that SFPUC can't do it all on their own, which is why they have launched the decentralized Non-Potable Water Program. The program allows private building owners and developers to build on-site infrastructure to capture, treat, and reuse alternate water sources, including stormwater, gray water, black water, and foundation drainage. Kehoe estimates buildings can reduce their potable water use by up to 65 percent by implementing these systems.

To ensure public safety and oversight, SFPUC, working with the local public health agency, received guidance from municipal leaders in Minnesota, New York City, Oregon and other regions that have already passed regulations supporting decentralized water treatment options. "It took two years to develop the regulatory framework to ensure the program could be safely implemented," Kehoe noted. The final version was rolled out in 2013, and in 2015 the city made it mandatory for all new buildings larger than 250,000 square feet. There are already 20 systems online, and Kehoe expects more to come. "Decentralized water systems aren't right for every community," she said. "But in a dense, rapidly growing environment (like San Francisco) it works."

UPPER OCCOQUAN'S HIDDEN GEM

Some people might be surprised to hear that San Francisco is seeking water management guidance from cities in the Midwest and on the east coast where water is seemingly plentiful. But wastewater reuse programs are not limited to drought-stricken communities. In fact, one of the most ground-breaking projects was launched by the upper Occoquan Service Authority in Fairfax, Va., which has been treating wastewater to water quality standards for almost 40 years.

The community, which is 40 miles west of Washington, D.C., was rural until the late 1960s when a new highway turned the agricultural community into a popular commuter destination. Within a few years, the eleven small and relatively inefficient wastewater treatment plants couldn't handle the rapid growth, and water quality in the local reservoir started to suffer, explained Chuck Boepple, executive director of the Upper Occoquan Service Authority. Despite it being the 1970s — when water scarcity wasn't even a thing — local leaders realized that they were going to need more, and better quality, water as the community grew. So the Virginia Water Control Board created the Upper Occoquan Service Authority (UOSA) to provide state-of-the-art treatment for all wastewater generated in the Occoquan Watershed, and established the Occoquan Watershed Monitoring Laboratory (OWML). They also adopted stringent discharge requirements and put a plan in place to build a new high-tech regional water reclamation facility to replace the eleven existing treatment plants.

The SFPUC headquarters at 525 Golden Gate consumes 60% less water than similarly sized buildings and is one of the first buildings in the nation with onsite treatment of gray and black water.

The new facility, which opened in 1978 and has gone through several expansions, features a multi-step treatment

HRSD's highly treated water passes through BAC/GAC filtration columns as part of the carbon-based advanced water treatment process at the SWIFT pilot facility.

HRSD's highly treated water passes through ultrafiltration columns as it's purified through the membrane-based advanced water treatment process at the SWIFT pilot facility.

process that exceeds water quality requirements. It includes:

- Initial conventional treatment to remove roughly 90 percent of incoming pollutants
- A high lime treatment process to create a barrier against viruses and reduce phosphorus to below 0.10 mg/L
- Multimedia depth filtration using granular activated carbon to meet requirements for total suspended solids and chemical oxygen demand.
- A chlorination and dechlorination process to create a barrier for pathogens.

"All of these treatment steps are fairly common," Boepple said, "but together they bring our effluent discharge to drinking water quality." While the treated water doesn't go to a direct potable reuse system, it is discharged directly upstream from the drinking water impoundment. A number of studies have been conducted since building and expanding the plant, and they all conclude the wastewater facility generates the highest quality water source entering the Occoquan reservoir. "The bigger the facility gets, the better our water quality gets," he said.

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A SWIFT SOLUTION

Upper Occoquan has become something of a legend, attracting visitors from all over the world, including Ted Henifin, general manager of the Sustainable Water Initiative for Tomorrow (SWIFT) at the Hampton Roads Sanitation District (HRSD) in eastern Virginia. SWIFT is a water purification project designed to enhance the sustainability of the region's long-term groundwater supply, while supporting Chesapeake Bay restoration and addressing salt water intrusion in the water system.

The idea for SWIFT emerged when local planners were discussing their frustration with having to continually update their thirteen local wastewater facilities to meet new pollutant rules and what their long-term water management strategies should be. "Every five to ten years we invest millions of dollars to address new restrictions," Henifin said.

HRSD General Manager Ted Henifin pumps the first taste of SWIFT purified water on September 15, 2016.

Rather than continuing to make incremental improvements, the team decided that with the next upgrade they wanted to bring their treated water to drinking quality standards, thus eliminating the need for future upgrades. Then to make the best use of the treated water, they would discharge it into the shrinking Potomac aquifer, which serves multiple states in the east coast region.

"The challenge was how to get it there," he said. They didn't want to pay to ship the treated water a long distance. Instead, they worked with engineering firm CH2M Hill to figure out if they could cost effectively put the water directly into the ground at the plant. "The model they built was more positive than we could have imagined," he said. Because the ground in that area is permeable, building injection wells would be relatively low cost, and the pressure dif-

--- See WASTEWATER con't on page 31

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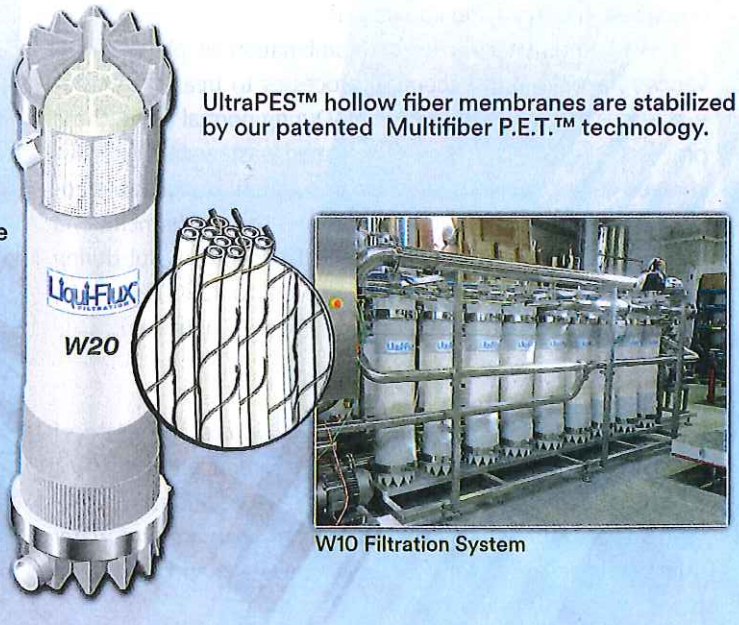

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--- WASTEWATER con't FROM page 13

ferential and size of the aquifer meant the water could move quickly into the water table to benefit all of the communities it serves over time.

It was still a billion-dollar project, but HRSD already had a $4.4 billion, 20-year capital improvement budget in place, half of which is driven by wet weather work. Henifin's team worked with EPA to adjust their investment strategy so they could use $1 billion of it for the SWIFT project, and push some of the wet weather work beyond the 20-year window. "We had to have a capital plan in place to make this work," he said. "It would have been very difficult to sell it as a discretionary project."

HRSD is using the Upper Occoquan facility as a model for its own treatment strategy. The utility launched a pilot program at one of the treatment facilities in June, and on September 15, at a press event, Henifin drank the first glass of the treated water. "It tasted great!" he said. HRSD's plan is to eventually treat as much as 120 million gallons of wastewater to drinking-water standards per day, then inject it into the aquifer.

Like Jassby, Henifin noted that this solution isn't right for every community. The lesson, he said, is that you have to look at all of your various water issues and opportunities to see if there might be one big solution. "I hope our project makes other people think about what is possible in water-rich communities like ours." **WW**

About the Author: Sarah Fister Gale is a Chicago-based correspondent for *WaterWorld*. Over the last 15 years, she has researched and written dozens of articles on water management trends, wastewater treatment systems and the impact of water scarcity on businesses and municipalities around the world.

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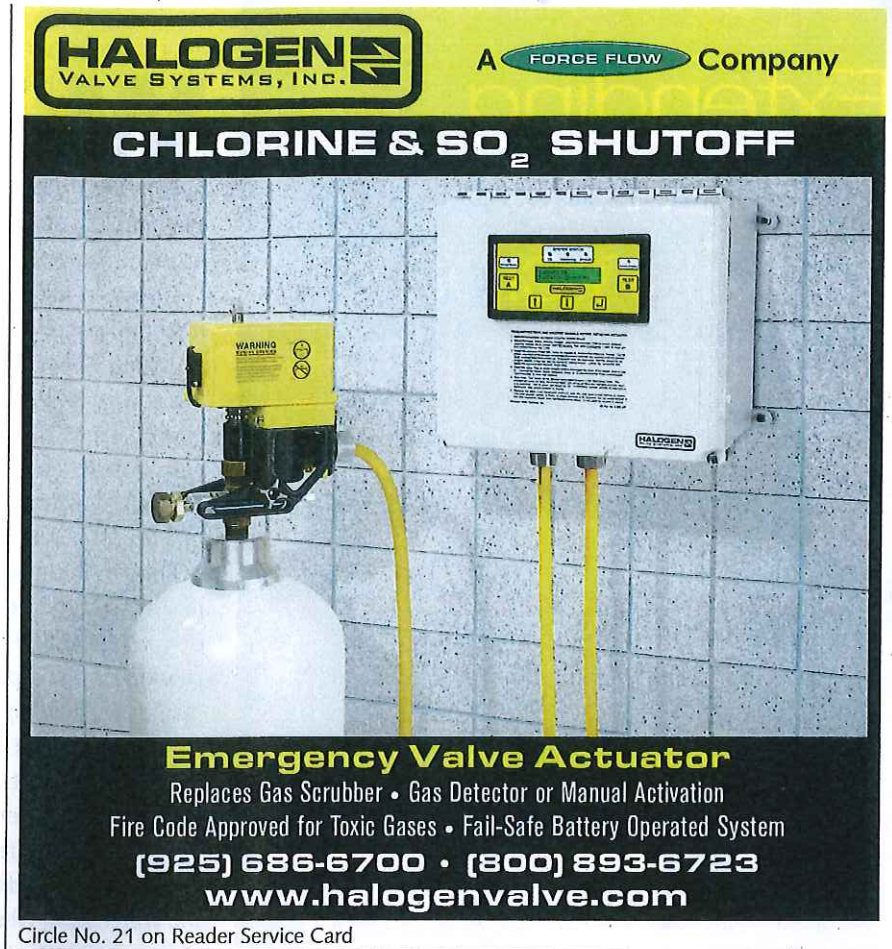

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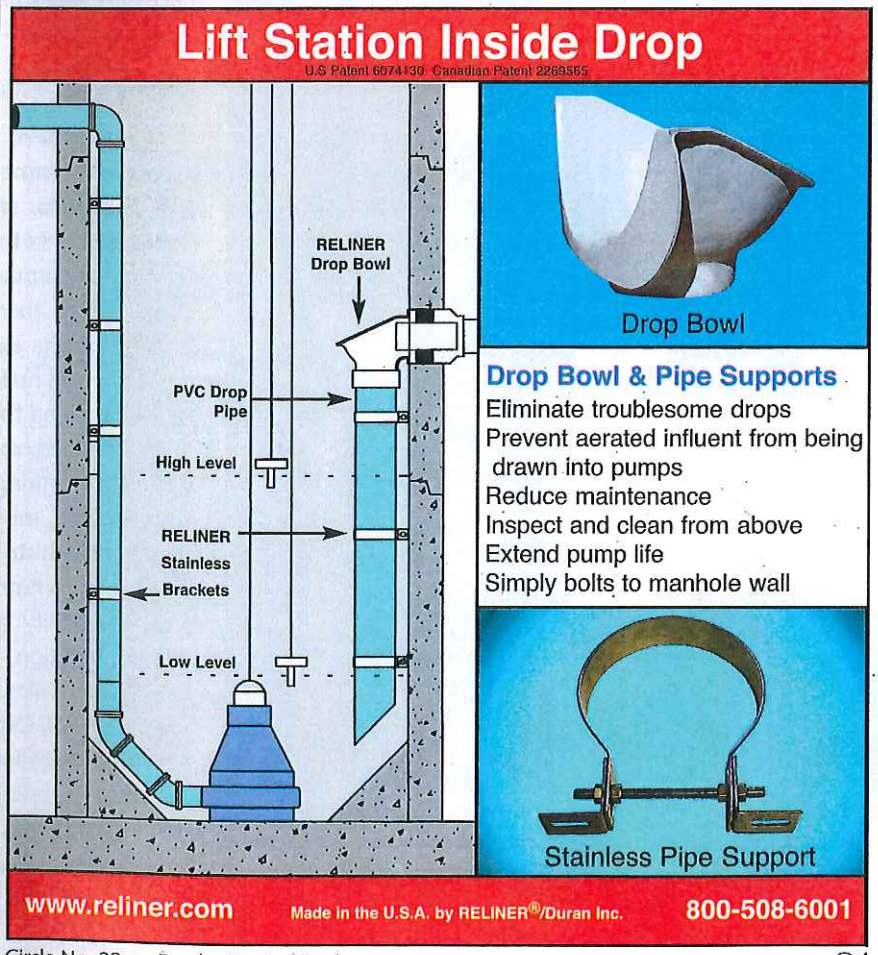

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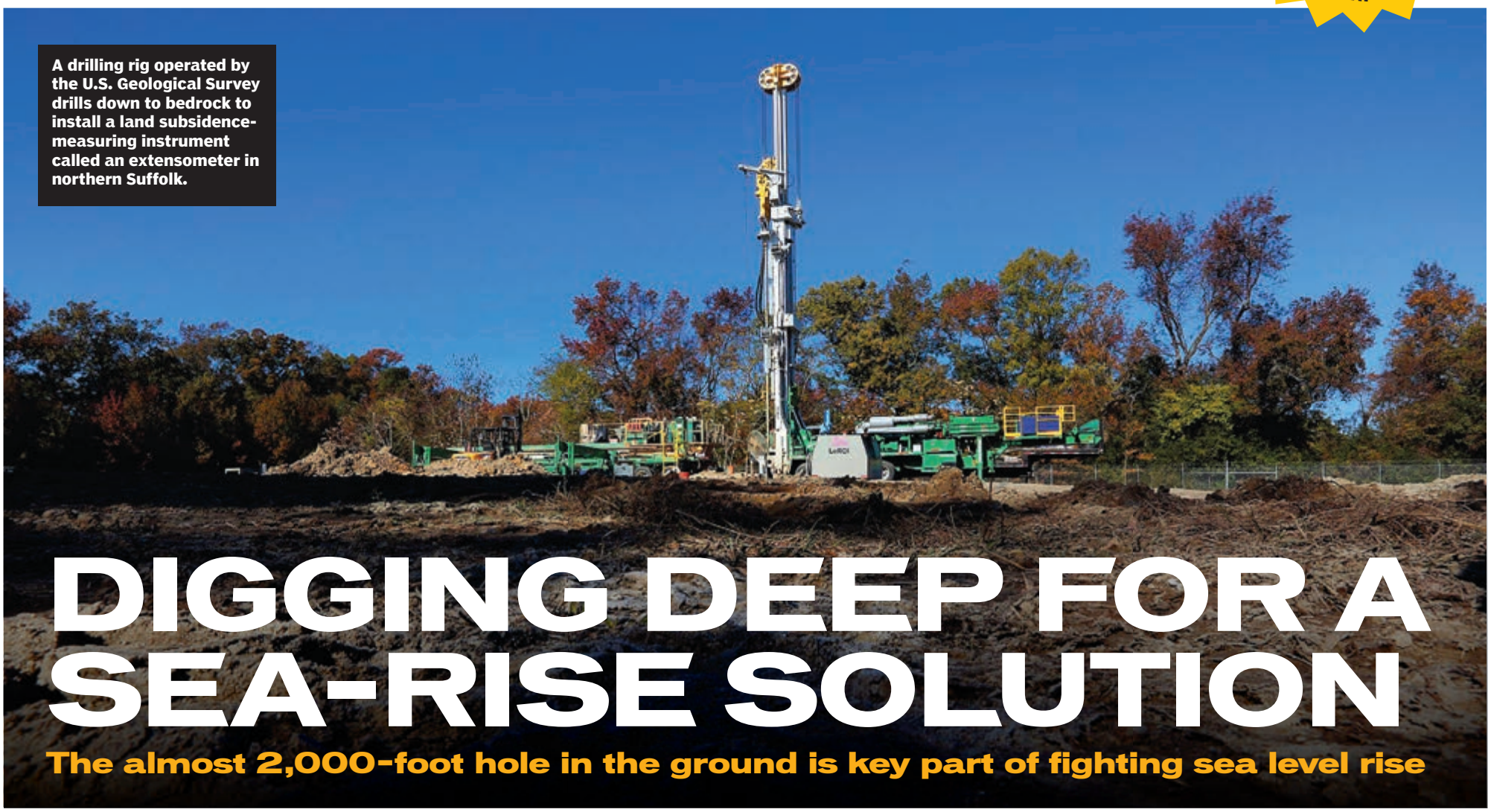


A drilling rig operated by the U.S. Geological Survey drills down to bedrock to install a land subsidence-measuring instrument called an extensometer in northern Suffolk.

DIGGING DEEP FOR A SEA-RISE SOLUTION

The almost 2,000-foot hole in the ground is key part of fighting sea level rise

STEVE EARLEY | THE VIRGINIAN-PILOT

By Dave Mayfield
The Virginian-Pilot

SUFFOLK

JUST EAST of Interstate 664, about as far north in this city as you can get, there's a hole in the ground. A deep, deep hole. Almost 2,000 feet. All the way to bedrock and beyond.

A monster of a drilling rig needed just a couple of weeks to get there, boring through clay, sand and shell that took nature millions of years to layer.

This week, the drillers plan to begin using their big machine to nudge section after section of protective casing down into the hole, all the way to the bottom. Inside it, they'll put even more pipe for a special device.

The work could take weeks more, and the cost will easily top $1 million.

To the crack team of U.S. Geological Survey drillers, it's just another well. They travel the country to bore many types of them for researchers.

But in Hampton Roads and coastal regions elsewhere, scientists have taken an

See **DRILLING, PAGE 14**

Old friends remember Bannon as bright, kind in school

KIMBERLY PIERCEALL | THE V-P

Stephen Bannon, seen in high school in 1971, was born in Norfolk. He's adviser to President-elect Donald Trump.

By Kimberly Pierceall
The Virginian-Pilot

For son with autism, family finds purpose in service

Parents combine young man's love of running and car rides to help others

DRILLING

BENT ROD GIVES SCIENTISTS HOPE

Continued from Page 1

extraordinary interest in this hole in Suffolk. This well will provide the framework for an instrument, known as an extensometer, that will help answer an important question: Could there be a way to help stave off sea level rise?

It's no coincidence that several hundred yards away, something else is in the works. The Hampton Roads Sanitation District recently drilled another well. A little more than a year from now it plans to begin testing a theory there: that injecting water from its treatment plants into a huge aquifer deep beneath the surface will slow and eventually reverse the sinking of land throughout the region.

Scientists factor in this sinking, known as subsidence, when calculating what's known as relative sea level rise. And in Hampton Roads, they say, the ground may be sinking as fast in some places as the Atlantic Ocean is rising.

That combination makes for a big threat. Only New Orleans, which also is experiencing dramatic subsidence, is considered more vulnerable among U.S. metro areas to rising seas.

So when HRSD begins injecting a million gallons a day of treated wastewater into the ground at its Nansemond plant in early 2018, the big question will be: What's that extensometer just around the corner saying?

Will it indicate that the land near the injection well is starting to rise? Will it show what many folks who support HRSD's plan are hoping: that we can slow the threat of the sea coming at us by rehydrating and reinflating the ground deep beneath us?

Ted Henifin, HRSD's general manager, will bet you $1 billion that the answer is yes. That's how much the agency plans to spend converting seven of its plants into aquifer-replenishment centers, if the demonstration at the Nansemond facility goes well.

It's a project known as SWIFT – Sustainable Water Initiative for Tomorrow. By 2030, the plants could together be pumping as much as 120 million gallons a day into the Potomac aquifer, all of it treated to drinking-water-quality standards.

Henifin said HRSD likely would pursue the project even if it didn't help with subsidence. He said recharging the aquifer would benefit groundwater users, and HRSD's discharges of treated, but still polluted, water into the Chesapeake Bay and its tributaries would all but cease.

Still, Henifin said, "I'd be disappointed if we don't see something" to confirm HRSD's models showing that subsidence can be slowed. "I'm very optimistic. I'm just not sure how long it will take."

HRSD is footing the cost of the Geological Survey project and provided the land for the federal agency's extensometer and some new groundwater-monitoring wells.

To David Nelms, who's helping oversee the federal role, it's a gratifying full circle in a career of more than three decades with the Survey, best known as the USGS.

Back when he started with the agency in 1984, Nelms was dispatched from Richmond down to Hampton Roads to check out a couple of extensometers. One of them was installed across the street from the former Union Camp mill near Franklin. The factory drew more than 40 million gallons a day of groundwater at the height of its paper production, more than any other user of the Potomac aquifer.

"I thought it was really cool. I was a kid straight out of college … and just the realization that pumping water out of the ground, you could see response as you looked" through the instrument's records, he said. When the mill shut down for a holiday period or because of a strike, the ground rose back – typically by no more than tenths of a millimeter, but enough to prove a correlation.

The Franklin instrument, put into operation in 1979, and another one installed north of downtown Suffolk in 1982 were the only such devices deployed by the USGS in Virginia. Their purpose was to measure the effect of the huge groundwater withdrawals in a "cone of depression" extending out from the mill.

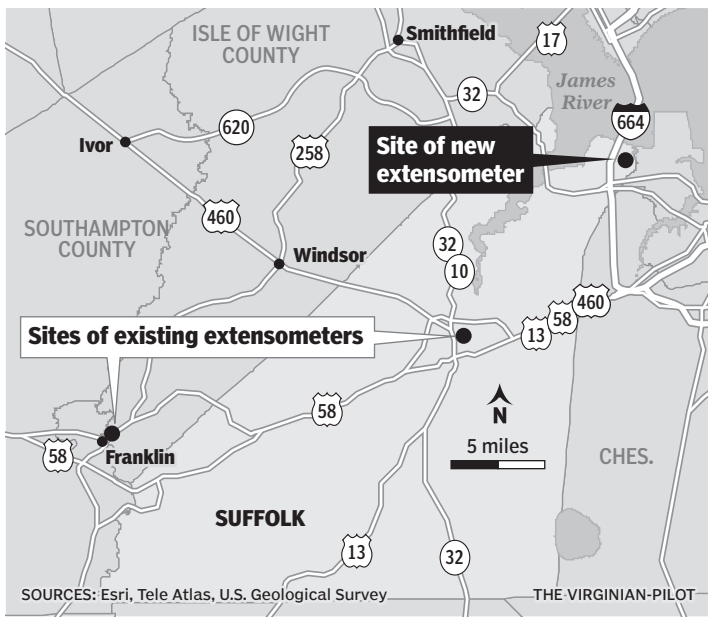
The USGS was first tipped off to the extent of subsidence in the region by surveyors from another federal agency who periodically measured elevations across the country. Around Franklin, "they kept having problems meeting their error tolerances," Nelms said.

STEVE EARLEY | THE VIRGINIAN-PILOT

The U.S. Geological Survey wants to collect a year's worth of data before the aquifer-injection demonstration begins. If that goes well, Hampton Roads Sanitation District plans to spend $1 billion to convert seven plants into aquifer-replenishment centers.

WILL SUBSIDENCE SLOW OR REVERSE?

The U.S. Geological Survey is drilling a new well in Suffolk in which an extensometer, which measures land surface elevation, will be installed.



SOURCES: Esri, Tele Atlas, U.S. Geological Survey THE VIRGINIAN-PILOT

"The water levels are going to go up, and that should cause the land to go up."

David Nelms, hydrologist at the U.S. Geological Survey

Sea level rise, much less subsidence's role in it, wasn't much talked about in his early days at the USGS.

In Virginia, subsidence was mostly a curiosity at that time.

Geologists said then and they still say that it's likely due in part to something known as glacial isostatic adjustment – basically, that Hampton Roads is on the lowering end of a land mass still settling after the weight of glaciers from the last ice age was lifted.

But they knew that withdrawals from the aquifer likely were playing a big role, too. Subsidence-stricken California, Texas and other states where huge underground reservoirs of water or oil have been depleted offered plenty of supporting evidence.

In Virginia, droughts are comparatively rare and fresh water plentiful. So the minuscule changes in ground levels were recorded by the duo of extensometers without much notice. An ink pen traced across a sheet of paper on a roll at each site, and at least once a month, a technician replaced the sheets. The old ones went into an archive in Richmond, where they were all but forgotten.

In 1995, during a period of budget-tightening, somebody at the USGS decided the instruments weren't worth maintaining, so the record-keeping stopped.

Nelms had long before moved on to other projects, but he remembers being irked back then about the decision. He suspected that if somebody ever found the time to dig into the history kept by the extensometers, he might find a story worth telling.

Nelms and fellow USGS hydrologist George Harlow found that somebody in the early 2000s when a former colleague at the agency took a faculty position at Virginia Tech. Thomas Burbey told them about a grad student named Jason Pope who was rummaging for research topics.

Have him comb through all those extensometer records, Nelms and Harlow suggested. Within a year, Pope had uncovered enough to lead-author a paper in a scientific journal. He'd added up rates of aquifer compaction – essentially, subsidence – averaging about 1.5 millimeters a year in Franklin and 3.7 millimeters a year in Suffolk during the periods in which the extensometers were in operation. The aquifer is much deeper in Suffolk.

It took a while for others to appreciate the implications of Pope's findings. If that compaction rate continued over a century, there'd be more than a foot of subsidence around downtown Suffolk. Figure that subsidence due to aquifer drawdowns was occurring not just there, but throughout the region. Then factor in predictions of an accelerating global rate of sea level rise – to two, three, four feet or more over the next hundred years – and it was becoming easier to get the big picture.

Clearly, Hampton Roads had a problem.

In the decade since, severe flooding events in Franklin and elsewhere in the region have loudened the subsidence alarm, and nuisance flooding in Hampton Roads' lowest-lying parts have increased the reminders. All it takes now in more and more places is a full moon and high tide to swamp intersections and isolate neighborhoods.

Still, the old extensometers in Franklin and Suffolk sat gathering dust in the metal sheds where they'd been installed. Like lonely sentinels without anyone to report to, they were checked by nobody at the USGS.

Then a year or so ago, Nelms and some colleagues began talking with Hampton Roads planners about whether the instruments could be put back in service. In the summer of last year, Nelms and a few others went out to take a look. In Franklin, they got more than they bargained for: Even without paper and ink, the instrument was still recording.

Nelms carries the evidence in the cab of his pickup, and he fished it out for a recent interview. It's a crooked, threaded steel rod. It had been part of the extensometer mechanism, and something happening in the ground beneath it had caused it to bend.

Something apparently not considered likely when the instrument was put in: Sometime between 1995 and 2015, the ground around Franklin had started steadily rising.

Enough that the casing for the extensometer pipe that went down into the ground pushed up the support post for a fulcrum that was connected to the threaded rod. The pressure was enough to bend the rod.

Calculating the angle of the bend and then applying simple geometry, Nelms figured the ground had rebounded by at least 27 millimeters, about an inch. Pope, who'd joined and stayed with the USGS after college, applied his own model and came up with a number that was nearly double that.

It didn't take long for the scientists to speculate on a link: the Franklin mill. Its groundwater pumping all but ceased with its shutdown by International Paper in 2010. Though parts of the mill reopened over the next several years, the withdrawals are just a fraction of their former level.

When HRSD's Henifin got a look at that bent rod, "it was a confirming moment," he said. "It helped me believe that our models" showing that a large percentage of the subsidence due to aquifer compaction could be reversed.

The USGS re-equipped the two old extensometers in February, and the data they've collected since then have further boosted Henifin's confidence.

It shows that in Franklin the land surface is still rising, at a rate now that's equivalent to about 1 millimeter a year, Nelms said. Near downtown Suffolk, though there's still subsidence, it has slowed to about 1.8 millimeters a year, less than half the annual average measured when the extensometer there was previously in operation, from 1982 to 1995.

Nelms said the Franklin mill's demise is the only obvious link to the changes.

In his trailer at the site where the new extensometer will go, there's a big poster that explains how the instruments work and what's been happening lately at the other two locations.

Over the rumble of the drilling rig, Nelms said he expects the instrument in northern Suffolk will be ready to start collecting data sometime early next year. That's assuming the drill crew doesn't have to abandon the hole, as it was forced to do with another one after some pipe and casing jammed deep beneath the surface.

Extensometers record everything electronically now, without paper and ink. The plan is to continuously display the new instrument's readings – and those of the other two – online for anyone to see.

Nelms said he is well aware that this is not just another science project, with the billion-dollar initiative HRSD has in mind.

"The scale of this thing is so large, the potential so large," he said.

Because of that, the USGS wants to collect a year's worth of data at the new site before the aquifer-injection demonstration begins. Everything suggests that when that experiment starts, Nelms said, "the water levels are going to go up, and that should cause the land to go up."

But, he said, "Nature can be sloppy sometimes, so until you really do this, do the measurements, you won't know. It could be pretty amazing what we'll be able to see."

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18 million

fewer pounds of pollutants in Chesapeake Bay

Plan to halt sewage discharges could do much to clean the bay, but poses a quandary

reduction in pollutants

A proposal by the Hampton Roads Sanitation District to curb treated water discharge at seven of its plants would mean 18 million pounds a year less of nitrogen, phosphorus and sediment going into the Chesapeake Bay.

potential issues

While advocates generally support the proposal, some also worry that HRSD's success could take too much pressure off the region's cities and counties to clean up their own acts when it comes to the bay.

By Dave Mayfield
The Virginian-Pilot

NEVER in the history of the Chesapeake Bay cleanup has one project promised to cut pollution by so much.

If the Hampton Roads Sanitation District all but stops discharging treated waste from seven of its plants, as it proposes, that'd mean 18 million pounds a year less of nitrogen, phosphorus and sediment going into the bay.

"How can it be a bad thing to get rid of these nutrients and sediment every year going forward?" said Peggy Sanner, who oversees legal matters in Virginia for the nonprofit Chesapeake Bay Foundation. "It's a hugely important benefit, assuming all the things work out."

But Sanner is among environmental leaders who have been scrutinizing the finer print of the HRSD proposal called SWIFT – Sustainable Water Initiative for Tomorrow. While still lavishing praise overall, she and others are tempering it with some caveats of concern.

Mostly, bay advocates are worried that HRSD's success could take too much pressure off the region's cities and counties to clean up their own acts when it comes to the bay.

The localities are facing a series of deadlines over the next decade and a half to significantly cut pollution-carrying runoff from

See **WASTE, PAGE 9**

In a wardrobe not so far, far away ...

VIRGINIA'S GARRISON of dedicated "Star Wars" costumers brings the series' Dark Side to life.

STEVE EARLEY | THE VIRGINIAN-PILOT

Debra Fowlkes, 45, dresses as bounty hunter Aurra Sing from "Star Wars." She's one of nearly 200 members of Garrison Tyranus, a Virginia branch of a worldwide organization of costumers.

By Teri Winslow
The Virginian-Pilot

SHE HAS "Star Wars" dinnerware, license plates, Christmas ornaments, costumes, action figures, posters and movie paraphernalia.

She dresses as bounty hunter Aurra Sing, complete with a 6-foot-long rifle, 6-inch-long finger extensions, white makeup and a shock of bright red hair.

She drives a special Jeep decked out in honor of the sci-fi franchise and has a poster of Han Solo trapped in carbonite on her refrigerator.

But as of a few days ago, Debra Fowlkes still hadn't seen "Rogue One: A Star Wars Story."

"I had to work," she told friends who went to the

See **STAR WARS, PAGE 7**

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WASTE | *Stormwater runoff still an issue, advocates say*

Continued from Page 1

streets and parking lots. If HRSD's project works out as planned, the wastewater agency will earn a massive amount of pollution credits – so many that it plans to give the localities whatever they need to take care of their own bay cleanup obligations.

That's a potential windfall that the cities and counties never saw coming, and they're eager to capitalize on it.

A study done five years ago for the Hampton Roads Planning District Commission estimated the region's localities could face spending a combined $2 billion to retrofit their stormwater management systems in order to comply with a stricter "pollution diet" prescribed under the bay cleanup.

Virginia Beach, the region's most populous city, would be hit with the biggest slice: Its current cost estimate is $335 million.

Under the SWIFT project, HRSD would treat effluent to drinking-water standards, then inject it underground into the Potomac aquifer. HRSD projects the cost at $2 billion, to be passed on in the form of higher bills to its ratepayers. It plans to phase in the project over a decade ending in 2030.

Computer models have predicted that HRSD's replenishment of the aquifer, which is rapidly being depleted by groundwater users, would slow or even reverse subsidence across much of the coastal plain. Scientists say the sinking of the land is largely caused by the aquifer's drawdown and has accounted for roughly half of Hampton Roads' relative sea level rise over the past half-century.

There's even more sureness about the potential benefit from HRSD's project to the Elizabeth, James and York rivers, where the discharge of treated, but still polluted, wastewater would all but end.

"Certainly, there would be significant water-quality benefits to the habitat, to critters and so forth," Sanner said during a recent conference organized by the Virginia Coastal Policy Center, part of the College of William & Mary Law School.

With less nitrogen and phosphorus going into the bay, dead-zone-creating algal blooms would diminish.

But Sanner said improvements to stormwater management systems also have the potential to be "meaningful," among the last major steps in the comprehensive, multiyear plan to clean up the bay.

Stormwater pollution has been increasing along with development across the bay watershed, in glaring contrast to some other pollution categories where significant progress has been made. And one of the advantages in focusing on runoff is the potential to touch many creeks and smaller rivers, Sanner said. HRSD's project, on the other hand, would cut pollution along the "main stem" rivers.

Sanner said she hopes that state regulators consider the "entirely unprecedented" impact of HRSD's proposal and tell the localities, "you can use these credits to meet some of your obligation, but you have to keep working on stormwater."

Whitney Katchmark, who oversees water resources issues for the planning district commission, called the credits a "good news, great opportunity development" for the localities. Utilizing them, she said, would save taxpayers a significant amount of money.

Even with the credits, Katchmark said, the region's cities and counties wouldn't completely end programs to better control runoff. She said they'd just pursue them more selectively. Among other reasons for such projects are to reduce bacterial pollution that causes closures of beaches and shellfish harvest areas or to address nuisance flooding and sea level rise.

"This just would give them a little more latitude" to assess the most cost-effective ways to manage stormwater, Katchmark said. "It's still such an emerging science, and there are not a lot of sure things."

She pointed to state grant documents showing it can easily cost tens of thousands of dollars per pound of phosphorus removed to build a retention pond or to plant marsh grasses – among the practices used to hold back or absorb nutrient runoff.

HRSD and planning district officials have estimated that even after localities used the credits freed by the SWIFT project to meet their own obligations, there still could be credits for more than 3 million pounds a year of nitrogen and phosphorus pollution available along the rivers of the lower bay.

That has raised the question of what would become of those credits. Could they be offered to the Navy, VDOT, Old Dominion University and dozens of other public and private entities that also have pollution diets under the bay cleanup? Could the credits be used to entice new industrial employers whose pollution could then be accommodated within the cleanup program?

Ted Henifin, HRSD's general manager, said both are possibilities. He said HRSD already has had "cursory" discussions with the Navy and VDOT about the credits.

It's also possible state lawmakers or regulators might seek to re-engineer how the credits could be used, he said.

Currently, guidelines for the state's decade-old nutrient credit trading system call for the credits to be sold or given away in the same watershed – what's earned by polluters that reduce discharges in the York stays in the York, for example. But from time to time, some legislators have expressed interest in allowing credits generated in one watershed to be swapped into another.

The scope of HRSD's project has opened up all kinds of questions, Henifin said: "In many ways, we're in unchartered territory."

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Could treated sewage be a tool against sea-level rise?

By BEN FINLEY
Jan. 14, 2017

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SUFFOLK, Va. (AP) — As a tool against sea-level rise, the idea seems a little counterintuitive: Add water to the ground.

But the laws of physics support it: Pump millions of gallons into a sandy aquifer deep below the Earth's surface, and its porous layers will expand like a sponge. The ground above it will rise, fortifying at least some of the land against the ocean's reach.

For decades, geologists have known that extracting large amounts of water can cause the ground to sink over time, sometimes by dozens of feet in places like California. Pumping it back in has slowed this subsidence and even slightly boosted ground levels in other places, experts say.

This approach could soon be tested in Virginia's Hampton Roads region, which is more threatened than any other place on the Atlantic Coast by the combination of sinking land and rising seas. The area's local sanitation department has proposed pumping millions of gallons of purified wastewater deep into the ground.

Combating sea-level rise is a shared threat along this stretch of the coast, but it's not the primary driver of this project, said Ted Henifin, general manager of the Hampton Roads Sanitation District. The primary motivation is to more effectively respond to water quality requirements for the Chesapeake Bay.

The district currently sends treated sewage into rivers that feed the bay. But persistent pollution levels prompted the Environmental Protection Agency in 2010 to phase in new limits on the total load of nitrates and phosphorous found in the water.

The district can meet the standards of a different federal law — the Safe Drinking Water Act — by pumping wastewater, purified to the point of being drinkable, deep underground.

Putting treated sewage into the ground isn't new. Orange County, California, has done it since the 1990s, mainly to keep salt water out of its aquifers.

And water injection has been discussed as a tool to boost land levels and fight against tidal flooding in cities such as Venice, Italy, according to Tom Burbey, director of the hydrologic sciences program at the National Science Foundation. (That plan was eventually abandoned in favor of floodgates).

Virginia's coastal region needs to hold on to as much dry land as it can. The area along the bay and Atlantic Ocean is afflicted by what's known as relative sea-level rise, which measures the cumulative effect of sinking land and rising water.

The population of 1.7 million people is the country's second most vulnerable to this predicament, behind New Orleans. Neighborhoods already endure routine flooding, as does the world's largest naval base in Norfolk. Sea levels have risen so much that utility lines that stretch from piers to docked ships sometimes must be shut off during high tides.

By some estimates, the area could lose five feet by century's end, according to The Center for Sea Level Rise at Old Dominion University in Virginia. Even a three-foot loss could permanently inundate as many as 176,000 residents, according to a 2012 report from the Hampton Roads Planning District Commission.

Increasing greenhouse gases have warmed the oceans, melting the polar ice caps and causing rising sea levels. But scientists also blame humans, at least in part, for the sinking ground.

In the Hampton Roads region, slightly more than half the relative sea-level rise is caused by subsidence that's mostly due to humans pumping water out of the ground, according to the U.S. Geological Survey. (The other cause is the land settling back down after being pushed up by glaciers during the last ice age.)

The Hampton Roads Sanitation District wants to inject an initial million gallons a day during a pilot project in 2018, said Henifin, the general manager. If all goes well, injection levels would eventually rise to 120 million gallons. Regular sampling at well sites would show if the injected water meets drinking standards.

The district still needs federal and state permits for the pilot project. And it will require approval from the Justice Department, which issued a consent decree in 2009 to address overflows from the sewer system.

But the idea has so far survived the scrutiny of the Chesapeake Bay Foundation, a conservation group.

"We need to view this, if successful, as a significant improvement," said Peggy Sanner, the foundation's assistant director for Virginia and senior attorney.

"Drinking water standards are higher than what comes out of the pipe right now," she added. "And millions of pounds of pollutants would not go into the bay."

When the pilot project starts, the U.S. Geological Survey plans to monitor the ground's movements.

"The physics tell you that the ground should come up," USGS hydrologist David Nelms said recently in Suffolk, Virginia, near the site of the planned pilot project.

He stood in a shed near a gauge, known as an extensometer, that reaches 2,000 feet into the bedrock. Graphs on the wall chart the layers of sand, clay and gravel that make up the Potomac Aquifer, which extends under almost all of eastern Virginia and parts of North Carolina.

Scientists not involved in the project say the physics makes sense, but no one should expect a significant change in ground level.

In places such as Nevada, water injection has mostly stopped subsidence and caused some of the ground to rise by a number of centimeters, said Burbey of the National Science Foundation.

Burbey expects a similarly minimal rise for Hampton Roads, at best. The Potomac Aquifer's sand layers should expand, he said, but its compacted clay layers won't rebound much.

"Once you've squeezed the water out of them, it's hard to reabsorb back into those clays," he said.

Michelle Sneed, a land subsidence specialist for USGS in California, said the Hampton Roads project will be closely watched by geologists and other experts.

"If you can get a lot of the land subsidence under control, it buys some time," she said. "Because nothing is going to stop the ocean."

Sanitation Department's clean water project could help fight sea level rise

By Kara Dixon (http://wavy.com/author/karadixonwavy/)

Published: January 25, 2017, 9:21 pm | Updated: January 25, 2017, 9:28 pm

HAMPTON ROADS, Va. (WAVY) — The Hampton Roads Sanitation Department (HRSD) says its project to clean wastewater could help prevent sea level rise.

General Manager Ted Henifin says the project started two years ago and is called SWIFT: Sustainable Water Initiative for Tomorrow.

Henifin says the department has already **successfully made wastewater drinkable (http://wavy.com/2016/09/15/treatment-process-turns-wastewater-into-drinking-water/)**. Officials hope that they can now use that treated water to stop the land from sinking.

"People have been pulling water out of the ground for about 100 years in our region and as they've pulled water out of the ground, the ground started to fill in place," Henifin said.

That means wastewater — including water from sinks, toilets and tubes — can be cleaned at a proposed treatment plant and put back underground to fight sea level rise.

"This is the only thing I'm aware of that we can do in our lifetime that can change what's happening to sea level rise," Henifin said.

Special Report: "The Rising Threat" (http://wavy.com/2016/12/15/special-report-the-rising-threat/)

Plans are already in place to build a pilot treatment plant to churn out clean wastewater and put in back in the ground.

Henifin says the project will be built at their Nansemond plant in Suffolk and should be up and running within a year, pumping 100 million gallons of water a day back into the ground. He says the department hopes to start construction on the first sustainable water purification facility starting in 2020. Five other plants will be built throughout Hampton roads by 2030.

Could treated sewage be a tool against sea-level rise? (http://wavy.com/2017/01/14/could-treated-sewage-be-a-tool-against-sea-level-rise/)

The project will cost $1 billion, but Henifin says they will use money from rearranged investments so the department's current financial plans will not be put in jeopardy. He also says construction of the plants will create jobs.

The department is also working with the United States Geological Survey, which is installing a extensometer at the site to measure how high or low the land rises and falls once groundwater is filtered back in.

The extensometer will go in a hole that is 20,000 feet deep, but will only reach 1,965 feet down, according to David Nelm with the USGS. He says the instruments are designed to work for long periods of time and that there are already two extensometers in Franklin and Suffolk.

Henifin says the results and reports kept from the extensometer and treatment plant will be analyzed by trained scientists in preparation for the future facilities.

"We want to have a lot of confidence that what we're doing today serves generations to come in Virginia and I think we're really doing it the right way. I think we'd all like for it to go Swifter for Swift but we're making it go as fast as we can," Henifin said.

Henifin says the project will not only help fight against sea level rise but keep the Chesapeake Bay healthy by discharging clean water underground.

He says the department is thrilled about the project and has high hopes for it.

"Our whole organization is excited about it. Folks I know, in the environmental world, the water world, everyone's talking about the project. It's really a career enhancing thing for everyone involved and we're excited to make it happen," he said.

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Why are hydrologists pumping treated sewage water into the ground?

By Chaffin Mitchell, AccuWeather staff writer
February 07, 2017, 3:49:07 PM EST

For decades, millions of gallons of treated sewage has been pumped into the ground. It sounds harmful, but it's actually quite the opposite. This process is crucial in keeping salt water out of aquifers and keeping groundwater replenished.

To date, nearly 490 billion gallons of recycled water have been recharged into the Central and West Coast Basin aquifers. That is one of many water recharge projects occurring all over the world.

Taking water out of the ground at the current rate has led to sinking of land in some parts of the world. By injecting water, the porous layers soak up the water like a sponge.

Sea level rise means there could be a greater force of the ocean to push seawater further underground into groundwater basins, thereby risking freshwater wells becoming salty.

Virtually all coastal aquifers around the world experience seawater intrusion to some degree.

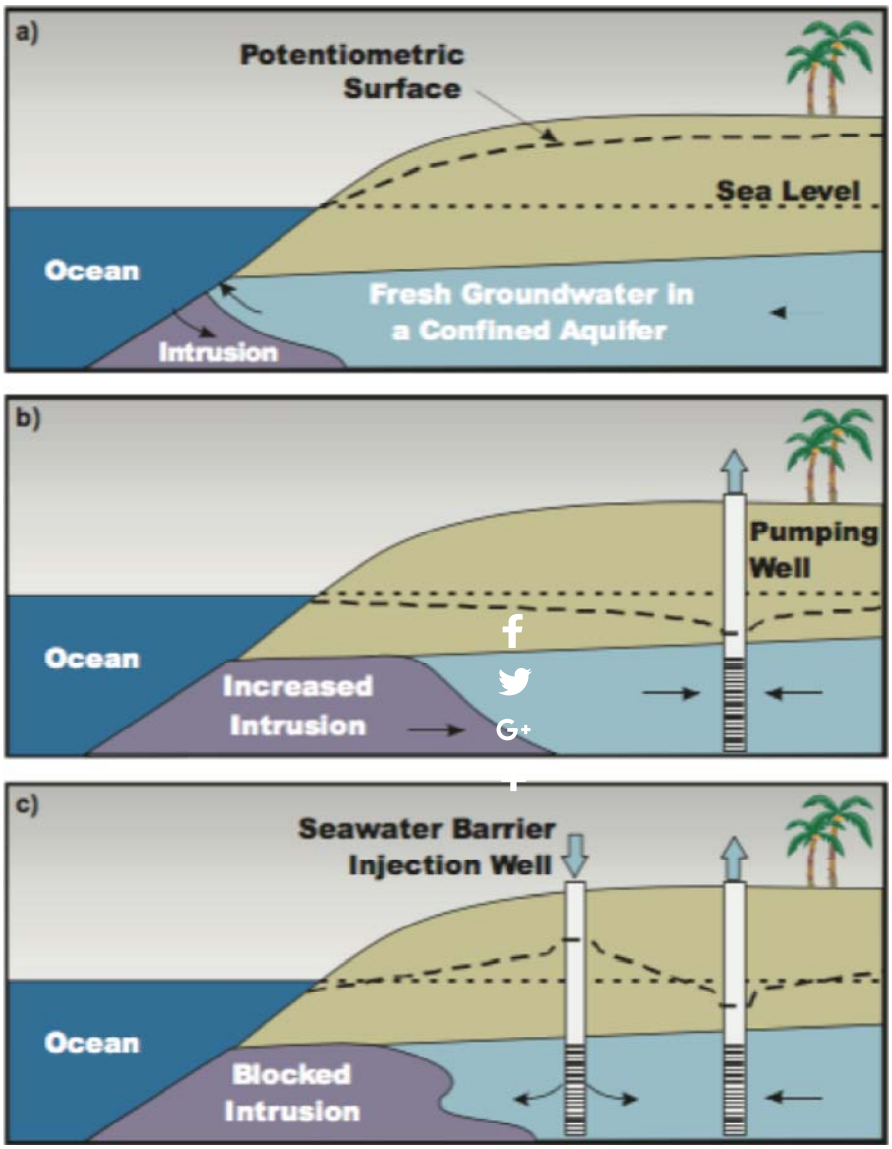


Image via WRD

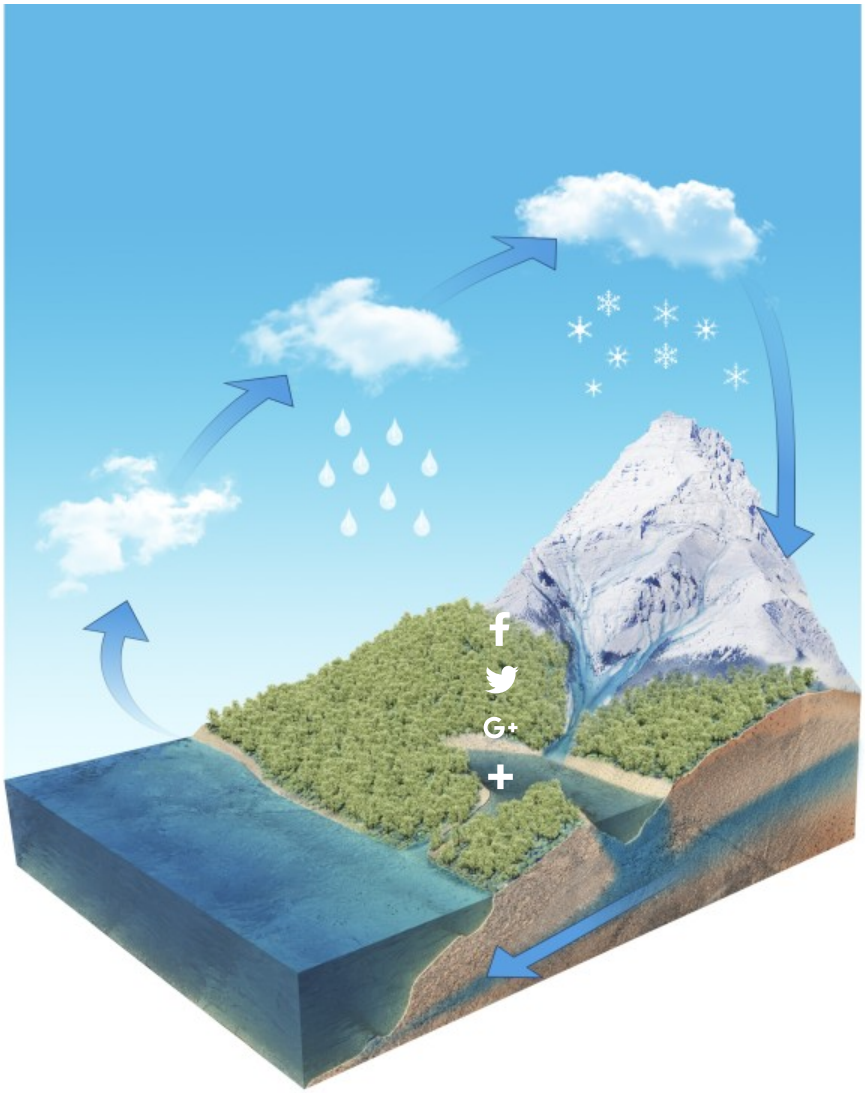
Ted Johnson, Chief Hydrogeologist of the Water Replenishment District of Southern California, said recycled water is pumped down into a line of barrier wells near the coast to stop this from happening.

"Our agency puts recycled water into recharge ponds to refill the aquifers and down wells to stop seawater intrusion," Johnson said.

Treated sewage water, also known as recycled water, goes through a very rigorous treatment process to remove all the nasty particles and produce clean water that can be reused for other purposes.

"Once the sewer water has been recycled, it can be put underground in two main ways: Either directly on the land surface so it can naturally drain underground by gravity to replenish the underlying groundwater aquifers, or in the cases where the water needs to go hundreds of feet deep, it is pumped down wells," Johnson said.

Experts say the ground surface is unlikely to rise in any noticeable amount.



3D-illustration showing the water cycle. (Didacta_produktionsbyra/Getty Images/iStockphoto)

Some of the positives of this process include a very reliable source that is locally available instead of having to import water from hundreds of miles away. It also has a lower carbon footprint than importing water and is also more cost effective than importing water.

"Maybe most importantly, in a water short area such as California, the use of recycled water means that we do not have to use drinking water for the seawater barrier wells or recharge ponds anymore – freeing up that drinking water for human consumption and helping to meet that demand," Johnson said.

There are also some drawbacks of this process. Some cons might be the public perception of using water that was formerly sewer water as a groundwater replenishment supply.

"We counter that by saying that all water on Earth is recycled water, it just keeps going round and round; there is no new water," Johnson said.

In this Dec. 16, 2016 photo, David Nelms, a hydrologist with the U.S. Geological Survey, gestures to an extensometer that's being installed in Suffolk, Virginia. The gauge, under the black plastic trash bag, reaches 2,000 feet into the ground and measures ground levels. The local sanitation department plans to inject treated wastewater into the aquifer, which could cause ground levels to rise and serve as a tool against sea-level rise. (AP Photo/ Ben Finley)

Another con is the expense for the startup. Tens to hundreds of millions of dollars which gets mitigated by the cost savings over time of not having to use imported drinking water.

"...the potential for leaching chemical constituents from aquifer materials during infiltration (which can be predicted beforehand), and possibly flooding of basements if the water table rises more quickly, or in different places, than expected," Steven Phillips Hydrologist & Groundwater Specialist U.S. Geological Survey said.

Agencies such as the WRD must provide artificial replenishment to supplement natural replenishment and keep the groundwater basins balanced to avoid more water taken out than going in.

By using recycled water for recharge, these basins and aquifers will be self sufficient for its local groundwater supply and will be less susceptible to drought and water shortages experts said.

The use of recycled water to replace imported water has been a real problem solver for now, but does not solve the problem forever because more groundwater is pumped out than is naturally replenished.

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How treated sewage water could help combat sea-level rise

Published February 07, 2017 | AccuWeather

For decades, millions of gallons of treated sewage water has been pumped into the ground to fight sea-level rise.

While this process sounds harmful, it's actually quite the opposite, according to experts. It is crucial in keeping salt water out of aquifers and keeping groundwater replenished.

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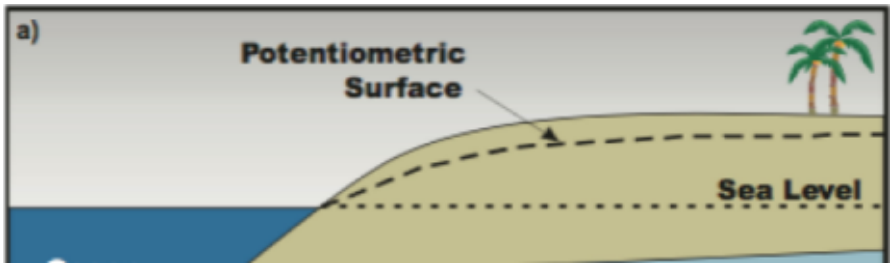

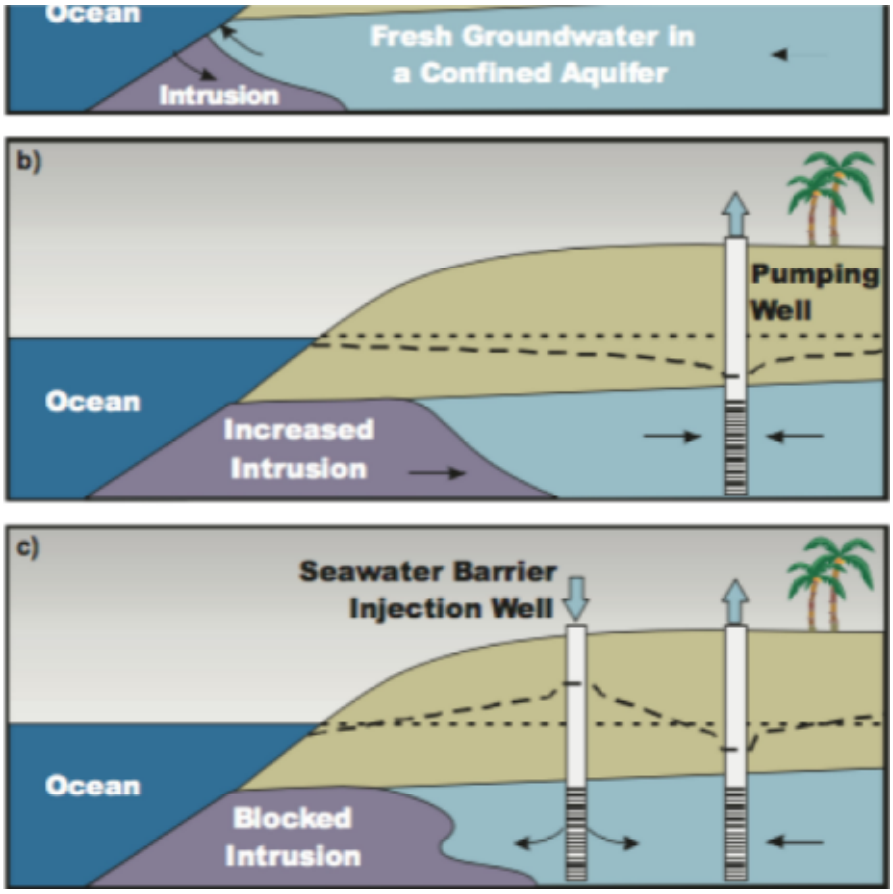

Image via WRD

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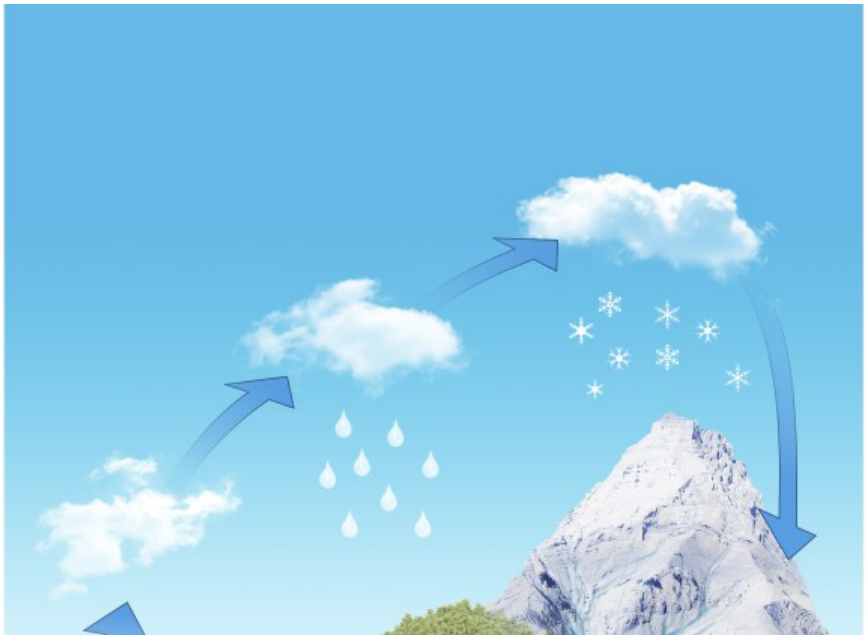

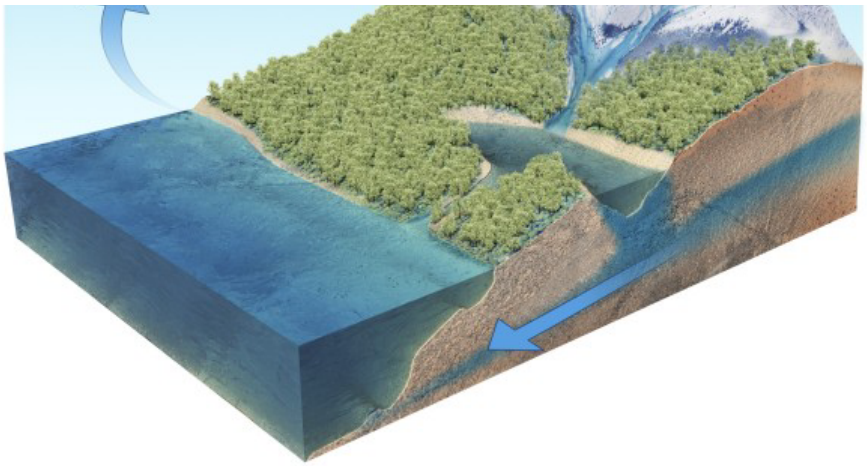

3D-illustration showing the water cycle. (Didacta_produktionsbyra/Getty Images/iStockphoto)

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However, there are some drawbacks of this process. One includes the public perception of using water that was formerly sewage water as a groundwater replenishment supply.

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In this Dec. 16, 2016 photo, David Nelms, a hydrologist with the U.S. Geological Survey, gestures to an extensometer that's being installed in Suffolk, Virginia. The local sanitation department plans to inject treated wastewater into the aquifer, which could cause ground levels to rise and serve as a tool against sea-level rise. (AP Photo/ Ben Finley)

Another con is the expense for the startup, which can cost tens to hundreds of millions of dollars.

Steven Phillips, hydrologist and groundwater specialist of the U.S. Geological Survey, said there are some other concerns related to chemical composition of the aquifers as well as area flooding in some cases.

"...the potential for leaching chemical constituents from aquifer materials during infiltration (which can be predicted beforehand), and possibly flooding of basements if the water table rises more quickly, or in different places, than expected," Phillips said.

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groundwater basins are balanced (to avoid more water being removed than added).

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Loan for Portsmouth, grant for HRSD in proposed House budget

By Jordan Pascale
The Virginian-Pilot

RICHMOND

Proposed budgets from the House of Delegates and the state Senate came out over the weekend and the major headlines, announced in January, were a proposed 3-percent raise for state employees and better pay for state police.

But two items in the House budget may stick out for Hampton Roads.

One is a $1.4 million grant to reimburse the Hampton Roads Sanitation District for an extensometer. That's a device used to measure the subsidence or sinking of land in the region. It's a key tool in measuring the effects of relative sea level rise.

Another is a $5.1 million loan over three years to help Portsmouth with cash flow. The city lost property tax revenues after the Virginia International Gateway port facility property changed from private to state ownership as part of its renegotiated lease.

It doesn't appear that either proposal is in the Senate budget.

The two chambers confer to come up with one spending plan, which must be done by Feb. 15.

It then goes to Gov. Terry McAuliffe, who can veto any part of it.

Extensometer

The HRSD is putting the finishing touches on a 2,000-foot hole where pipe and an extensometer are installed at the Nansemond Treatment Plant in Suffolk.

The state grant pays them back for that device, which measures how much the land is rising or sinking.

About half of the relative sea level rise in Hampton Roads is caused by gradual land sinking due mostly to businesses and residents pumping water out of the ground.

Decades ago the area had two extensometers that measured one to 4 millimeters of subsidence a year, but that data collection stopped because of a lack of money.

A renewed focus on the devastating effect sea level rise could have on Hampton Roads has led to restarting the measurements.

Sinking land floods more easily.

More than 176,000 residents could be displaced if the land drops 3 feet or more, according to the Hampton Roads Planning District Commission.

Hampton Roads could subside 5 feet by 2100, according to the Center for Sea Level Rise at Old Dominion University.

HRSD wants to slow subsidence, and maybe even reverse it, by injecting treated wastewater into the region's main aquifer, eventually at a clip of 120 million gallons a day – more than enough to fill up the Rose Bowl each day.

HRSD has been taking wastewater from toilets and sinks and treating it to the point where it's drinkable again. Ted Henifin, HRSD's general manager, famously drank the treated water at a media event last year.

The agency plans to spend $1 billion by 2030 converting seven of its plants into aquifer-replenishment centers, if the demonstration at the Nansemond facility goes well.

Port loan

The treasury loan for lost port property tax comes after Portsmouth officials were frustrated with the state's recently signed, nearly 50-year deal to lease the privately owned Virginia International Gateway.

The city is set to lose out on $3.3 million in tax revenue over the next three years because $64 million in assets at the Virginia International Gateway property will come off the tax rolls.

City officials said last year they can't afford to lose that money and suggested it could hurt its public safety and education budgets.

The state, through the Virginia Department of Transportation, would loan Portsmouth $1.7 million a year, allowing the city to not miss out on tax revenue.

Planned expansion of the port will include buying expensive cranes under the private side, which will bring a big increase in property tax revenue that will enable Portsmouth to repay the state loan.

State Sen. Louise Lucas, D-Portsmouth, also had proposed a bill that would create two funds to help struggling port cities. One fund would go to economic development, the other to transportation projects heavily used by the ports.

The bill passed the Senate 28-11. The House will take up Senate bills starting this week.

While the idea to create the funds may be an easy sell, finding money to fill them isn't.

It doesn't appear either chamber's proposed budgets include appropriations for those funds.

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KRISTEN ZEIS | THE VIRGINIAN PILOT

Norfolk Mayor Kenny Alexander speaks with Optima Health President and CEO Michael Dudley before a news conference Wednesday at the former J.C. Penney location in Military Circle Mall in Norfolk.

Health insurer plans to hire 200 for new Military Circle Mall office

By Eric Hartley
The Virginian-Pilot

NORFOLK

A health insurance company will hire about 200 people for a new customer-service center inside the former J.C. Penney at Military Circle Mall, the city announced Wednesday.

The contract with Optima Health is the first major development deal since Mayor Kenny Alexander and two other new council members took office last summer. It's also part of a broader city effort to revitalize Military Highway and the struggling mall.

Optima, a unit of Sentara Healthcare, will rent 45,000 square feet in the building, which is owned by the Norfolk Economic Development Authority.

Starting June 1, Optima will become the second tenant in the two-story former department store. Movement Mortgage is leasing the first floor, about 90,000 square feet, and also plans to open its office there in June. Movement is relocating 550 jobs from Virginia Beach and plans to hire 200 new people over two years.

Under an initial seven-year lease, Optima will pay rent that starts at just under $600,000 per year, then goes up by 2.5 percent a year. The new office is linked to a deal Optima signed with the state in February to serve people covered by Medicaid who have long-term needs.

The new program, called Commonwealth Coordinated Care Plus, covers older people and those with disabilities and chronic illnesses.

Randy Ricker, a vice president with Optima, said the new Military Circle center will house two main groups of employees. The first is an operations team that will pay claims, answer phones and do other administrative tasks. The second includes nurses and social workers who will call people who are homebound or in nursing homes to make sure they're getting the care they need. That can include doctor's appointments, but also non-medical needs such as Meals on Wheels visit, Ricker said.

Serving those with long-term needs more efficiently is key, Ricker said, because they make up only 30 percent of the people on Medicaid in Virginia but account for 70 percent of the costs.

The J.C. Penney store at Military Circle closed in 2014. Later that year, Norfolk's development arm bought it and 1,400 parking spaces – 16 acres in all – for $2.5 million. The City Council and Development Authority voted last year to spend $18 million to renovate the building into office space.

The deal with Optima for half the second floor leaves 45,000 square feet left to rent. Alexander and other officials said it also moves Norfolk past the break-even point on the investment.

Following a news conference inside the old department store, the Development Authority voted to approve the Optima deal. Members then took a tour of the building, which is unfinished but will soon be filled with hundreds of cubicles. Movement Mortgage plans to start moving in furniture this month.

Andrew Yancey, a business development manager for the city, said nearly everything except the structural steel is new, including the electrical and HVAC systems, sprinklers and roof. Crews removed the old department store escalator and filled in the resulting hole in the first-floor ceiling. They also added windows for more lighting.

"It's basically a new building on top of some old bones," Yancey said while walking through the second floor.

Alexander pointed to the promise of almost 1,000 new workers coming to Military Circle every day. City officials hope those jobs will draw new restaurants and other businesses.

Councilwoman Angelia Williams Graves, whose ward includes the mall, said she has fond memories of going there as a child.

But in the past five years, it has lost three anchor stores – Sears in 2012, J.C. Penney in 2014 and Macy's last year.

"Our mall was on life support, and so now I think it might be able to breathe a little bit on its own," Graves said.

Turning to the city staff present, she added: "But I don't want you guys to stop. I want you to make sure we bring this area back so that it is a living, breathing facility here in the city of Norfolk."

Localities, led by Hampton, line up for $2B windfall

HRSD project would yield pollution credits, share them with cities, counties

By Dave Mayfield
The Virginian-Pilot

HAMPTON

Every time the Hampton Roads Sanitation District clears another hurdle in its proposal to inject as much as 120 million gallons a day of highly treated wastewater deep below ground, some leaders of local cities and counties see dollar signs.

The project, called SWIFT – Sustainable Water Initiative for Tomorrow – promises to all but end HRSD's discharges of treated, but still polluted, water into the Chesapeake Bay. That would earn HRSD a massive amount of pollution-reduction credits that it's offering to localities to help them dodge toughening standards for stormwater runoff into the bay.

Regional planners have estimated the credits could be worth as much as $2 billion in combined savings for the 11 cities and counties that stand to benefit.

Hampton is the first of the localities aiming to lock in its windfall. Its City Council is scheduled to vote March 22 on a deal to acquire nitrogen, phosphorus and sediment reduction credits generated by HRSD's project.

On Wednesday, when council members got a sneak peek of the agreement at a work session, HRSD's general manager, Ted Henifin, acknowledged the too-good-to-be-true appearance of the deal.

Hampton will get the credits for free, allowing it to avoid as much as $200 million in stormwater system upgrades it otherwise would have to make.

"Is it something for nothing? Yes," Henifin said. "A free lunch."

The potential windfall is enough to lead Hampton to put off a planned increase this year in a fee that city residents pay for stormwater management, City Manager Mary Bunting said. She didn't specify how much the rate would have gone up.

Henifin said he expects the other localities that stand to gain from the credit-trading deal – the cities of Chesapeake, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach and Williamsburg, and the counties of James City and York – to reach similar agreements with HRSD by Aug. 1.

In an interview, he said that Chesapeake likely will be next in line. According to a Hampton Roads Planning District Commission consultant's memo in 2011, that city faced having to invest $255 million in stormwater upgrades to comply with tightening guidelines for nitrogen, phosphorus and sediment pollution under the bay cleanup.

HRSD's project calls for treating wastewater at seven of its plants to drinking-water standards, then injecting it into the Potomac aquifer, the main aquifer underlying the region.

HRSD plans in early 2018 to begin a one-year demonstration of the project at its Nansemond plant in northern Suffolk, also the site of a new research center that it plans to break ground for March 31. The Suffolk demo calls for pumping 1 million gallons a day into the ground, and if it succeeds, HRSD plans to phase in full-scale aquifer injection at that plant and others over the next decade. It estimates the total project could cost $1 billion.

The pollution credits it stands to earn would be more than enough to cover the 11 localities' stormwater cleanup obligations in the York and James rivers and their tributaries.

Henifin said HRSD plans to tell the cities and counties by 2025 whether it will proceed fully with its project and that it will guarantee them credits through 2036 – allowing them time to make other plans under the bay cleanup, should the project not come to fruition.

Officials in Hampton and other localities have said that, regardless of what happens with the HRSD project, they still plan to invest in some stormwater improvement projects to address flooding and other issues. And any new housing or commercial developments will have to meet tougher standards for runoff.

Bay Journal

Hampton Roads treating wastewater till it's good enough to return to aquifer

Rebuilding depleted drinking water supply could also reduce rate of sea level rise, slash pollution

Karl Blankenship | March 15, 2017

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A pilot project at the York River Treatment Plant tested different technologies to turn wastewater into drinking water. (Karl Blankenship)

Little more than a day before, the water pouring from a tap outside the York River Treatment Plant had been wastewater: a mix of sewage flushed down toilets, soapy water drained from bathtubs, food wastes washed down the sink and industrial waste piped into sewer lines.

Now, the water coming out the silver spigot was crystal clear, filling a clean glass that said "SWIFT" on its side.

And it tasted like, well, water.

Despite its checkered past, the water was good enough to drink —maybe too good, according to officials from the Hampton Roads Sanitation District, which operates the York River plant and a dozen others in southeastern Virginia. Instead of just treating wastewater and discharging it into the river as they've done for decades, district officials say they've now produced a valuable resource that can solve multiple problems facing the region.

"We don't have to waste the water," said Jamie Heisig-Mitchell, the HRSD's chief of technical services. "We can actually use it for something that benefits the state."

In an effort that may redefine what is doable at the region's wastewater treatment plants, the district is proposing to take the treated wastewater from seven of its nine largest facilities, then treat it again to meet drinking water standards.

But instead of having people drink it, they want to pump it into a deep aquifer underlying the region. That would help rebuild eastern Virginia's depleted water supply, they said, as well as reduce the rapid rate of sea level rise in the Hampton Roads area. It would also slash nutrient discharges far beyond what the district must do to meet Bay cleanup goals. Hence the SWIFT acronym, which stands for Sustainable Water Initiative for Tomorrow.

Supporters say the $1 billion project could provide all of those benefits without increasing costs for the district's ratepayers beyond what's currently projected — if the district is allowed to postpone some needed fixes to address sewer overflows.

The project represents a huge change in thinking for the regional agency which, since its creation in the 1940s, has focused simply on treating wastewater and discharging it into the river. "We spend our lives trying to improve the environment, but we still pollute," said Ted Henifin, general manager of the sanitation district. "We put out water that is highly treated and meets the needs of the receiving water body, but we don't feel great at the end of the day.

"We are going to feel wonderful if we can pull this off."

Local governments are on board because it could also substantially reduce costs to control stormwater runoff. State officials credit the sanitation district for the kind of innovative thinking they say is needed to not only help meet Bay cleanup goals — but to maintain those reduced nutrient pollution levels into the future.

Environmental groups also agree the concept has merit, though they want to see more details. They are concerned that, while the project helps the region's big rivers and the Bay, it could delay improvements to local streams.

Nonetheless, the vision put forward by HRSD has injected an air of optimism into environmental discussions at a time when issues facing the Bay are often expensive — and complicated — said Peggy Sanner, assistant director and senior attorney with the Chesapeake Bay Foundation's Virginia office.

"We all furrow our brows, and we trudge forward," she said. Then, she added, "you go to meetings where SWIFT is discussed, and everybody leaves with a lighter heart."

"People are understandably excited by it, but we can't abandon caution."

A new direction

The district has never been in the drinking water business. The HRSD was created by the state as an independent agency with its own rate-setting authority to clean up sewage problems in Southeast Virginia which, back then, were contaminating shellfish beds and swimming beaches.

Today, it handles wastewater for 1.7 million people — collectively, more than any other utility in the state. Its 13 plants treat 160 million gallons a day, and serve 18 cities or counties.

The genesis of the SWIFT project, officials said, came as the district engaged in long-range planning the last couple of years. It had invested $500 million over the previous decade to upgrade its wastewater treatment plants to meet Bay nutrient reduction goals.

Still, officials realized that more costly requirements could be coming. There are growing concerns about various emerging contaminants in wastewater discharges that can harm aquatic life, such as pharmaceuticals and personal care products. And, if other nutrient sources don't meet their Bay cleanup goals, wastewater plants could be on the hook to make up the difference.

HRSD officials worried that they could face a series of incremental, and potentially costly, upgrade requirements in the future. Further Bay-related nutrient reduction upgrades alone

could cost another $750 million, according to district estimates.

Officials began toying with the idea of incorporating the maximum feasible treatment technology at their plants. "Our thought process was 'let's take our water all the way to drinking water, and maybe the regulators won't do anything more to us,' " Henifin said.

But it would be clean drinking water that's not immediately needed in the Hampton Roads area, which relies on reservoirs for most of its supply and already has treatment plants to handle that.

Then, officials hit on the idea of injecting their treated water into the ground. The region sits above the huge Potomac Aquifer, a major water source for much of Eastern Virginia. Commercial and residential wells there pump out an estimated 144 million gallons a day, which far exceeds its recharge rate.

Those withdrawals also contribute to land subsidence in the region. Water levels in the Hampton Roads region are rising at the rate of about 4 millimeters a year — the highest pace in the nation outside New Orleans. About half of that is attributed to rising sea levels, and the other half to sinking land — much of the latter caused by withdrawals from the Potomac Aquifer.

Also, it is a confined aquifer, which means it's largely surrounded by dense layers of rock and clay, so water in the Potomac Aquifer was pressurized — so much so that when wells were first drilled into it, the water came out on its own, without the need for pumps.

That's no longer the case today. And as pressure in the aquifer has been reduced, scientists are worried it could start drawing in salty ocean water, ruining the aquifer as a drinking-water source. The potential lack of a reliable water supply has raised concerns about future economic growth in much of the state east of Interstate 95, which is above the aquifer.

The HRSD plan would pump 120 million gallons a day of treated drinking water into the ground. That — along with natural recharge — would help re-pressurize the aquifer, prevent saltwater intrusion and maintain it as a viable water source.

"There will be no development in eastern Virginia if we don't have a water source," Henifin said. "So, putting this water into the aquifer really creates a future for eastern Virginia that doesn't exist."

Although the greatest impact would be in Virginia, computer modeling shows that the benefits of repressurizing the aquifer would actually reach into Maryland and North Carolina, he said.

Injecting treated water could slow the rate of sea level rise in Hampton Roads. The region is already suffering from increasing rates of flooding, and whole city blocks in Norfolk are being elevated for protection. Tidal marshes, which provide valuable habitat for many species, are being lost faster than they can migrate to higher ground.

Injecting water won't end sea level rise, but will reduce the rate by about a quarter, giving localities — and ecosystems — more time to adapt. "No one has put a value on that, but it's huge," Henifin said.

Not a new concept

The sanitation district last year began experimenting with treatment technologies that can purify wastewater into drinking water at its York River plant in Seaford. This year, it's building a larger demonstration project at its Nansemond treatment plant in Suffolk, which will be capable of processing 1 million gallons a day, then pumping it into the aquifer.

If no problems crop up after that project has run for a year, the HRSD would like to move forward with incorporating the technology at seven of its nine largest plants. (One of the others discharges into the Atlantic Ocean and is not bound by Bay cleanup requirements, and the other is being retired.)

While no other place in the state is doing precisely what the Hampton Roads district plans, other utilities are doing aspects of it. In Northern Virginia, the discharge from an upstream wastewater treatment plant flows into the Occoquan Reservoir, from which the Fairfax County Water Authority draws and treats drinking water. In the Hampton Roads area, the city of Chesapeake pumps excess treated drinking water into an aquifer, where it is stored until it's needed during dry spells.

But across the nation, California's Orange County has been injecting heavily treated wastewater into its aquifer, as the HRSD is proposing, for four decades. Today, it's injecting about 100 million gallons daily.

"We see wastewater not as a waste, but as a resource," said Michael Markas, general manager of the Orange County Water District, at a workshop last December sponsored by the William & Mary Law School.

The process takes less energy than it does to pump water from Northern California or the Colorado River, Markas said, and it's considerably less expensive than desalinating ocean water. One concern voiced by scientists and others is that new chemicals, or those not recognized as problems today, could inadvertently be pumped into the aquifer and pose a threat in the future. The district has a scientific advisory panel to identify potential new

contaminants; it is now testing for about 400 substances, but none has reached levels of concern in treated water, Markas said.

The nonprofit National Water Research Institute has organized a similar expert panel to advise the HRSD.

HRSD officials also note that no one will be drinking any of their injected water anytime soon. Groundwater near the proposed aquifer injection points only moves at the rate of 3–30 feet per year. The nearest wells to any of those sites are more than a mile away, and some of those go into shallower groundwater above the Potomac aquifer. The HRSD is planning a survey of wells near proposed injection points.

"It could be hundreds of years before anyone would be withdrawing the actual water molecules that we put in there into their wells," Henifin said. By that time, any potential contaminants of concern would have been considerably diluted by other aquifer water, he said. Further, the contaminants would likely have been filtered out by passing through the clay and sediment particles in the aquifer, part of the natural cleansing system in groundwater.

Covering the cost

The sanitation district is under a court-approved consent decree requiring it to address overflows of raw, but diluted, waste from its sewer system, which take place during heavy or prolonged rains when the ground is soaked and water infiltrates into the sewer lines.

Those overflows amount to about 5 million gallons annually, a fraction of the 160 million gallons of effluent the district's facilities treat daily. But the HRSD estimates it would cost $2.2 billion to fix.

To make the $1 billion SWIFT project possible, the district will propose, in a plan due to the U.S. Environmental Protection Agency in October, that most of the sewer overflow work be delayed. Instead, the HRSD would use the funds now planned for sewer repairs to turn wastewater into drinking water and inject it back into the aquifer. That, they argue, would slash the HRSD's nitrogen discharges into the James River from 3.4 million pounds annually now, to 500,000 pounds.

Henifin said the HRSD still plans to address some sewer overflow issues — those with the greatest public threat — but the bulk of the improvements would be put off until after 2030 when the SWIFT project is completed.

At about that time, he said, the bonds that were used to finance Bay-related wastewater upgrades a decade ago will begin expiring, freeing up money to complete the sewer overflow

work without major rate increases.

"By rearranging some things, and slowing down the wet weather work, we can actually put [SWIFT] in front without changing that rate projection," Henifin said. "We really believe with the environmental benefits of this project, this is the one to work on first."

Environmental concerns

Environmental groups credit the HRSD for putting forward an innovative proposal that could accelerate the nutrient cleanup of large rivers in the area, as well as the Chesapeake. But they also have some concerns, particularly about whether smaller creeks and other local waters would share in the broader benefits.

Because some sewer overflow work would be delayed, environmental groups would like more details about how fixes would be prioritized, and how long it would take before the upgrades are completed.

Likewise, they want to keep an eye on the technologies being used for SWIFT, as well as the safeguards that the sanitation district is planning — including trying to anticipate issues, such as new contaminants, that may not be evident for years.

"It is new, and there are just a lot of questions that go along with that," said Jamie Brunkow, the Lower James Riverkeeper. "Our job is to be a voice for the river so we try to keep an eye on any potential impacts that could come forward in the future."

The biggest question that he and others have is what will become of the pollution reduction "credits" that will be generated if the sanitation district slashes its nutrient discharges far below what's required — nearly eliminating them in many places.

The HRSD would like to see some of those credits used to reduce the burden on local governments in the area of meeting stringent stormwater pollution reduction requirements set in the Chesapeake Bay Total Maximum Daily Load, or pollution diet, which are to be met by 2025. Although the HRSD is not responsible for stormwater, Henifin said the same ratepayers are paying for both projects and should get some financial relief. By some estimates, Bay-related stormwater improvements could cost communities in the Hampton Roads area about $1.8 billion.

The SWIFT project would make huge nutrient reductions compared with the relatively modest ones to be achieved through stormwater controls. The biggest impact of the project would be in the large tidal rivers, where wastewater discharges would largely come to an end.

Smaller creeks, though, tend to benefit more from stormwater upgrades, environmentalists contend. "There are a lot of people who fish boat and swim in those areas, and stormwater is really their biggest concern," Brunkow said. "It is not the wastewater."

Sanner, of the CBF, said local officials have indicated stormwater work would continue, albeit at a slower pace, but "we'd like to see that spelled out."

Only a handful of credits would be needed to offset stormwater improvements, though. Another looming concern for environmentalists is what would happen with the potentially millions of pounds of nutrient credits that would remain.

Virginia has regulations that restrict how such trades could take place, and typically, trading is supposed to occur in areas near where reductions are made. But environmentalists worry the surplus credits will create a temptation to allow increased nutrient discharges in more distant places — perhaps even other river basins — than is currently allowed.

"We need to be aware of that possibility," Sanner said. She suggested that a portion of the credits should be "retired" and not used at all.

Long-term implications

Russ Baxter, Virginia deputy secretary of natural resources for the Chesapeake Bay, acknowledged that the proposal, if it goes ahead, will create issues "and we're going to have to work through those."

But he is hopeful that the project will help spur innovations by other treatment plant operators. The HRSD is the largest wastewater entity in the state and is better situated to undertake a unique project — which requires a lot of experimentation and monitoring — than most others. "But there may be things that are learned or technologies that are used in this that will help other, smaller plants examine different ways of water reuse," Baxter said.

He credited the HRSD for "going out on a limb" with a proposal that deals with multiple regional problems when all it had to do was address a sewer overflow problem. Most importantly, he said, the sanitation district is tackling one of the biggest issues facing the region — how nutrient reductions would be maintained after the 2025 Bay cleanup deadline, even as the region continues to grow.

"They're not thinking about tomorrow. They are thinking about serving a growing area over the long term, and how they are going to do that while protecting water quality," Baxter said. "So, I give them a lot of credit, because that is the way we have to think now.

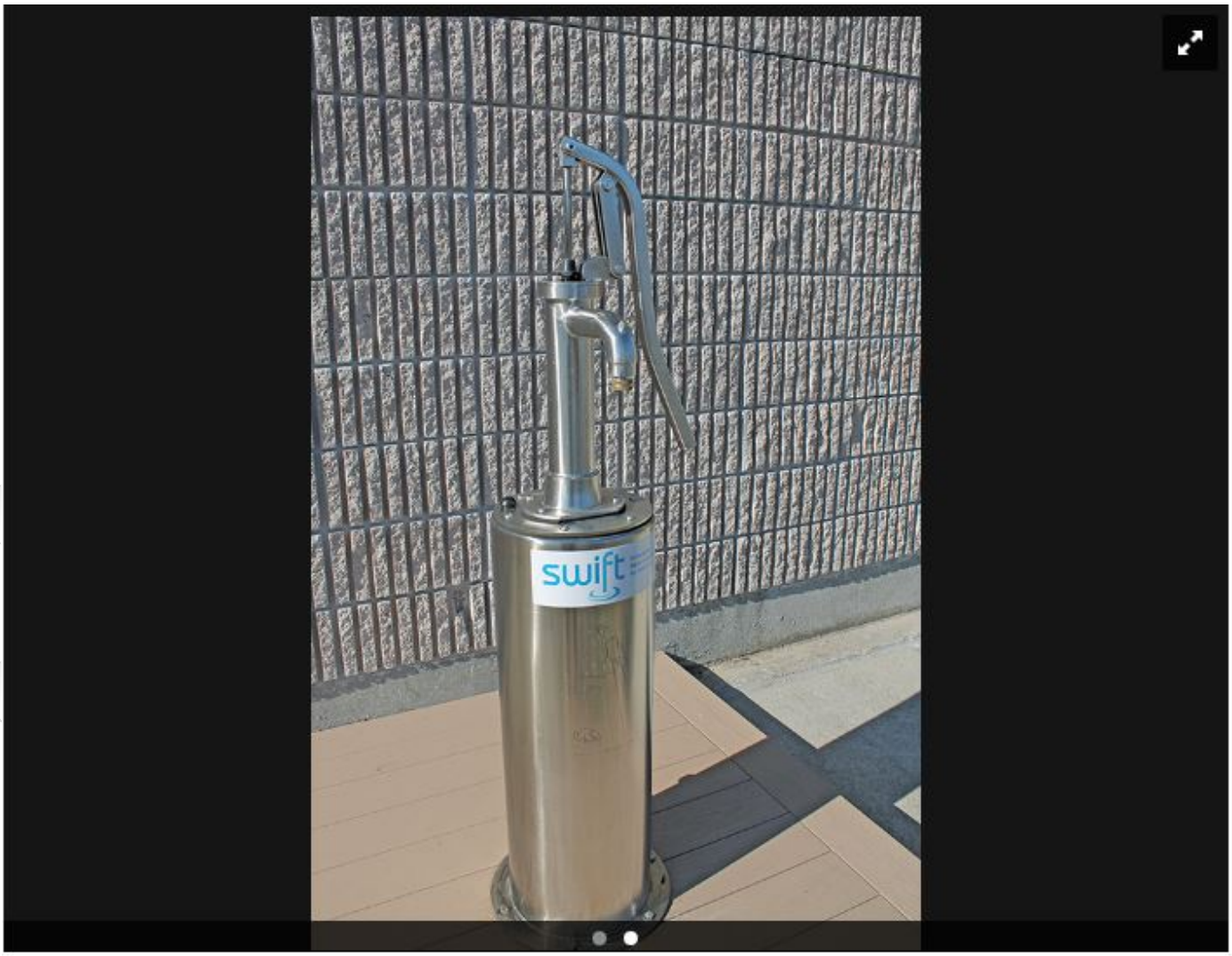
"All of this doesn't stop in 2025. It keeps going on and on."

Category: Conservation + Land Use Pollution

About Karl Blankenship

Karl Blankenship is editor of the Bay Journal and executive director of Chesapeake Media Service. He has served as editor of the Bay Journal since its inception in 1991. Send Karl an e-mail.

Read more articles by Karl Blankenship



The pump outside the York River Treatment Plant dispenses drinking water that was partly sewage just a day earlier. (Karl Blankenship)

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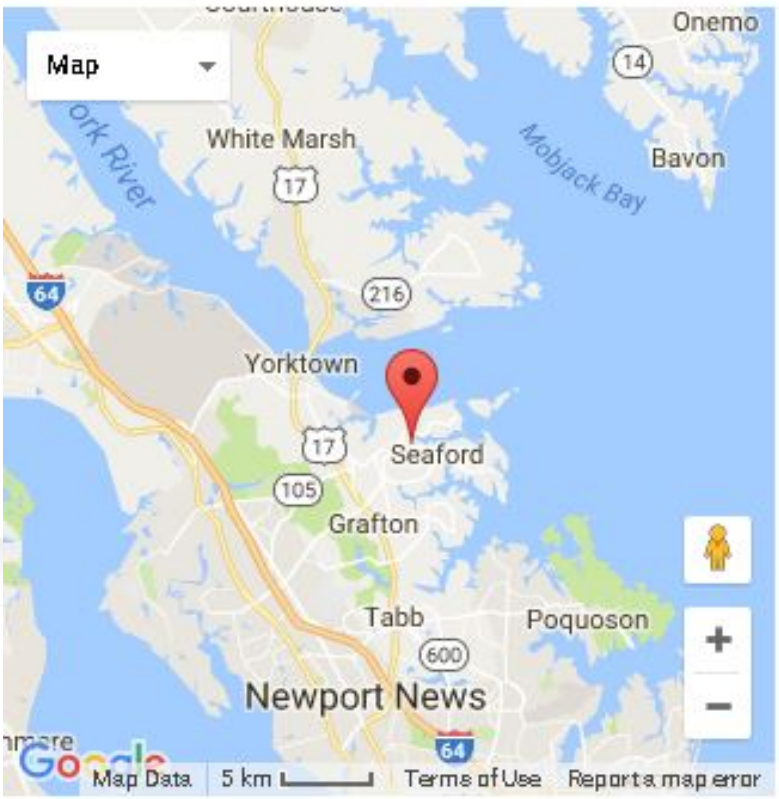

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SUNDAY, MARCH 19, 2017

STATE BUDGET WRITER ALSO W&M'S BEST-PAID ADJUNCT

$60,000

Annual pay for state Sen. Thomas K. "Tommy" Norment at the College of William and Mary.

Among William and Mary adjuncts making more than $10,000 per year, the average pay was **$19,300**. In addition, 155 adjuncts at the school make less than $10,000. The median pay for adjuncts at the University of Virginia Law School is about **$6,000**.

Senate Majority Leader Thomas K. "Tommy" Norment is one of the most powerful legislators in the General Assembly. He also teaches courses and advises the president at the College of William and Mary, which is near Norment's district.

By Travis Fain
tfain@dailypress.com

RICHMOND — Senate Majority Leader Thomas K. "Tommy" Norment is the highest paid adjunct professor at the College of William and Mary by a wide margin.

An attorney who has been in the Virginia Senate since 1992, Norment also makes more than double what any adjunct professor at the University of Virginia School of Law is paid, pulling in $60,000 a year in a field that typically pays less than $10,000.

He makes more than judges who moonlight as professors, more than William and Mary adjuncts who manage campus legal assistance clinics and more than a long list of part-time professors outside the law school who have distinguished resumes in their fields.

The reason, according to the school: Norment's work load, his experience and his dealings with College President Taylor Reveley, whom the powerful legislative leader and co-chairman of the Senate's budget committee advises on university matters.

"It won't be apples to apples to compare an adjunct professor with Sen. Norment," William and Mary spokesman Brian Whitson said.

The Daily Press did so anyway following a debate during this past legislative session as to whether Norment's dual role as a public university professor and

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CONFLICT QUESTION: Norment's dual role was called into question by state Sen. Chap Petersen, D-Fairfax, who was upset that his bill to limit the number of out-of-state students at Virginia universities died in one of Norment's committees. Norment also sponsors spending measures for William and Mary. Norment has cited an opinion from former state Attorney General Bob McDonnell that his position doesn't present a conflict. William and Mary says it also sees no conflict.

VA CHOICE PROGRAM ADDING TO WORKLOAD

In Hampton, more manpower needed to process referrals

By Hugh Lessig
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Three years ago, Congress authorized $10 billion to provide a community-based shortcut for veterans seeking health care.

Since then, the Hampton VA Medical Center has more than doubled its staff to keep pace with the program. Yet recent government reports indicate the shortcuts aren't happening as intended across the VA system regionally or nationally.

With the program set to expire in August and a new administration in charge, the future of Veterans Choice remains unsettled.

Under Veterans Choice, patients who wait more than 30 days for an appointment at a VA health provider can be referred elsewhere for care. The same goes for veterans who live more than 40 miles driving distance from the nearest VA health center with a full-time doctor.

See **CHOICE/Page 8**

WATER PLAN A WIN-WIN?

AILEEN DEVLIN/DAILY PRESS

Water flows through a pipe off West Lewis Road in Hampton on Tuesday. Local governments could get a break on the cost of improvements to drainage and stormwater systems under an HRSD plan.

Pumping treated wastewater into aquifer to boost groundwater could also cut stormwater project fees

By Dave Ress
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HAMPTON — The Hampton Roads Sanitation District says it has a deal for the region: a plan to stop discharging treated wastewater into the Chesapeake Bay that could save property owners hundreds of millions of dollars in fees for drainage and stormwater projects.

The idea is already set to give Hampton property owners a financial break next year, even though the regional authority doesn't expect its plan — which calls for pumping highly treated wastewater into the area's main groundwater aquifer — to be fully ramped up before 2025.

Instead of the 13 percent hike in stormwater fees Hampton had been bracing for next year,

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INSIDE

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Lights from the Abbington at Hampton Center Apartments reflect over water in a drainage ditch that leads into the Lynnhaven Lake in Hampton.

WATER

Continued from 1

to be followed by a 12.5 percent increase for fiscal year 2020, the city now plans to hold steady at $7.83 a month for residential property for the next few years, city water resources engineer Brian Lewis said.

What makes it possible is a new offer from HRSD to let localities use credits it expects to earn for reducing discharges of pollutants into the area's waterways. It will extend the offer to 10 other Hampton Roads cities and counties in months to come, HRSD general manager Ted Henifin said.

"It should end up saving the community money," he said.

The money

Here's how it's supposed to work:

HRSD estimates the cost of the equipment to treat wastewater to drinking water standards will run about $1 billion by 2025. Henifin thinks he can fit that into the authority's current $4 billion, multidecade construction plan with current and already-planned rates by pushing back some projects. He thinks federal and state regulators will agree to the juggling of project timing.

By slashing HRSD emissions, Henifin hopes to clear the way to give local governments a break on the roughly $1.8 billion cost of improving their drainage and stormwater management facilities to hit tough water quality standards set by federal and state regulators. Hampton's bill will likely be in the $100 million to $200 million range to hit its 10 year deadline to cut nitrogen discharges by 5.6 tons a year, phosphorus by 1.2 tons and sediment by 494 tons.

Those standards apply to HRSD and the localities alike, but existing environmental law allows all of them to trade credits earned by reducing pollutants. The arrangement is similar to the cap and trade system President Ronald Reagan's administration used to phase out leaded gasoline, and that many environmentalists suggest as a way to cut greenhouse gas emissions.

The trade-off, using credits already in hand and credits to come when the aquifer injection is underway, could allow localities to adjust the timing of their own stormwater projects, and possibly to accelerate flood control efforts, Henifin said. It could also allow localities to shift their focus from retro-fitting existing facilities to new water quality initiatives, he said.

In Hampton, Lewis isn't planning any major changes for next year. The city's current plans call for it to finish a nearly $1.7 million project along Indian River creek and the Pochin Place area, a $365,000 project at Air Power Park and a $700,000 project involving new ditches, storm drains and other facilities in the Winchester Drive area. It also plans to create new wetlands northeast of the intersection of Buckroe Avenue and Ralph Street and at Thomas Eaton Middle School to absorb stormwater.

But recommending a fee level for stormwater management — and in this case, deciding no increase is needed after all — means looking many, many years into the future. Doing that, Lewis feels comfortable that the HRSD aquifer project will allow savings on stormwater projects down the pike.

The needs

Henifin says his proposal addresses two critical water resources needs.

The first is flows of water carrying heavy loads of dirt, nitrogen and phosphorus.

Rain running off of lawns fertilized with nitrogen and phosphorus into storm drains and onto city streets, and from there into area waterways can carry huge amounts of all three, as well as such toxic chemicals as the drippings of oil, brake and transmission fluids that cars and trucks leave behind them.

And the phosphorus in detergents and nitrogen from human waste that flow into the region's sewers and then to HRSD's treatment plants, like the runoff from city streets and drains, could feed algae if those chemicals reach the bay. The algae in turn deprive oysters, crabs and fish of the oxygen they need to live. On top of that, dirt washing into the bay blocks sunlight from reaching the plants that shellfish and fin fish eat.

The second issue is the rapidly dropping level of groundwater in the Potomac aquifer.

It's the only source of drinking water for some 21,000 homes and businesses in James City County; it is where Smithfield gets its water, as do tens of thousands of Hampton Roads residents and businesses with private wells.

The aquifer supplies the giant WestRock paper mill in West Point.

It's what the rest of the Peninsula relies on for water in times of drought. And groundwater levels have dropped 200 feet or more over the past century. If they fall much farther — the critical point is a layer of clay that lies about 300 feet below the Peninsula — wells in the region could start running dry.

HRSD's plan to inject about 100 million gallons a day of purified wastewater into the ground by 2025 is roughly the same amount the region is now taking out. That should keep water levels from dropping further. At the same time, it means 100 million fewer gallons a day of wastewater, not currently purified to drinking water standards as Henifin proposes doing, won't carry anything into the bay at all.

"We're watching this very closely," said Bill Hayden, spokesman for the state Department of Environmental Quality. "It has a lot of possibilities."

The complications

In Newport News, director of engineering Everett Skipper is looking forward to a detailed briefing from Henifin.

In addition to the fees city residents pay for stormwater drainage works — which have been rising slowly for the past six years and currently stand at $11.25 a month for homeowners — the $1 billion HRSD would need to spend comes from the fees it charges property owners, he said.

Whether and how potential savings on the one side from future credits HRSD can provide the city balance any increases in HRSD fees is one question Skipper wants to look at.

Another big question is about projects HRSD might schedule after the aquifer injection project, he said.

The authority and the localities it serves are under an order from the U.S. Environmental Protection Agency to deal with overflows from sanitary sewers into storm drains and area waterways during wet weather. HRSD said it would take on projects to address that order.

But if those are delayed, it's not clear whether cities would have to re-assume those costs, Skipper said. And if that happens, fees for sewer service might have to rise.

"We don't disagree that there's likely to be a net overall savings to the region, but we need to figure out how all the pieces fit together," he said.

Ress can be reached by phone at 757-247-4535.

Project to remedy falling ground levels

Published 9:20 pm Saturday, March 18, 2017

By Alex Perry
email

An ongoing regional project starting in North Suffolk aims to remedy decades of sinking ground levels.

Project SWIFT — Sustainable Water Initiative for Tomorrow — is a $1 billion effort by the Hampton Roads Sanitation District to inject treated wastewater into the Potomac aquifer at treatment plants across Hampton Roads. The goals are to reverse the compaction of the aquifer and reduce harmful discharge into the Chesapeake Bay.

A $25-million research center is set to break ground at the end of March at the Nansemond Treatment Plant. The 27,000-square-foot demonstration facility will treat one million gallons of water per day upon completion in January 2018.

HRSD general manager Ted Henifin said this research center will collect data throughout the year for procedural improvements.

“It will identify ways to reduce cost and improve operations and modify treatment processes, referring to the research center demonstration project,” he said.

The center will be developed into a full-scale facility for another $150 million. The remaining budget will be spent to build six other facilities at water treatment plants across Norfolk, Williamsburg and York County by 2030.

Scientists compare subsidence changes — sinking ground levels — when calculating relative sea level rises in the region. A 2003 scientific journal paper showed rates of aquifer compaction, or subsidence, were 1.5 millimeters annually in Franklin and 3.7 millimeters annually in Suffolk.

“Some of the highest rates of sea level rise along the East Coast are in Hampton Roads,” U.S. Geological Survey groundwater specialist David Nelms said. “Those rates you see are twice what you see for the global average.”

A 2,000 foot hole at the Nansemond water treatment plant holds an extensometer that measures ground movement. Five wells at the extensometer site will be equipped with instrumentation to measure pressure in the Potomac aquifer. A well at the facility will inject 1 million gallons of water into the aquifer daily.

Nelms said the goal is to remedy “cones of depression” throughout the coastal plains.

“It’s healing the impact of pumpage since the 1930s,” he said. “Most of that water that’s been pumped out never gets back to that aquifer. This will be like a healing process.”

Nansemond plant water is treated for harmful agents such as sediment, phosphorus and nitrogen. Injecting this water eases the amount discharged into the Chesapeake Bay.

“A big part of this plan is to minimize what they would be discharging to the bay,” Nelms said.

He said that the Potomac aquifer has been compacting at a rate of 3 to 4 millimeters per year, and that these slight changes over a long time add up.

“It’ll be interesting to see what kind of rates we get as the ground comes back up,” he said.

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HRSD introduces two projects

Published 10:04 pm Friday, March 31, 2017

Ground was broken and a ribbon was cut Friday morning on two projects in Suffolk that will help provide more natural resources for future generations.

The Hampton Roads Sanitation District broke ground on a $25 million research center as part of an initiative called SWIFT: Sustainable Water Initiative For Tomorrow.

“SWIFT is about taking used water that is wasted today and turning it into a valuable resource,” said Ted Henifin, general manager of HRSD.

The initiative aims to take wastewater that currently is discharged into the Chesapeake Bay and instead treat it to drinking water standards and inject it into the aquifer, helping to raise the groundwater level.

“This really is a game-changer for Virginia,” Gov. Terry McAuliffe told those assembled near the Nansemond Water Treatment Plant in North Suffolk on Friday morning. “We always have to balance economic growth with protecting the environment, and you can do that.”

McAuliffe said the project will help economic development.

“I can’t bring more businesses in here that need access to water at the present time, because the aquifer is so depleted,” he said. With more resources in the aquifer, more businesses will be able to use it.

Henifin said the water will be treated with UV disinfection as well as a trace amount of chlorine, in addition to how it’s already treated.

The project will aid localities, because HRSD will dramatically reduce the amount of sediment, nitrogen and phosphorus it discharges into the bay. That will allow localities to avoid costly retrofits, because they will no longer have to reduce their discharge of nutrients, allowing them to redirect that money to other priorities.

Henifin said the Southeastern Public Service Authority will be affected, because eventually it will no longer be able to deliver leachate from the landfill to HRSD for treatment.

“At some point in the future, SPSA won’t be able to send us” untreated leachate, Henifin said. That means SPSA will have to treat the trash juice itself before delivering it to HRSD, or take it somewhere else. SPSA currently has an excess of leachate at the landfill and is seeking options on what to do with it.

The SWIFT research center will be paid for with the rate-payers of HRSD, Henifin said. Rates aren’t expected to go up more than they already were.

The other project, a $1.35 million extensometer, is being funded through the General Assembly budget. It is expected to provide data on ground sinking in Virginia.

"This device will aid Suffolk and the region in our planning for the sea level rise we all know is coming," Mayor Linda T. Johnson said at Friday's event.

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HRSD project could be a jobs-making machine, McAuliffe says

By Dave Mayfield
The Virginian-Pilot
Mar 31, 2017

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Woman taking clear water at a lake by hands

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SUFFOLK

The Hampton Roads Sanitation District's proposal to pump treated wastewater into the main aquifer beneath coastal Virginia has the potential to be a "game-changer" for economic development in the state, Gov. Terry McAuliffe said Friday.

McAuliffe spoke at the ceremonial groundbreaking for a $25 million research center associated with HRSD's Sustainable Water Initiative for Tomorrow. The center, at HRSD's Nansemond plant in northern Suffolk, will help with a demonstration at the facility early next year in which 1 million gallons a day is to be injected deep below the surface.

If it works as envisioned, HRSD plans to roll out the SWIFT program to five other plants over the next decade. Eventually, it would mean that 120 million gallons a day of wastewater that's now treated and discharged into rivers would go through a series of extra treatment steps to make it clean enough to drink. Then it would be pumped into the Potomac aquifer. The total project cost is estimated at $1 billion.

HRSD and its backers have focused a lot on the SWIFT project's potential for reducing pollution of the Chesapeake Bay. They've also pointed to models showing that rehydrating the aquifer should slow subsidence, or sinking of the land – a problem that's added to Hampton Roads' vulnerability to sea level rise.

Less talked about has been the potential for job creation. That's what McAuliffe focused on Friday.

The Potomac aquifer – the main underground freshwater source in the mid-Atlantic – has been under increasing stress in recent decades. Heavy withdrawals, particularly by paper companies and some other industrial users, have caused its layers to compact.

McAuliffe said that when he met early on in his term with David Paylor, director of the Department of Environmental Quality, "I asked him: 'What keeps you up at night?' "

Paylor's reply, McAuliffe said: "Our aquifer. He said, 'I'm terrified what's happening with the aquifer.' "

Virginia environmental regulators have told some big aquifer users to plan on reductions in their permitted withdrawals. And new companies with any interest in significantly tapping underground sources are out of luck.

"We really don't have that water today," the governor said.

In has stepped HRSD with models indicating that pressure levels within the aquifer would increase across hundreds of miles if its injection plan is carried out.

That's in spite of the fact that HRSD's input of 120 million gallons a day at the SWIFT project's full operation would be less, still, than what's coming out of the aquifer – currently, about 150 million gallons a day, according to state officials' estimates, with about 100 million of that under permits issued to large users.

"We are actually going to be putting drinking water back. It will rehydrate our aquifer, which will allow us to do more economic development," McAuliffe said.

In an interview after the event, the governor said, "I have a major project I'm looking at right now in this region, and water's a big part of it." He didn't identify the prospect or say whether he has mentioned the SWIFT project to the company.

Also on Friday, HRSD formally signed a pollution credit exchange agreement with the city of Hampton that was prompted by the SWIFT project. Under the agreement, HRSD committed to give the city enough credit to help Hampton meet its obligations for stormwater pollution reductions under the Chesapeake Bay cleanup.

HRSD stands to earn a massive amount of pollution credits if the SWIFT project goes through because it would all but stop discharging treated, but still polluted, water into the bay and its tributaries. Localities across Hampton Roads have lined up behind Hampton to take advantage of HRSD's offer to give away the credits for nitrogen, phosphorus and sediment pollution. Combined, it's been estimated, the credits could save them more than $1 billion in stormwater system upgrades.

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Dave Mayfield
Reporter

Dave Mayfield writes about the environment for The Virginian-Pilot.

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ADAPTATION

Can sewage save sinking coastal Va.?

Kavya Balaraman, E&E News reporter

Published: Thursday, July 6, 2017

The site of the Sustainable Water Initiative for Tomorrow project near Norfolk, Va. The contraption is designed to address subsidence by injecting treated wastewater into the ground. Kavya Balaraman/E&E News

SUFFOLK, Va. — People here in coastal Virginia are beginning to see changes: Tides are a little higher, storms bring water into the streets and basements sometimes flood.

In Fort Norfolk, where charming houses and pristine gardens edge the Hague — a horseshoe-shaped inlet of water that dips in from the Elizabeth River — nuisance flooding has become more common. Norfolk is part of a larger region called Hampton Roads, where storms are starting to bring the ocean inland. Last month, a gale swept water into the streets of Virginia Beach, cutting off road access to the narrow strip of land on which the community of Sandbridge is located.

Residents aren't necessarily talking about climate change, said David Nelms, with the U.S. Geological Survey's Virginia Water Science Center. But they are definitely noticing something.

"It doesn't matter what's causing it," Nelms said, "because people are getting their feet wet."

Rising sea levels aren't the only reason Virginia's southern coast is being frequently flooded. The region is also slowly sinking into the ocean, thanks to a phenomenon called "subsidence." Every year, scientists estimate, the southern portion of the Chesapeake Bay sinks very slightly, by anything between 1 and 5 millimeters. This slow sinking of the earth has been documented in other parts of the country, including Houston-Galveston, Texas, and Santa Clara Valley, Calif.

But in eastern Virginia, it's coupled with the fact that sea levels are creeping higher every year.

"In California, they had feet of subsidence. We've only had inches. But inches in a tidal area becomes kind of critical," said Nelms.

All over the country, subsidence is generally caused by human activity. Virginia's eastern shoreline is no different; scientists have linked the loss of elevation to groundwater usage.

Now, a group of officials with the Hampton Roads Sanitation District (HRSD) and USGS are experimenting with an ambitious plan to fix that: pumping treated sewage into the ground.

Flooded roads and basements

The earth stretching between Interstate 95 and the coast is composed mostly of sand and silt. When too much water is pulled out, the layers compress against each other and the ground drops.

It's a bit like letting air out of a balloon, said Jack Eggleston, a USGS hydrologist.

"When the pressure goes down, the surface sinks," he explained.

Unlike Houston-Galveston and Santa Clara Valley, which saw elevation drops of up to 3 meters, southern Virginia is sinking more slowly. But it's also a flat, coastal region that's simultaneously dealing with some of the most rapid sea-level rise in the country.

A 2013 report from USGS suggests that by the end of the century, up to 176,000 people living in the southern Chesapeake Bay area could be "permanently inundated or regularly flooded." Economic damage could amount to $26 billion.

Areas fringing the coast will face the direst threats, but those farther inland — like Franklin and Southampton — can experience flooding as well if they're close enough to a body of water.

"Scientists first realized that it has to do with groundwater in the 1970s," explained Eggleston.

"And some efforts were made to directly measure the sinking in the 1980s and early '90s," he added. "But I think more attention has been paid to it in the last 10 years because water levels are rising."

Rising waters have led to more frequent flooding on the roads and in basements in the last decade, said Nelms. He recalls a recent event he attended with a group of researchers who were looking at how more frequent flooding could affect local real estate. He told them that going by the statistics he had seen, it's fair to assume that everyone in the neighborhood knew one person who would be affected by sea-level rise in their lifetime.

"This lady in the back raised her hand and said, 'I am already,'" he recalled. "It's become really noticeable in the last 10 years."

An ambitious solution

HRSD's new project, sited just miles from the Atlantic coastline, is based on an ambitious plan to reverse the effects of subsidence. Next year, it will start a pilot to inject treated wastewater into collapsing ground layers. Officials hope to eventually use it along the state's entire coastline.

The initiative includes a research facility, currently under construction, as well as an injection well and a piece of equipment called an extensometer. On the surface, the contraption looks like some piping. But those pipes extend deep into the earth, planted firmly in the bedrock. Scientists use it to measure any movement in the land's elevation, up or down.

The idea for the project, said Nelms, was born from an older extensometer in the area. USGS had set up the equipment in the 1980s but eventually abandoned it due to funding issues. Twenty years later, when scientists came back to the spot, they found that the extensometer had registered a slight elevation in the land, and they quickly associated it with the closure of a nearby paper mill, which had been one of the largest withdrawers of groundwater in the area.

As the Virginia Department of Environmental Quality grew more concerned about groundwater withdrawals, HRSD officials had an idea. Simply reducing permits and preventing people from accessing groundwater could isolate eastern Virginia from an economic standpoint, reasoned HRSD General Manager Ted Henifin. Instead, he began to look into adding to the water table.

To do so, the project will involve treating wastewater and then pumping it into the ground, instead of releasing it into the Elizabeth, James or York rivers. The water will help boost the Potomac Aquifer, preventing the land from compacting into itself and sinking. The facility includes an under-construction research center due to open next April. It will have the capacity to treat a million gallons of water every day, said Leila Rice, director of communications with the HRSD.

That water will then be pumped into the ground using a nearby injection well. Scientists will use the extensometer to monitor progress.

"We've done a lot of study work to get to this point," said Henifin. "We've piloted the treatment process and proved that we can make drinking-quality water through it."

The next step, he added, is getting the research facility built and putting the water into the ground, so scientists can start gathering data to understand how it affects the landscape.

Henifin hopes they will expand the project to full scale by 2020 and, in the following decade, put 100 million gallons of water in the ground every day. Modeling indicates that if they do so for the next 50 years, previous and current sinking will reverse — even if groundwater continues to be used at the same rate.

But the researchers are being cautious. A similar project in Norfolk failed a few years ago because the water being injected into the ground didn't match the chemistry of the aquifer itself. Instead, components in the water began to react and precipitate a material that plugged the streams. Based on that experience, said Nelms, the scientists are figuring out how to match the chemistry of the treated water with that in the aquifer.

"It isn't simple, but water levels pretty much throughout the coastal plain have been dropping for years," said Eggleston. "And if those water levels can recover, it's likely the land surface will stop sinking."

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HRSD program will save Newport News money, but it's already spent

By **Reema Amin**
ramin@dailypress.com

JULY 15, 2017, 6:12 PM | NEWPORT NEWS

Newport News joined Hampton, Poquoson and Norfolk in supporting a Hampton Roads Sanitation District program that would pump highly treated wastewater back into the aquifer, expecting to collectively save area cities and counties up to $2 billion.

But Newport News expects to break even as it works on pipe improvements that HRSD will put on hold until 2030, which means utility bills for Newport News residents won't go down.

Everett Skipper, Newport News' director of engineering, says Newport News is expected to need $55 million long term — the same amount that HRSD's new program could save — to do some critical work that HRSD will pick back up in the 2030s. And that's reduced from an original $120 million.

"We still have that (management) responsibility to maintain and be good stewards of the sewer systems, and by delaying and pushing out the work that HRSD was going to do under the Wet Weather Management Plan and the rehabilitation plan, we may need to do more work sooner."

Sustainable Water Initiative for Tomorrow, or SWIFT, is a program that will purify already-treated wastewater to drinking-water quality. The water will then be injected into the Potomac aquifer, which is where a majority of local groundwater comes from. Right now, water is pumped, treated and sent back into the waterways.

The program is expected to reduce or reverse ground subsidence — when land loses pressure — and reduce the impact of sea level rise. And that's where HRSD expects the billions in savings for localities to play in.

The Environmental Protection Agency requires localities to reduce the amount of pollutants in their waters and expects them to earn Total Maximum Daily Load credits, or TMDL credits, as it does the necessary work. That improvement work costs money.

But HRSD expects its SWIFT program to get those credits. That would save Newport News $55 million, officials have said.

"It's to improve water quality and remove so many pounds of nutrients at each location," Skipper said of the TMDL credits. "So we would have to go to multiple, multiple locations and do smaller projects to generate the total credits that we have to have. In this case, HRSD is suggesting that the total credits generated by SWIFT will more than offset that."

The memorandum of agreement that Newport News signed shows that the state has conceptually agreed to this, Skipper said.

But implementing SWIFT means that HRSD's previous plan to reduce stormwater from getting into the wastewater system — set in a memorandum of agreement with the region in 2015 — must be pushed back to the 2030s, Skipper said.

In a rehabilitation study from 2015, the city found that it would need about $120 million to do all the necessary work. The engineering department whittled that cost down to $55 million — the same amount of savings that HRSD projected for Newport News with SWIFT.

So instead of doing the full work, Newport News will work on the worst parts for now, Skipper said. But, he said, of the rehab plan: "None of this ever stays the same for a real long time. We're often shooting bullets at moving targets."

Ted Henifin, HRSD's general manager, said most localities have the capital built into wastewater fees to do the work they want. Newport News is "pretty unique" in having a plan to address some of its issues before HRSD steps in after 2030; he hasn't heard of a similar plan from most of the other cities.

"All we're planning to do is tighten those up from allowing stormwater from leaking into the sewer system. Typically, there's no urgency in that," Henifin said.

Utility bills will go up each year, said City Manager Cindy Rohlf. But that's at a rate that's already expected since the SWIFT program's savings will be offset by the work Newport News plans to do.

HRSD will increase its rates by 9 percent annually from 2018 through 2023, according to Skipper. Stormwater bills will probably drop back to an expected 3 percent rise in bills over the next five years, while wastewater will be closer to a 5 percent annual increase, he said.

Amin can be reached by phone at 757-247-4890.

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DEQ requests public input on Chickahominy River water withdrawal

James City County wants to take water out of the Chickahominy River at the Chickahominy Riverfront Park. The intake would be about 500 feet south of where Gordon Creek meets the Chickahominey River. The treatment plan would be at the eastern end of the park near the W&M Tack Family Boathouse. The campground water front along the Chickahominy River with the mouth of Gorden's Creek.(Bottom right.. the area where the intake would be built). (Joe Fudge / Daily Press)

By **Troy Jefferson**
Tjefferson@vagazette.com

JULY 19, 2017 | JAMES CITY COUNTY

The James City Service Authority is seeking input on an application to withdraw nearly 17 million gallons per day from the Chickahominy River.

The authority is applying for a permit from the Department of Environmental Quality, which regulates how much water can be removed from surface and subterranean water sources.

James City County Administrator Bryan Hill said the county is trying to pursue options to ensure a sustainable long-term water supply for the county's residents. The county is facing a pair of factors in its search.

In 2032, the county's existing DEQ ground water permit will expire. The state has said it wants to cut back on service authorities and localities that draw water from a regional aquifer that has suffered a steady century long-decline because human consumption has outpaced regeneration.

County officials believe the Chickahominy River could be a solution.

If approved, the permit will allow the authority pull water from the southeast bank of the Chickahominy River and on the northwest peninsula of Chickahominy Riverfront Park.

Riverfront Park is close to an existing water pumping infrastructure, which would simplify building a water treatment plant and save money.

"We're aligning ourselves to ensure James City County can make the most logical choice on how to move forward with our water in the year 2032," Hill said.

Hill said the county is also pursuing plans with the Hampton Roads Sanitation District and the latter organization's Sustainable Water Initiative For Tomorrow (SWIFT) program.

HRSD plans to take already highly treated wastewater that would otherwise be discharged into the Elizabeth, James or York rivers and purify it through additional rounds of advanced water treatment to produce drinking-quality water, according to SWIFT's website. The water would be treated to match the existing groundwater standards and added to the aquifer, the primary source of groundwater throughout eastern Virginia.

HRSD expects the earliest approvals for state and federal regulators for SWIFT are late 2018 or early 2019. The project is also expected to cost $1 billion that would be bore regionally by HRSD rate payers.

County board of supervisors chairman Kevin Onizuk said he still doesn't know all the particulars of the Chickahominy proposal but said the need for a county long-term water supply is paramount.

"As a board of supervisors we've been looking at all sources of water ... our team has been working very diligently to find affordable options that would possibly avoid the need for the Chickahominy," Onizuk said.

James City Service Authority currently draws about 5.3 million gallons a day from its wells. The county expects the current extraction to increase with projected population increase in the coming years.

"Water is predicated on growth. We're slated to double our population by 2050," Hill said.

In February, the county successfully negotiated a withdrawal permit with the DEQ allowing it to draw up to 8.4 million gallons a day from its wells through 2027.

Hill said the county will still need approval from the Virginia Marine Resources Commission and the Army Corp of Engineers to pull water from the Chickahominy River.

Jefferson can be reached by phone at 757-790-9313.

Provide feedback

Call or email the Department of Environmental Quality at matthew.link@deq.virginia.gov or at 804-698-4078. The public can request copies of the permit from DEQ representative Matthew Link.

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Bay Journal

Hampton Roads treating wastewater till it's good enough to return to aquifer

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Karl Blankenship | July 31, 2017

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A pilot project at the York River Treatment Plant tested different technologies to turn wastewater into drinking water. (Karl Blankenship)

Little more than a day earlier, the water pouring from a tap outside the York River Treatment Plant had been wastewater: sewage flushed down toilets, soapy water drained from bathtubs, food waste washed down the sink and industrial waste piped into sewer lines.

Now, the water from the silver spigot was crystal clear, filling a clean glass that said "SWIFT" on its side.

And it tasted like water from a well.

The water was good enough to drink — maybe too good, according to officials from the Hampton Roads Sanitation District, which operates the York River plant and a dozen others in southeastern Virginia. Instead of just treating wastewater and discharging it into the river as they've done for decades, district officials say they've now produced a valuable resource that can solve multiple problems facing the region.

"We don't have to waste the water," said Jamie Heisig-Mitchell, chief of technical services. "We can actually use it for something that benefits the state."

Their work may redefine what is doable at the region's wastewater treatment plants. They now propose taking treated wastewater from seven of its nine largest facilities and treating it again to meet drinking water standards.

Then, they want to pump the double-treated water into a deep aquifer underlying the region. That would help rebuild eastern Virginia's depleted water supply, they said, as well as reduce the rapid rate of sea level rise in the Hampton Roads area. It would also slash nutrient discharges far beyond what the district must do to meet Bay cleanup goals. This is especially true in large tidal rivers, where wastewater discharges would largely come to an end.

They call it SWIFT: the Sustainable Water Initiative for Tomorrow.

Supporters say the $1 billion project could provide all of those benefits without increasing costs for the district's ratepayers beyond what's currently projected — if the district is allowed to postpone some needed fixes to address sewer overflows.

The project represents a huge change in thinking for the regional agency which, since its creation in the 1940s, has focused simply on treating wastewater and discharging it into the river.

"We spend our lives trying to improve the environment, but we still pollute," said general manager Ted Henifin. "We put out water that is highly treated and meets the needs of the receiving water body, but we don't feel great at the end of the day. We are going to feel wonderful if we can pull this off."

Local governments in the Hampton Roads area are on board with SWIFT because they face nearly $2 billion in stormwater upgrades to meet Bay goals, and SWIFT could substantially reduce those costs. State officials credit the sanitation district for the kind of innovative thinking they say is

needed to not only help meet Bay cleanup goals, but to maintain reduced nutrient levels into the future.

Environmental groups agree the concept has merit, though they want to see more details. They are concerned that, while the project helps the region's big rivers and the Bay, it could delay improvements to local streams that reduce stormwater runoff. "There are a lot of people who fish boat and swim in those areas, and stormwater is really their biggest concern," said Jamie Brunkow, the Lower James Riverkeeper. "It is not the wastewater."

Nonetheless, the vision put forward by the sanitation district has injected an air of optimism into environmental discussions at a time when problems facing the Bay are often expensive — and complicated — to fix, said Peggy Sanner, assistant director and senior attorney with the Chesapeake Bay Foundation's Virginia office.

"We all furrow our brows, and we trudge forward," she said. Then, she added, "you go to meetings where SWIFT is discussed, and everybody leaves with a lighter heart."

"People are understandably excited by it, but we can't abandon caution."

A new direction

The sanitation district has never been in the drinking water business. It was created by the state as an independent local agency to clean up sewage problems in southeast Virginia.

Today, it handles wastewater for 1.7 million people. Its 13 plants treat 160 million gallons a day, and serve 18 cities or counties.

The SWIFT project emerged from a long-term planning process.

The district invested $500 million over the previous decade to upgrade its wastewater treatment plants to meet Bay nutrient reduction goals, and more costly requirements are likely in the future. There are growing concerns about emerging contaminants in wastewater discharges, such as pharmaceuticals and personal care products, which can harm aquatic life. And, if other nutrient sources don't meet their Bay cleanup goals, wastewater plants could be on the hook to make up the difference.

Further Bay-related nutrient reduction upgrades alone could cost another $750 million, according to district estimates.

Officials began toying with the idea of incorporating the maximum feasible treatment technology at their plants. "Our thought process was 'let's take our water all the way to drinking water, and maybe the regulators won't do anything more to us,' " Henifin said.

But the process would produce clean drinking water, which is not immediately needed in the Hampton Roads area.

Then, officials hit on the idea of injecting their treated water into the ground. The region sits above the huge Potomac Aquifer, a major water source for much of Eastern Virginia. Commercial and residential wells there pump out an estimated 144 million gallons a day, which far exceeds its recharge rate.

Those withdrawals also contribute to land subsidence in the region. Water levels in the Hampton Roads region are rising at the rate of about 4 millimeters a year — the highest pace in the nation outside New Orleans. About half of that is attributed to rising sea levels, and the other half to sinking land — much of the latter caused by withdrawals from the Potomac Aquifer.

Also, it is a confined aquifer, which means it's largely surrounded by dense layers of rock and clay, so water in the Potomac Aquifer was pressurized — so much so that when wells were first drilled into it, the water came out on its own, without the need for pumps.

That's no longer the case today. And as pressure in the aquifer has been reduced, scientists are worried it could start drawing in salty ocean water, ruining the aquifer as a drinking-water source. The potential lack of a reliable water supply has raised concerns about future economic growth in much of the state east of Interstate 95, which is above the aquifer.

The HRSD plan would pump 120 million gallons a day of treated drinking water into the ground. That — along with natural recharge — would help repressurize the aquifer, prevent saltwater intrusion and maintain it as a viable water source.

"There will be no development in eastern Virginia if we don't have a water source," Henifin said. "So, putting this water into the aquifer really creates a future for eastern Virginia that doesn't exist."

Injecting treated water could also slow the rate of sea level rise in Hampton Roads. The region is already suffering from increasing rates of flooding, and whole city blocks in Norfolk are being elevated for protection. Tidal marshes, which provide valuable habitat for many species, are being lost faster than they can migrate to higher ground.

Injecting water won't end sea level rise, but will reduce the rate by about a quarter, giving localities — and ecosystems — more time to adapt. "No one has put a value on that, but it's huge," Henifin said.

While no other place in the state is doing precisely what the Hampton Roads district plans, other utilities are doing aspects of it. In Northern Virginia, the discharge from an upstream wastewater treatment plant flows into the Occoquan Reservoir, from which the Fairfax County Water Authority

draws and treats drinking water. In the Hampton Roads area, the city of Chesapeake pumps excess treated drinking water into an aquifer, where it is stored until it's needed during dry spells.

Covering the cost

The sanitation district is under a court-approved consent decree requiring it to address overflows of raw, but diluted, waste from its sewer system, which take place during heavy or prolonged rains when the ground is soaked and water infiltrates into the sewer lines.

Those overflows amount to about 5 million gallons annually, a fraction of the 160 million gallons of effluent the district's facilities treat daily. But the HRSD estimates it would cost $2.2 billion to fix.

To make the $1 billion SWIFT project possible, the district will propose, in a plan due to the U.S. Environmental Protection Agency in October, that most of the sewer overflow work be delayed. Instead, the HRSD would use the funds now planned for sewer repairs to turn wastewater into drinking water and inject it back into the aquifer. That, they argue, would slash the HRSD's nitrogen discharges into the James River from 3.4 million pounds annually now, to 500,000 pounds.

Henifin said the HRSD still plans to address some sewer overflow issues — those with the greatest public threat — but the bulk of the improvements would be put off until after 2030 when the SWIFT project is completed.

At about that time, he said, the bonds that were used to finance Bay-related wastewater upgrades a decade ago will begin expiring, freeing up money to complete the sewer overflow work without major rate increases.

"By rearranging some things, and slowing down the wet weather work, we can actually put [SWIFT] in front without changing that rate projection," Henifin said. "We really believe with the environmental benefits of this project, this is the one to work on first."

Impact on cleanup goals, costs

The biggest question that he and others have is what will become of the pollution reduction "credits" that will be generated if the sanitation district slashes its nutrient discharges far below what's required — nearly eliminating them in many places.

The HRSD would like to see some of those credits used to reduce the burden on local governments that are tasked with meeting stringent stormwater pollution reductions set in the Chesapeake Bay Total Maximum Daily Load (TMDL), or pollution diet, which are to be met by 2025.

Although the HRSD is not responsible for stormwater, Henifin said the same ratepayers are paying for both projects and should get some financial relief. By some estimates, Bay-related stormwater improvements could cost communities in the Hampton Roads area about $1.8 billion.

Eric Martin, public works director for the City of Chesapeake, called SWIFT a "game changer" for the region's local governments looking at potentially large rate increases to deal with stormwater. "That all comes out of the bottom line household budget," Martin said. "If we can meet a requirement through the sanitary sewer system charges, then we don't have that pressure to raise the stormwater utility piece."

Sanner, of the CBF, said local officials have indicated stormwater work would continue, albeit at a slower pace, but "we'd like to see that spelled out."

Only a handful of credits would be needed to offset stormwater improvements, though. Another looming concern for environmentalists is what would happen with the potentially millions of pounds of nutrient credits that would remain.

Virginia has regulations that restrict how such trades could take place, and typically, trading is supposed to occur in areas near where reductions are made. But environmentalists worry that the surplus credits will create a temptation to allow increased nutrient discharges in more distant places — perhaps even other river basins — than is currently allowed.

"We need to be aware of that possibility," Sanner said. She suggested that a portion of the credits should be "retired" and not used at all.

Russ Baxter, Virginia deputy secretary of natural resources for the Chesapeake Bay, acknowledged that the proposal, if it goes ahead, will create issues "and we're going to have to work through those."

He praised the sanitation district for tackling one of the biggest issues facing the region — how nutrient reductions would be maintained after the 2025 Bay cleanup deadline, even as the region continues to grow.

"They are thinking about serving a growing area over the long term, and how they are going to do that while protecting water quality," Baxter said. "So, I give them a lot of credit, because that is the way we have to think now."

Category: Local Government

About Karl Blankenship

Karl Blankenship is editor of the Bay Journal and executive director of Chesapeake Media Service. He has served as editor of the Bay Journal since its inception in 1991. Send Karl an e-mail .

Read more articles by Karl Blankenship

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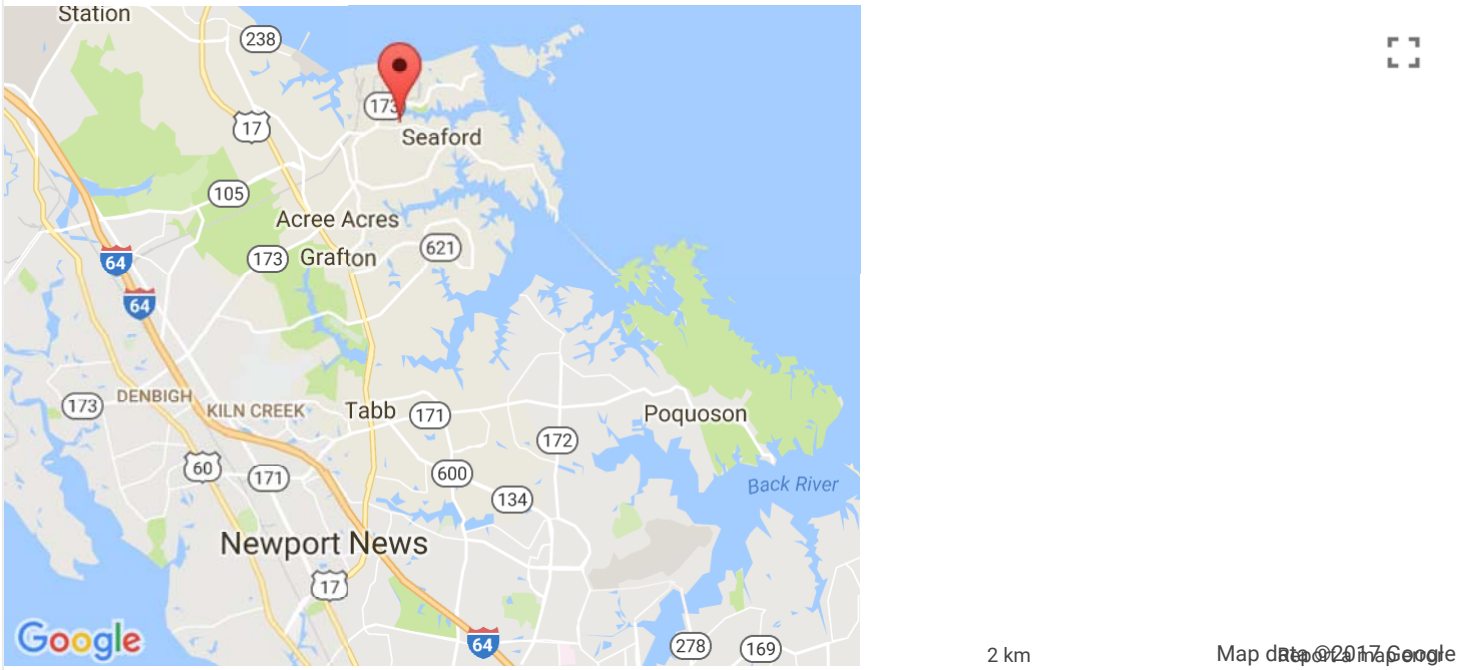

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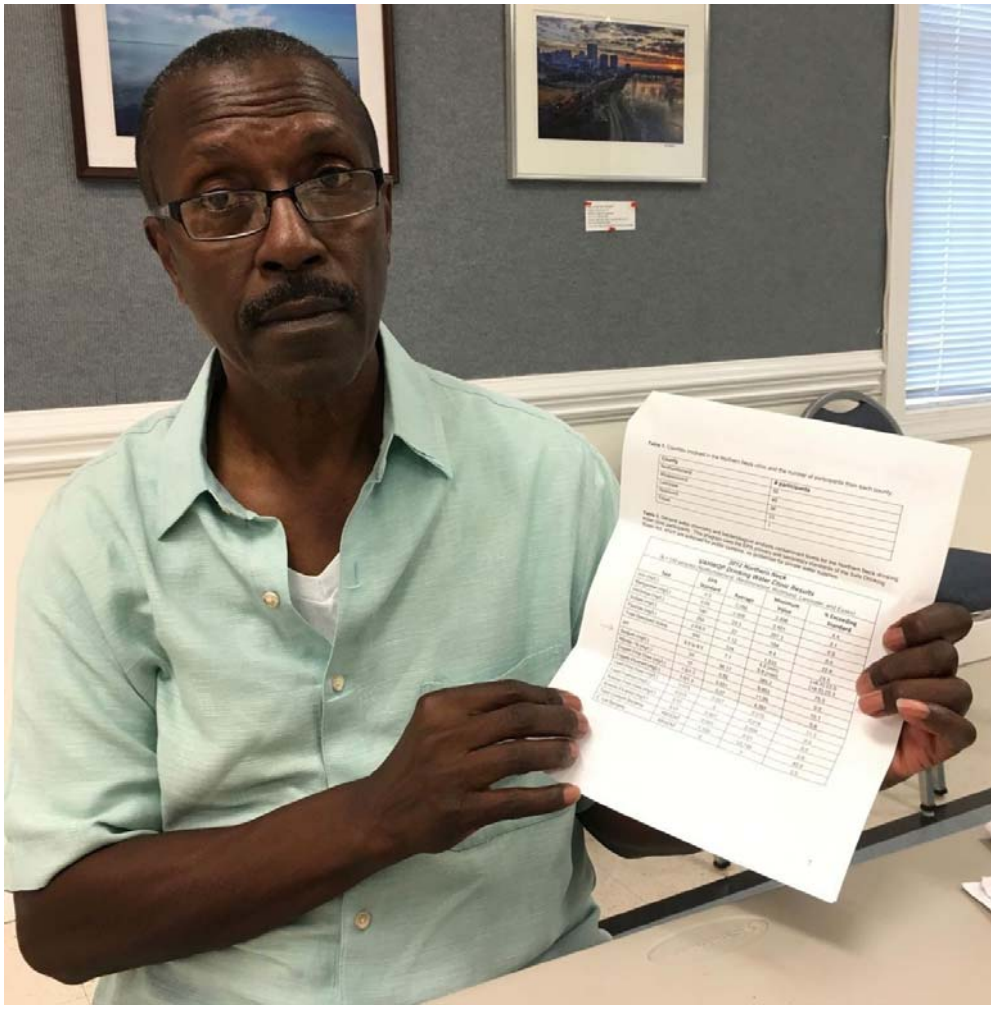
Virginia tightens spigot on big water users to stem Potomac Aquifer decline

By Pamela A. D'Angelo For The Free Lance-Star Aug 5, 2017



Gerald Howard was shocked by the high amount of sodium found in the water from the well at his Northumberland home.

Pamela A. D'Angelo for the free lance–star

Top water users

After 30 years of drilling drinking water wells in the Northern Neck, Todd Saunders can tell you about the biggest change to his business—the water table is dropping.

"Most of the wells are at the same depth, but over at least the last 10 years, the water table has probably dropped 20 feet in some areas," said Saunders, who owns L&H Co. in Montross. "The King George area has dropped real fast over the last 20 years."

When Saunders drills a new well, he's actually tapping into water pressure. When water is pumped from an aquifer, it reduces pressure in the areas around any particular well, reducing how high water will rise within a well.

Now, when Saunders drills a new well, where he might have found the standing level of water at 100 feet, it's at around 130 feet. He attributes it to increased development and industry.

Virginia's Office of Water Supply, which oversees water use, has been aware of the problem for years. Last year, the Joint Legislative Audit and Review Commission, which makes recommendations to the General Assembly, confirmed what the Department of Environmental Quality and United States Geological Survey had been saying all along: The Tidewater Region's (east of Interstate 95) deep groundwater supplies, such as the heavily used Potomac Aquifer, are insufficient to meet the demands of current and future users.

Industry in Virginia accounts for about 140 permits issued for groundwater withdrawals greater than 300,000 gallons of water per day. During the last 18 months, DEQ, through its water supply office, has been dialing back the amount of permitted groundwater withdrawal by the state's 14 largest users, according to water supply chief Scott Kudlas.

Here are the 14 largest permitted users of groundwater from the Potomac Aquifer, as of 2014:

International Paper (Franklin Mill)

James City Service Authority

Western Tidewater Water Authority (Suffolk and Isle of Wight)

City of Chesapeake

City of Portsmouth

Solenis, Inc. (Ashland)

Smithfield Packing Company, Inc.

Newport News Waterworks

Colonial Williamsburg

City of Franklin (pending appeal)

Town of Smithfield

Portsmouth Genco (Cogentrix)

City of Norfolk

"Collectively, they represented 87 to 90 percent of the withdrawal in the region," said Kudlas. "The allocated withdrawal was in the neighborhood of 146 million gallons per day and now it's down in the neighborhood of 70 million gallons per day."

DEQ wants to reduce withdrawals, particularly in what they deem as critical areas, to the point that rates of water level declines are substantially reduced or reversed by 2025. The new permits include a 10-year drawdown plan by users.

Thirteen of the 14 have the new permits. The one holdout, the city of Franklin, has appealed.

How effective are these cuts to permits toward reaching that goal?

"The pressure response to either increasing or decreasing withdrawal is pretty rapid," said USGS groundwater hydrologist Randy McFarland. "It's pretty much a direct relationship. The more you pump, the more the water levels come down. If you decrease or stop pumping, the water levels come back in a proportional amount."

He uses the International Paper mill in Franklin as an example. The mill had been the largest permitted groundwater user, with average daily withdrawals of over 30 million gallons before closing in April 2010. During the mill shutdown, DEQ observed water level aquifers showing "a slow and irregular recovery" in the Potomac Aquifer.

But that declined when the mill resumed operations in 2012, despite switching to a different product that decreased withdrawals to about 13 million gallons a day.

Reported groundwater withdrawals from locations within groundwater management areas—which require a permit when more than 300,000 gallons per day is withdrawn—totaled about 75.5 million gallons per day for 2015, or approximately 56 percent of all groundwater withdrawals in the state.

And it's not just industry that's pulling out large amounts of groundwater.

"We're concerned about the unpermitted portion of the withdrawals because of its size and that it appears to be the fastest-growing portion of the withdrawal," said Kudlas.

Unpermitted and unmanaged

A 2008 USGS report estimated that all the unpermitted withdrawal combined draw nearly 30 million gallons a day. Kudlas said that may be up to around 40 million gallons a day this year.

"What that means is you have a bigger and bigger chunk of the withdrawal that is unmanaged," he said.

So who are those unpermitted users?

Kudlas says they are just regular folks.

"They are individual homeowners and people who live in a subdivision on a public system who have a private well to irrigate their landscape. They are [people with] geothermal heat pumps," he said.

Last year, DEQ reached out to a community of diverse groundwater stakeholders—from paper mills to environmentalists—and appointed an advisory committee to come up with ways the state might ensure the long-term viability of the aquifer system for future growth and development.

When the group, known as the Eastern Virginia Groundwater Management Advisory Committee, looked into unpermitted users, they found limited data on homeowner wells.

“The biggest data limitation is the pre-1990 and especially the pre-1982 wells because there was no permitting required—that is going to be a considerable number of wells,” the committee noted during one meeting last year.

The panel also found that places such as Virginia Beach were allowing lawn irrigation systems that tapped into groundwater instead of the public water supply, to skirt drought prohibitions.

“Every new house in the last 15 to 20 years almost always put in a well for irrigation,” the committee noted. “There is enabling legislation to govern/regulate these wells, but most localities have not opted to adopt the rules.”

The group was also concerned with over-pumping leading to land subsidence, where land sinks from water being pumped out at rates faster than an aquifer can recharge. In parts of Virginia, water flows back in fairly quickly, but in the Coastal Plain, wells drilled into deep sand layers can intercept water that has traveled from recharge areas several counties away.

A study conducted by USGS in 2013 found that 25 percent of the land subsidence in the Coastal Plain could be attributed to the over-pumping of groundwater.

Groundwater remains contentious throughout the state, with issues ranging from a property owner’s rights to drill to the responsibility of an unpermitted user for the health of an aquifer. The group did not reach a consensus on all the issues, according to one member, but agreed on 12 recommendations to DEQ that will make their way to the General Assembly Nov. 1.

That about 25 percent of the aquifer is used by domestic wells

took members by surprise.

“There were a lot more there than was expected,” members noted during one meeting. “The drillers know that the Potomac Aquifer can produce.”

Too much salt

The potential for salt water entering aquifers that are drawn down is also a concern.

Regions that are closest to salt water, as the Northern Neck is with the Chesapeake Bay, have the greatest potential for what’s referred to as salt-water intrusion, where declining levels of fresh water is replaced by nearby salt water.

McFarland said it takes a long time for salt water to move into the aquifer, and as far as scientists can tell, that hasn’t happened in the Tidewater Region.

He also said people who live along Coastal Plain have naturally occurring sodium in their well water. And the deeper the well, the more salt. Some of Northumberland County’s wells drill down some 800 plus feet to reach water.

Gerald Howard, a retiree who had moved back to his hometown in the Northern Neck, first noticed a problem with his well water in 2012. When he would wash his car, a white film remained. He joined 158 other homeowners around the Northern Neck in a state well-water testing clinic.

“I was shocked with the results,” said Howard, referring to the high levels of sodium found. “According to EPA standards, it should be 20 milligrams per liter and the average was 90.17. It was 75.5 percent above the standard.”

He went before the Northumberland Board of Supervisors with results to ask if they could do anything. Many on the board had heard the same complaints about salt from other residents.

They had no solution, with the exception of one board member, a plumber, who offered to sell Howard a reverse-osmosis filter.

Since then, Howard has bought his drinking water. But he's concerned for people in the community with high blood-pressure who don't know about the salt in their water. He said African –Americans like him are prone to the disease, which can be exacerbated by excessive salt intake.

"I think people should be informed, so they have a choice," he said. "Every family has somebody with high blood pressure."

Erin Ling, who coordinates the state household water quality program, said high levels of salt in well water is definitely a concern and should be taken seriously, especially by people who are most at risk.

"Most folks are consuming around 2,000 milligrams of sodium per day, so they'd have to drink a lot of water for it to impact their health," she said. "We do see a fair amount of naturally occurring sodium out in the coastal plain. It's mostly just a function of the sediment."

Seeking solutions

In a state where one of five people rely on well water, more monitoring needs to be done, Kudlas said.

Some of the solutions the committee discussed included providing robust funding for monitoring, establishing an annual state water resources forum where stakeholders can obtain and share information, banking and/or trading credits for water usage and injecting treated wastewater into aquifers.

Hampton Roads Sanitation District's Sustainable Water Initiative for Tomorrow (HRSD SWIFT) is currently underway as a pilot project that would inject treated wastewater into aquifers. Similar projects are being evaluated for New Kent and Hanover.

Still, for DEQ, the biggest problem may be the unpermitted wells.

"Without addressing unpermitted withdrawals, we could end up in a situation similar to the [Chesapeake] Bay program, where significant costs are incurred by permitted withdrawals," committee members said in a draft final report. "But, at the end of the day, it becomes apparent that the problem will not be solved without addressing unpermitted withdrawals."

The final report will be given to DEQ this month.

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Here and Now

East of I-95, Virginia Begins to Limit Permitted Groundwater Users

By PAMELA D'ANGELO • AUG 9, 2017

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Groundwater in the Coastal Plain, East of I-95, is under stress. During the last 18 months, Virginia water officials have been negotiating cuts to groundwater withdrawals by the state's biggest users. Now, they are looking at another large user.

Listen
1:33

Pamela D'Angelo reports.

From paper mills to cities, the Department of Environmental Quality has been quietly working with the Commonwealth's 14 largest permitted groundwater users. Scott Kudlas oversees the state's water supplies. He says they withdraw anywhere from 2 to 36 million gallons a day.

“About 87 to 90% of the water allocation for withdrawal from the Potomac Aquifer.”

The largest user, WestRock paper mill in West Point, pulls about 22 million gallons of water a day. Over the next ten years the company has agreed to cut back to about 17 million gallons a day.

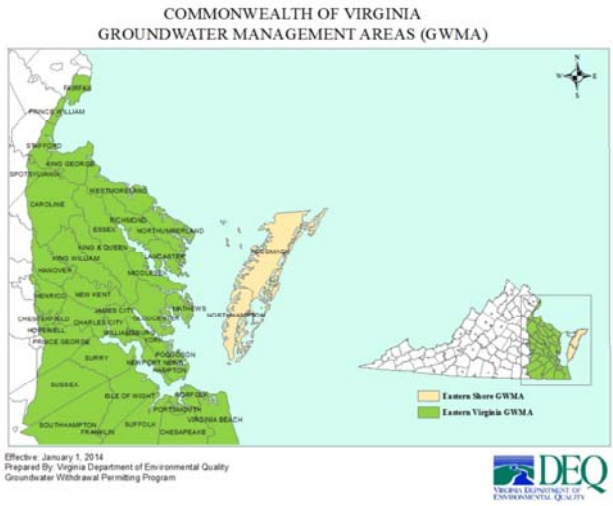
So far 13 of the 14 largest users have agreed to gradual cutbacks that will nearly halve their collective total daily withdrawals.

“The allocated withdrawal was in the neighborhood of 146 mgd and now it's down in the neighborhood of 70.”

And there's another big user that's not permitted and is estimated to be taking nearly 40 million gallons a day. So, who is it?

“They're you and me. They are individual homeowners on individual private wells and people who live in a subdivision on a public system who have a private well that they've installed to irrigate their landscape, they are geothermal heat pumps.”

DEQ asked a wide range of stakeholders – including home builders, paper mills and environmentalists – for help in how the state might protect the aquifer for future growth and development.



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Groundwater management areas along Virginia's coast.

CREDIT DEPARTMENT OF ENVIRONMENTAL QUALITY

This week, The Eastern Virginia Groundwater Management Advisory Committee made 12 recommendations. Those ranged from ensuring funding for groundwater monitoring, considering banking and trading credits for water usage to injecting treated wastewater into aquifers like the Hampton Roads Sanitation District’s SWIFT (Sustainable Water Initiative for Tomorrow) pilot project.

Finalized recommendations will go to the General Assembly in November.

Here are Virginia's Largest Permitted Groundwater Users in the Coastal Plain:

- International Paper (Franklin Mill)
- James City Service Authority
- Western Tidewater Water Authority (Suffolk and Isle of Wight)

- City of Chesapeake
- City of Portsmouth
- Solenis, Inc. (Ashland)
- Smithfield Packing Company, Inc.
- Newport News Waterworks
- Colonial Williamsburg
- City of Franklin (pending appeal)
- Town of Smithfield
- Portsmouth Genco (Cogentrix)
- City of Norfolk

You can find the full report here (http://www.deq.virginia.gov/Portals/0/DEQ/Water/GroundwaterPermitting/EVGMAC/GWAC_FinalReport ver=2017-08-08-092925-940).

This report, provided by Virginia Public Radio (https://virginiapublicradio.org/), was made possible with support from the Virginia Education Association (http://www.veanea.org/).

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Appendix B: Nutrient and Sediment Trading Agreements

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 10th day of August, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Chesapeake (the "City") (each a "Party" and jointly, the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's

compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale

HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions.

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF CHESAPEAKE

HAMPTON ROADS SANITATION DISTRICT

By: _____
Edward G. Henifin
General Manager

CITY OF CHESAPEAKE

By: _____
James E. Baker
City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin					
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles			
TN	2915	10,628	13,543			
TP	1082	2424	3506			
TSS	473,926	1,098,693	1,572,619			

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin					
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles			
TN	TBD	TBD	TBD			
TP	TBD	TBD	TBD			
TSS	TBD	TBD	TBD			

For any credit need noted as "To Be Determined" or "TBD," please refer to Paragraph 1.c. for process for updating and reissuing this Attachment A.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Chesapeake, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			
York			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

MS4 TMDL Action Plan Provision for Use of HRSD-Generated Water Quality Credits

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement ("agreement") for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This agreement in no way limits the City's ability or option to fund or pursue funding for water quality or flood control projects currently or in the future. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). The quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are: 13,543 lbs/yr TN, 3506 lbs/yr TP, and 1,572,619 lbs/yr TSS.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 31st day of March, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Hampton (the "City") (each a "Party" and jointly, the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL, WIP, and Watershed General Permit. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's

compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of credits (or comparable TN, TP and TSS waste load allocations to effect the permanent transfer contemplated by this Agreement) set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent credit transfers, when applicable, HRSD shall modify its Watershed General Permit Registration to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the credit transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its credit transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God,

government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to transfer credits as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they

have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions. .

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF HAMPTON

HAMPTON ROADS SANITATION DISTRICT

By: Frederick N. Elofson
Commission Chair

CITY OF HAMPTON

By: Donnie R. Tuck
Mayor

By: Mary Bunting
City Manager

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin			**York River Basin**		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	1,386	2,376	3,762	2,326	3,987	6,313
TP	329	564	893	553	947	1,500
TSS	150,688	258,322	409,010	191,183	327,743	518,926

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin			**York River Basin**		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	TBD	TBD	TBD	TBD	TBD	TBD
TP	TBD	TBD	TBD	TBD	TBD	TBD
TSS	TBD	TBD	TBD	TBD	TBD	TBD

For any credit need noted as "To Be Determined" or "TBD," please refer to Paragraph 1.c. for process for updating and reissuing this Attachment A.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Hampton, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			
York			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

MS4 TMDL Action Plan Provision for Use of HRSD-Generated Water Quality Credits

The City is implementing a redevelopment-based MS4 TMDL Action Plan consisting of three primary components: (1) Current Stormwater Projects, (2) the HRSD SWIFT Project, and (3) Future Redevelopment Projects. Each of the three components of the plan is further described below.

Current Stormwater Projects. The first component of this plan consists of water quality improvements from current stormwater projects, including recent, ongoing or other near-term projects credited in accordance with the procedures established in MS4 Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015). For purposes of the First Bay TMDL Permit Cycle and the associated TMDL Action Plan, this includes creditable projects completed or to be completed prior to the end of the first permit cycle. A schedule of the reduction credits from such projects is set forth herein.

SWIFT Project. The second component of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). the quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are_____ lbs/yr TN, _____ lbs/yr TP, and _____ lbs/yr TSS and for the York River Basin are _____lbs/yr TN, _____lbs/yr TP, and _____lbs/yr TSS.

Future Redevelopment Projects. The third component of this plan is the City's intent to achieve reductions through additional stormwater quality improvements from redevelopment projects, even though the first two components are expected to fully meet the Chesapeake Bay TMDL requirements of the City's MS4 Permit. The City requires redevelopment projects to comply with TP reduction criteria (and thus to also achieve associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. An additional benefit of aligning this plan with the normal redevelopment cycle (rather than scheduling retrofits prior to redevelopment activity) is the conservation of scarce state and local resources for other important public purposes. As this plan component is not required to meet MS4 Permit requirements, no schedule of reduction credits is provided; however, the City intends to track such reductions for appropriate credit in the future.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 29TH day of AUGUST, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and James City County, Virginia (the "County") (each a "Party" and jointly the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The County owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the County by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the County will reduce MS4-related TN, TP and TSS discharges pursuant to County-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the County is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the County may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the County may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Regulatory Modifications to the County's TMDL Obligations. The County has achieved substantial progress towards its Chesapeake Bay TMDL reduction goals as a result of County-wide stormwater management requirements dating back to 1990. Future modifications to the TMDL, WIP or VPDES General Permit for the MS4 may be more cost-effectively addressed by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects. By utilizing HRSD-generated TN, TP and TSS credits to implement the County's Chesapeake Bay TMDL Action Plan, County Capital Improvement Funds as well as state resources may be reserved for locally important drainage or water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the County is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the County acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the County the quantity of water quality credits needed to meet the County's compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution

and delivery to the County of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The County shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The County shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects occurring prior to the effective date of the County's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the County.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the County shall not exceed the lesser of (i) the County's initial estimate of credit needs, or (ii) 95 percent of the County's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The County's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the County's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the County under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the County the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the County to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. County's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the County shall include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the County and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the County shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The County agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the County no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or

impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the County shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the County (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the County and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the County its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the County with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or

any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions. .

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND JAMES CITY COUNTY

HAMPTON ROADS SANITATION DISTRICT

By: _____
Edward G. Henifin
General Manager

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND JAMES CITY COUNTY

COUNTY OF JAMES CITY

By: _____
County Administrator

ATTEST:

_____
County Clerk

APPROVED AS TO FORM:

_____
Asst. County Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by County as of Effective Date of this Agreement]

	James River Basin			York River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	194.88	334.08	528.96	16.45	28.20	44.65
TP	39.13	67.08	106.21	2.52	4.32	6.84
TSS	16682.89	28599.24	45282.13	751.52	1288.32	2039.84

Section 2: County-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of County's TMDL Action Plan]*

	James River Basin			York River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	194.88	334.08	528.96	16.45	28.20	44.65
TP	39.13	67.08	106.21	2.52	4.32	6.84
TSS	16682.89	28599.24	45282.13	751.52	1288.32	2039.84

* DEQ approved the County's TMDL Action Plan prior to the effective date of this Agreement. Section 2 is complete. Please refer to the Agreement at Paragraph E regarding potential future credit use.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the County on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the County in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): James City County, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			
York			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION ATTACHMENT C

MS4 TMDL Action Plan Provision for Use of HRSD-Generated Water Quality Credits

The County is implementing a MS4 TMDL Action Plan consisting of three primary components: (1) Current Stormwater Projects, (2) Stormwater Reductions from Stricter Development Requirements, and (3) the HRSD SWIFT Project. Each of the three components of the plan is further described below.

Current Stormwater Projects. The first component of this plan consists of water quality improvements from current stormwater projects, including recent, ongoing or other near-term projects credited in accordance with the procedures established in MS4 Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015). For purposes of the First Bay TMDL Permit Cycle and the associated TMDL Action Plan, this includes creditable projects completed or to be completed prior to the end of the first permit cycle. A schedule of the reduction credits from such projects is set forth herein.

Stricter Development Requirements. The second component of this plan consists of the strict development standards which require all development to meet the Chesapeake Bay Preservation Act (CBPA) requirements throughout the County, not just within the CBPA buffer zone. According to DEQ Guidance Memorandum 15-2005, the County may receive credit for all stormwater treatment facilities installed after July 1, 2009 outside of the CBPA buffer including those treating less than 1 acre total.

SWIFT Project. The third component of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the County and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the County's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). the quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are 528.96 lbs/yr TN, 106.21 lbs/yr TP, and 45,282.13 lbs/yr TSS and for the York River Basin are 44.65 lbs/yr TN, 6.84 lbs/yr TP, and 2,039.84 lbs/yr TSS.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 11th day of July, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Newport News (the "City") (each a "Party" and jointly, the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from stormwater water quality improvement projects, development projects and redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal development and redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually

generate and transfer to the City the quantity of water quality credits needed to meet the City's compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated new development and redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale

HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD and the City shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD and the City, including annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD or the City.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD or the City are unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD and the City reserve the right to terminate or renegotiate this Agreement in the event HRSD or the City experience significant financial or budgetary challenges which, in HRSD's or the City's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions.

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a Virginia court of competent jurisdiction or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF NEWPORT NEWS

HAMPTON ROADS SANITATION DISTRICT

By: _____

Edward G. Henifin
General Manager

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF NEWPORT NEWS

CITY OF NEWPORT NEWS

By: _____
Cynthia D. Rohlf
City Manager

ATTEST:

_____
City Clerk

Contents Approved:

_____
Everett P. Skipper P.E.
Director, Department of Engineering

Approved as to Form and Correctness:

_____
Deputy City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	4,344	7,609	11,953
TP	995	1,743	2,738
TSS	451,373	790,726	1,242,099

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	TBD	TBD	TBD
TP	TBD	TBD	TBD
TSS	TBD	TBD	TBD

For any credit need noted as "To Be Determined" or "TBD," please refer to Paragraph 1.c. for process for updating and reissuing this Attachment A.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Newport News, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

Draft Provision for the Use of HRSD-Generated Water Quality Credits for MS4 Chesapeake Bay TMDL Action Plan Development

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). The quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are_____ lbs/yr TN, _____ lbs/yr TP, and _____ lbs/yr TSS.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 28 day of June, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Norfolk (the "City") (each a "Party" and jointly, the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's

compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale

HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions.

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Norfolk; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Norfolk, Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF NORFOLK

HAMPTON ROADS SANITATION DISTRICT

By: _____
Edward G. Henifin
General Manager

CITY OF NORFOLK

By: _____
Douglas L. Smith
Interim City Manager

ATTEST:

_____
City Clerk

Contents Approved:

_____
David Ricks, P.E.
Director, Department of Public Works

Approved as to Form and Correctness:

_____
Assistant City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin			**Little Creek Watershed**		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	3,585	6,146	9,731	981	1,682	2,663
TP	789	1,352	2,141	193	332	525
TSS	463,719	794,947	1,258,666	80,018	137,174	217,192

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin			**Little Creek Watershed**		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	TBD	TBD	TBD	TBD	TBD	TBD
TP	TBD	TBD	TBD	TBD	TBD	TBD
TSS	TBD	TBD	TBD	TBD	TBD	TBD

For any credit need noted as "To Be Determined" or "TBD," please refer to Paragraph 1.c. for process for updating and reissuing this Attachment A.

Little Creek Watershed credits as shown in Section 1 above and to be determined in Section 2 above will become part of this Agreement upon inclusion of the Little Creek Watershed as part of the James River Basin for the purposes of the Chesapeake Bay TMDL by DEQ and credits provided effective upon HRSD receiving notice of such action.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Norfolk, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			
Little Creek			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

Draft Provision for the use of HRSD-Generated Water Quality Credits for MS4 Chesapeake Bay TMDL Action Plan Development

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). the quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are_____ lbs/yr TN, _____ lbs/yr TP, and _____ lbs/yr TSS and for the Little Creek Watershed are _____ lbs/yr TN, _____ lbs/yr TP, and _____ lbs/yr TSS (subject to the Little Creek Watershed inclusion as part of the James River Basin by DEQ).

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 5TH day of JULY, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Poquoson (the "City") (each a "Party" and jointly the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's

compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale

HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions. .

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF POQUOSON

HAMPTON ROADS SANITATION DISTRICT

By: _____
Edward G. Henifin
General Manager

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF POQUOSON

CITY OF POQUOSON

By: _____
J. Randall Wheeler
City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin			York River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	0.0	0.0	0.0	408.52	700.32	1108.84
TP	0.0	0.0	0.0	74.90	128.40	203.30
TSS	0.0	0.0	0.0	23,975.8	41,101.4	65,077.2

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin			York River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	0.0	0.0	0.0	408.52	700.32	1108.84
TP	0.0	0.0	0.0	74.90	128.40	203.30
TSS	0.0	0.0	0.0	23,975.8	41,101.4	65,077.2

* DEQ approved the City's TMDL Action Plan prior to the effective date of this Agreement. Section 2 is complete.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Poquoson, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			
York			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

MS4 TMDL Action Plan Provision for Use of HRSD-Generated Water Quality Credits

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). The quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are 0.0 lbs/yr TN, 0.0 lbs/yr TP, and 0.0 lbs/yr TSS and for the York River Basin are 1108.84 lbs/yr TN, 203.30 lbs/yr TP, and 65,077.2 lbs/yr TSS.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 18th day of September, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Portsmouth (the "City") (each a "Party" and jointly, the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's

compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations - set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale

HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions. .

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF HAMPTON

HAMPTON ROADS SANITATION DISTRICT

By: _____
Edward G. Henifin
General Manager

CITY OF PORTSMOUTH

By: _____
Dr. L. Pettis Patton
City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
Asst City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Waste Load Allocation Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Waste Load Allocation Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	4,788	8,208	12,996
TP	938	1,608	2,546
TSS	397,243	680,988	1,078,231

Section 2: City-Calculated and HRSD-Accepted Waste Load Allocation Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	TBD	TBD	TBD
TP	TBD	TBD	TBD
TSS	TBD	TBD	TBD

For any waste load allocation need noted as "To Be Determined" or "TBD," please refer to Paragraph 1.c. for process for updating and reissuing this Attachment A.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Portsmouth, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

MS4 TMDL Action Plan Provision for Use of HRSD-Generated Water Quality Credits

The City is implementing a redevelopment-based MS4 TMDL Action Plan consisting of three primary components: (1) Current Stormwater Projects, (2) the HRSD SWIFT Project, and (3) Future Redevelopment Projects. Each of the three components of the plan is further described below.

Current Stormwater Projects. The first component of this plan consists of water quality improvements from current stormwater projects, including recent, ongoing or other near-term projects credited in accordance with the procedures established in MS4 Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015). For purposes of the First Bay TMDL Permit Cycle and the associated TMDL Action Plan, this includes creditable projects completed or to be completed prior to the end of the first permit cycle. A schedule of the reduction credits from such projects is set forth herein.

SWIFT Project. The second component of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). the quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are_____ lbs/yr TN, _____ lbs/yr TP, and _____ lbs/yr TSS.

Future Redevelopment Projects. The third component of this plan is the City's intent to achieve reductions through additional stormwater quality improvements from redevelopment projects, even though the first two components are expected to fully meet the Chesapeake Bay TMDL requirements of the City's MS4 Permit. The City requires redevelopment projects to comply with TP reduction criteria (and thus to also achieve associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. An additional benefit of aligning this plan with the normal redevelopment cycle (rather than scheduling retrofits prior to redevelopment activity) is the conservation of scarce state and local resources for other important public purposes. As this plan component is not required to meet MS4 Permit requirements, no schedule of reduction credits is provided; however, the City intends to track such reductions for appropriate credit in the future.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 27th day of September 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Suffolk (the "City") (each a "Party" and jointly, the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed,

to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part based on the anticipated enhancement to and sustainability of the long-term groundwater supply in addition to reliance on the water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its

MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible. The parties acknowledge that a demonstration project is already underway at the Nansemond Treatment Plant located in the City of Suffolk.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions.

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF SUFFOLK

HAMPTON ROADS SANITATION DISTRICT

By: _____

Edward G. Henifin
General Manager

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF SUFFOLK

CITY OF SUFFOLK

By: _____
Patrick Roberts
City Manager

ATTEST:

_____
City Clerk

Contents Approved:

_____
Eric Nielsen
Director, Department of Public Works

Approved as to Form:

_____
Assistant City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	2,077	3,561	5,638
TP	491	841	1,332
TSS	219,233	375,828	595,061

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]*

	James River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	TBD	TBD	TBD
TP	TBD	TBD	TBD
TSS	TBD	TBD	TBD

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Suffolk, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

Draft Provision for the Use of HRSD-Generated Water Quality Credits for MS4 Chesapeake Bay TMDL Action Plan Development

The City plans to utilize water quality credits generated by HRSD to supplement its Chesapeake Bay TMDL reduction commitments. These credits in conjunction with structural and non-structural practices will satisfy the City of Suffolk's reduction requirements for the Chesapeake Bay TMDL while balancing the importance of local water quality, fiscal responsibility, and future groundwater supplies.

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). The quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are 5,638 lbs/yr TN, 1,332 lbs/yr TP, and 595,061 lbs/yr TSS.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 20th day of September, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Virginia Beach (the "City") (each a "Party" and jointly the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a Virginia Stormwater Management Program (VSMP) Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VSMP Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VSMP Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VSMP Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. MS4 TMDL Action Plan. To meet the requirements of the City's VSMP Permit, the City plans to implements projects targeted to improve water quality and achieve permit compliance. As a result of the VSMP Permit, the City is required to develop and implement Chesapeake Bay and Local TMDL Action Plans. The City plans to implement five water quality retrofit projects on prior developed lands within the permit term to reduce the discharge of TN, TP, and TSS and to meet permit compliance. The City also will be implementing projects that address the local water quality impairments. The credits provided by HRSD under this Agreement may be used to assist the City with meeting the Chesapeake Bay TMDL pollutant reduction requirements for the Second and Third Bay TMDL Permit Cycle. The TN, TP, and TSS credits generated by the water quality retrofit projects that are implemented by the City and located within the Chesapeake Bay watershed will reduce the amount of credits transferred.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's

compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation with the implementation of the second Chesapeake Bay TMDL Action Plan.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VSMP Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015) and current related DEQ guidelines.

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VSMP Permit in effect as of the effective date of this Agreement and through the stormwater management facilities that were constructed within the regulated service area during January 1, 2006 through June 30, 2009, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's draft planning level estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. In 2021, following DEQ's approval of the City's Second Bay TMDL Action Plan and the subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., the City will update Attachment A and submit to HRSD for approval by setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated by the City for HRSD approval in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe

Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall include in its second and third Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VSMP permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD. HRSD will notify the City no later than 90 days after becoming aware of a suspension.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder,

without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions.

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF VIRGINIA BEACH

HAMPTON ROADS SANITATION DISTRICT

By: _____
Edward G. Henifin
General Manager

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF VIRGINIA BEACH

CITY OF VIRGINIA BEACH

By: _____
David L. Hansen
City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Draft Planning Level Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin (Except Lynnhaven River & Little Creek Watersheds)			**Lynnhaven River Watershed**			**Little Creek Watershed**		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	1,670	2,830	4,500	4,440	7,560	12,000	930	1,570	2,500
TP	440	760	1,200	1,180	2,020	3,200	260	440	700
TSS	214,600	365,400	580,000	555,000	945,000	1,500,000	114,700	195,300	310,000

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin (Except Lynnhaven River & Little Creek Watersheds)			**Lynnhaven River Watershed**			**Little Creek Watershed**		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
TP	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
TSS	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

For any credit need noted as "To Be Determined" or "TBD," please refer to Paragraph 1.c. for process for updating and reissuing this Attachment A.

Lynnhaven River Watershed and Little Creek Watershed credits as shown in Section 1 above and to be determined in Section 2 above will become part of this Agreement upon inclusion of the Lynnhaven River Watershed and Little Creek Watershed as part of the James River Basin for the purposes of the Chesapeake Bay TMDL by DEQ and credits provided effective upon HRSD receiving notice of such action.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20th immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Virginia Beach, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James River			
Lynnhaven River			
Little Creek			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

Draft Provision for the Use of HRSD-Generated Water Quality Credits for MS4 Chesapeake Bay TMDL Action Plan Development

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in addition to stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. In addition to the Chesapeake Bay TMDL Action Plan pollutant reductions, the City is required to implement water quality improvement projects to address local water quality impairments and to implement five water quality retrofit projects on prior developed lands, which will help improve water quality, within the city. The TN, TP, and TSS credits generated by the City's implemented water quality retrofit projects that are located within the Chesapeake Bay watershed will reduce the amount of credits transferred.

In closing, this component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). The quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin (exclusive of the Lynnhaven River and Little Creek Watersheds) are 4,500 lbs/yr TN, 1,200 lbs/yr TP, and 580,000 lbs/yr TSS, for the Lynnhaven River Watershed are 12,000 lbs/yr TN, 3,200 lbs/yr TP, and 1,500,000 lbs/yr TSS and for the Little Creek Watershed are 2,500 lbs/yr TN, 700 lbs/yr TP, and 310,000 lbs/yr TSS (subject to the Lynnhaven River Watershed and Little Creek Watershed inclusion as part of the James River Basin by DEQ).

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 16TH day of August, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Williamsburg (the "City") (each a "Party" and jointly, the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's

compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale

HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions.

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Williamsburg; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Williamsburg, Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF WILLIAMSBURG

HAMPTON ROADS SANITATION DISTRICT

By: _____
Edward G. Henifin
General Manager

CITY OF WILLIAMSBURG

By: _____
Marvin Collins, III
City Manager

ATTEST:

_____
City Clerk

Contents Approved:

_____
Dan Clayton
Director, Department of Public Works

Approved as to Form and Correctness:

_____
City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin			York River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	298	744	1,042	178	445	623
TP	72	181	253	43	108	151
TSS	32,495	81,239	113,734	14,997	37,493	52,490

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin			York River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	TBD	TBD	TBD	TBD	TBD	TBD
TP	TBD	TBD	TBD	TBD	TBD	TBD
TSS	TBD	TBD	TBD	TBD	TBD	TBD

For any credit need noted as "To Be Determined" or "TBD," please refer to Paragraph 1.c. for process for updating and reissuing this Attachment A.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Williamsburg, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			
York			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

Draft Provision for the use of HRSD-Generated Water Quality Credits for MS4 Chesapeake Bay TMDL Action Plan Development

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). the quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are 1,042 lbs/yr TN, 253 lbs/yr TP, and 113,734 lbs/yr TSS and for the York River Basin are 623 lbs/yr TN, 151 lbs/yr TP, and 52490 lbs/yr TSS.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 31st day of JULY, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the County of York (the "County") (each a "Party" and jointly the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The County owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the County by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the County will reduce MS4-related TN, TP and TSS discharges pursuant to County-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the County is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the County may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the County may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The County expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the County's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the County is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the County acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the County the quantity of water quality credits needed to meet the

County's compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the County of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The County shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The County shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the County's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the County.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the County shall not exceed the lesser of (i) the County's initial estimate of credit needs, or (ii) 95 percent of the County's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The County's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the County's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the County under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of waste load allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the County the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale

HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the County to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. County's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the County shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the County and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent waste load allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the County shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The County agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the County no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the County shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the County (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the County and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the County its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the County with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

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14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

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IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND COUNTY OF YORK

HAMPTON ROADS SANITATION DISTRICT

By: _____

Edward G. Henifin
General Manager

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND COUNTY OF YORK

COUNTY OF YORK

By: _____
Neil A. Morgan
County Administrator

ATTEST:

_____
County Clerk

APPROVED AS TO FORM:

_____
County Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by County as of Effective Date of this Agreement]

	James River Basin			York River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	49.5	137.4	186.9	0	0	0
TP	6.12	22.08	28.2	88.46	549.24	637.7
TSS	2,324.64	8,682.96	11,007.60	49,800.3	168,540.0	218,340.3

Section 2: County-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of County's TMDL Action Plan]

	James River Basin			York River Basin		
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles
TN	49.5	137.4	186.9	0	0	0
TP	6.12	22.08	28.2	88.46	549.24	637.7
TSS	2,324.64	8,682.96	11,007.6	49,800.3	168,540.0	218,340.3

* DEQ approved the County's TMDL Action Plan prior to the effective date of this Agreement. Section 2 is complete.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the County on or before
each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the County in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): County of York, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			
York			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

MS4 TMDL Action Plan Provision for Use of HRSD-Generated Water Quality Credits

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration to which the County and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the County's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). The quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are 186.9 lbs/yr TN, 28.2 lbs/yr TP, and 11,007.6 lbs/yr TSS and for the York River Basin are 0 lbs/yr TN, 637.7 lbs/yr TP, and 218,340.3 lbs/yr TSS.

Volume 2

Regional Wet Weather Management Plan (RWWMP)

1434 Air Rail Avenue
Virginia Beach, VA 23455

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Executive Summary

EX.1 Background

HRSD (the Hampton Roads Sanitation District) is the regional wastewater agency in southeast Virginia providing services to 18 Localities (14 of these are within the scope of the Consent Decree) and an approximate population of 1.7 million people. Each of the Localities manages their own wastewater collection systems which discharge to HRSD's system of wastewater collection pipes, pumping stations, and treatment plants. The regional sanitary sewer system (Localities and HRSD) has varying levels of service to accommodate increased flows during wet weather events before sanitary sewer overflows (SSOs) occur.

A Consent Decree was entered between HRSD, the United States Environmental Protection Agency (EPA), and the Virginia Department of Environmental Quality (DEQ) in 2010 to perform tasks related to reducing the occurrence of SSOs in the regional system. The decree included a condition assessment program with associated rehabilitation actions, as well as the development of a Regional Wet Weather Management Plan (RWWMP). This document serves as the completion of the obligations to prepare the RWWMP and outlines HRSD's approach for capacity-related SSO mitigation.

Through amendments to the Consent Decree in 2014 and 2017, HRSD has taken on the obligation of providing wet weather capacity from the 14 Localities that discharge to the regional system, as well as transforming the original RWWMP into an Integrated Plan (IP) that incorporates the significant environmental benefits provided by the Sustainable Water Initiative for Tomorrow (SWIFT) Program.

EX.2 Adaptive Regional Plan

EPA has encouraged the use of adaptive management approaches in a wide variety of settings. Adaptive management features iterative decision making to manage uncertainty in addressing municipal environmental challenges. This approach has been particularly necessary with long-term community sewer rehabilitation and related programs. Almost every such program has needed multiple major modifications. In addition to responding to changing community circumstances, adaptive management also allows communities to continually prioritize the greatest public health and community benefits for the next public dollar invested. Given the scope, cost, complexity, and evolving nature of the challenges which HRSD and the Hampton Roads region face, the RWWMP necessarily features an adaptive management approach.

There are a number of other adaptive management factors that create significant uncertainties (and opportunities) about any infrastructure investment plan that spans more than a decade. These uncertainties/opportunities include:

- The impact of sea level rise and recurrent flooding on the region's infrastructure, land use patterns and economy;
- Understanding the system response to almost $700 million in wet weather capacity-related investments and evaluations over the past ten years;
- Magnitude and spatial patterns of community growth and redevelopment;
- Future of the extensive Department of Defense (DoD) facilities in the Hampton Roads Region and HRSD priorities regarding these ubiquitous facilities throughout the service area;

- How effectively Locality and HRSD Management, Operations, and Maintenance (MOM) programs will address sewer system degradation and inflow/infiltration (I/I) levels;
- Regional economic vitality and household income and employment levels;
- Changing regional environmental and public health priorities, specifically post implementation evaluation of the Chesapeake Bay TMDL (Total Maximum Daily Load) after the 2025 completion;
- Changing technologies and opportunities to achieve multiple benefits for public sewer-related investments; and,
- Levels of federal and state financial support for unfunded environmental mandates.

These uncertainties will have a profound effect on the location, volume, significance and priority of future wet weather capacity-related overflows. This will particularly be the case for the capacity-related investment currently projected for the 2030-2053 program implementation period.

HRSD is committed to the SWIFT Program which provides unprecedented environmental benefits. Figure EX-1 displays the comparison of reductions in total suspended solids (TSS), total phosphorous (TP) and total Kjeldahl nitrogen (TKN) for the RWWMP and SWIFT for a 50-year life cycle. The reductions in nutrients and solids going to rivers and the Chesapeake Bay from SWIFT are orders of magnitude greater than the reductions from the RWWMP. This graphic makes it crystal clear that the environmental benefits from SWIFT dwarf the benefits from the RWWMP.

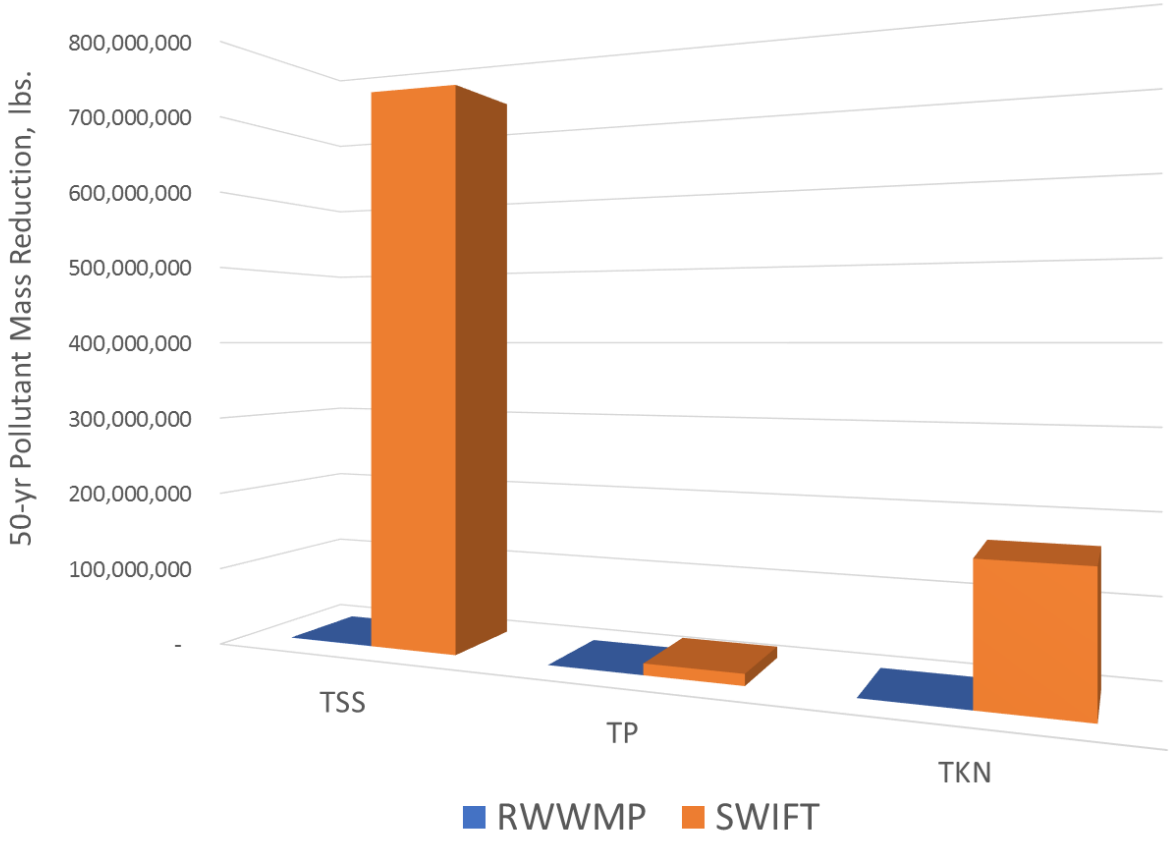

Figure EX-1. Pollutant Load Reductions – SWIFT vs. RWWMP

As part of HRSD's Integrated Plan, six High-Priority RWWMP Projects will be constructed through 2030. These projects were selected based on their ability to provide the greatest environmental and human health benefits. Further, this $208 million investment will reduce SSO volume at the 5-year

Level of Service by 47% - a significant reduction. Figure EX-2 depicts this reduction in modeled SSO volume at the 5-year Level of Service.

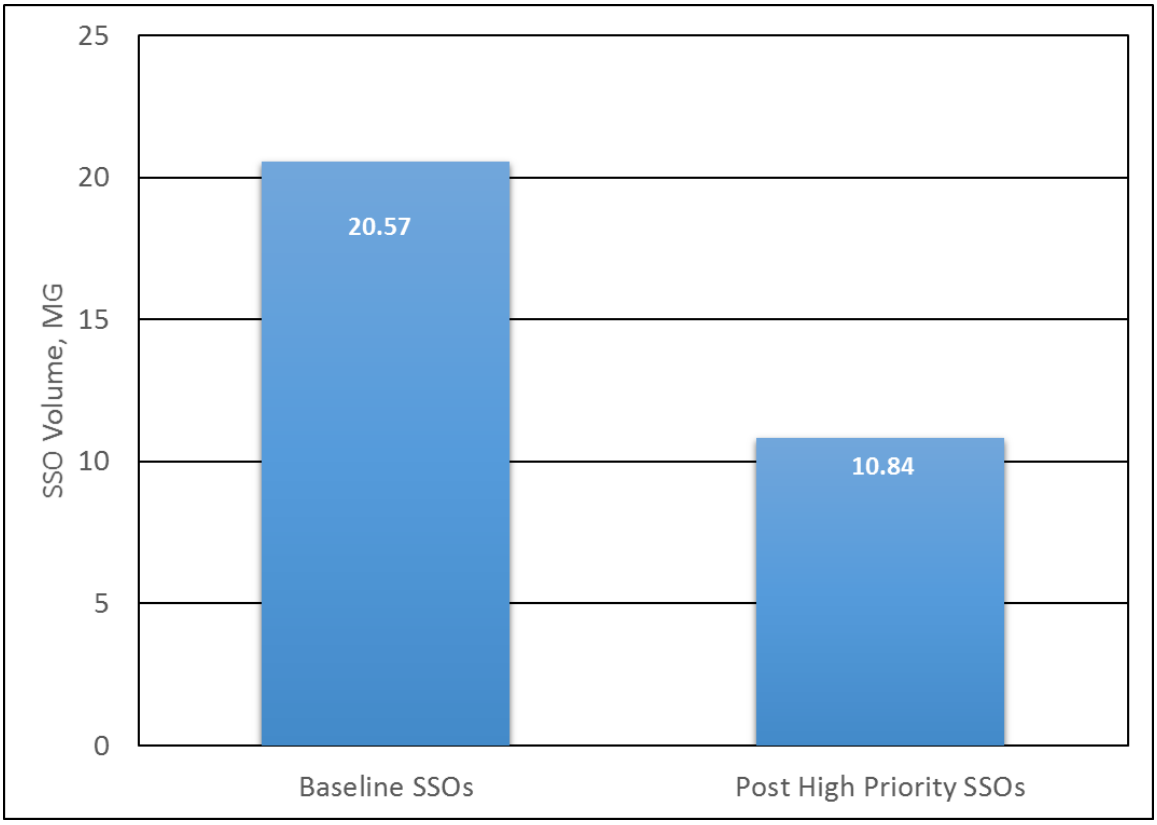

Figure EX-2. High-Priority Project SSO Reduction

The economic stress on the residents of the region, coupled with ever-changing environmental priorities, necessitate an adaptive management approach to allow the region to make wise future investments through understanding and responding to the conditions as they exist in that future timeframe.

Accordingly, HRSD's plan features an Adaptive Regional Plan comprising four phases as follows:

Table EX-1. Four Phases of the Adaptive Regional Plan

Phase	Description	Timeframe	Cost
1	Planning, Interim System Improvements, Condition Assessment and Repairs, Rehabilitation Action Plan	2008 – 2025	$700,000,000
2	SWIFT Implementation, Pathogen Source Tracking Program and High-Priority Projects	2020 - 2030	$1,318,000,000
3	Re-Evaluation and Preparation of a Final Remedial Measures Plan	2028 - 2030	$2,000,000
4	Implementation of the Final Remedial Measures Plan	2030 -	To be determined

Phase 1 includes the $700 million that HRSD will spend by 2025 in Interim System Improvements, Rehab Action Plan projects, Condition Assessment and repairs, and planning associated with the RWWMP. Then Phase 2 consists of the $1.1 billion SWIFT Program, the $208 million in High-Priority Projects, and $10 million Pathogen Source Tracking Program.

Following that work, Phase 3 is a re-evaluation assessment and preparation of a Final Remedial Measure Plan for the review and approval of EPA and DEQ. This phase will take place between 2028 and 2030 and will culminate in submittal of a Final Remedial Measures Plan by December 31, 2030. This will provide the critical adaptive management review period while the investments in Phase 2 are ongoing.

The Final Remedial Measures Plan may include implementation of the full suite of wet weather projects identified in Volume 2, identification and implementation of a more limited sub-set of projects providing the greatest environmental benefits, abandoning further wet weather work and redirecting all resources to other regional environmental priorities, or some combination of these potential outcomes.

Phase 4 will consist of implementing the Final Remedial Measures Plan as approved by EPA and DEQ in accordance with the schedule contained in the Plan.

This Adaptive Regional Plan is an environmental and economic necessity and is consistent with EPA policy and guidance on adaptive management and integrated planning. In this plan, HRSD will have spent $2 billion by 2030 addressing the most pressing and important environmental challenges that the region faces. This spending will place a heavy burden on regional ratepayers. It is necessary to re-evaluate the needs and circumstances in 2030 to better identify the highest regional environmental and public health priorities at that time as well as an expeditious implementation schedule for additional sewer system investments.

EX.3 Plan Development

HRSD worked closely with the Localities through the duration of the IP/RWWMP development in both collecting and exchanging data, as well as consulting with them on the components of the plan. This included more than 200 meetings between the Localities and HRSD since 2007.

Initial flow monitoring was conducted by the Localities and HRSD from 2008 through 2010 to develop hydrologic flow parameters used for creating a hydraulic model of the system. These models of both the regional system and the Localities upstream systems were constructed from data from HRSD's network along with data provided by the Localities. The models were tested and calibrated using the flow, pressure, and rainfall data collected from hundreds of points throughout the system, until they adequately simulated the actual conditions.

HRSD's modeling approach included a number of technical details worth mentioning in this Executive Summary. Rather than using a "typical" rainfall event, the work in the RWWMP is based on the concept of a peak flow recurrence using statistical analysis of more than 60 years of local rainfall data and the hydrologic model parameters. This produces a true 5-year peak flow rather than using a 5-year rainfall event which may or may not generate a 5-year peak flow. Secondly, HRSD contracted with national experts in hydrometeorology to develop a typical rainfall event (duration and intensity) that has led to past SSOs. This firm also assisted with the development of spatial distribution factors which are applied to the rainfall depths to compensate for rainfall occurring in varying amounts at different points during an event and not fall equally across the system This information was used to develop target peak flows for the different peak flow recurrence values at many points in the system.

In addition to wet weather considerations, the Consent Decree requires flows developed in the models be projected through the year 2030 to accommodate growth anticipated. HRSD used population and employment information from the local planning agency and observed wet weather flows from new developments to project 2030 flows in each sewer basin in the model. Table EX-2 shows the Projected Dry Weather Flow Increase summarized for each treatment plant service area.

Table EX-2. Projected Dry Weather Flow Increase	
TP Service Area	Percent Growth (ADF)
Army Base	1%
Atlantic	14%
Boat Harbor	3%
James River	5%
Nansemond	43%
VIP	7%
Williamsburg	27%
York River	9%
SYSTEMWIDE	**13%**

In parallel to FPR data and flow projections, both the Localities and HRSD expended considerable effort in collection of sanitary sewer evaluation survey (SSES) data of the gravity sewer systems throughout the region. This information was evaluated to identify the appropriate level of system rehabilitation required to reduce the amount of I/I which enters the sanitary sewers during wet weather events. HRSD developed an approach that included work on both the public pipes and also private systems (single family laterals and commercial/multi-family properties). This program created an estimate of total I/I peak flow reduction (normalized to the 10-year peak flow) along with a cost estimate to accomplish the work. A preliminary I/I Reduction Program was developed for the Level of Service selection as part of the Alternatives Analysis Report, and then refined for the selected Level of Service. Table EX-3 shows the summary of the I/I Reduction Program as part of the final RWWMP.

Table EX-3. Summary of I/I Reduction Program by TP Service Area							
		Public		Private		Total	
Treatment Plant	Number of I/I Reduction Areas in Program	I/I Reduction (MGD)	Cost ($Million)	I/I Reduction (MGD)	Cost ($Million)	I/I Reduction (MGD)	Cost ($Million)
Army Base	0	0	$0	0	$0	0	$0
Atlantic	45	18.0	$141.3	9.2	$35.2	27.2	$176.5
Boat Harbor	28	7.7	$59.8	2.2	$6.6	9.9	$66.4
James River	16	4.8	$37.9	1.9	$6.7	6.7	$44.6
Nansemond	20	12.9	$112.5	5.5	$23.1	18.4	$135.6
VIP	50	34.3	$262.9	7.3	$22.7	41.6	$285.6
Williamsburg	26	14.2	$108.4	4.2	$15.4	18.4	$123.8
York River	6	1.7	$17.4	0.9	$2.4	2.6	$19.8
Total	**191**	**93.6**	**$740.2**	**31.2**	**$112.1**	**124.8**	**$852.3**

Using the flows generated from the growth projections and the I/I Reduction Program, HRSD analyzed the remaining capacity-limitations throughout the regional system. The Consent Decree includes a two-step process for development of capacity solutions for the RWWMP with an

Alternatives Analysis Report (AAR) and then the final RWWMP. In the AAR, three Levels of Service were considered with capacity improvement solution sets and cost estimates developed for each: the 2-year, 5-year, and 10-year peak flow recurrence.

HRSD selected a 4-year LOS as its system-wide performance level but would design solution sets to a 5-year LOS. This allows a margin of safety for the Post-RWWMP Implementation Monitoring and Performance Assessment.

The AAR was submitted to the EPA and DEQ in August 2016 and since that time further optimization and refinement of the I/I Reduction Program and the solution set for the selected Level of Service has occurred. Development of the capacity-improvement solution sets was an intensive effort using a variety of tools, criteria, and through many intensive workshops considering multiple alternatives. Solutions included upgrades to existing piping and pumping stations, new pressure reducing stations (PRSs), wet weather storage facilities, as well as the I/I reduction. These solutions were developed for both the regional system as well as the upstream Locality systems. Table EX-4 summarizes the solutions developed for the RHM to meet the 4-year LOS.

Table EX-4. Summary of RHM Solutions

Type	HRSD Assets	Locality Asset
Inverted Siphon Improvements (each)	2	0
New/Improved PRS (each)	21	0
PS Improvement (each)	24	41
Storage Facilities (each)	12	0
Storage Volume (MG)	27.3	0
Upsize FM (mi)	29.26	4.58
Upsize GM (mi)	9.05	0.81

The treatment plant capacities were also evaluated against the anticipated peak flow for the 4-year Level of Service and three facilities were identified with recommended improvements. Table EX-5 lists these solutions as well as planning level costs.

Table EX-5. TP RWWMP Improvements

TP	RWWMP Upgrades	Capital Cost, $2017
BH	None	
JR	Additional secondary clarifiers and return activated sludge pumping	$44,700,000
WB	None	
YR	None	
AB	None	
AT	4.1 MG equalization tank and additional influent screening	$24,400,000
NA	None	
VIP	Influent pumping and 1 MG equalization tank	$27,000,000
TOTAL		**$96,100,000**

EX.4 High-Priority Projects

The Fourth Amendment to the Consent Decree includes the requirement that HRSD identify a set of High-Priority Projects (HPPs) to be implemented in parallel with SWIFT. Scoring criteria were established that considered SSO load reduction for each project, location of the affected SSOs, and reduction in I/I from each project.

After developing the full set of RWWMP solutions (comprised of more than 500 different elements), HRSD performed a modeling evaluation of each individual element to determine its effectiveness in SSO reduction as well as identifying the location of the affected SSOs. This information along with I/I reduction data was used to calculate the total score for each project, and $208 million worth of High-Priority Projects were selected. These projects included a variety of improvements and were located in six different Localities. Table EX-6 shows the High-Priority Projects by Asset Type.

Table EX-6. High-Priority Projects by Asset Type

Asset Type	Cost ($ Millions)	% of Total
PRS	$13.0	6.3%
Storage	$38.8	18.7%
HRSD Pump Station	$35.2	16.9%
HRSD Conveyance	$17.7	8.5%
Locality Pump Station	$12.6	6.0%
Locality Conveyance	$3.9	1.9%
I/I Reduction	$86.5	41.7%
Total	**$207.7**	**100%**

The High-Priority Projects are scheduled to be completed by 2030 and are estimated through modeling to reduce baseline SSO volume by approximately 47% for the 5-year peak flow recurrence event.

While the HPPs are being implemented, HRSD intends to continue its Pathogen Source Tracking Program to address bacteria impairments in local water bodies. These efforts will focus on identifying, locating and eliminating chronic and persistent non-SSO-related sources of human-sourced bacteria. Many such projects are completed with several more on-going in several Localities in the system. These projects provide far greater public benefits than reducing SSOs during large storm events.

EX.5 Cost Estimating, Sequencing and Scheduling

As mentioned previously, there are 529 different elements that have been identified as part of the 4-year LOS RWWMP solution set. Using national and local data, each element was carefully evaluated to develop a Class 4 level cost estimate (representing concept study/feasibility level work). The total cost by asset type is shown in Table EX-7.

Table EX-7. RWWMP Capital Costs by Asset Type

Asset Type	Cost ($ Millions)	% of Total
PRS	$248.93	13.8%
Storage Facilities	$112.09	6.2%
HRSD Pump Station	$96.74	5.4%

Table EX-7. RWWMP Capital Costs by Asset Type		
Asset Type	Cost ($ Millions)	% of Total
HRSD Conveyance	$89.27	5.0%
TP Upgrades	$96.11	5.3%
Locality Pump Station	$114.45	6.4%
Locality Conveyance	$190.94	10.6%
I/I Reduction	$852.27	47.3%
Total	**$1,800.8**	**100%**

Figure EX-3 provides the program cost estimate allocated by TP and asset ownership.

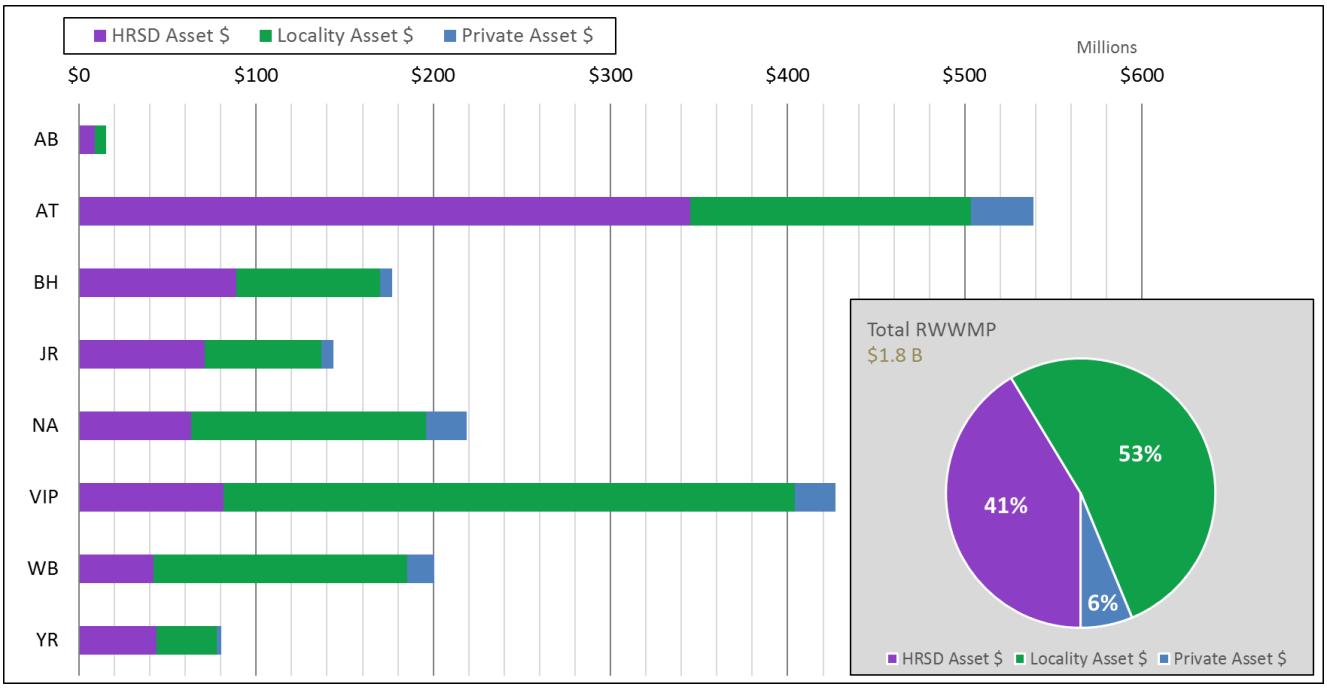

Figure EX-3. RWWMP Project Cost Estimates by TP

The elements were also assembled together into projects that mimic the way HRSD would likely implement a CIP project. Elements were grouped based on ownership (HRSD vs. Locality), location, work type for contractor specialties (e.g., I/I reduction or wet weather storage facility), and limiting the dollar value in some cases. The 529 elements were grouped into 174 projects.

Each of these projects was also evaluated to determine a sequence of construction. Through the modeling performed for the individual HPPs, it was clear that the sequence of implementation could actually make the SSOs increase until the full plan was completed. Therefore, a sequencing process was performed to determine which projects need to be completed before other projects are completed. This sequencing occurred at the treatment plant level and follows hydraulically interconnected projects.

Following sequencing of the projects, they were scheduled to fit available cashflow in HRSD's Financial Plan for the purpose of the Financial Capability Assessment. The RWWMP was scheduled with an overall implementation covering a 34-year period starting in 2020 through the end of 2053. The High-Priority Project phase runs from 2020 through 2030, concurrent with the implementation

of SWIFT and the Pathogen Source Tracking program. The three remaining primary phases, of eight-years duration each, are divided as follows:

- Phase 1: 2030 through 2037
- Phase 2: 2038 through 2045
- Phase 3: 2046 through 2053

Table EX-8 shows the elements and total accumulated cost corresponding to each.

Table EX-8. RWWMP Projects by Implementation Phase for Financial Capability Assessment

Phase	Completion Time Frame	Number of Projects	Number of Elements	Total RWWMP Project Costs ($ Millions)
RWWMP High-Priority Projects	2020 – 2030	6	34	$207.7
Overlap RP/CIP	Completion date as indicated in CIP	8	24	$0.00*
RWWMP Phase 1	2030 – 2037	28	50	$326.8
RWWMP Phase 2	2038 – 2045	73	242	$678.7
RWWMP Phase 3	2046 – 2053	59	179	$587.6
	Total	**174**	**529**	**$1,800.8**

**Costs for overlap projects are in HRSD's CIP and RAP.*

Locality asset improvements are scheduled as early as possible, contingent on hydraulic dependencies with respect to downstream improvements. The first Locality asset improvements occur in the first year of Phase 1 and final completion of all improvements is by the end of 2053. This scheduling reality is reflected in Figure EX-4 which shows the distribution of expenditures for HRSD asset improvements and Locality asset improvements within the overall cashflow for the full RWWMP.

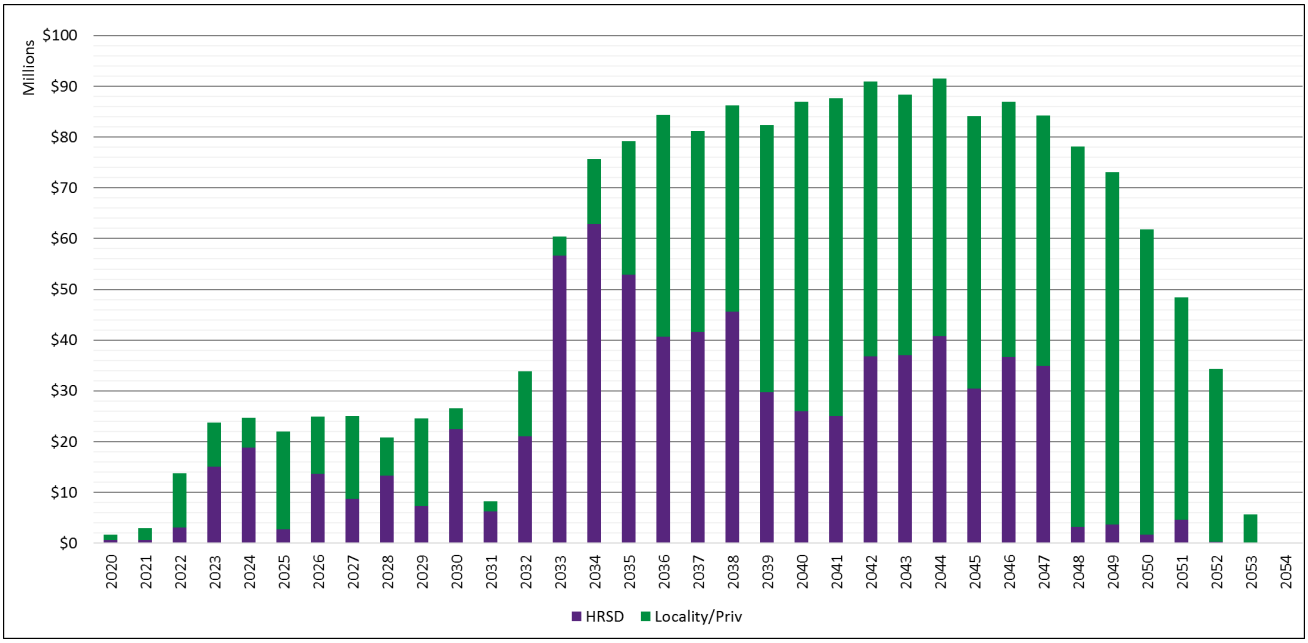

Figure EX-4. RWWMP Schedule Cash Distribution by Ownership

Projects from each of the eight treatment plant service areas were scheduled across the entire RWWMP implementation duration. This spread approach results in program implementation activities providing benefits broadly across the service area. This approach is reflected in Figure EX-5 which shows the cash flow distribution per treatment plant service area.

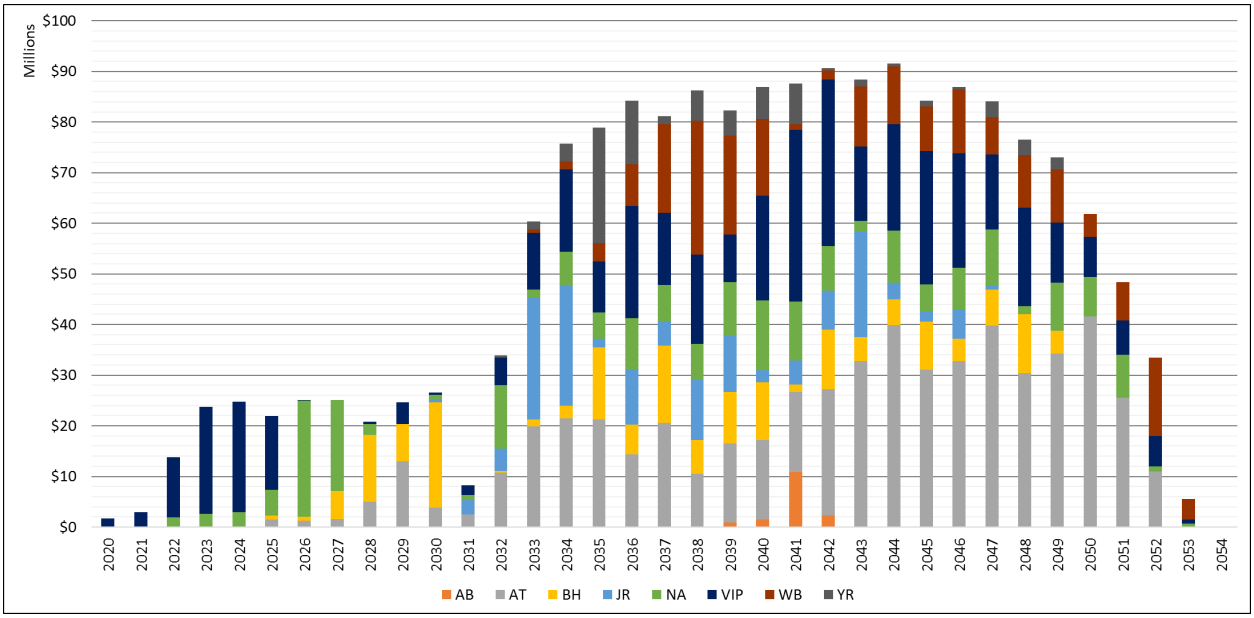

Figure EX-5. RWWMP Schedule Cash Distribution by TP

EX.6 Affordability

A critical element to successful implementation of the RWWMP is determining the financial impact on Hampton Roads communities. HRSD has evaluated the RWWMP regional affordability impacts, modeled using currently available guidance from the EPA document for Financial Capability Assessment (FCA), and supplemental evaluation factors considered for a more complete representation of local financial capability. Total costs for the Integrated Plan are summarized in Table EX-9 with respect to Median Household Income (MHI) and EPA's residential indicator component for financial impact where greater than 2% is considered high financial burden. These costs include all estimated wastewater and stormwater costs for HRSD and the Localities.

Table EX-9. Peak Residential Impact for Selected LOS

Scenario	Schedule Completion	Regional MHI	Peak HHLD Cost, $/yr	Peak Year	Peak MHI Impact, %	HHLDS >2% HHLD Income	Financial Impact
Integrated Plan	2053	$61,908	$1,301	2049	2.10%	55%	High

At a finer level of granularity, Figure EX-6 shows the peak residential indicator by census tracts in the service area for MHI in each.

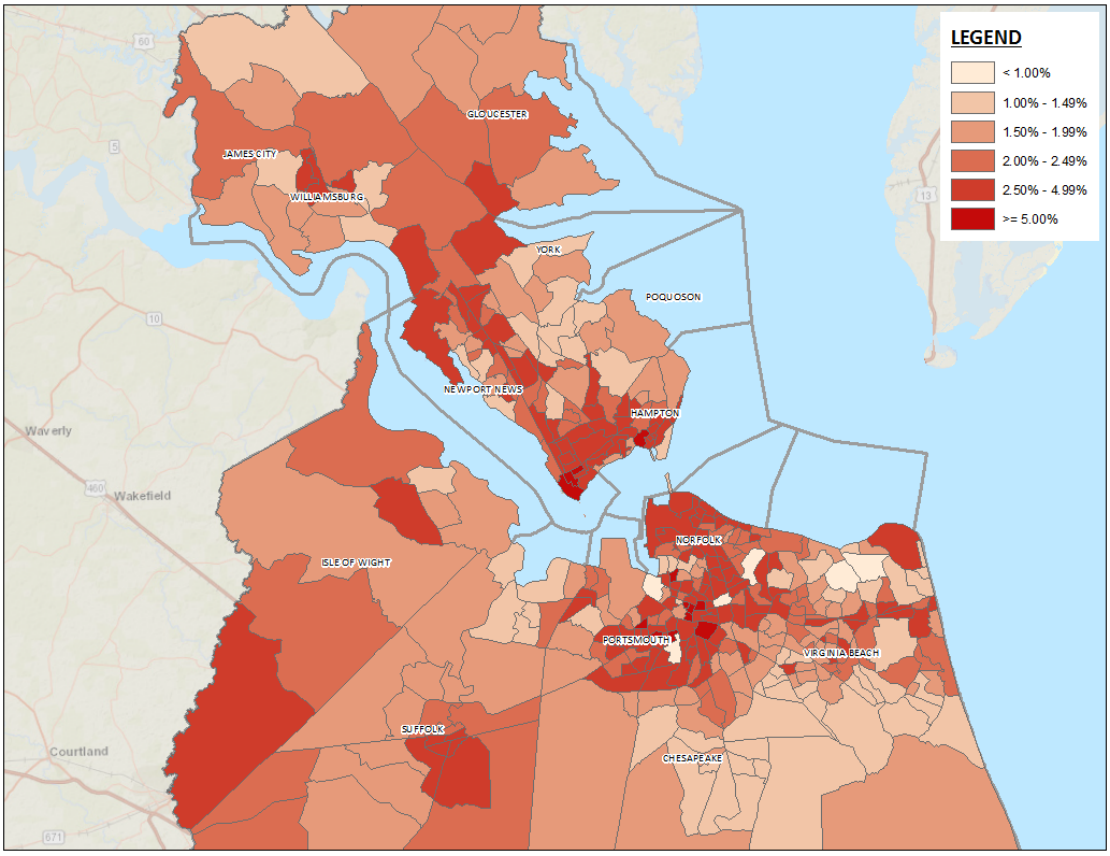

Figure EX-6. Peak Residential Indicator by Census Tract Level MHI

Median household income for the region does not consider income inequality both between communities and within each community. Residents falling into potentially vulnerable populations would experience a vastly different economic burden from increases to non-discretionary expenses than median household income alone would indicate.

In an effort to quantify the true impact to the region, the peak financial burden was evaluated relative to income quintiles. Each of the quintile brackets contain approximately 20% of the population. The results of a residential impact assessment of these brackets are shown in Table EX-10. For the peak cost per household under the Integrated Plan scenario, the lowest and second lowest quintiles (40% of the population) were calculated with residential impacts of 9.2% and 3.5%, respectively.

Table EX-10. Regional Quintile Analysis of RI for the Selected LOS

Quintile [1]	Mean Household Income	Upper Limit	Peak RI, Integrated Plan
Lowest Quintile	$14,183	$26,219	9.2%
Second Quintile	$36,722	$47,510	3.5%
Third Quintile	$59,118	$72,168	2.2%
Fourth Quintile	$89,292	$109,998	1.5%
Highest Quintile	$176,797	N/A	0.7%

[1] Quintile income per ACS 5-Year estimates (2011-2015); MSA: Virginia Beach-Norfolk-Newport News, VA-NC Metro Area (part); Virginia

The financial burden resulting from stormwater and wastewater costs is substantial and widespread. The burden on vulnerable populations is crushing with people in the lowest income quintile paying more than 9% of their household income for stormwater and wastewater services. Regionwide 55% of households are paying more than 2% (EPA's threshold for high burden) of their household income for stormwater and wastewater and in some communities, like Norfolk where 64% of households are in this high burden category. When the marginal environmental benefit of SSO reduction is considered, the cost of the full RWWMP is not justified and is a poor use of scarce resources. Figure EX-7 shows the impact by community and regionwide.

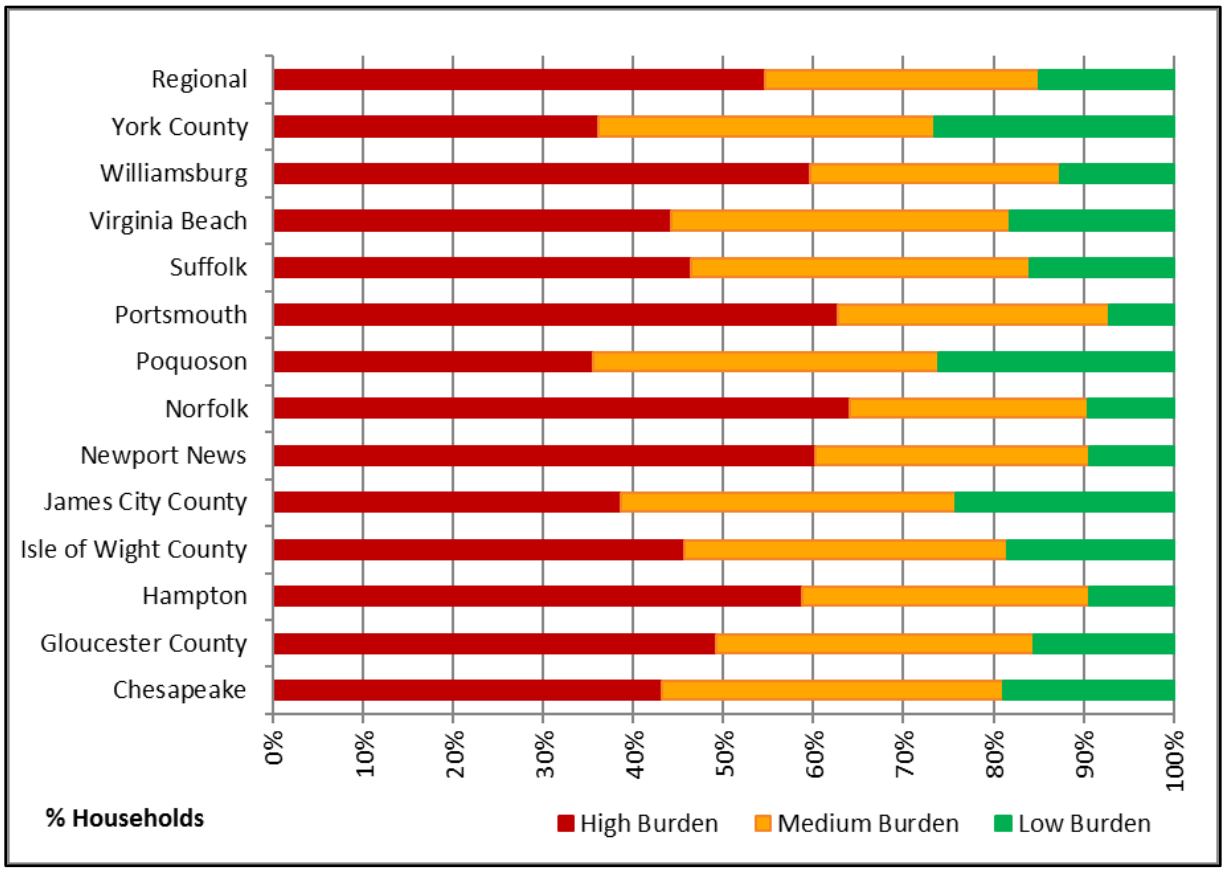

Figure EX-7. Peak Costs per Household Impacts by Locality

EX.7 Conclusion

This Adaptive Regional Plan is an environmental and economic necessity and is consistent with EPA policy and guidance on adaptive management and integrated planning. In this plan, HRSD will have spent $2 billion by 2030 addressing the most pressing and important environmental challenges that the region faces. This spending will place a heavy burden on regional ratepayers. It is necessary to re-evaluate the needs and circumstances in 2030 to better identify the highest regional environmental and public health priorities at that time as well as an expeditious implementation schedule for additional sewer system investments.

Section 1

Introduction

Sanitary sewer overflows have not been a priority issue in Hampton Roads. With large, tidally influenced receiving waters, the few overflows that have occurred are quickly assimilated into the environment, creating no lasting water quality impacts beyond the immediate, temporary impact in the vicinity of the actual SSO. Regional environmental activist organizations were not focused on SSOs. Public health officials were not concerned due to the sporadic natural (both spatially and temporally) of SSOs in the region. The region had been (and continues to be) focused on the critical Clean Water Act related issues of managing stormwater and restoring the Chesapeake Bay through the challenging Total Maximum Daily Load process.

The regional focus on SSOs was created by EPA's national enforcement priority process that identified SSOs as a priority and committed to putting every wastewater treatment system with a capacity greater than 100 million gallons per day under federal enforcement. This policy failed to take into account actual local water quality and public health impacts and applied a "one size fits all" process of enforcement, largely based upon the enforcement actions taken against communities to address Combined Sewer Overflows (CSOs) that discharged billions of gallons with nearly every rainfall event. In contrast, the HRSD Regional System discharged less than 100,000 gallons total in 2009 while the Consent Decree was being negotiated,

Beginning with a Special Order by Consent (SOC) signed in 2007 with the regional Localities and the DEQ, and then an Administrative Order and Consent Decree signed with the EPA and DEQ, HRSD has been diligently implementing an extensive evaluation, analysis, and planning process for the regional sanitary sewer system. This RWWMP is being submitted in accordance with the Third Amended Consent Decree (May 30, 2014) and the Fourth Amendment (February 21, 2017) and is the culmination of numerous planning documents and reports completed by HRSD.

Several changes have occurred during the planning process, including an extensive study to consider regional sanitary sewer system consolidation as well as the development of an Integrated Plan with the Sustainable Water Initiative for Tomorrow (SWIFT) Program. This has required modifications to the Consent Decree outlined in the next section.

The RWWMP serves as a companion document to the Final Condition Assessment Report and Rehabilitation Action Plan ("Rehab Plan" or "RP") for increasing the Level of Service (LOS) and overall system reliability to reduce SSOs and improve water quality. While the Rehab Plan, submitted in November 2014 and approved in May 2015, focuses on condition and age related defects, the RWWMP addresses system capacity during wet weather events with accommodations for forecasted growth. In some cases, the RWWMP includes proposed capacity upgrades for facilities that are also targeted for action in the Rehab Plan, and this overlap was accounted for during development of the scheduling and cost for the RWWMP.

An Alternatives Analysis Report (AAR) was completed and submitted to the EPA/DEQ on schedule in July 2016 which thoroughly detailed the comparison between various LOS. Each LOS provided an increasing amount of SSO reduction from 2-year to 5-year and 10-year, but at significantly higher costs. In the AAR, HRSD identified the 4-year LOS as the selected LOS. Work from August 2016 through the submittal of this report has focused exclusively on further developing the solution set to meet this 4-year Level of Service. The solutions presented in the AAR have been improved, put into a

constructible sequence, and scheduled out based on affordability and HRSD's financial plan and limitations. Each of these topics is covered in this document.

Section 2

Consent Decree Requirements

The first Consent Decree between the EPA/DEQ and HRSD was entered in February 2010 and includes a multi-step process for developing the RWWMP. In general, the progression is:

1. Develop a Flow, Pressure, and Rainfall Monitoring (FPRM) Plan
2. Develop a Regional Hydraulic Model (RHM) Plan
3. Implement the FPRM Plan by installing monitoring devices and collecting data
4. Document the FPRM results in a report
5. Construct the RHM using data collected from Localities and HRSD's system
6. Calibrate the RHM using the FPRM results and document the results in a report
7. Prepare a Preliminary Capacity Assessment Report
8. Develop and calibrate Locality Hydraulic Models (LHMs)
9. Prepare an Alternatives Analysis Report
10. Finalize the planning in the RWWMP

In addition to the steps necessary to construct the RWWMP, several other items are included in the Consent Decree:

- Develop a Condition Assessment Plan
- Prepare a Preliminary Condition Assessment Report
- Complete field assessments and prepare a Final Condition Assessment Report and Rehab Plan
- Implement a significant number of Interim System Improvements
- Document the Management, Operations, and Maintenance (MOM) Program
- Submit a Short Term Wet Weather Operational Plan
- Prepare an SSO Emergency Response Plan
- Coordinate with Localities
- Public Participation via annual public meetings and newsletters
- Annual and Semi Annual Reporting along with quarterly briefings
- Payment of Civil and Stipulated Penalties
- A Post-RWWMP Implementation Monitoring and Performance Assessment

With the submission of this RWWMP, all the Consent Decree requirements have been fulfilled with the exception of ongoing reporting, the Post-RWWMP Performance Assessment which will be completed at the end of the implementation period, and a few remaining Interim System Improvement Projects which are due in 2018.

Since the signing of the Consent Decree in 2010, there have been several significant changes through amendments in 2013, 2014, and 2017:

- The April 4, 2013 Amendment focused on the Regionalization Study with an accompanying schedule adjustment for the RWWMP while requiring several additional Interim System Improvement projects;

- The May 30, 2014 Third Amended Consent Decree was developed after the Localities declined the regionalization approach. HRSD proposed a hybrid regionalization approach to take on the responsibility for the entire RWWMP relieving the Localities of their participation in the program through the SOC. This extended the RWWMP deadline to October 1, 2017, while adding several more Interim System Improvement projects; and,
- The February 21, 2017 Fourth Amendment to the Consent Decree allowed for HRSD to include consideration of the SWIFT Program (referenced as Aquifer Replenishment Program) as part of an Integrated Plan with the RWWMP. An additional element was included for High-Priority Projects to be conducted in parallel with the SWIFT Program.

The requirements in the Consent Decree relating to the RWWMP are in Section XI and begin with the Preliminary Capacity Assessment Report which was completed and submitted to the EPA/DEQ in July 2012. This report detailed the capacity limitations for the three Levels of Service being evaluated (2-, 5-, and 10-year).

Paragraph 40 of the Consent Decree describes the requirements for the AAR, which was due (and submitted) by August 1, 2016. For each peak flow Level of Service, the AAR provided the results of HRSD's work to analyze costs and SSO reduction impacts, as well as an initial review of affordability. A single Level of Service was required to be selected for final development in the RWWMP. Paragraphs 41 through 44 of the Consent Decree list requirements for consideration of I/I removal, consultation with Localities, and detail the minimum standard for what the AAR should include.

The requirements for the final RWWMP begin in Section XI.C and are summarized as follows:

- Paragraph 45 – Submit RWWMP by October 1, 2017 for EPA/DEQ review and approval. The RWWMP should be developed in consultation with the Localities and reflect HRSD's responsibility for designing, funding, and building Level of Service adequate capacity throughout the regional sanitary sewer system, regardless of asset ownership. The plan will consider capacity at the treatment plants in addition to the collection system and must accommodate the peak hourly flow at the selected LOS.
- Paragraph 46 – The RWWMP should describe in detail the measures to be performed to achieve the specified Level of Service.
- Paragraph 47 – The selected alternative should provide details on all upgrades required for treatment plants, pumping stations, gravity mains, and force mains to achieve the LOS. Operating pressures should be provided along with measures to be implemented to reduce I/I.
- Paragraph 48 – The general outline of the RWWMP is provided as an appendix to the Consent Decree, and the Integrated Plan may be referenced for consideration in sequencing and scheduling the RWWMP projects.
- Paragraph 49 – A Post-RWWMP Implementation Monitoring and Performance Assessment Plan must be included.
- Paragraph 50.a and 50.b – A schedule shall be included in the RWWMP for each identified, major measure including interim milestones. From the Consent Decree: *The schedule in the RWWMP also shall accommodate expenditures on and revenues resulting from the ARP and related measures in the Integrated Plan to be implemented by HRSD in order to (i) facilitate compliance with other requirements of the CWA applicable to HRSD and/or its member Localities; (ii) provide important water quality benefits for the Chesapeake Bay and other waters in the region; and/or (iii) ameliorate other regional human health or environmental issues; provided that (a) HRSD demonstrates that greater human health or environmental benefits will be obtained through implementation of some or all of the projects in the ARP before completion of all of the RWWMP Collection System projects; and (b) HRSD also provides an implementation*

schedule for both the ARP and the RWWMP that is as expeditious as possible as determined through an acceptable Financial Capability Assessment and good engineering practice.

- Paragraph 50.c - A group of High-Priority Projects should also be identified for construction concurrent with the SWIFT Program with justification for project selection. The schedule shall also include provisions for acceleration if, for any reason, SWIFT is delayed or abandoned.
- Paragraph 50.d – Work expediency from the Consent Decree: *HRSD shall provide in the RWWMP that all work and actions required by the Consent Decree be completed as expeditiously as possible, except to the extent that HRSD makes the demonstration in Paragraph 50.b., i.e. (a) HRSD demonstrates that greater human health or environmental benefits will be obtained through implementation of some or all of the projects in the ARP before completion of all of the RWWMP Collection System projects; and (b) HRSD also provides an implementation schedule for both the ARP and the RWWMP that is as expeditious as possible as determined through an acceptable FCA and good engineering practice. HRSD may supplement the FCA with any additional information which it believes is relevant to an understanding of HRSD's and the Region's financial capability, to the extent contemplated by the FCA.*
- Paragraphs 54 through 59 – Requirements are outlined for review and approval of the RWWMP, as well as implementation of the approved plan. The Fourth Amendment to the Consent Decree requires that the RWWMP will be considered a material modification to the Consent Decree and must go through public comment and Court approval.

Section 3

Locality Consultation, Public Outreach and Agency Coordination

Since prior to initiation of the Special Order by Consent with the Locality and DEQ in 2007, HRSD has worked diligently to share information with the Localities in the development of the RWWMP. Public outreach and coordination with the regulatory agencies has also been a major part of the Consent Decree execution.

3.1 Locality Consultation

3.1.1 Capacity Team, Locality Team, and DUC

HRSD and the Localities have been meeting regularly since 2005 to address issues related to sanitary sewer system capacity improvements. In the early years through 2012, two separate groups met: the Locality Team which included representatives from each of the Localities and DEQ, and also a smaller working group called the Capacity Team. The Locality Team met monthly with meetings facilitated by HRSD to review general progress of the work and set objectives. The Capacity Team met weekly on the remaining Mondays of each month to implement the goals and objectives of the Locality Team. This included development of the Regional Technical Standards, flow thresholds, and set the basis for the state Special Order by Consent. After the Consent Decree was initiated, the Capacity Team served as a working group to make consistent deliverables (e.g., flow monitoring practices and evaluation) and act as an information sharing conduit. HRSD was building the RHM using facility data and flow parameters collected from the Localities with discussion held during these regular meetings. After 2012, the meetings switched to a singular meeting group of Localities, HRSD, and DEQ. Discussions included development of a private property I/I program and regionalization. Eventually, the meetings switched to quarterly in 2014 after HRSD fully took on the responsibility for the regionalized approach to the RWWMP. Since January 2007, there have been 148 Capacity Team and Locality meetings. The complete list of these meetings is shown in Table 3-1 along with general topics of discussion, and available attendance sheets for those meetings are included in Appendix A.

Table 3-1. Capacity Team/Locality Team Meetings

Meeting Dates	Discussion Items
January 14, 2007	Review DUC Retreat Update, Training Outline for February 11th, Capacity Assessment and New Connection Practices, Regional Data Coordination, Annual Report Template, Work Plan Update
November 26, 2007	Discuss Hampton Roads Planning District Commission SSO data update, hydraulic model software selection, primary and secondary point of contacts for Localities, Locality Overflow Points, HRSD MOM Program review. Review DEQ Special Order by Consent, EPA Administrative Order, Regional Technical Standards applicable to the Flow Monitoring Plan. Discuss available data relative to the Regional Hydraulic Model, Master Metering Program, HRPDC ftp site, flow meters for Flow Monitoring Programs, evaluation and upgrade of the SCADA system

Table 3-1. Capacity Team/Locality Team Meetings

Meeting Dates	Discussion Items
December 17, 2007	Discuss Flow Monitoring Plan-issues, challenges and status. Master Meter Program status and Regional Hydraulic Model updates. Review Flow Acceptance Letter, Flow Projection Data, Data Sharing, and Communications Plan.
January 7, 2008	Review EPA 308 Update, Flow Monitoring Plan Updates, Capacity Assessment and New Connection Practices, Flow Acceptance Letter, Regional Data Coordination, Work Plan Update, Directors of Utilities Meeting Capacity Team Update
January 28, 2008	Review Flow Monitoring Plan- DEQ Comments, Deployment Schedule, Permanent Programs. Regional Hydraulic Model and Master Meter Program Status updates. Discuss Flow Acceptance Letter, Information Sharing, Public Participation Plan.
March 10, 2008	Review existing processes of Locality Plan Review staff to determine how Flow Acceptance Letter and Capacity Assurance Programs can be integrated to accommodate Consent Order requirements
March 17, 2008	DEQ will discuss the draft flow acceptance letter and the threshold criteria for being subject to the letter and the Flow Monitoring Plans, covering points in the consent decree that were referred to us by the legal team
March 31, 2008	Discuss Flow Monitoring Programs - DEQ comments, Deployment Schedule, Permanent Programs. Regional Hydraulic Model update, discuss data needs and GIS template. Review Master Meter Program Status Update, Flow Acceptance Letter, Information Sharing and Public Participation Plan/Locality Public Communications.
April 7, 2008	Discuss Consent Decree update, Capacity Team work plan for the next 90 days, SOC Compliance update, public communications update, data collection update
April 14, 2008	Discuss Flow Acceptance (DEQ transmittal letter, flow acceptance letter, DEQ closure April 21st), SSORS review (cause list and volume estimation consistency)
April 21, 2008	Discuss Flow Acceptance (discussion with DEQ to achieve concurrence and closure) Regional Wet Weather Management Plan (1st quarterly newsletter draft) SSORS Review (cause list finalization)
April 28, 2008	Review Flow Acceptance Process, Sewage Flow Projection Data, and Upcoming Training. Discuss Flow Monitoring Programs progress update, Regional Hydraulic Model data needs and GIS template update, Master Meter Program status update, Information Sharing, Public Participation Plan/Locality Public Communications
May 5, 2008	Discuss Design Firms Training (review of topics and responsibilities, sewage flow projection data, regional design guidelines, flow acceptance process), Short Term Wet Weather Operating Plan Review, SSORS Review (cause list finalization), RDII/Input Hydrographs Methodology Training
May 12, 2008	Discuss DEQ's perspective, Overview of the Special Order by Consent, Flow Acceptance Process, Applying the Regional Design Guidelines, Regional Sewage Flow Projection
June 2, 2008	Discuss Annual Report Outline Review, SSES Plans

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
June 3, 2008	Review Special Order by Consent Requirements (Interface between Locality and HRSD models, Information Requirements, referenced methods for RDII estimation), Monitoring and Model Calibration. Discuss status of Locality Modeling and Flow Estimation, Regional Hydraulic Modeling Users Group, Approaches to Estimating Rainfall Derived from Infiltration and Inflow (RDII) - Unit Hydrograph with SWMM Groundwater Approach, Hydrologic Approach using HSPF
June 23, 2008	Discuss MOM Program Consistency, Flow Acceptance Process Modification, Rainfall Data Review (JCSA, Newport News, Portsmouth, Suffolk, Chesapeake, Hampton, HRSD)
June 30, 2008	Review SSORS Cause List update, SOC Annual Report outline, Regional Rainfall Network, Flow Acceptance Process Update, Flow Monitoring Programs progress update, Regional Hydraulic Model update (data needs and GIS template), Master Meter Program status update, Information Sharing, Participation Plan/Locality Public Communications
July 14, 2008	Discuss Regional Technical Standards Technical Interpretation No. 1, Short Term Wet Weather Operating Plan, July 21 Meeting with DEQ (Confirm Technical Interpretation, MOM Expectations, Flow Acceptance Process)
July 21, 2008	Discuss Flow Acceptance Status Report, Technical Interpretation on RTS Section 3.3.3, DEQs Expectations for MOM submittal
July 28, 2008	Review Flow Acceptance Process Update, Short Term Wet Weather Operating Plan review, Flow Monitoring Programs progress update, Regional Hydraulic Model update (data needs and GIS template, model development), Master Meter Program status update, HRFOG, Information Sharing, Participation Plan/Locality Public Communications
August 4, 2008	Discuss SSES Plan Contents, Submittal of Flow Evaluation Reports, DEQ draft MOM Guidelines, MOU with the Health Dept. for public notification of SSOs, EPA Modeling Meeting
August 18, 2008	DEQ review of the Flow Evaluation Reports, Calculating the Peak Flow Threshold (multifamily and commercial), SSES Plans and peak flow calculations, C in MOM, RTS Technical Interpretation No 1, MOU with Health Dept. on SSO Notification, LOPS, SSES table of contents
September 22, 2008	Discuss updating the Water Consumption Pump Station Association (Presentation by Jay Bernas with HRSD), Developing Inflow Hydrographs (developing input hydrographs at all connect points to the HRSD system for the purpose of hydraulic modeling)
September 29, 2008	Review Regional Water Consumption/Facilities/Land Use Dataset Development, Flow and Rainfall Monitoring Programs progress updates, Regional Hydraulic Model update (data needs and GIS template, model development, input hydrograph development), Master Meter Program status update, HRFOG, Annual Reports, Application of the Regional Sewage Flow Projection Data Table and Use of Duration, Information Sharing, Participation Plan/Locality Public Communications
October 6, 2008	Discuss HRFOG (review documents HRPDC sent out), Rain (Are we there yet?), Peak Flow Threshold Training, Flow Acceptance

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
October 27, 2008	Review Flow and Rainfall Monitoring Programs progress updates, Regional Hydraulic Model update (GIS data delivery, GIS data validation), Master Meter Program status update (Access to data, installation progress), HRFOG, Annual Reports, Common CMOM Elements, Peak Flow Threshold Determination, Information Sharing, Participation Plan/Locality Public Communications
November 3, 2008	Discuss Process for building/calibrating regional model and coordinating with locality models
November 24, 2008	Review Regional Technical Standards Technical Interpretation No. 2, Regional Hydraulic Model update (GIS data validation, Regional Model Process), SSES Basin Results, Master Meter Program status update (Access to data, installation progress), HRFOG, Common CMOM Elements, Information Sharing (HRSD Regional SharePoint Site, Meter Data), Locality Plans for Rate Increases
December 1, 2008	Discuss SSES Basin Determination (What do the numbers tell us? Are there outliers?), Private Property Issues (How do we approach this topic? When?), I/I Abatement Programs and Flow Acceptance (Should this have some regional consistency? When should the issue be addressed?)
December 15, 2008	Discuss Locality Summary of all service areas
January 26, 2009	Review Regional Hydraulic Model update, SSES Plans and Field Activities, Master Meter Program status update, HRFOG, Information Sharing (HRSD Regional SharePoint Site, Meter Data)
February 2, 2009	Discuss Suffolk's Draft I/I Mitigation Banking approach, SSES Plans (mutual regional accountability for conformance with the RTS), Long Term Simulation, RWWMP (localities plans in the EPA approved plan), Resource sharing for SSES
February 23, 2009	Review SSES Plans and Field Activities, Flow Evaluation Reports, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Information Sharing (HRSD Regional SharePoint Site, Meter Data)
March 2, 2009	Discuss SSES Plan Review Status (update on the committees' work reviewing SSES plans and the process for moving forward), RTS Interpretation (questions regarding manholes and how much work needs to be done under a phased investigation), Regional Response to DEQ comments (these will need a regionally consistent response), Review of EPA language (subject to joint defense agreement)
March 9, 2009	Discussion on Subject to the Joint Defense Agreement outline
March 16, 2009	Review and stick to comments that have regional impact and find regionally consistent answers to address the comments, Draft table summarizes comments that were common to 7 or more localities we'll work out way down until we find the point where regional significance ceases
March 30, 2009	Review SSES Plan, Flow Evaluation Reports, Flow Parameter Database Delivery, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
April 27, 2009	Review SSES Plan, Flow Evaluation Reports, Flow Parameter Database Delivery, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing
May 4, 2009	Discuss SSES Plan Status (Poquoson in, Suffolk revisions in soon, guidance pending from DEQ on Chesapeake pump run time), Flow Evaluation Reports (issues with Suffolk's Flow Parameter Sample), Conditional Flow Acceptance (need HRSD to revise form, Newport News and Suffolk have one), LOP Analysis (meet when non-LOPs are thought to be a result of HRSD system, meet with localities when LOPs activate)
June 1, 2009	Review SSES Plan Issues, Flow Evaluation Reports, Flow Parameter Database Delivery, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing
June 29, 2009	Review SSES Plan Submittals, Flow Evaluation Reports, Flow Parameter Database Delivery, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing
July 6, 2009	Discuss SOC issues to discuss (service basins vs. service areas - SSES, Peak Flow Commitment and Modeling, Extent of Locality Models, Conflicts between the Rehab Plan and RWWMP)
August 31, 2009	Review RTS Technical Interpretation No.4 (DRAFT), SSES Field Activities, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, SOC Annual Report, Information Sharing
September 28, 2009	Review SSES Field Activities, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, SOC Annual Report, Information Sharing
October 5, 2009	Discuss Groundwater Modeling, HRSD Consent Decree
October 26, 2009	Discuss Common CMOM Program Elements (HRFOG, Wet Weather Operation, Flow, Rainfall and Pressure Monitoring, SSO Response, Flow Acceptance, Regional Design Guidelines, Sewer System Modeling, SSES Planning and Execution), Peak Flow Threshold Determination and Application
November 2, 2009	Discuss RTS Technical Interpretations, Use of Hydraulic Model to estimate Peak Flow for the purpose of SSES, Basin Determination, Initial Flow Evaluation Report Impressions from review committee
November 30, 2009	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing, DEQ Comments
December 14, 2009	Agenda not available

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
January 4, 2010	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing, DEQ Comments
January 25, 2010	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing, DEQ Comments
February 22, 2010	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing, DEQ Comments
March 29, 2010	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Groundwater Model Process, RTS Technical Interpretations, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing, DEQ Comments
April 26, 2010	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Groundwater Model, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing, DEQ Comments
May 24, 2010	Review Groundwater Modeling, DEQ Comments, SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Master Meter Program status update, HRFOG, Private Property I/I Abatement Program, Information Sharing
June 28, 2010	Review RTS Minor Revision No. 1, SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Flow Monitoring Program status update, HRFOG, I/I Abatement Program, DEQ Comments, Information Sharing
July 26, 2010	Review RTS Minor Revision No. 1, SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Flow Monitoring Program status update, HRFOG, I/I Abatement Program, DEQ Comments, Information Sharing
August 16, 2010	Review Finalization of minor Revision No 1, RGST continued, Condition Assessment documentation format
August 30, 2010	Review RTS Minor Revision No. 1, SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Flow Monitoring Program status update, HRFOG, Private Property I/I Abatement Program, DEQ Comments, Information Sharing
September 23, 2010	Discuss Hydraulic Modeling and Capacity Assessment presentation
September 27, 2010	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Flow Monitoring Program status update, HRFOG, Private Property I/I Abatement Program, DEQ Comments, Information Sharing
October 25, 2010	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Flow Monitoring Program status update, HRFOG, Private Property I/I Abatement Program, DEQ Comments, Information Sharing

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
November 1, 2010	Discuss RGST, Locality Modeling Guidelines
November 15, 2010	Review and discuss version 4 of the RGST Business Rules
November 22, 2010	Review and discuss latest version of the RGST Business Rules and get DEQ involved, discuss use of measured data vs. representative data for model inputs
November 29, 2010	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, Flow Monitoring Program status update, HRFOG, Private Property I/I Abatement Program, DEQ Comments, Information Sharing, Consent Decree Annual Meeting
December 6, 2010	Discuss HRSD taking the lead in the private property I/I abatement program
December 13, 2010	Hammer out an agreement on the outline of the proposed Private Property I/I Abatement Program at the capacity team level and then go to the DUC in February
December 20, 2010	Review and discuss the latest version of the Private Property I/I Program
January 18, 2011	Review and discuss the updated HRSD managed Private Property I/I Abatement Program outline option
January 31, 2011	HRSD Data Analysis Presentation, Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, RHM Workshop with EPA/DEQ, Flow Monitoring Program status update, HRFOG, Private Property I/I Abatement Program, DEQ Comments, Information Sharing, Consent Decree Annual Meeting
February 7, 2011	Discuss Rehab Plan format and content, RGST (Business Rules redux)
February 28, 2011	Review SSES Field Activities, Rehabilitation Planning, Regional Hydraulic Model Update, LOP Coordination, Flow Monitoring Program status update, HRFOG, Private Property I/I Abatement Program, DEQ Comments, Information Sharing
March 14, 2011	Review and discuss version 10 of the RGST business rules, discuss the comments HRSD received from DEQ/EPA on the Interim RHM Report
March 28, 2011	Review SSES Field Activities, Rehabilitation Planning and the Business Rules, Regional Hydraulic Model Update, Flow Monitoring Program status update, HRFOG, Private Property I/I Abatement Program, DEQ Comments, Information Sharing
April 25, 2011	Agenda not available
May 2, 2011	Review and discuss version 13 of the RGST Business Rules, bring your rehab cost estimates to explore
May 16, 2011	Review and discuss version 15 of the Business Rules and the technical interpretation proposed by Gloucester County for partially developed subdivisions

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
May 23, 2011	DEQ will join us to discuss the latest version of the Business Rules
June 6, 2011	Discuss Regional Hydraulic Model Report (key concepts prior to July 31 submittal to EPA/DEQ), consensus on 2030 population and employment forecasts, Capacity Assessment Process, provide EPA with percentage of pump curves that are field verified from all Localities
June 20, 2011	Discuss Summary of DEQ meeting on Business Rules, Consensus document on 2030 population forecasts, example of Rehab Business Rules application from Suffolk, Private Property Locality data request
June 27, 2011	Review SSES Field Activities, Rehabilitation Planning and the Business Rules, Regional Hydraulic Model Update, Flow Monitoring Program status update, HRFOG, Private Property I/I Abatement Program, DEQ Comments, Information Sharing
July 11, 2011	Discuss Rehab Plan Format and content, Business Rules version 17, 2030 Population and employee forecast status and consensus document
July 25, 2011	Discuss ongoing Flow, Pressure, and Rainfall Data Collection. Review SSES Field Activities, Rehabilitation Planning and the Business Rules, Private Property I/I Abatement Program, Regional Hydraulic Model Update, Capacity Assessment, HRFOG, DEQ Comments, Information Sharing
August 1, 2011	Special Capacity Team Meeting
August 15, 2011	Discuss Amended Section 7 of the RTS and MOA principles
August 22, 2011	Special Capacity Team Meeting
August 31, 2011	Special Capacity Team Meeting
September 12, 2011	Review and discuss the EPA Affordability Guidance and template for calculating the residential indicator
September 19, 2011	Collect necessary data to perform the EPA calculation of the Residential Indicator, revise template to reflect MOM costs
October 3, 2011	Discuss Capacity assessment (locality and HRSD), Affordability, MOA issues
October 24, 2011	Discuss revised Section 7 of the Rehab Plan Amendment
October 31, 2011	Review Flow, Pressure, and Rainfall Data Collection, SSES Field Activities, Rehabilitation Planning, Private Property I/I Abatement Program, Regional Hydraulic Model Update, Capacity Assessment, HRFOG, SOC Amendment, DEQ Comments, Information Sharing
November 14, 2011	Discuss affordability rates from the current Locality and HRSD costs to the 1.5% that DEQ mentioned last week, and calculations of PFC given the particulars of rehab approach
November 28, 2011	Review Flow, Pressure, and Rainfall Data Collection, SSES Field Activities, Rehabilitation Planning, Private Property I/I Abatement Program, Regional Hydraulic Model Update, Capacity Assessment, HRFOG, DEQ Comments, Information Sharing

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
December 5, 2011	Discuss Rehab Approach (come with examples to illustrate numerically your rehab specific approach with regard to rehab extent and peak flow reduction), Affordability (discuss calculation), RWWMP (how are costs allotted amongst HRSD and Localities), Approach to DEQ Coordination Meeting, Locality PS Capacity Assessment, Minor Revision No 5 (Is the region ok with this?),
December 12, 2011	Discuss gaining consistency about MOM estimating program costs for the purpose of the affordability analysis in the included categories
December 19, 2011	Discuss MOM costs (provide your estimation so they can be complied), Basins that have a different 10 PHF Q in the RHM than in the Locality SSES Plan - What is the PFC?
January 9, 2012	Discuss DEQ Coordination meeting highlights, DUC Meeting review, Capacity Assessment Process and Schedule, Overview of the RWWMP Process, HRSD Rehab Plan approach, HRSD Private Property I/I Abatement Program
January 30, 2012	Review and discuss the current approach and relationship between the Rehab Plans, LOS analysis and RWWMP, and the recent DEQ proposal
February 6, 2012	Discussion about a technical path forward and addressing the set of critical concerns
February 13, 2012	Discussion about a technical path forward and addressing the set of critical concerns
February 21, 2012	Discuss revised approach for moving forward
February 27, 2012	Special Capacity Team Meeting
March 12, 2012	Final preparation for the EPA/DEQ meeting
March 19, 2012	Discuss and review the proposed approach to ament the SOC to provide for concurrent rehab plan and RWWMP development and the proposed compromise approach for loading growth flows and dealing with degradation
March 26, 2012	Discuss the approach to conducting concurrent rehab planning and RWWMP development, the comments on the approach to growth and degradation, and which requirements of the SOC that may be suitable for staying or modifying in the event that regionalization goes forward
April 9, 2012	Discuss the Regional Affordability Document
April 16, 2012	Review and discuss the Minor Revision No 2
May 21, 2012	Discuss update from DOF/EPA/DEQ meeting on regionalization, Sample Capacity Assessment Results, Capacity Assessment Schedule and related concerns
June 4, 2012	Discuss Regionalization Status, Review of approach to contract RWWMP under current SOC/CD, Discuss DEQ meeting, Capacity Assessment Process/Timeline
June 18, 2012	Discuss the approach to Locality Capacity Assessment
June 25, 2012	Locality Capacity Assessment presentation

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
July 16, 2012	Discuss the cost-effective I/I removal and the movement on regionalization
July 23, 2012	Discuss Regionalization (HRSD proposed CD Delays, Decree Amendment, continued SOC work, delayed SOC work), Preliminary capacity Assessment (status and use of RHM) Rehabilitation Plan (cost effective and feasible rehab for all SSES Basins, affordability and schedule)
July 30, 2012	Review DEQ comments from last week, future DEQ involvement and regionalization
August 6, 2012	Discuss Regionalization, Private Property I/I (data request), Preliminary Peak Flow Estimates (PPFEs) and related information, Affordability
August 13, 2012	Discuss Flow Agreements, outstanding technical issues, technical approach to regional comparative analysis of WWMP
August 27, 2012	Discuss Affordability, Regionalization, Private Property I/I (data request)
September 17, 2012	Discuss Cost Effective Analysis
September 24, 2012	Discuss Cost Effective Analysis (specifically the I/I Reduction Curve)
October 15, 2012	Review Consent Decree update (EPA still working), Annual Reports (due at the end of the month), PPFEs (HRSD may be asking for more detailed info in limited areas for the private property I/I work), MU2011 (update to software is needed), Cost effective curve
November 5, 2012	Discuss Consent Decree Mod Status, Regionalization Update, Model topics, Cost Effectiveness Analysis, Comparative Analysis
November 19, 2012	Discuss PPFEs and Private Property I/I Program
December 3, 2012	Discuss PPFEs, Comparative Analysis, Private Property I/I Program Update
December 17, 2012	Discuss Rehab Plans, CD Modification, Comparative Analysis, Regionalization
March 4, 2013	Discuss Consent Decree modification status, Regionalization update, HRSD Rehab Plan, Private Property Program Update, Technical Approach to the Comparative Analysis
April 1, 2013	Discuss CD Modification status, Locality Capacity Assessment, Comparative Analysis Methodology and Process
April 15, 2013	Discuss CD Modification update, Regional Hydraulic Model Update, Comparative Analysis (Non-Regional Capacity Enhancements)
May 6, 2013	Discuss the Comparative Analysis
June 3, 2013	Discuss the Comparative Analysis, updates to the RHM, parking lot issues
June 17, 2013	Discuss Flow Agreements, parking lot issues

Table 3-1. Capacity Team/Locality Team Meetings	
Meeting Dates	**Discussion Items**
July 8, 2013	Discuss Comparative Analysis Details, Locality Data Requests, Flow Agreements
July 22, 2013	Discuss Required data submittals for facilities and flow, Rehab costs (regional and non-regional), Parking lot issues (timeline)
June 2, 2014	Discuss status of the Consent Decree modification, upcoming SSES work in Locality systems by HRSD, upcoming Flow Monitoring in Locality systems by HRSD
September 15, 2014	Discuss Consent Decree status, SOC Modification, work in Localities Systems (Flow Monitoring, SSES), RWWMP Schedule, Flow Acceptance, Hydraulic Models (Mike Urban update, data requests)
December 1, 2014	Discuss SSES status, additional flow monitoring, 2030 population forecasts, SOC status, RWWMP schedule/inputs
March 2, 2015	Discuss data submittals, follow-up on Capacity Related SSOs under the MOA, HRSD Rehab Pilots, HGL Policy, Locality Interface Points on RWWMP Schedule
June 1, 2015	Discuss HRSD I/I Reduction Pilots, RWWMP Status, Locality Capacity Related SSOs
September 21, 2015	Discuss comments on I/I reduction program
December 7, 2015	Discuss Flow Pressure and Rainfall Data Access (Telog and Pi), Flow Acceptance Policy, RWWMP Update (Schedule, Models, I/I reduction program, affordability, points of interaction)
July 18, 2016	Discuss Regional Wet Weather Management Plan Selected Level of Service Solution Set presentation
September 19, 2016	Discuss the ongoing efforts expected from the MOA for HRSD and the Localities as well as expectations on sharing data/information, discuss how coordination can be improved between HRSD and the Localities and what ongoing work your Locality is doing on the Regional System
January 30, 2017	Discuss Regulatory Status, optimization progress, RWWMP status and schedule
April 10, 2017	Review the Regional Wet Weather Solutions for the upcoming RWWMP, discuss the Integrated Plan
June 19, 2017	Discuss preliminary selection of High-Priority Projects, update preliminary affordability, RWWMP schedule update, process for resetting design standards for new development flows, RHM update process
August 28, 2017	Discuss sensitive conversations about negotiations with EPA, DOJ and EPA

Beyond the Capacity Team, HRSD has regularly briefed the Directors of Utilities Committee (DUC) on major issues involving the Consent Decree. The Hampton Roads Planning District Commission (HRPDC) has provided meeting space, equipment, and representatives to monitor these efforts since the beginning for the Capacity Team and the DUC Committee Meetings. Table 3-2 provides a listing of the DUC meetings pertaining to the Consent Decree RWWMP or SWIFT. The agendas for these meetings are provided in Appendix A.

Table 3-2. DUC Meetings

DUC Meeting Date	Topics
August 6, 2008	Model FOG Ordinance
December 3, 2008	Capacity Team Update
January 7, 2009	Capacity Team Update
February 4, 2009	Capacity Team Update
March 4, 2009	Capacity Team Update
April 1, 2009	FOG Program
October 7, 2009	Consent Decree Briefing
November 4, 2009	I/I Abatement Program
December 2, 2009	FOG Civil Penalties
January 6, 2010	FOG Civil Penalties
May 5, 2010	Elizabeth River Bacteria TMDL
October 6, 2010	FOG Enforcement Response Plan
February 2, 2011	Private Property I/I
March 2, 2011	Capacity Team Update
April 6, 2011	Rehabilitation Guidelines, Standards and Tools
May 4, 2011	Private Property I/I
June 1, 2011	Private Property I/I and Rehabilitation Guidelines, Standards and Tools
July 6, 2011	Capacity Team Update
August 3, 2011	Consent Decree Deliverables Schedule
September 7, 2011	Proposed Amendment to Regional Technical Standards and Memorandum of Agreement for Private Property I/I Abatement
October 5, 2011	Special Order by Consent Briefing
November 2, 2011	Chesapeake Bay TMDL and SSOs
December 7, 2011	Consent Decree Update
January 4, 2012	Special Order by Consent and Rehabilitation Planning
February 1, 2012	EPA Integrated Planning Framework
April 4, 2012	Special Order by Consent Issues
May 2, 2012	Regional Sanitary Sewer Consolidation
June 6, 2012	Regional Sanitary Sewer Consolidation

Table 3-2. DUC Meetings	
DUC Meeting Date	Topics
July 11, 2012	Regional Sanitary Sewer Consolidation Study
August 1, 2012	Regional Sanitary Sewer Consolidation Study
September 5, 2012	Regional Sanitary Sewer Consolidation
February 6, 2013	Regional Sanitary Sewer Consolidation Study
March 6, 2013	Regional Sanitary Sewer Consolidation
April 3, 2013	Regional Sanitary Sewer Consolidation Study
June 5, 2013	Regional Sanitary Sewer Consolidation
August 7, 2013	Regional Sanitary Sewer Consolidation Study
October 2, 2013	Regional Sanitary Sewer Consolidation Study
November 6, 2013	Regional Sanitary Sewer Consolidation and Affordability
December 4, 2013	Regional Sanitary Sewer Consolidation Study
January 8, 2014	FOG Program and Regional Sanitary Sewer Consolidation
February 15, 2014	Memorandum of Agreement and Special Order by Consent
March 5, 2014	Regional Sewer System MOA, FOG and Affordability
April 2, 2014	Regional Sanitary Sewer Memorandum of Agreement
June 4, 2014	Regional Sanitary Sewer Consolidation
October 1, 2014	Special Order by Consent
November 12, 2014	FOG Enforcement, Special Order by Consent and Integrated Planning
January 7, 2015	Aquifer Recharge
February 4, 2015	Affordability and HRSD Operating Pressure Policy
May 6, 2015	Affordability
November 4, 2015	I/I Reduction Plan and RWWMP Schedule
March 1, 2017	Integrated Plan and RWWMP
June 7, 2017	High-Priority RWWMP Projects
September 6, 2017	Integrated Plan and RWWMP Update

3.1.2 Model Users Group

The original SOC required each Locality to develop a Locality Hydraulic Model to evaluate capacity and prepare solutions for the RWWMP. HRSD believed that having a consistent approach and tools would benefit the RWWMP, Localities, and HRSD. At significant expense, HRSD purchased hydraulic model software licenses for each Locality (and DEQ) along with regular yearly maintenance fees. This was in an effort to share information more easily and have a more consistent product.

Meetings were also held early in the program to clearly describe what data HRSD would need to build the RHM, review data quality, and answer questions.

To supplement the software and kick-off meetings, HRSD initiated Model Users Group meetings to serve as a conduit for obtaining information from and providing data to the Localities. Localities were invited to present their approaches to the group and there was significant exchange of ideas.

3.1.3 Data Sharing

At each step through the process, HRSD has shared information with the Localities. All Annual and Semi-Annual Reports are provided to the Localities along with every approved submittal under the Consent Decree. This includes all condition assessment data and the Rehab Action Plan, GIS data, SSO data, and results from the hydraulic modeling. HRSD established an online tool for Localities to access all the HRSD flow, pressure, and rainfall monitoring data in near real time. HRSD was also at the forefront of leading the development of standards and data collection for a regional sanitary sewer GIS.

3.1.4 Individual Meetings

At numerous points during the RWWMP development, HRSD has met with each Locality individually to review results specific to that Locality. This has included population forecasting, modeling results, I/I program development, capacity solution consultation, or to ask questions. With 14 Localities involved in the RWWMP Program multiplied by the various topics, HRSD has consulted significantly with the Localities. HRSD has met with the Localities individually five times as well as additional meetings to coordinate the SSES work performed by HRSD and development of the Locality Hydraulic Models.

Table 3-3. Meetings with Individual Localities

Date	Meeting Name	Discussion Items
12/2/2013	Locality Infrastructure Analysis for RWWMP (City of Suffolk)	Planning and Data Review • Regionalization Approach to Management of Wet Weather Challenges • Discuss existing locality capacity assessments • Identify additional data needed for expanded capacity assessment of locality system • Data Requests for available condition assessment and rehabilitation information
12/12/2013	Locality Infrastructure Analysis for RWWMP (City of Portsmouth)	
12/16/2013	Locality Infrastructure Analysis for RWWMP (James City Service Authority)	
12/17/2013	Locality Infrastructure Analysis for RWWMP (City of Virginia Beach)	
12/18/2013	Locality Infrastructure Analysis for RWWMP (City of Newport News)	
12/19/2013	Locality Infrastructure Analysis for RWWMP (City of Hampton)	
1/9/2014	Locality Infrastructure Analysis for RWWMP (Isle of Wight)	
1/15/2014	Locality Infrastructure Analysis for RWWMP (City of Norfolk)	
1/16/2014	Locality Infrastructure Analysis for RWWMP (Smithfield)	
1/23/2014	Locality Infrastructure Analysis for RWWMP (York County)	
2/13/2014	Locality Infrastructure Analysis for RWWMP (City of Poquoson)	
	Locality Infrastructure Analysis for RWWMP (City of Williamsburg)	
2/14/2014	Locality Infrastructure Analysis for RWWMP (City of Chesapeake)	
6/30/2014	Locality SSES/FM Coordination (City of Norfolk)	• Discuss any significant findings from the locality infrastructure analysis data requests
7/11/2014	Locality SSES/FM Coordination (City of Virginia Beach)	
7/14/2014	Locality SSES/FM Coordination (City of Williamsburg)	

Table 3-3. Meetings with Individual Localities

Date	Meeting Name	Discussion Items
7/15/2014	Locality SSES/FM Coordination (City of Hampton)	• Review of catchments selected for additional flow monitoring • Communication plan for SSES field activities; review of selected areas • Address locality concerns for fieldwork (i.e., permitting, schedule)
7/17/2014	Locality SSES/FM Coordination (City of Portsmouth)	
7/29/2014	Locality SSES/FM Coordination (City of Newport News)	
7/30/2014	Locality SSES/FM Coordination (City of Chesapeake)	
8/6/2014	Regionalized SSES Field Work Kickoff Meeting (City of Norfolk)	• Discussion of Investigative Approach, Health and Safety procedures, emergency contacts • Address work schedule, traffic control, public notification concerns, coordination with Fire Department
10/10/2014	Regionalized SSES Field Work Kickoff Meeting (City of Virginia Beach)	
10/21/2014	Regionalized SSES Field Work Kickoff Meeting (City of Chesapeake)	
10/29/2014	Regionalized SSES Field Work Kickoff Meeting (City of Portsmouth)	
2/20/2015	RWWMP Phase 2 SSES Coordination Meeting (City of Portsmouth)	• Recap of Phase 1 fieldwork • Discussion of Phase 2 Investigative Approach • Address work schedule, traffic control, permitting, health and safety • Introduction of SSES Contractors
2/23/2015	RWWMP Phase 2 SSES Coordination Meeting (City of Chesapeake)	
3/3/2015	RWWMP Phase 2 SSES Coordination Meeting (York County)	
3/3/2015	RWWMP Phase 2 SSES Coordination Meeting (JCSA)	
3/16/2015	RWWMP Phase 2 SSES Coordination Meeting (City of Norfolk)	
3/9/2015	Regionalized Rehab Planning (City of Suffolk)	To develop a mutual understanding of the availability and applicability of current flow data: • Status of Post-Rehab flow monitoring • Use of post-rehab flow estimates in RWWMP • Review of planning data and catchments being evaluated for I/I Reduction Program
3/15/2015	Regional I/I Reduction Program Coordination (City of Portsmouth)	The meeting purpose was to: • Follow-up on the Regional Phase 2 SSES investigation/review the catchments where HRSD intends to perform CCTV inspections • Communication plan for any pending fieldwork • Provide an update on the status of the RWWMP I/I reduction program • Discuss the catchments being evaluated in the RWWMP I/I reduction program based on wet weather flow parameters provided prior to March 2015.
3/31/2015	Regional I/I Reduction Program Coordination (City of Newport News)	
4/2/2015	Regional I/I Reduction Program Coordination (City of Chesapeake)	
4/13/2015	Regional I/I Reduction Program Coordination (City of Williamsburg)	
4/14/2015	Regional I/I Reduction Program Coordination (City of Hampton)	
4/14/2015	Regional I/I Reduction Program Coordination (York County)	
4/14/2015	Regional I/I Reduction Program Coordination (JCSA)	
4/22/2015	Regional I/I Reduction Program Coordination (City of Poquoson)	
5/27/2015	Regional I/I Reduction Program Coordination (City of Norfolk)	
8/11/2015	RWWMP I/I Reduction Program (City of Virginia Beach)	The primary objectives of our meeting will be to: • Present the locations where HRSD is planning I/I reduction activities
	RWWMP I/I Reduction Program (City of Suffolk)	
8/12/2015	RWWMP I/I Reduction Program (City of Portsmouth)	

Table 3-3. Meetings with Individual Localities

Date	Meeting Name	Discussion Items
	RWWMP I/I Reduction Program (City of Chesapeake)	• Determine if there is any additional information your locality has that could impact the planned rehabilitation activities.
8/20/2015	RWWMP I/I Reduction Program (City of Newport News)	
8/21/2015	RWWMP I/I Reduction Program (County of Gloucester)	
	RWWMP I/I Reduction Program (James City Service Authority)	
8/25/2015	RWWMP I/I Reduction Program (City of Norfolk)	
8/26/2015	RWWMP I/I Reduction Program (York County)	
	RWWMP I/I Reduction Program (City of Williamsburg)	
9/1/2015	RWWMP I/I Reduction Program (City of Hampton)	
9/2/2015	RWWMP I/I Reduction Program (City of Poquoson)	
8/22/2016	Review Chesapeake Solutions in AAR	An overview of the AAR and the 4-year solutions was presented at the last Capacity Team meeting on July 18. This meeting will go over Locality-specific solutions in greater detail. Please forward this invitation to appropriate Locality staff so they may attend.
	Review Virginia Beach Solutions in AAR	
8/24/2016	Review JCSA Solutions in AAR	
	Review York County Solutions in AAR	
8/26/2016	Review Hampton Solutions in AAR	
	Review Poquoson Solutions in AAR	
	Review Isle of Wight Solutions in AAR	
	Review Newport News Solutions in AAR	
8/29/2016	Review Portsmouth Solutions in AAR	
	Review Suffolk Solutions in AAR	
8/31/2016	Review Williamsburg Solutions in AAR	
9/2/2016	Review Norfolk Solutions in AAR	
4/17/2017	Review of RWWMP Williamsburg Solution Sets	Review of Locality improvements identified for the Regional Wet Weather Management Plan.
	Review of RWWMP Poquoson Solution Sets	
4/19/2017	Review of RWWMP Gloucester Solution Sets	
	Review of RWWMP Hampton Solution Sets	
	Review of RWWMP JCSA Solution Sets	
4/20/2017	Review of RWWMP Chesapeake Solution Sets	
	Review of RWWMP Norfolk Solution Sets	
	Review of RWWMP Virginia Beach Solution Sets	
4/21/2017	Review of RWWMP Portsmouth Solution Sets	
	Review of RWWMP Suffolk Solution Sets	
4/24/2017	Review of RWWMP Newport News Solution Sets	
	Review of RWWMP Isle of Wight Solution Sets	
4/25/2017	Review of RWWMP York County Solution Sets	

3.2 Agency Coordination

3.2.1 Quarterly Briefings

As required by the Consent Decree, HRSD has been holding briefings for the EPA and DEQ typically each January and July since 2010. The Consent Decree has a set expectation for the briefings in Paragraph 51, and HRSD supplemented that list with an overall Consent Decree program review. This included the Condition Assessment Program, MOM Program, and other non-RWWMP activities. Attendance over the years included representatives from the EPA, DEQ Tidewater Regional Office, DEQ Headquarters, Department of Justice, and HRSD (and consultant) staff. Localities were invited to listen to each briefing. Fifteen separate quarterly briefings have been provided to the EPA and DEQ.

3.2.2 Technical Calls

From 2010 through 2013, HRSD supplemented the formal quarterly briefings with technical calls held with EPA and DEQ representatives. These calls provided a more frequent and thorough discussion of ongoing activities. Eleven calls were held during the RWWMP development on the following dates:

- October 15, 2010
- February 1, 2011
- March 15, 2011
- April 21, 2011
- May 31, 2011
- July 11, 2011
- August 16, 2011
- September 20, 2011
- October 26, 2011
- October 25, 2012
- March 25, 2013

3.2.3 Technical Workshops

HRSD facilitated numerous Technical Workshops with the EPA and DEQ from January 2011 to October 2015. In these workshops, detailed explanations were held on model construction, long-term recurrence analysis approaches, rainfall/flow distribution, and hydrologic and hydraulic modeling techniques. Numerous questions from the EPA and DEQ were answered in the eight Technical Workshops on the following dates:

- June 22, 2011
- November 16, 2011
- May 10, 2012
- December 6, 2012
- January 22, 2014
- April 1, 2014

- August 7, 2014
- October 22, 2015

3.3 Public Outreach

Seven Annual Public Meetings have been held since 2010 where HRSD has provided a briefing of ongoing Consent Decree efforts along with steps that residents can take to protect receiving waters. The Localities were invited to each Annual Public Meeting. Meetings were held on the following dates:

- January 25, 2011
- January 24, 2012
- January 22, 2013
- January 30, 2014
- January 27, 2015
- January 26, 2016
- January 24, 2017

In addition to the meeting, an informational newsletter has been published by each February and all past copies have been available on the www.hrsd.com website.

Section 4
System Overview

4.1 Background

HRSD's history, mission, vision, awards, service area and unique regional approach are highlighted in this section.

4.1.1 History

POLLUTION IS POISON

AN EMPHATIC DENIAL

VOTE YES

In 1934, the Virginia General Assembly created the Hampton Roads Sanitation Disposal Commission with instructions to plan the elimination of pollution in Hampton Roads. Recommendations were made to the General Assembly, which resulted in the Sanitary Districts Law of 1938, along with "an Act to provide for and create the Hampton Roads Sanitation District." This Act required qualified voters within the District to decide, in a general election on November 8, 1938, if they favored creation of such a District. This referendum failed to gain a majority by about 500 votes out of nearly 20,000 votes cast and led to a revision of the Act. Another referendum was held on November 5, 1940, which resulted in a majority vote for the creation of the Hampton Roads Sanitation District. The District was named after Hampton Roads, a four-century-old ship anchorage located near the convergence of the James, Elizabeth and Nansemond Rivers, before they flow into the Chesapeake Bay in southeastern Virginia.

The Enabling Act provides for HRSD to operate as a political subdivision of the Commonwealth of Virginia for the specific purpose of water pollution abatement in Hampton Roads by providing a system of interceptor mains and wastewater treatment plants to handle sewage generated in the region by the surrounding Localities.

HRSD began operations on July 1, 1946, using facilities acquired from the United States government. The Warwick County Trunk Sewer, HRSD's first construction project, began on June 26, 1946, and was funded by HRSD's $6,500,000 Primary Pledge Sewer Revenue Bonds dated March 1, 1946. The Army Base Treatment Plant was HRSD's first treatment plant and began operation on October 14, 1947. The population of HRSD's service area has increased from nearly 288,000 in 1940 to approximately 1.7 million in 2017, and the treatment system has expanded over the years to meet the needs of a growing region.

4.1.2 Service Area Descriptions

HRSD's service area includes 18 cities and counties of southeast Virginia, an area of approximately 3,100 square miles with a population of approximately 1.7 million. To ensure responsive assistance and the ability to meet future needs, HRSD works closely with the communities it serves.

Table 4-1. Service Area Description	
Cities	**Counties**
Chesapeake	Gloucester
Hampton	Isle of Wight (including the Town of Smithfield)
Newport News	James City
Norfolk	King and Queen*
Poquoson	King William*
Portsmouth	Mathews*
Suffolk	Middlesex*
Virginia Beach	Surry*
Williamsburg	York

**Towns within the counties served by HRSD include Urbanna* and West Point*. These communities are part of the Small Communities Division which are not part of the Regional Wet Weather Management plan.*

4.1.2.1 Infrastructure Description

HRSD operates nine major treatment plants in Hampton Roads and four small facilities on the Middle Peninsula. These 13 plants are designed to treat 249 million gallons of wastewater each day.

The HRSD Interceptor System is comprised of two main subsystems: North Shore and South Shore, which are hydraulically separate with names reflecting their broad geographic relationships to the James River. HRSD interceptor system facilities between the York River and the James River, as well as those in Gloucester County, are part of the North Shore system. HRSD facilities in Mathews County are operated and maintained by the Small Communities Division, but transmit their flow to the North Shore system for ultimate transmission to the York River Treatment Plant. Facilities south of the James River are part of the South Shore system. This section provides an overview of the facilities managed, operated and maintained by HRSD.

The existing HRSD interceptor system is comprised of approximately 500 miles of pipelines and nearly 90 pumping stations in the systems covered by this document. The HRSD pumping station count is subject to change as pumping facilities are decommissioned, new pumping facilities are brought online and/or interim pumping facilities are deployed as necessary to assist the system.

4.1.2.2 Wastewater Treatment Plants

HRSD currently operates nine major treatment plants in Hampton Roads, five in the South Shore System and four in the North Shore System. In 2013, HRSD completed the Chesapeake-Elizabeth Treatment Plant Feasibility Study, which evaluated taking the treatment plant offline and diverting flow to other treatment plants. Using 2021 as the target closure date, the study determined that the HRSD interceptor system and remaining treatment plants have the ability and capacity to serve the current and projected needs of the Chesapeake-Elizabeth plant and all other South Shore jurisdictions. This study projects significant capital and operations and maintenance savings to close the Chesapeake-Elizabeth plant as compared to continuing operations. HRSD has accepted the findings of the study and is initiating steps necessary to close Chesapeake-Elizabeth plant by December 2021. With implementation of this closure, HRSD will have four active treatment plants remaining on the South Shore.

4.1.2.3 Collector and Interceptor System

The collection and interceptor systems in Hampton Roads convey wastewater from the Localities to one of HRSD's wastewater treatment plants. HRSD and the Localities make every effort to convey water that enters the system, whether as sanitary sewage or from wet weather sources, to an HRSD treatment facility.

Wastewater generated by private residences and businesses usually flow through gravity pipelines owned by a Locality. From there, the wastewater typically flows to a Locality-owned pump station where it is then either lifted into another Locality gravity pipe or pumped via a Locality-owned force main into a large interceptor pipeline owned by HRSD. In a few areas, wastewater flows by gravity from the Locality system to an HRSD gravity pipe. Once in the HRSD collection system, the wastewater is typically pumped to a treatment plant where the wastewater is treated and discharged. The schematic below illustrates the wastewater flow path described above.

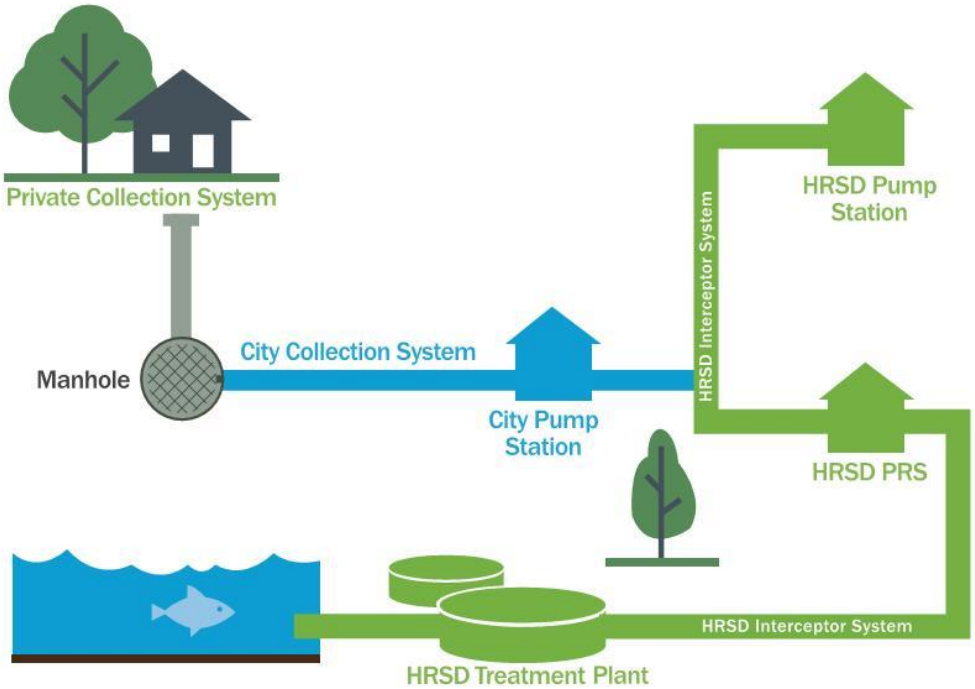

Figure 4-1. HRSD Wastewater Flow Path

The Hampton Roads topography is relatively flat, with many creeks, rivers, and a generally high water table. This topography makes deep gravity lines generally impractical to construct and necessitates the wide use of pumping, and often repumping, wastewater through the Locality collection systems and into the HRSD interceptor system. As a result, wastewater often has to be pumped several times before arriving at a treatment plant.

HRSD's interceptor system consists primarily of force mains, which are pressurized pipelines, with pumped wastewater that is delivered to the treatment plants. HRSD's system includes some large gravity mains in a few older areas of Hampton Roads which convey flow to large pumping stations. Overall, approximately 90 percent of HRSD's interceptor system by pipe length is comprised of force mains with the remaining 10 percent consisting of gravity mains. Detailed statistics and maps of the interceptor system are provided on Tables and Figures 4-2 and 4-3.

The interconnectivity of HRSD's force mains allows for certain, limited diversion of flows among treatment plants located within the same HRSD shore, as there is no hydraulic connection between the North Shore and South Shore subsystems. This diversion capability allows for limited flexibility so flows can be diverted in different directions to enable the plants to utilize capacity to the fullest potential. If capacity is limited in one portion of the system, HRSD is sometimes able to redirect the flow to another treatment plant.

The HRSD system also utilizes a relatively unique feature for a collection system—pressure reducing stations (PRSs). These PRSs are in-line pumping stations that enable pressure reduction in force mains upstream of the PRS. HRSD PRSs are designed to provide pumping assistance to large portions of the force main system based on thorough evaluation of upstream lift station pumping capabilities and projected system demands. Their broad operational criteria establish the pressures expected in HRSD's system customized for the particular sub-portion of the system that each PRS serves.

The Locality collection systems that deliver the flow to the HRSD interceptor system are, by contrast, mostly comprised of gravity pipe. Overall, approximately 85 percent of the Locality collection systems are comprised of gravity mains and the remaining 15 percent consists of force mains. The Locality collection systems also contain nearly 1,900 active pump stations, of which approximately half are directly connected via force main to HRSD facilities and the remaining half are lift stations that deliver the flow to downstream Locality-owned facilities.

Many of the hundreds of pump stations, including the PRSs, are manifolded via a network of connected force mains. Each pump station also reacts to normal flow rate changes coming from its upstream service area as well as occasional higher flow rates during wet weather events. Pump stations manifolded together must also react to varying pressure conditions as various connected pump stations turn on and off. Given the scale of this regional system, with only some pump stations actively pumping at any given moment, the collection and interceptor system experiences a complex range of flows and pressures.

As a toolset for managing this complexity, HRSD has many flow and pressure meters within its system and at strategic locations in portions of the Locality collection systems. These installations are part of a Flow, Pressure and Rainfall (FPR) Monitoring system. This FPR system includes many flow, pressure and rainfall meters and gauges that enable HRSD to monitor, maintain and manage system performance and reliability as well as to calibrate and verify system hydraulic modeling.

Table 4-2 shows a summary of the active assets that HRSD currently owns and operates in its North Shore and South Shore systems:

Table 4-2. HRSD North Shore and South Shore Interceptor System Overview - 2017

	North Shore System	South Shore System	Total System
Number of HRSD Pump Stations	33	37	70
Number of HRSD Pressure Reducing Stations	3	16	19
Total Length of HRSD Force Main (mi.)	193	294	487
Total Length of HRSD Gravity Main (mi.)	29	24	53
Number of HRSD Gravity Manholes	711	597	1,308

Table 4-3 shows a summary of the active assets that the Localities in the Hampton Roads region own and operate taken from the August 2016 information submitted by the Localities to HRSD.

Table 4-3. Locality Collection System Overview

	North Shore System	South Shore System	Total Locality System
Number of Locality Pump Stations	648	1,235	1,883
Number of Locality Terminal Pump Stations	208	726	934
Total Length of Locality Force Main (ft.)	1,544,000	3,075,000	4,619,000
Total Length of Locality Gravity Main (ft.)	9,470,000	18,051,000	27,521,000
Number of Locality Gravity Manholes	48,300	77,900	126,200

Source: Hampton Roads regional sanitary sewer asset database maintained by HRSD (retrieved August 18, 2016)

The combination of Locality-owned collection system assets and HRSD interceptor assets provide continuous wastewater service to the Hampton Roads region through carefully coordinated planning, operation and maintenance. HRSD and Locality systems form the regional system evaluated for wet weather capacity for which improvement solutions were developed as a part of the RWWMP. As shown in Table 4-3, there are approximately 934 terminal Locality pump stations that discharge directly into HRSD's system which creates a complicated network to manage flows and pressures.

Even with the scale of this regional system, the historical performance of these systems has continuously improved over the more than 70 years that the regional system has been in place. Such ongoing improvement efforts have resulted in a present-day system with minimal SSO impacts to the surrounding communities in recent years. HRSD continues to partner with the Localities to maintain and improve these systems by application of best industry practices and responsible innovation to continue providing world-class wastewater collection and treatment service to the residents of Hampton Roads.

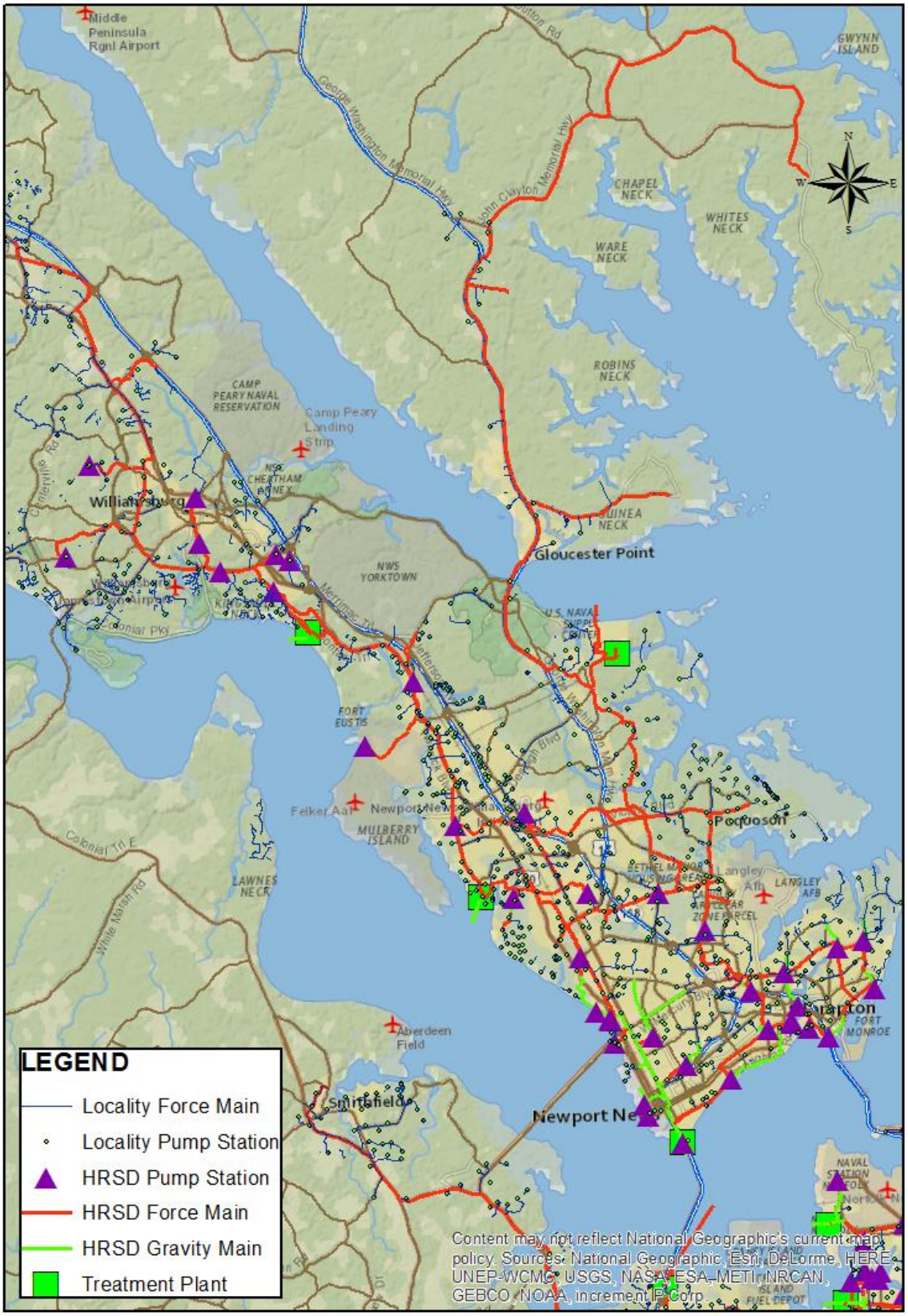

Figure 4-2. HRSD North Shore Interceptor System

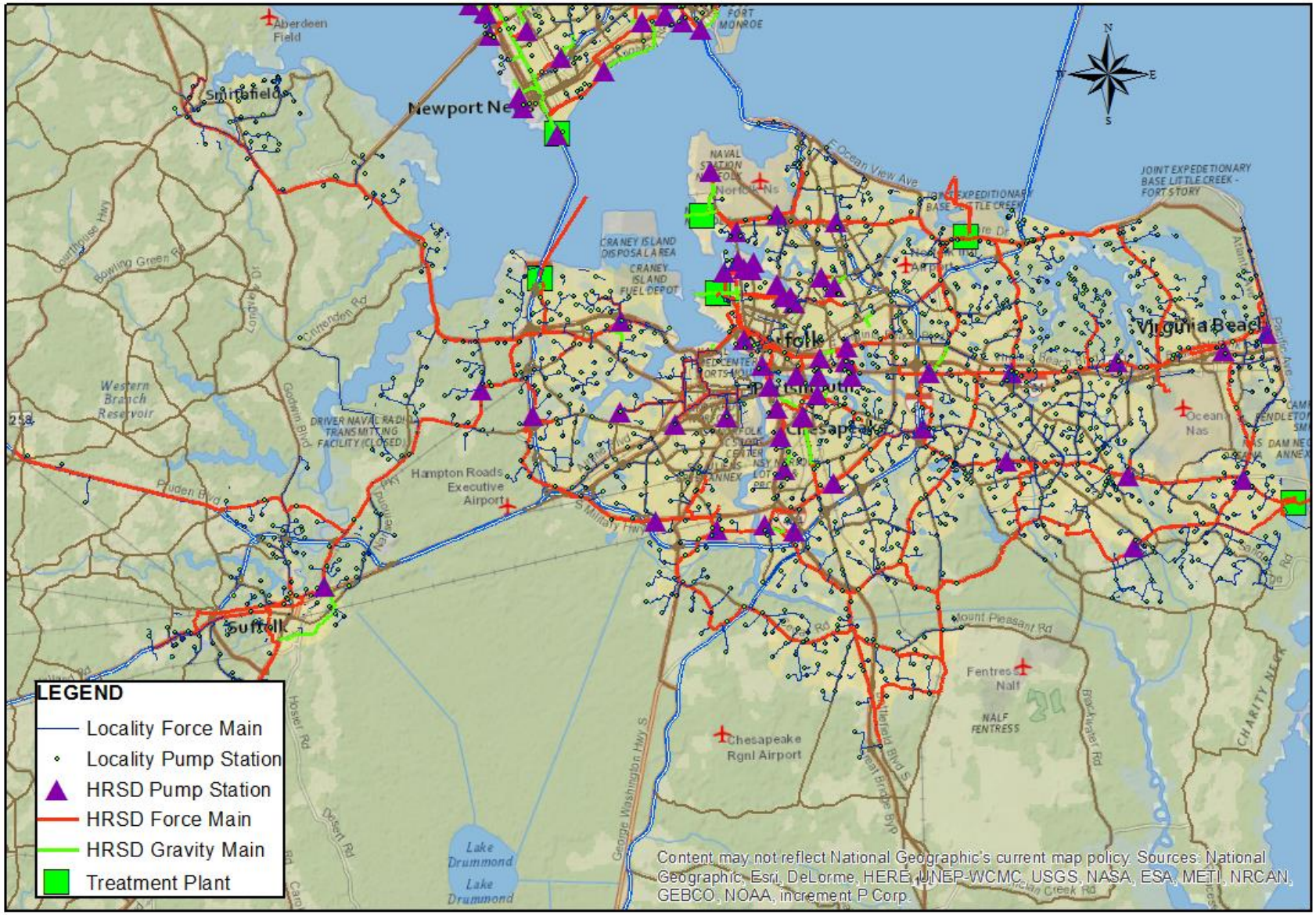

Figure 4-3. HRSD South Shore Interceptor System

Section 5

Population, Employment and Flow Forecasts

5.1 Population and Employment Forecasts

Growth in the Hampton Roads region, and throughout the country, is difficult to predict. Many plans have been developed with infrastructure constructed only to have growth occur differently than projected. In addition to the challenges presented in estimating growth rates and locations of growth, it has become apparent that new growth (and retrofitted existing areas) has a lower per capita demand for water, and therefore has a lower base sanitary flow generation rate.

As required by the Consent Decree, Year 2030 growth is the planning horizon and was based on Hampton Roads Transportation Planning Organization (HRTPO) projections to 2040 with a linear interpolation to 2030. These values, published in 2015 in consultation with each Locality's planning department, represent the best estimate of anticipated growth in the Hampton Roads region. Table 5-1 presents the projected change in population and employment through 2030 for each Locality served or potentially served by the regional sanitary sewer system as part of the Consent Decree.

Table 5-1. Population and Employment Changes through 2030 by Locality

Locality	Population Change	Employment Change
Gloucester	1,815	1,713
Hampton	-4,879	6,136
JCSA	26,930	12,841
Newport News	4,316	4,878
Poquoson	377	703
Williamsburg	2,402	2,696
York	11,316	9,581
North Shore Total	42,277	38,548
Chesapeake	61,330	25,190
Norfolk	10,574	5,141
Portsmouth	88	8,080
Smithfield	2,283	1,596
Isle of Wight	12,898	8,588
Suffolk	62,880	15,004
Virginia Beach	42,120	34,276
South Shore Total	192,173	97,875
System Total	234,450	136,423

To be conservative, HRSD set individual service areas with a net population or employment decline to zero change.

5.2 Flow Forecasts

HRSD has collected water consumption data based upon water meter readings billed through HRSD and thus has consumption data for the entire service area for many years. The region consumes nearly 20 percent less water today than was consumed in 2008, despite a growing population. Based on the recent consumption data, the average HRSD residential account uses 134 gallons per day (gpd) and, assuming 3.1 people per account, that is less than 45 gpd per capita. Based on this data in the HRSD Regional System and in other systems throughout the country, a base sanitary flow of 45 gpd per capita was applied to growth projects to project future 2030 flows. A base sanitary flow of 24 gpd/employee was applied for non-residential growth. Using an estimated 3.1 persons per equivalent residential unit (eru) and a 2.5 peaking factor, the 10-year peak wet weather flow for growth was established at 350 gpd/eru. Note that this is a macroscale assumption for planning purposes. The region will be working together to establish a new design standard for pump stations serving new development. Wet weather flow parameters for the model were developed to produce the 350 gpd/eru value for the long-term simulation 10-year target peak flow which translates to approximately 333 gpd/eru at the 5-year target peak flow.

It is this data upon which HRSD is forecasting future flows for the region on a macro scale. For the purposes of RWWMP planning, the use of macro scale numbers, grounded in current data, is the most prudent approach to keep the RWWMP investment and schedule feasible. Increases to these long-term planning numbers would inflate the price and stretch the schedule and ultimately require oversized regional infrastructure wasting scarce resources that would be better invested in jobs, housing, education or public safety. As described in Section 17, a re-evaluation of flows will be performed in 2028 to account for variances from flow projections. Table 5-2 presents the projected dry weather flow increases in average daily flow for each treatment plant service area based on the final RWWMP flow routing. Note that as further descried in this document, flows from the Chesapeake-Elizabeth TP are included in other TP Service Areas.

Table 5-2. Projected Dry Weather Flow Increase

TP Service Area	Percent Growth (ADF)
Army Base	1%
Atlantic	14%
Boat Harbor	3%
James River	5%
Nansemond	43%
VIP	7%
Williamsburg	27%
York River	9%
SYSTEMWIDE	**13%**

Section 6

Alternatives Analysis Report Overview

6.1 Integration with SWIFT

HRSD and the region have faced multiple Clean Water Act (CWA) obligations over the past few years and have additional obligations in the near-term future. HRSD has spent more than $800 million in recent years to address system reliability, capacity, and to upgrade many of their treatment plants to meet nutrients requirements associated with the Chesapeake Bay TMDL. It is anticipated that additional spending for nutrient reductions in the next round of discharge permits will be required.

Localities also face CWA obligations through their stormwater (MS4) permit requirements. Estimates for compliance with these requirements vary widely but some estimates put a $2 billion capital price tag for nutrient reductions over the next 10 years with the accompanying operations and maintenance costs that could dwarf the upfront capital costs over the service life of the MS4 improvements. The report entitled "Cost Estimates for the Chesapeake Bay TMDL" (Hampton Roads Planning District Commission, August 2011) bracketed costs between $1.8 billion and $2.2 billion.

These obligations have had and will continue to cause utility rates to increase over time. It is important to note that the same ratepayers must fund both the Locality and HRSD obligations.

In October 2011, EPA initiated their Integrated Planning framework which recognizes that communities face multiple CWA obligations; and, when these obligations are addressed individually "this approach may have the unintended consequence of constraining a municipality from implementing the most cost effective solutions in a sequence that addresses the most serious water quality issues first" (memorandum from Nancy Stoner and Cynthia Giles dated October 27, 2011). This framework focuses primarily on prioritizing and sequencing CWA investments rather than choosing between obligations. In essence, the Integrated Planning Framework allows communities to identify cost-effective and protective solutions and implement the most beneficial projects first.

HRSD is proposing to integrate CWA investments with SWIFT and RWWMP. Clearly, SWIFT offers more significant and wide-ranging water quality benefits compared to the RWWMP (see Section 17 for comparison of benefits). Thus, after the ongoing piloting and agency approval process, HRSD will first implement the SWIFT during the period of 2018 through 2030. During the SWIFT implementation, HRSD will also construct some High-Priority RWWMP Projects consistent with its established financial plan. HRSD estimates that approximately $208 million will be invested in High-Priority RWWMP Projects between 2019 and 2030.

This approach maximizes early high-value CWA water quality benefits while also accomplishing the requirements of the Consent Decree.

6.2 Level of Service Analysis

As part of the AAR (submitted in July 2016), a Level of Service Analysis was performed with detailed evaluations of the 2-, 5-, and 10-year peak flow scenarios. The following section reviews the information presented in the AAR and is based on the wet weather solutions identified at that time.

6.2.1 Process Overview

The Consent Decree defines Level of Service in terms of peak hourly sewer flow derived from a long-term simulation. The rainfall record that was used for this simulation was from the Norfolk International Airport for a 62-year period starting in 1953.

The 2-, 5-, and 10-year solutions sets developed in the AAR each provide different levels of protection against SSOs and have different costs associated with these levels of protection. The real environmental consequence of most capacity related overflows in the HRSD Regional System are minor in an absolute sense. During major storms, inflow to the system is also elevated and wastewater becomes highly diluted. Estimates of benefits used in this analysis focused on volume of SSOs avoided as predicted by modeling. The benefit of these reductions however is dwarfed by the reductions made through implementation of the SWIFT program. To ensure that HRSD's selected Level of Service represents an optimized investment, an analysis was performed that examined the cost of each Level of Service and the volume of SSOs avoided.

6.2.2 Cost/Benefit Analysis

The primary basis for selecting the Level of Service was through a cost/benefit analysis of each Level of Service. For this analysis, the theoretical modeled 50-year life cycle volume of SSO eliminated by the solution set associated with each specified Level of Service was estimated and analyzed against the cost to provide that solution set.

The first step was to estimate the overflow volumes associated with the 2-, 5-, and 10-year representative events without any solution sets. Model runs were performed using the baseline scenario with the planned level of I/I reduction work, which is consistent across all proposed levels of service and no capacity improvements.

The 50-year life cycle overflow volume eliminated by each LOS solution set was estimated using the exceedance probability associated with each representative event and what that would translate to as a volume capture during a 50-year life cycle time period.

To understand the incremental benefit gained by realizing each higher Level of Service, the total life cycle SSO volume eliminated by each LOS was plotted against the unit cost for each LOS ($ per SSO gallon eliminated). Significant effort was expended to develop these LOS solution sets as detailed in the AAR. Using these data, the incremental volume eliminated was plotted against the incremental unit costs between each LOS. A point of inflection was identified where the incremental cost of going from a 5-year to a 10-year escalates rapidly. This indicates that the point of diminishing returns is in the vicinity of a 5-year LOS.

6.2.3 Selected Level of Service

HRSD selected a 4-year LOS as its system-wide performance level but would design solution sets to a 5-year LOS. This allows a margin of safety for the Post-RWWMP Implementation Monitoring and Performance Assessment.

6.3 LOS Capital Costs from the AAR

Initial program costs were developed to facilitate a comparison between the Levels of Service in consideration during AAR development. Cost estimation was performed at a Class 4 level representing concept study/feasibility level work. Unit prices were adjusted for the Hampton Roads area through the use of bid tabs and a local cost index. Additional details of costing methodology are outlined in Section 13.

Summaries of costs, for each LOS evaluated, are provided at the TP and asset-type level in Tables 6-1, 6-2 and 6-3. These costs are planning level estimates and are based on RWWMP solutions at the time of the AAR. Solution elements and costs differ from the AAR for the optimized RWWMP shown later in this report.

Table 6-1. AAR 2-Year LOS Total Capital Costs ($ Thousands)

TP	Wet Weather Capacity Improvements										I/I Reduction Program		Total
	HRSD Force Main	Locality Force Main	HRSD Gravity Main	Locality Gravity Main	HRSD Pump Stations	Locality Pump Stations	HRSD PRS	HRSD Storage	HRSD Siphon	HRSD TP	Public Asset Costs	Private Asset Costs	
Army Base	$18,205	$178	$0	$0	$0	$5,849	$0	$0	$0	$0	$19,469	$2,195	$45,896
Atlantic	$124,770	$537	$4,707	$5,461	$1,470	$5,674	$83,487	$17,877	$0	$2,880	$231,668	$48,366	$526,897
Boat Harbor	$4,894	$1,427	$13,982	$23,778	$7,584	$15,228	$0	$11,976	$17,194	$0	$91,908	$10,682	$198,653
James River	$36,036	$2,020	$0	$8,576	$1,837	$16,291	$5,201	$0	$0	$43,200	$39,910	$12,223	$165,294
Nansemond	$5,066	$878	$10,643	$5,940	$13,588	$9,890	$34,934	$4,709	$0	$0	$140,749	$27,909	$254,306
VIP	$11,626	$4,777	$14,792	$10,191	$27,583	$37,479	$14,005	$2,131	$0	$26,064	$263,574	$23,243	$435,465
Williamsburg	$0	$1,794	$0	$2,878	$5,093	$24,852	$19,102	$4,562	$0	$25,920	$125,737	$17,057	$226,995
York River	$0	$0	$0	$1,527	$0	$6,602	$4,222	$0	$0	$0	$64,294	$8,468	$85,113
Total	$200,597	$11,611	$44,124	$58,351	$57,155	$121,865	$160,951	$41,255	$17,194	$98,064	$977,309	$150,143	$1,938,619
	$212,208		$102,475		$179,020						$1,127,452		

Table 6-2. AAR 5-Year LOS Total Capital Costs ($ Thousands)

TP	Wet Weather Capacity Improvements										I/I Reduction Program		Total
	HRSD Force Main	Locality Force Main	HRSD Gravity Main	Locality Gravity Main	HRSD Pump Stations	Locality Pump Stations	HRSD PRS	HRSD Storage	HRSD Siphon	HRSD TP	Public Asset Costs	Private Asset Costs	
Army Base	$18,205	$178	$0	$0	$0	$11,544	$8,695	$0	$0	$0	$19,469	$2,195	$60,286
Atlantic	$139,344	$1,477	$5,025	$8,613	$2,386	$9,708	$86,757	$35,079	$0	$6,480	$231,668	$48,366	$574,903
Boat Harbor	$7,681	$1,650	$10,651	$34,365	$18,261	$15,411	$0	$20,585	$17,194	$0	$91,908	$10,682	$228,388
James River	$36,036	$3,699	$0	$17,386	$4,772	$16,659	$27,454	$0	$0	$43,200	$39,910	$12,223	$201,339
Nansemond	$5,615	$1,149	$10,643	$13,922	$16,223	$18,114	$49,974	$7,226	$0	$0	$140,749	$27,909	$291,524
VIP	$18,673	$5,826	$13,815	$18,151	$39,324	$51,457	$9,400	$23,743	$0	$26,064	$263,574	$23,243	$493,270
Williamsburg	$0	$3,236	$0	$8,486	$11,483	$29,016	$19,433	$6,535	$0	$23,040	$125,737	$17,057	$244,023
York River	$0	$0	$0	$1,527	$0	$6,600	$4,535	$0	$0	$0	$64,294	$8,468	$85,424
Total	$225,554	$17,215	$40,134	$102,450	$92,449	$158,509	$206,248	$93,168	$17,194	$98,784	$977,309	$150,143	$2,179,157
	$242,769		$142,584		$250,958						$1,127,452		

Table 6-3. AAR 10-Year LOS Total Capital Costs ($ Thousands)

TP	Wet Weather Capacity Improvements										I/I Reduction Program		Total
	HRSD Force Main	Locality Force Main	HRSD Gravity Main	Locality Gravity Main	HRSD Pump Stations	Locality Pump Stations	HRSD PRS	HRSD Storage	HRSD Siphon	HRSD TP	Public Asset Costs	Private Asset Costs	
Army Base	$18,205	$178	$0	$0	$11,160	$19,257	$10,328	$0	$0	$0	$19,469	$2,195	$80,792
Atlantic	$142,060	$2,094	$8,318	$12,544	$3,115	$11,906	$106,079	$60,586	$0	$10,080	$231,668	$48,366	$636,816
Boat Harbor	$7,681	$1,650	$28,571	$37,010	$27,004	$19,888	$0	$27,162	$17,194	$0	$91,908	$10,682	$268,750
James River	$36,036	$3,699	$0	$17,739	$5,321	$23,413	$30,691	$0	$0	$43,200	$39,910	$12,223	$212,232
Nansemond	$11,053	$1,149	$10,643	$16,071	$17,424	$25,806	$51,312	$9,852	$0	$0	$140,749	$27,909	$311,968
VIP	$21,654	$5,859	$26,246	$22,823	$52,112	$65,534	$11,559	$28,594	$0	$26,064	$263,574	$23,243	$547,262
Williamsburg	$79	$3,236	$0	$12,065	$20,638	$35,382	$19,928	$18,357	$0	$21,600	$125,737	$17,057	$274,079
York River	$0	$0	$0	$2,045	$0	$11,354	$4,535	$0	$0	$0	$64,294	$8,468	$90,696
Total	$236,768	$17,865	$73,778	$120,297	$136,774	$212,540	$234,432	$144,551	$17,194	$100,944	$977,309	$150,143	$2,422,595
	$254,633		$194,075		$349,314						$1,127,452		

6.4 Affordability from the AAR

Affordability impacts were modeled for the AAR using guidance from the EPA document for Financial Capability Assessment (FCA).[1] The residential indicator component (RI) of the EPA matrix measures the financial impact of current and proposed wastewater collection, treatment and wet weather control costs on residential users within a service area. The portion of costs related to the residential component is based on relative flow contribution.

The peak residential indicator was calculated for infrastructure improvements needed to achieve the selected Level of Service for both an RWWMP-only and an Integrated Plan scenario. Eligible wastewater and stormwater costs for current and projected annual operation, maintenance, and debt service were included in the calculation. The residential share of these eligible costs was calculated based on the residential portion of wastewater flows, which were determined to be 70% of the total wastewater flows.

Resulting peak costs per household (CPH) during the assumed implementation timeframe for each scenario are outlined in Table 6-4. For the Integrated Plan, it was assumed that SWIFT would offset a significant portion of the costs for stormwater associated with the Chesapeake Bay TMDL. The remaining portion of the estimated TMDL stormwater costs could be directed by Localities to projects that address recurrent flooding and sea level rise adaptation projects.

[1] U.S. Environmental Protection Agency (EPA), Combined Sewer Overflow Guidance for Financial Capability Assessment and Schedule Development, USEPA-832-B-97-004, 1997

Table 6-4. AAR Peak Residential Impact for Selected LOS					
Scenario	Implementation Complete	Peak HHLD Cost, $/yr	Peak Year	Peak MHI[1] Impact, %	HHLDS >2% HHLD Income
RWWMP Only	2042	$1,333	2035	2.12%	54%
Integrated Plan	2053	$1,184	2035	1.88%	46%

[1] Regional MHI, used as the basis of RI evaluation for the AAR, was a weighted average of Locality incomes sourced from American Community Survey (ACS) 5-yr estimates (2010-2014) adjusted to 2016.

On a regional basis, 46% of the households will be high burdened with the selected LOS under an Integrated Plan. When examined at a Locality level however, seven communities have a high burden impact ranging from 46% to 65% of total households. These seven Localities include three of the five largest cities in the region, and represent a population of more than 780,000 – nearly half of the entire Hampton Roads population.

The MHI represents the median income, which does not consider income inequality within a geographic area, and thus does not adequately quantify the true burden on the most vulnerable residents. One method of understanding the true impact to the region is to evaluate the financial burden relative to income quintiles.

Each of the quintile brackets contain approximately 20% of the households. The results of a residential impact evaluation of regional brackets are shown in Table 6-5. For the peak CPH under a RWWMP-only scenario, the lowest two quintiles were calculated with residential impacts of 9.3% and 3.6%, respectively. The Integrated Plan scenario reduced the impact somewhat, but 40% of the population is still above an RI of 3.6%, with 20% above an RI of 8.2%.

Table 6-5. AAR Regional Quintile Analysis of RI for the Selected LOS			
Quintile	Mean Household Income [1]	Peak RI, RWWMP	Peak RI, Integrated Plan
Lowest Quintile	$14,402	9.26%	8.22%
Second Quintile	$37,116	3.59%	3.19%
Third Quintile	$59,616	2.24%	1.99%
Fourth Quintile	$89,983	1.48%	1.32%
Highest Quintile	$176,275	0.76%	0.67%

[1] Quintile income per ACS 5-Year estimates (2010-2014); MSA: Virginia Beach-Norfolk-Newport News, VA-NC Metro Area (part); Virginia

Considerable variation exists when income quintiles are examined at the Locality specific level. It was determined that in every Locality at least 20%, but in some cases more than 60%, of the population will be high burdened by either the RWWMP-only or the Integrated Plan.

The selected LOS for both the RWWMP and the Integrated Plan, therefore, represents a significant and widespread financial burden on the Hampton Roads region.

6.5 Schedule from the AAR

In addition to residential affordability impact considerations, the selected LOS for the RWWMP and the Integrated Plan were analyzed against the existing HRSD financial plan through 2038 and a financial projection through 2057. It should be noted that HRSD's aggressive financial plan was

developed in anticipation of a $2 billion RWWMP investment without the benefit of the affordability analysis completed as part of this RWWMP.

This financial review was undertaken to determine the shortest completion schedule which allowed adequate funding of all projected capital expenses without causing the debt service coverage ratio (DSCR) to drop below 2.0. The DSCR target was set by the HRSD Commission in April 2016 as a result of the credit agency warnings and an independently performed analysis of the rating factors of peer utilities.

The RWWMP analysis had the following major assumptions:

- RWWMP cost of $2,179,157,000
- RWWMP implementation begins in 2019

The Integrated Plan analysis had the following major assumptions:

- RWWMP cost of $2,179,157,000
- SWIFT cost of $1,066,000,000
- Integrated Plan implementation begins in 2019, with SWIFT completed in 2031
- Approximately $200,000,000 in High-Priority RWWMP Projects accomplished between 2020 and 2031
- Remainder of RWWMP begins in 2030

Under the scenarios reviewed for affordability, and within constraints of HRSD's financial plan, the program can be completed no earlier than 2042 for an RWWMP-only implementation and no earlier than 2053 for an Integrated Plan.

Section 7

RWWMP Development Process

7.1 Overall Sequence of Events

Development of the RWWMP has been a multi-year series of challenging tasks beginning prior to the lodging of the Consent Decree (CD) in 2009. The general sequence of these major events has been as follows:

1. Preparation of the Flow, Pressure, and Rainfall (FPR) Monitoring Plan. This document outlined the specific needs for collecting sufficient data to develop and calibrate the Regional Hydraulic Model. The FPR Monitoring Plan was approved with entry of the Consent Decree in February 2010. Design and installation of the hundreds of measuring devices identified in the Plan began in 2007.
2. Preparation of the Regional Hydraulic Model (RHM) Plan, which outlined the approach, tools and specifications for the Regional Hydraulic Model. This document was also approved with entry of the Consent Decree in February 2010.
3. Implementation of the FPR Monitoring Plan and the Final FPR Monitoring Report. After completion of the required 12-month monitoring period in March 2011, HRSD reviewed the data (using its approved Data Quality Standards and Procedures) and generated the Final FPR Monitoring Report, which was submitted in June 2011.
4. Implementation of the Regional Hydraulic Model Plan. The RHM was calibrated and verified according to the RHM Plan with a final Regional Hydraulic Model Report submitted in July 2011.
5. Preparation of a Preliminary Capacity Assessment Report. Following approval of the RHM Report, HRSD used the hydrologic flow parameters provided by the Localities (and calibrated with the FPR data at regional sites) to evaluate the conveyance and treatment capacity of the HRSD system against the 2-, 5-, and 10-year peak flow scenarios. Documentation of these results was provided in the Preliminary Capacity Assessment Report in July 2012.
6. Implementation of a Regionalization Study. In spring 2012, HRSD proposed to the EPA and DEQ the concept of regionalizing the sewer infrastructure in the Hampton Roads region. Upon agreement and modification of the Consent Decree in the Second Amendment, HRSD and the Localities undertook this evaluation, which included a Comparative Analysis of capital costs and was completed by HRSD. The full Regionalization Study was provided to the EPA and DEQ in August 2013; however, the Localities declined the proposal. An alternate hybrid approach to regionalization was proposed by HRSD, accepted by the Localities (Memorandum of Agreement dated March 2014), and incorporated into the Third Amended Consent Decree (May 2014). This amendment changed the completion date of the RWWMP to October 1, 2017, and an interim document, the Alternatives Analysis Report, was required to be submitted by August 1, 2016.
7. Collection of Additional Sanitary Sewer Evaluation Survey (SSES) Data Collection. With HRSD taking responsibility for the complete RWWMP implementation in the Third Amended Consent Decree, additional flow monitoring and SSES data collection was required in specific portions of the Locality's sewer collection systems. Following a gap analysis, HRSD implemented a 12-month data collection period until June 2015. These data were evaluated and incorporated into the planning process.

8. Verification of the RHM. Following the data collection period, a significant amount of new information was available regarding peak flows in the system and how the system performed. This information was used by HRSD together with data for new or changed facilities to adjust specific flow parameters and the model facility data. The updated RHM was then verified against the calibration of 2010 with improved results.
9. Development and verification of Locality Hydraulic Models (LHMs).
10. Development of the Alternatives Analysis Report (AAR). HRSD completed an analysis of the various options for SSO mitigation, selected a recommended Level of Service, and provided the associated costs and schedule. This document was submitted in July 2016.
11. Completion of the Regional Wet Weather Management Plan. Using the information from the AAR, the solutions have been updated and optimized for the selected Level of Service. The projects have been sequenced and loaded into a master schedule. New data have become available from the Localities to update the affordability information presented in the AAR.

Figure 7-1 below provides an outline of the overall process.

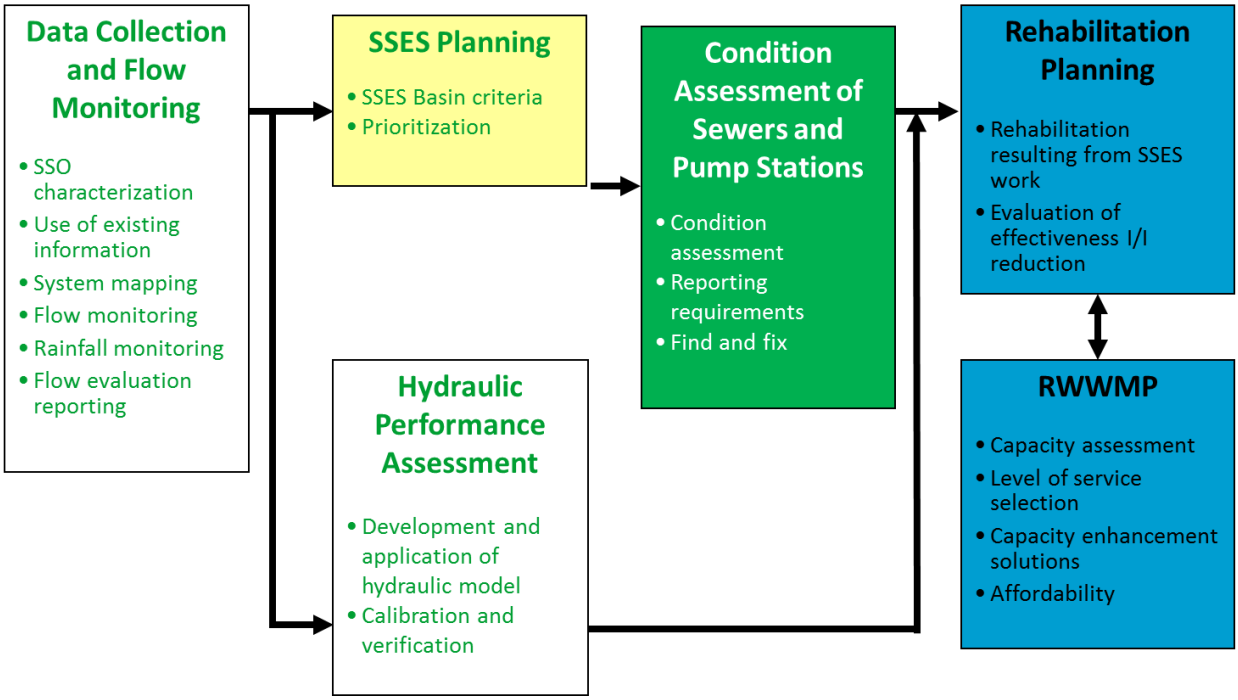

Figure 7-1. Wet Weather Planning Process Outline

7.1.1 Steps in Development of the AAR

In general, HRSD's approach to the Level of Service selection in the AAR was to develop a balance between reduction in infiltration/inflow (I/I) and the selection of capacity improvement projects to address the remaining flow in the system. The general steps in this process were as follows:

1. Identify the treatment plant service area boundaries. HRSD's interconnected network of force mains allows flow to be shifted at numerous points in the system from one treatment plant to another. There are multiple factors that go into selecting the service area boundaries including nutrient discharge limitations, plant capacities, system capacity, and natural borders (e.g., wide rivers).

2. Perform an I/I Reduction Cost-Effectiveness Analysis. The cost-effectiveness analysis established methodologies for determining system and treatment plant capacities, approximate cost for I/I reduction and estimated cost for conveyance, storage and treatment capacity. The analysis identified an optimal combination of I/I removal in conjunction with system capacity improvements based on the peak flow recurrence with 2030 growth. These optimum levels of I/I removal were specific to each treatment plant service area.

   The basis of the cost for the I/I reduction is that the higher the peak hour I/I density is, expressed as a gallon per acre per day (gpad) in each basin, the lower the unit cost of removal. As an increment of I/I is removed, the flow in gpad is reduced and the cost of removing the next increment of flow increases. Because the peak I/I flow rate in each catchment is different, it was assumed that the percentage of cost-effective I/I removal would be different in every catchment. The purpose of this portion of the analysis was to estimate the costs and flows removed.

   HRSD updated its cost-effectiveness analysis based on the revised flow parameters and treatment plant boundaries. This work identified sewer catchments in the regional system where I/I reduction was determined to be cost-effective.
3. Prepare I/I Reduction Estimates. The sewer catchments identified in the cost-effectiveness analysis were carefully reviewed against SSES data collected to estimate the amount of I/I on the public side and private side. An estimated I/I reduction and cost for each catchment was developed. These planning-level estimates will be refined prior to actual implementation, but were necessary for subsequent RWWMP development.
4. Generate Post-Rehab Flows. Each catchment in the network was evaluated for growth potential and I/I reduction. Peak flows for the 2-, 5-, and 10-year events were generated at the catchment level for loading into the model.
5. Evaluate Capacity using Post-Rehab Flows. With the post-rehab flows in the model, a capacity evaluation was performed to identify remaining limitations in system capacity. This information was shared with the Localities so that any system insight could be relayed to HRSD.
6. Develop Solution Sets. Using a set of modeling tools and a standardized approach and criteria, HRSD developed multiple solution options to eliminate the modeled capacity-related SSOs and 1.5-foot freeboard exceedances under the 2-, 5- and 10-year peak flow scenarios within each treatment plant service area. The options were evaluated against each other to select a comparable and efficient solution set for each flow scenario.
7. Estimate Costs. Using construction costs from recently bid projects, HRSD estimated capital costs for the solution sets. The cost estimate included I/I reduction, capacity improvements, and treatment plant upgrades.
8. Level of Service Analysis. Based on the estimated life cycle amount of SSO reduction, costs, and other factors described later in this report, HRSD analyzed the 2-, 5-, and 10-year peak flow scenarios to select an appropriate path for the RWWMP.
9. Preliminary Affordability Analysis. Factoring in all outstanding debt costs to date as well as those associated with the Consent Decree, Locality costs, and other HRSD costs, preliminary estimates were made for the residential indicator, household income burden and impacts at the lowest two quintiles of income. Based upon the split of expenditures, HRSD also evaluated its debt service coverage ratio. These measures were used to describe the financial impact of the proposed plan.

This sequence of events was critical in laying the foundation for the RWWMP. Selection of the Level of Service and the projects identified were the basis for optimization and finalizing the RWWMP as detailed in the following sections.

7.2 Major Assumptions

The RWWMP portrays the improvements necessary to meet a specific Level of Service for a fixed point in time. The following subsections review assumptions made in the development of the plan.

7.2.1 System Changes

HRSD has been developing the RWWMP since 2007 with the initial Flow, Pressure, and Rainfall Monitoring Plan and Regional Hydraulic Model Plan. Since then, numerous HRSD and Locality construction projects have been completed that have changed the wastewater system physical network and performance. These include pump station improvements, new facilities, changes to force mains in diameter, length, and routing, as well as gravity system improvements. HRSD has attempted to include the most current system information while also being cognizant that planned projects are not always implemented in the anticipated timeframe. Only completed projects and projects that were actually under construction were included. Therefore, the RWWMP has been developed based on the status (as understood from the Localities) through June 2016 which was the latest date HRSD could accommodate for meeting the RWWMP submission deadline.

7.2.2 Chesapeake-Elizabeth TP Closure

HRSD is continuously improving its wastewater treatment facilities as evidenced by the years of VPDES permit compliance and national compliance awards received. As new regulations and stricter discharge standards are promulgated, HRSD must balance the treatment capabilities between facilities with ever tightening permit limits. The Chesapeake-Elizabeth (CE) Treatment Plant (TP) in Virginia Beach was identified several years ago as being the next plant in line for major treatment improvements to reduce nutrient discharge into the Chesapeake Bay. This upgrade would need to be completed by December 31, 2021, to meet the new discharge limits.

HRSD has an interconnected system and flow within the CE TP service area can be alternatively routed to the Atlantic, VIP, Army Base and Nansemond TPs. A study was conducted to weigh the cost of projects required to close the CE TP and re-route the flow to other treatment plants with available capacity, relative to the capital costs required to upgrade the facility to higher treatment standards along with ongoing operation and maintenance costs. It was determined that it would be significantly more cost-effective to close the facility and re-route the flow. HRSD has identified facility improvements needed to maintain conditions in the CE TP service area until the full RWWMP is completed. Therefore, throughout this document the CE TP is shown to be closed. The conveyance improvements necessary to re-route the flow are currently being designed and will be constructed by the end of 2021. These projects are included in the RHM as existing and are not presented in the RWWMP solution sets.

7.2.3 Flow Parameters

The RHM includes wet weather flow parameters and a modeled representation of time varying groundwater infiltration developed by HRSD. The flow parameters were originally developed by the Localities based on flow monitoring performed from 2007 to 2009, and have been updated if new flow monitoring data was collected. Many Localities used a “representative basin” approach that assigned flow parameters to unmonitored sewer catchments that were similar to flow monitored catchments in age, location, or other features. Using HRSD’s extensive flow, pressure, and rainfall monitoring program, HRSD calibrated the model at major junction points and made recommendations in some locations for parameter improvements; however, many unmonitored catchments still existed. To address this issue at catchments with assumed significant flows, in conjunction with the Third Amended Consent Decree focused on hybrid regionalization, HRSD installed more than 73 temporary wastewater flow meters within Locality sewer systems from the fall

of 2014 through the spring of 2015. Flow data from these temporary meters were used to develop updated wet weather flow parameters for the monitored Locality service areas. The RHM was updated to include these flow parameters.

The updated wet weather and groundwater flow parameters were incorporated into the RHM to improve model results. The updated RHM was then validated to historic rainfall, flow, and pressure data. The RHM simulations continue to accurately represent those observed at the calibration monitoring sites presented in the Regional Hydraulic Modeling Report and improve the overall model calibration results.

7.3 Modeling Approach

HRSD has continually refined its modeling approach during development of the RWWMP to accurately estimate the hourly 2-, 5-, and 10-year peak flows and system operation. The following sections provide an overview of the models used and the modeling approach, and highlight the major improvements and changes implemented after completing the Preliminary Capacity Assessment Report.

7.3.1 Peak Flow Recurrence Approach

As defined in the Consent Decree, the RWWMP is based on evaluation of "minimum peak flow scenarios" to select a Level of Service. From Section IV, Definitions, of the Consent Decree:

> *In each scenario, the "peak flow recurrence" means the highest hourly peak flow that is expected to occur within the Regional Sanitary Sewer System once in the time period specified (i.e., 2, 5, or 10 years). HRSD shall determine these peak flows based on a statistical analysis of long term flow simulations that HRSD will carry out using the Regional Hydraulic Model…*

This approach is technically advanced compared to many other wet weather planning approaches around the country in that it does not use a specific rainfall event (e.g., a 2-year design storm) to develop a set of capacity improvements. Instead, it uses a more logical long-term simulation approach to identify the statistical probability of a peak flow occurring at each return frequency. In all cases, the evaluation criteria are set at the hourly average peak flow value.

7.3.2 Development of Target Peak Flows

Target peak hourly flows with 2-, 5-, and 10-year recurrence were determined by performing long-term hydrologic simulations using 62 years of hourly rainfall data from Norfolk International Airport. The 62-year rainfall record was applied to simulate 62 years of hourly flows in the hydrologic (not hydraulic) model including base sanitary, rainfall dependent inflow and infiltration, and time varying groundwater. The hydrologic model is based on flow parameters developed at the catchment level (typically Locality service areas) and can be measured at various junction points in the system. The nature of the computer model allows for the simulations to be run for extended periods, where the hydraulic model (with detailed descriptions of pipes, pump stations, etc.) cannot be run for similar periods due to computer processing time.

Once the simulations with 62 years of rainfall events were run in the hydrologic model, the highest 62 records were selected, a statistical analysis using a Log Pearson Type III approach was used to identify the 2-, 5-, and 10-year peak flows at many points in the system. Early in the RWWMP development, consideration was given to using representative events that generated flows close to the 2-, 5-, and 10-year peak flows. These were actual rainfall events recorded at the Norfolk airport rain gauge in the 62 years of data that produced a peak flow near the Log Pearson Type III value. Unfortunately, it was found that due to the variable nature of these events with different intensities

and antecedent conditions, they produced counter-intuitive results in parts of the system where the 5-year event could cause more overflows than the 10-year event. Instead, a target peak flow approach was used for the RWWMP.

In developing these target peak flows, HRSD determined that rainfall occurs in varying amounts at different points during an event and does not fall equally across the system. To accommodate this reality, spatial distribution factors (SDFs) were developed for incorporation into the hydrologic modeling with nationally recognized experts in hydrometeorology, Vieux and Associates, Inc., contracted to perform the analysis. Vieux and Associates evaluated radar data on storm cells to document the locally derived SDF by computing the average rainfall intensity over the storm cell area divided by the maximum point rainfall within each cell. These points are plotted against the cell area in Figure 7-2. Statistics were developed to show the median or 50 percent exceedance and the 90 percent exceedance in Figure 7-2. To be conservative, the 90 percent exceedance curve was used in these analyses.

As an example, for small individual service areas less than approximately five square miles, it is appropriate to use the measured point rainfall since the SDF equals 1.0. For larger areas of influence, the SDF applied to the point rainfall is progressively smaller, thereby applying less rainfall uniformly over the entire service area for a given recurrence interval. The rainfall area of influence for a point of interest is an ellipse that encompasses all upstream areas and is typically much larger than the service area. For example, the largest influence area in the system, the 560-square-mile tributary to the Nansemond Treatment Plant (TP), has an SDF of 0.53.

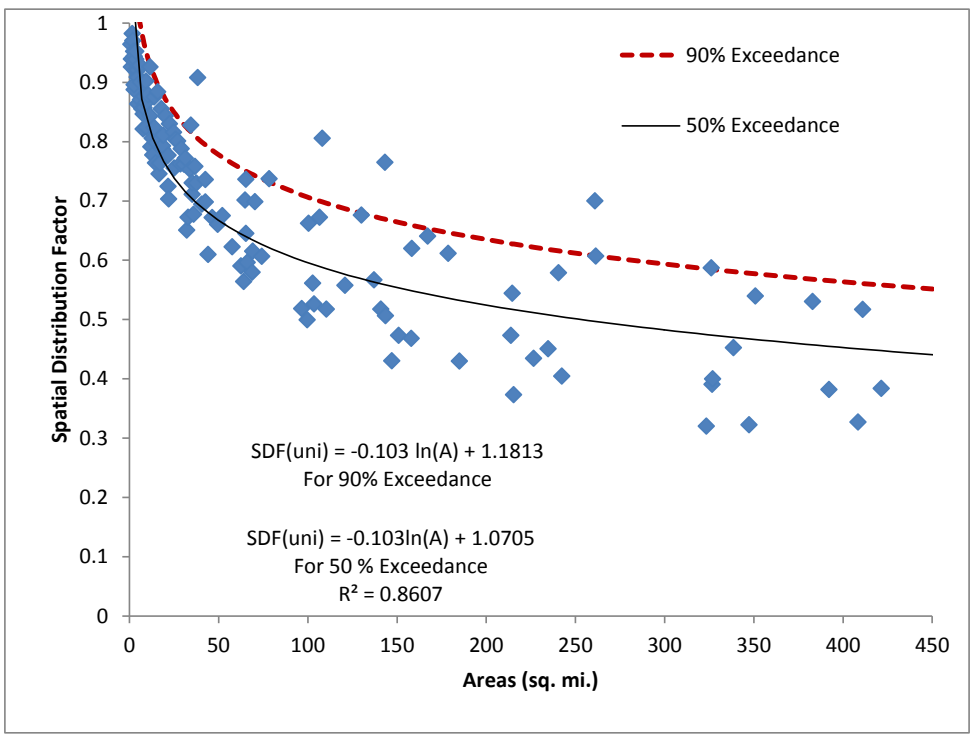

Figure 7-2. Spatial Distribution Factor for Uniform Rainfall with Median and 90% Exceedance

HRSD's approach to modelling this complex system was explained to the EPA and DEQ in a series of intensive technical workshops held in the 2014 timeframe. The analysis described in this document used the value appropriate for the specific location within the system. SDF values of 1.0

(representing full, unadjusted rainfall) were used for individual service areas and the uppermost portions of the HRSD system. The SDF values for a point of interest get progressively smaller moving downstream in the collection system to represent the rainfall spatial variability associated with the increasingly larger rainfall influence area.

The outcome of the long-term hydrologic simulations was the target peak flow throughout the system for the 2-, 5-, and 10-year recurrence using the SDF specific for each system location of interest. These hourly target peak flows, for the 2-, 5- and 10-year recurrence, are the "peak flow recurrence" values required by the Consent Decree described in the "Minimum Peak Flow Scenarios."

7.3.3 Regional Hydraulic Model Application

Modeling of a wastewater collection and transmission network requires both hydrologic and hydraulic modeling. The hydrologic modeling develops the input flows which are loaded into a hydraulic model. The hydraulic model simulates the performance of the actual system with friction loss in pipes, pumps turning on and off, and storage filling and draining. As mentioned previously, the hydraulic model requires significantly more computer processing time and can only be run for shorter periods of days instead of years that can be simulated in the hydrologic modeling.

As described previously, the initial modeling early in the RWWMP development used actual historic events to represent the 2-, 5-, and 10-year peak flows, which produced inconsistent (counterintuitive) results in some instances. To make a consistent progression from 2-year to 10-year flows throughout the system, HRSD contracted with Vieux and Associates, Inc. to perform the necessary analyses. Vieux evaluated the historical rainfall data record to create a rainfall hyetograph typical of events that produced reported capacity-related SSOs. Observed rainfall for events that produced reported SSOs were analyzed to determine typical rainfall duration and intensity that lead to SSOs for unnamed storms with less than a 10-year to 15-year rainfall frequency. A typical rainfall distribution with 4-hour duration was developed and the rainfall volumes were scaled to have the simulated peak flows approximate the target 2-, 5-, and 10-year peak flows at selected locations. This typical hyetograph was used throughout the RWWMP modeling to simulate rainfall in the Hampton Roads area.

The second part of the hydraulic modeling approach needed to address how to apply the SDF approach to manage system pressures and boundary conditions. If the RHM would be loaded with the full SDF of 1.0 at all upstream locations simultaneously, it would produce much higher peak flow in downstream points than the target peak flows. This technically challenging issue was resolved by modeling the system in pieces. A stepwise approach was adopted to simulate flows working from downstream point in the system to upstream points. The following descries the individual steps in more detail:

1. Analyze the RHM network to identify facilities in the main interceptor network with a rainfall influence area of similar size corresponding to one of the following SDF ranges: less than 0.55, 0.55-0.66, 0.66-0.72, 0.72-0.80, and 0.80-0.88.
2. Establish breakpoints at the upper end of these ranges for SDF brackets of 0.55, 0.66, 0.72, 0.80 and 0.88 depending on the TP service area.
3. Run the RHM using flows developed with the lowest SDF bracket applicable for the TP service area. This generates the appropriate peak flows for those facilities that are downstream of the first upstream breakpoint because they were identified as having a lesser or equal SDF than the SDF applied.
4. Run the RHM using flows developed with the next SDF bracket using the hydraulic grade line (HGL) time series derived from the previous simulation as boundary condition at all breakpoints.

This generates the appropriate peak flows for those facilities that are downstream of the next breakpoint and upstream of the first breakpoint.

5. Continue with the RHM simulations through the SDF of 0.88.
6. Develop a separate model from the RHM, called the Upstream Hydraulic Model (UHM), that includes all RHM facilities upstream of the SDF 0.88 breakpoint. The UHM is a subset of the RHM and can be thought of as a series of separate submodels each with a single downstream connection point. Each submodel uses the boundary HGL time series appropriate for the connection point (i.e., upstream submodels use the HGL from the 0.88 simulation whereas submodels near the TP use time series from the RHM simulation with a smaller SDF).
7. Perform UHM simulations with flow inputs that have each individual service area wet weather flow hydrograph scaled to have the peak flow equal the service area-level target peak flow.

While this approach significantly increases the number of simulations and implementation effort (multiple steps with varying boundary conditions versus a single model run), it better represents the peak flow conditions within the system. The net result is that the peak flows used in the RHM and downstream portions of the UHM are slightly greater than the target values defined by the long-term hydrologic simulations. This RHM/UHM modeling approach was used for all capacity analyses and to evaluate facility improvements.

7.3.4 Locality System Models

HRSD, in consultation with the Localities, is responsible (per the Third Amended Consent Decree) for wet weather capacity within the Locality sanitary sewer systems. Therefore, HRSD has also evaluated the Locality infrastructure that is upstream of the RHM extent to identify capacity limitations and select appropriate capacity improvements. As mentioned previously, this effort included reviewing and modifying flow parameters using data from temporary flow meters installed by HRSD at selected locations within the Locality systems.

Infrastructure, GIS, and hydraulic model data were obtained from each Locality and Locality Hydraulic Models (LHMs) were created that include Locality systems upstream from connections to the terminal pump stations and HRSD gravity sewers modeled with the RHM.

The LHMs include all Locality lift stations and force mains, 10-inch diameter and larger gravity sewers, selected portions of 8-inch sewers (e.g., first segment upstream from pump stations and 10-inch sewers and those downstream from lift stations) and sewers downstream from reported capacity-related SSOs. HRSD performed a detailed review of capacity related SSOs from data contained in the Sanitary Sewer Overflow Reporting System (SSORS) database maintained by the Hampton Roads Planning District Commission.

The LHMs exclude systems that do not have lift stations, 10-inch sewers, capacity-related SSOs, or 10-year target peak flows equal to or greater than 350 gallons per minute (i.e., the full-flow capacity of an 8-inch sewer at minimum design slope) because such systems can be described as having sufficient capacity.

All Locality pump stations are included in either the LHMs or as a terminal pump station in the RHM. Therefore, and taken together, these facilities represent the defined term in the Third Amended Consent Decree “Specific Relevant Areas of Concern.”

LHM simulations were performed with wet weather flow hydrographs scaled to have the peak flow equal to the service area-level target peak flow. Overflows from 2-, 5-, and 10-year 4-hour event LHM simulations were compared against detailed mapping of capacity-related overflows reported in the SSORS database. The LHMs were found to accurately simulate reported SSOs, validating the model construction and flows.

7.4 Increasing Hydraulic Capacity

7.4.1 Solution Set Evaluation Approach

For both development of the AAR and the RWWMP, teams convened to examine the potential combination of solutions that could be implemented to eliminate SSOs and freeboard violations (within 18 inches of the lowest manhole in the system) for the Levels of Service. Solutions that were considered for the regional collection system included:

- I/I Reduction
- Terminal Locality and HRSD pump station upgrades
- Upgrades or new pressure reducing stations (PRSs)
- Storage facilities
- Force main upgrades
- Force main improvements for measured high head loss (i.e., unusually high friction coefficients)
- Force main valving modifications to reroute flow within a TP service area
- Gravity main upgrades

Solution sets were examined on a treatment plant service area basis with subset areas used in larger treatment plant service areas to focus on localized issues.

In addition to solutions identified through the RHM, capacity limitations in the upstream Locality systems were also addressed. Initial modeling with the LHMs for free outfall conditions at the interface point with the regional model allowed HRSD to identify restrictions in the system that downstream improvements would not address. Typical deficiencies identified by this analysis included lift stations with insufficient pumping capacity and gravity mains with insufficient capacity. In addition to capacity related deficiencies, velocities that exceeded acceptable limits were identified and resulted in considering replacement with larger diameter force mains in select cases. Minimum velocities were also considered for sizing of proposed force mains to address cleansing and to prevent debris accumulation. Solutions considered for Locality systems included:

- Lift station upgrades
- Force main upgrades
- Gravity main upgrades

Also included in the wet weather improvements are HRSD planned projects such as the 45 Interim System Improvements identified in the Consent Decree as well as other CIP projects currently in construction that would improve the performance and capacity of the HRSD system. Facilities required by the end of December 2021 to take CE TP out of service are included in the models as existing facilities and are not included in the presented RWWMP solution sets as they will be completed outside of the RWWMP

7.4.2 Tools Used for Solution Set Development

HRSD utilized numerous modeling tools to evaluate different alternatives for development of the Level of Service solution sets. The RHM was the most comprehensive tool to evaluate a proposed solution; however, due to the long run times for this hydraulically dynamic and computationally intensive model, it was not feasible to use the RHM for quick testing of various concepts. In all cases though, the RHM was used as the final test to validate the solutions selected were acceptable.

HRSD developed two screening tools that were used for the concept evaluation stage of the process. A hydrologic routing tool was utilized to determine peak flows for each Level of Service at many

points in the system. This tool was also used in long-term simulations as described in the following section for determining the required storage facility volumes.

Another tool was applied to approximate the HGL for the existing facilities and evaluate improvement alternatives using flows from the long-term simulation. This spreadsheet model calculated headloss based on lengths, diameters, and friction factors, and was able to represent the effects on the HGL from pressure reducing stations, as well as from reductions in flow diverted to storage facilities. The approximate HGL profiles within major interceptor routes were compared against critical elevations determined for each connection point along major interceptors. The critical elevations were based on terminal pumping station shutoff heads and included friction loss expected in the Locality force main upstream from the connection point. Using these tools, HRSD was able to test a variety of alternatives in workshops prior to detailed analysis with the RHM simulations.

7.4.3 Solution Set Development Approach

HRSD followed a consistent, independent approach when developing the solution sets for each Level of Service. The following steps were completed during the solution set development:

1. A review was performed of any Interim System Improvement project already required by the Consent Decree. These would be confirmed to already be included in the model.
2. A review of the Rehabilitation Action Plan (RP) projects in the treatment plant service area was completed. In most cases, the RP identified projects that required replacement for condition only and did not include a capacity change. As described in the RP, HRSD may decide to address critical defects in the RP and leave major improvements for the RWWMP with modifications for increased capacity.
3. HRSD's existing CIP was checked to determine if any projects were already planned in the near-term for the subject area. Based on the justification for the project, it was considered for inclusion if it provided a capacity improvement.
4. The capacity analysis results were evaluated to identify specific locations in the system that may be more restricted than other areas. If many SSOs were modeled, then a regional solution was considered. Single, isolated SSOs would suggest a more localized solution.
5. Long-term simulations were applied to determine the peak daily flows during dry weather and under high groundwater conditions.
6. Conveyance solutions were first identified to manage elevated dry weather flows under high groundwater conditions without storage facilities, excessive reliance on PRSs, or excessive surcharging of gravity systems. These conditions were expected to occur following wet weather events and continue for several days or more. The peak factors ranged from 1.4 to 2.0 times typical average daily flow depending on the treatment plant service area. The spreadsheet model was loaded with flows using the appropriate peaking factor on average daily flow and solutions for this condition were the first to be selected for further consideration.
7. The spreadsheet model was also loaded with the applicable peak flows, and numerous alternative solutions were identified. The following approach helped guide the solution set development:
    - Consider a single terminal pumping station upgrade first if it is an isolated capacity limitation.
    - Use wet weather storage if flow conditions are conducive. Diverting peak flows out of the system can be one of the most cost-effective means of managing wet weather flows. It reduces the peak flow, and necessary improvements, all the way downstream through the treatment plant. The system must be required to pass minimum flows during the wet weather event without use of the storage facility or the facility will be activated too

frequently and may not be able to empty within a few days after the event. Also, during the high dry weather flow condition mentioned previously, the storage facility cannot be used.

- If velocities and headloss per 1000 feet are high in the downstream force main, then a parallel or replacement force main is selected.
- Utilize PRSs to reduce upstream pressures and avoid interceptor construction where velocities in existing force mains are not excessive. PRSs can be used to assist several upstream locations at once and should be considered before upgrading multiple terminal pumping stations. In general, if more than five pump station improvements are needed, a downstream improvement was considered to be more cost effective. If more regional solutions are not effective, then the upgrade of terminal pumping stations was considered.

Generally, the guidelines followed for solution set development were as follows:

- Target force main velocities to no more than 8-10 feet per second (fps)
- Target minimum pipe velocities for new force mains to be 2 fps during average day conditions
- Target maximum PRS assistance to 80 to 85 feet of Total Dynamic Head (TDH)
- Terminal pump station target maximum TDH of 150 to 200 feet
- Selected storage facility peak flow shaving rates that did not result in storage durations of more than a few days and did not result in an excessive number of events per year
- Verify that there is sufficient capacity to effectively drain storage facilities within days of the wet weather event

Various options were considered regarding flow routing within treatment plant service area boundaries established for the RWWMP. This was mostly applicable to the Atlantic TP but was also used in considering options for the Boat Harbor and James River TPs.

After evaluating the options for each Level of Service in each TP plant service area, the most feasible and cost-effective solution was selected factoring in constructability and other concerns.

These final solution sets were then tested in the RHM and adjustments in pipeline diameters, pumping assistance, storage shaving rates, and terminal pump station improvements were made until all modeled SSOs and freeboard criteria violations were addressed.

Through implementation of the above-mentioned process, solution sets were developed for the peak flow scenarios to reduce the hydraulic grade lines to accommodate peak flow conditions without modeled capacity SSOs or freeboard criteria violations.

7.4.4 Storage of Peak Wet Weather Flows

Storing peak wet weather flows is a very cost-effective means of managing the upgrades necessary for achieving a specific Level of Service. Storage facilities allow downstream facilities to have smaller peak flow capacity. All wastewater systems operate with lower average daily flows for the vast majority of their service life. Only during the relatively infrequent wet weather events must the larger capacity of the system be called upon. Limiting the swing of dry weather to wet weather flows helps with both operation of pumping facilities, maintaining appropriate velocities in pipelines, and sizing treatment facilities.

HRSD has selected to use wet weather storage facilities as a means of limiting the swing of these flows and pressures. As described previously, the solution sets were sized to manage dry weather flow with high groundwater conditions without use of the storage facilities and excessive use of the

PRSs. When flows exceed these rates, the storage can be activated to shave flows and limit the flow rate passing the facility.

Through long-term simulations that considered number of activations per year and storage duration, HRSD has determined that each storage facility should be designed to allow at least 2.0 times the average daily flow (ADF) to pass as a guideline. Reducing this value below 2.0 times ADF leads to longer duration drain times and higher storage volumes.

Volumes for each storage facility are calculated using long-term simulation. Initial passing rates were approximated in the spreadsheet model. For example, if the peak flow at the location of a storage facility is 10 MGD with an ADF of 3 MGD, then the minimum passing rate would be 2.0 times ADF, or 6 MGD. Final passing rates to be used in the long-term simulations were determined from RHM simulations. The long-term simulation model applied the full 62-year rainfall record with the final passing rate, and anything in excess is diverted into the storage facility. A statistical analysis is performed to determine the volume of storage necessary for the selected Level of Service. This value is a peak volume calculation and is larger than the volume necessary for the associated peak hourly flow event. When the full solution set is tested in the RHM, the peak volume storage is measured against the peak flow storage to verify this sizing.

The system is also tested in the RHM with a storage drainage rate to verify that the system can handle the flows following the wet weather event. Generally, storage facility sizes have been limited to 6 MG for constructability reasons and drain times less than 2-3 days following a peak wet weather event were considered acceptable.

7.4.5 LHM System Improvements

Locality system improvements were developed to provide capacity for the peak flow event of interest without overflows or freeboard criteria violations.

HGL boundary conditions from UHM simulations that included the identified improvement solution sets were applied to the LHMs to refine the capacity improvements identified in LHM simulations with free outfall conditions. In the relatively few cases where additional SSOs were simulated in the Locality gravity system upstream of a terminal pump station, the terminal pump station was improved to eliminate excessive surcharging of the Locality system instead of upsizing the gravity system. The RHM/UHM and LHMs were then simulated with these additional pump station improvements to verify that no SSOs or minimum freeboard criteria violations occurred.

7.4.6 Operational Strategies

In developing the solution sets, HRSD attempted to maintain or utilize specific operational strategies in lieu of more expensive capital projects. There are several metrics that impact the operation of the system.

Force main velocity over the range in operating flows is a critical metric and can pose negative consequences when the velocity falls above or below the acceptable range. High velocities can cause excessive headloss, high power consumption, and damage to the force mains. Low velocities allow particulates to settle and harden in the force mains, especially at low points, which increase roughness, decrease the cross-sectional area, and reduce the pipe capacity. Gas generated in the force mains due to long transit times present operational problems and reduce capacity when allowed to accumulate at high points in the force main alignment. HRSD has selected solutions that keep the velocities within an acceptable range where possible; however, due to the wide variation between peak wet weather flows and average dry weather flows, it is difficult and often impossible to meet the velocity criteria with a single force main solution.

The second operational metric that was considered was maximum Total Dynamic Head (TDH) produced within the system. The existing pumping network and force mains have been designed with specific maximum pressures, and when those are exceeded the pumping stations cannot discharge into the system and pressurized force mains can fail. The typical design pressure for force mains is at least 150 psi (or nearly 350 feet) for the piping materials mostly used in the HRSD and Locality force main system. The capacity improvement solutions that HRSD selected have maintained system pressures below 200 feet in nearly all cases during the peak of the events. In one case, a PRS has been added in lieu of a Locality pumping station improvement specifically because pressures were above 200 feet without the PRS. This operational strategy will also reduce life cycle pumping costs and reduces the range in discharge pressures experienced by the terminal pump stations.

A third operational strategy is the use of PRSs which reduce upstream pressures at optimum locations within the force main conveyance system. Velocities must be considered as well as discharge pressures downstream of the PRS, but if these can be accommodated, then the PRS is a cost-effective means of managing wet weather flows. Operationally, it is best to provide sufficient conveyance capacity such that the PRSs do not need to operate during dry weather conditions. This decreases the pressure variation at terminal pump stations and improves their dry weather performance. PRSs create less construction disruption and other impacts compared to force main projects. PRS facilities have proven to be an effective solution and HRSD has installed temporary PRSs in various parts of the system until final facilities can be installed to improve wet weather system performance. New PRSs were assumed to provide no more than 80 to 85 feet with existing pump technology. Further, a minimum suction pressure must be maintained to avoid pump damage and negative pressures in upstream force mains.

Lastly, shifting flow between service areas using manual or automatic valving has been considered. HRSD currently has nutrient discharge limits and shifting dry weather flow has been evaluated versus changing wet weather flow routing. For the Level of Service analysis, the flow boundaries for treatment plant service areas were kept fixed, with further optimization for the selected Level of Service.

7.5 Optimization

The process laid out in the Consent Decree for the RWWMP involves taking the selected Level of Service from the AAR and optimizing the solution set. The objective of this effort is to find an efficient way to provide the desired capacity while reducing plan cost and providing other benefits. HRSD considered various ways to optimize the solutions using the general process outlined in Figure 7-3.

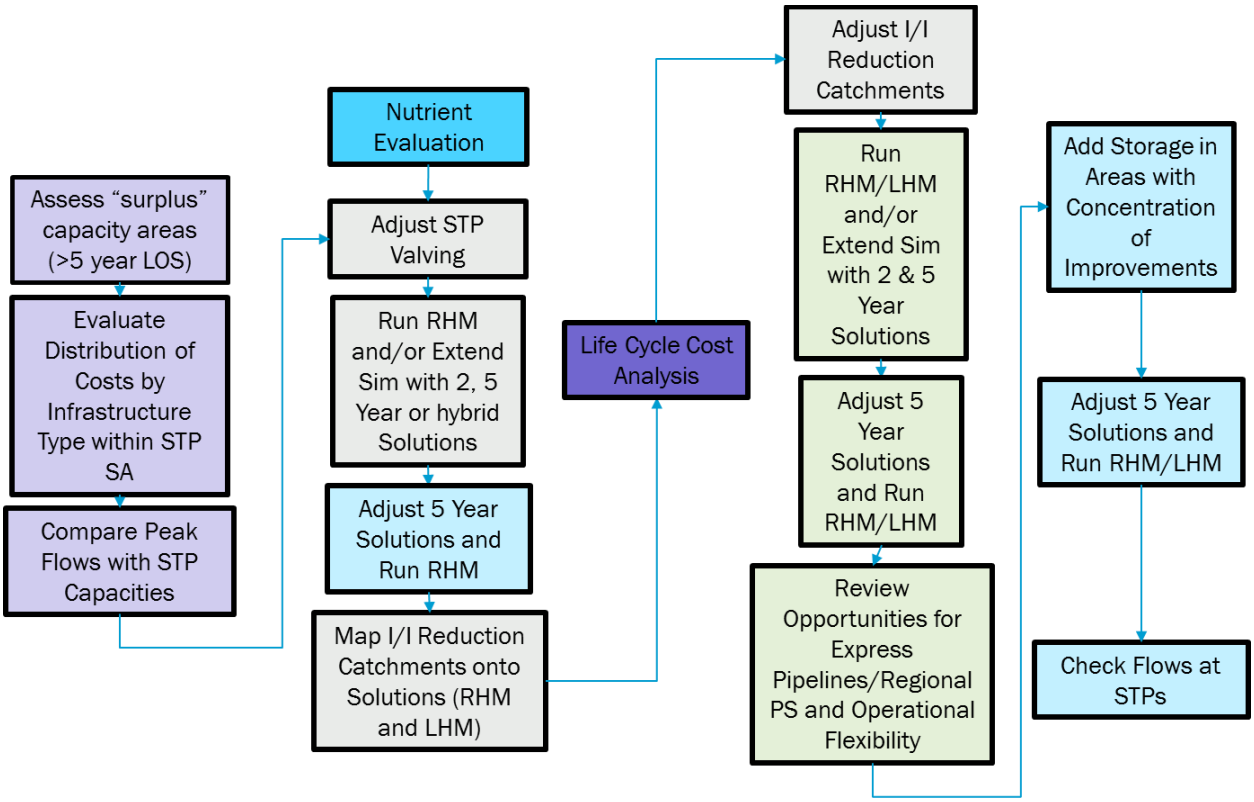

Figure 7-3. Optimization Process

The first consideration involved reviewing potential surplus capacity that may exist with the AAR solution set as well as reviewing the types of solutions selected in each treatment plant service area (SA). A review of capacities at the treatment plants was also conducted to identify facilities where surplus capacities existed. Combined with a consideration of nutrient requirements for the treatment plants, the systems were examined to find where flows could be shifted from one treatment plant service area to another. The existing solution set from the AAR was compared to the potential flow shifts to determine what additional capacity improvements might be required to accommodate the flow shifts.

The second step in the optimization involved a significant re-evaluation of the I/I Reduction Program. The original selection of catchments focused mainly on cost-effectiveness at the macro scale and considered only dollars per gallon removed. The optimization of this program included review of how close to the treatment plant the catchments were, if they were upstream of a storage facility, or if it appeared surplus capacity existed in facilities downstream of the catchments. Criteria were established as well for I/I reduction efficiency. The overall program was adjusted to eliminate approximately 100 catchments with a corresponding cost of $400M. The revised I/I Reduction Program can be found in the next section and the subsequent solution set optimization considered the flow reductions from this revised I/I Reduction Program.

RHM simulations were performed with flows that recognize the optimized I/I Reduction Program to identify what facilities would be required to meet the same Level of Service as the AAR. The AAR solutions in each region were reviewed collectively in detail and optimized with the revised flows to determine if the desired capacity could be provided with alternative solutions that reduced the cost and have other benefits such as improved ease of implementation, consolidated facilities at one site (preferably one already owned by HRSD), and reduced other impacts. As an example, the

Nansemond TP service area solution set in the AAR included storage facilities at Wilroy Road and Constance Road along with pressure reducing stations at each site. In the optimization process, the storage was consolidated at Wilroy Road and Constance Road now just has a PRS. In other locations, flow routing options were considered with multiple alternatives. Capital and approximate life-cycle cost were also considered in the solution set selection. In a few cases, further adjustments were made to the I/I Reduction Program.

Another consideration made in the solution set optimization was to build in operational flexibility where feasible and that did not produce a cost increase. An example of this is the Tabb PRS and Storage Facility in York County. This facility is modeled to transmit flow from Poquoson west to the James River TP; however, the new PRS was positioned so it could have the operational flexibility to pump north to the York River TP if necessary for operational reasons.

The detailed facility optimization process took several months with multiple workshops held for each TP service area. Upon completion, a nearly $400M capital cost reduction was achieved while still maintaining the Level of Service proposed in the AAR.

Section 8

Infiltration and Inflow (I/I) Reduction Program

8.1 Removal of Infiltration/Inflow (I/I)

In general, the wet weather planning solutions were based on a mix of flow reductions and capacity improvements through increases in pumping and piping infrastructure. In order to develop these capacity solutions, HRSD established a process to estimate an appropriate flow reduction achieved through system rehabilitation as detailed in this section. The extent of I/I reduction is a function of the optimal level of I/I removal specific to each treatment plant service area. The cost-effectiveness analysis identified the leakiest catchments and optimal removal rates per TP. Because each TP service area has its own unique set of characteristics with respect to flow, capacity, geography and density, the optimal removal rates are different for each. Areas with higher hydraulic capacity in the existing system had a lower optimal I/I removal rate than a service area where the existing facilities are at or near capacity.

8.1.1 I/I Reduction Cost-Effectiveness Analysis

The cost-effectiveness analysis established methodologies for determining system and treatment plant capacities, approximate pricing for I/I reduction and estimated pricing for conveyance, storage and treatment capacity. The analysis estimated an optimal combination of I/I removal in conjunction with system capacity improvements based on the 10-year peak flow recurrence with 2030 growth. Cost-effectiveness should be similar for lower levels of service. Using the 10-year peak flow is solely a worst-case scenario/normalization point and does not indicate any commitment to attaining a 10-year Level of Service.

The basis for the I/I removal curve is the concept that the higher the I/I density on a gallon per acre per day (gpad) in each basin, the lower the unit cost of removal. As an increment of I/I is removed, the flow in gpad is reduced and the cost of removing the next increment of flow increases. Because the peak flow rate in each catchment is different, it was assumed that the percentage of cost-effective I/I removal would be specific to each catchment.

Because of different system capacities and leakiness, minimum I/I densities for inclusion in the I/I Reduction Program were established for each TP service area based on the cost-effective evaluation. Additionally, threshold levels for comprehensive rehabilitation (budgeted for complete renewal/replacement) were established for each TP service area, as shown in Table 8-1.

Table 8-1. HRSD I/I Reduction Program Planning Criteria

TP	I/I Density, 10-Year Peak RDII GPD/Acre Sewered Area (GPAD)	
	Minimum	Comprehensive Level
AB	7,900	12,000
AT	5,200	12,000

Table 8-1. HRSD I/I Reduction Program Planning Criteria		
	I/I Density, 10-Year Peak RDII GPD/Acre Sewered Area (GPAD)	
TP	Minimum	Comprehensive Level
BH	8,600	19,000
JR	6,500	16,000
NA	3,500	8,000
VIP	8,700	20,000
WB	3,600	9,800
YR	3,400	7,500

Generally, catchments below the minimum I/I density listed in Table 8-1 were not included in the program.

8.1.2 Catchment Selection

Catchments were evaluated for consideration in the I/I Reduction Program using the thresholds from the cost-effectiveness analysis. For each TP service area, the leakiest catchments were selected and I/I reduction targets were developed depending on I/I Reduction Plan type and scope.

Preliminary results were further refined based on combinations of Locality input, cost effectiveness, and optimization to most efficiently achieve the selected Level of Service. Areas were selectively eliminated from the program for the following reasons:

- More recent flow data reduced peak RDII below the minimum I/I density threshold
- Estimated I/I reduction was below 50,000 gpd
- The unit cost of I/I removal was considered excessive (around $15/gpd removed or higher)
- Optimization process

Initially 287 areas were selected and these were later optimized to a total of 191 areas for inclusion in the I/I Reduction Program projections across the entire regional service area. Note that HRSD has estimated the flow reductions for each of these catchments but is not guaranteeing that flow reduction/rehabilitation work will take place in each of these catchments or that the estimated reduction will be achieved in each catchment. The objective is to achieve the selected Level of Service and HRSD may substitute flow reduction for capacity improvements, shift locations of I/I reduction, or make other changes as additional and more detailed information becomes available. Many of the flow reductions were based on flow and SSES information provided by the Localities which will not be verified until implementation design.

8.2 Rehabilitation/Replacement Scope Development

Catchment-specific I/I Reduction Program Plans were developed for the selected areas based on the following approach. Scoping logic was dependent on available condition data and catchment leakiness, as estimated by I/I density in gallons per acres per day (gpad) using 10-year flow modeling. Plan type determined the quantity of infrastructure rehabilitation/replacement (R/R) assumed for each catchment, which formed the basis of the I/I reduction and cost estimates. The I/I Reduction Program Plan types are as follows:

- Comprehensive
- Data-Driven

- General

For each catchment included in the program, a scope of R/R work was developed to estimate planning level costs and I/I reduction. Capital cost estimates include future SSES activities for all I/I reduction catchments prior to rehabilitation design. Table 8-2 provides an overview of the R/R scoping logic.

Table 8-2. Criteria for I/I Reduction Program Plan Types

Criteria	Comprehensive Approach	Data-Driven Approach	General Approach
SSES Data Availability	Any amount of SSES data was acceptable for planning	Smoke Testing and MH Inspection Data Greater than 75% of Catchment and CCTV Greater than 25% of Catchment	CCTV Less than 25% of Catchment
Assumed Rehabilitation to Replacement Ratio used for Budgetary Cost Estimate	70%/30% Replacement/Rehabilitation	50%/50% Replacement/Rehabilitation	50%/50% Replacement/Rehabilitation
Public system R/R	100%	Manholes and pipes included based on known defects. Manholes based on connection to scoped public pipe	Sliding scale for R/R scope based on I/I density
Single Family Private R/R	Target 100%, with an assumed 70% participation rate	Laterals based on known defects or connected to scoped public pipe	Target equal to % Public R/R
Non-Single Family (NSF) R/R	May apply to all scoping approaches if one of the following criteria are met: • Top 30% of leakiest catchments in TP service area • Private NSF equivalent length >50% of entire catchment		

8.2.1 Sanitary Sewer System Evaluation Data

Available sanitary sewer condition data and field investigation results were provided by each Locality to facilitate regional R/R planning. Condition assessment data included smoke testing, night flow isolation, manhole inspections, CCTV, historical system records and rehabilitation documentation.

The National Association of Sewer Service Companies (NASSCO) provides widely accepted industry standards for underground infrastructure assessment. In several cases, Localities submitted condition data resulting from a non-NASSCO compliant inspection approach. These inspection methods typically identified significant inflow, structural, and operational defects; and were considered valid reference information for rehabilitation plan development. Conversion logic is provided in Appendix B to detail how specific Locality asset condition records were correlated to standardized coding and subsequently applied to scoping efforts.

HRSD also collected additional SSES data in select Locality areas between 2014 and 2015 to supplement data gaps for catchments with significant I/I. Sanitary sewer condition information, both from Localities and supplemental HRSD efforts, was compiled into a single database. This composite data, where feasible and of sufficient extent, was utilized to develop the scope of work for the regional I/I Reduction Program.

8.2.2 Comprehensive Plan Scope Development

The “Comprehensive” approach was utilized in the leakiest catchments, and programmed funding to rehabilitate/replace all public sanitary sewer assets and test (and replace if needed) all single family private laterals. A maximum reduction of 70 percent of I/I associated with the scoped assets was

assumed using this approach. Non-single family (i.e., multi-family and commercial properties) assets were included on a selective basis.

Public System. A replacement versus repair ratio of 70%/30% for public assets was presumed in catchments where comprehensive R/R was planned. This assumption reflects a realistic construction approach for significant contiguous system R/R, considering catchment-wide comprehensive R/R was only applied to the leakiest catchments by TP service area (i.e., where the cost-effective I/I reduction target was greater than 60 percent).

Private Single Family Laterals. The assumption was that all private single family laterals in the catchment will be targeted for testing. However, for cost estimating purposes, a homeowner participation rate of 70 percent was assumed. It was further assumed that 25 percent of those participating would have defects requiring R/R.

8.2.3 Data Driven Plan Scope Development

The "Data-Driven" approach was used when at least 25 percent of the catchment has available CCTV/condition data to facilitate scoping of assets for R/R based on documented defects. I/I reduction and costs were estimated as a function of the specific assets identified in the rehabilitation scope. Single family laterals connected to scoped assets, and selective non-single family assets, were included in the planning scope. Appendix B contains a list of the NASSCO PACP and MACP qualifying and significant inflow defects that resulted in an asset being included for R/R.

The following protocols were used to develop the R/R scope for public sanitary sewer assets. These protocols were not intended to commit to a specific rehabilitation method for a given asset or defect.

- For qualifying pipe defects, the whole asset, from upstream to downstream manhole, was included in the R/R scope (i.e., no point repairs).
- Manholes with qualifying defects were included in the R/R scope.
- Pipes and manholes located directly between pipe segments scoped for whole asset R/R were included in the scope, regardless of condition.
- Defective mainline cleanouts, or mainline cleanouts connected to pipes being replaced, were scoped to be replaced with manholes.
- Public laterals connected to pipelines scoped for whole asset R/R, were included in the scope for replacement. For cost estimating purposes, laterals were assumed to be located at 50 foot intervals along each segment of pipe. Defective laterals, not otherwise associated with whole asset R/R, were included in the scope. Laterals included in the scope were assumed to be replaced, rather than repaired, for cost estimating purposes.
- Private laterals would be tested and repaired if found to be a source of excessive I/I for all public laterals addressed.
- Unless supported by other evidence, unresolved positive smoke tests and dye tests were assumed to be a lateral defect and scoped for replacement.
- Missing or defective lateral cleanout caps and plugs were assumed to require a whole cleanout assembly replacement, rather than replacing a single cap or plug, so that the new cleanout assembly will conform to current standard sizes.
- Assets with issue documentation from supplemental Locality records were included in R/R scope.

Previously Rehabilitated Assets. Defects that had been remedied after condition assessment was performed were excluded from the data-driven R/R scope of work, unless it was determined that the rehabilitation effort did not adequately address the identified defect.

8.2.4 General Plan Scope Development

The "General" approach was used if a catchment I/I density was above the minimum threshold, but below the comprehensive threshold (refer to Table 8-1), and sufficient CCTV was not available for a data-driven R/R scope. Percentages of system in the R/R scope and corresponding I/I reductions were developed as a function of I/I density for each wastewater treatment plant service area.

Public System. The percentage of the public system planned for R/R was a function of the I/I density in gpad (catchment leakiness). A minimum of 30 percent public asset R/R was assumed for catchments that met the minimum I/I density for cost-effective abatement. The percent assets in the R/R scope followed a sliding scale up to 100 percent asset R/R at comprehensive levels. Cost estimates programmed funding for SSES to identify the actual rehabilitation work needed.

Private Single Family Lateral R/R. The R/R goal scope assumed an equivalent percentage of private laterals and the percentage of public R/R. For cost estimating purposes, a homeowner participation rate of 70 percent was assumed, as well as a material defect rate of 25% of participating laterals.

8.2.5 Private Non-Single Family R/R

Inclusion of private NSF assets was assigned independently from the scoping approaches described above. NSF R/R was only prescribed for parcels greater than 1 acre within catchments selected for the I/I Reduction Program. For cost estimating purposes, a 70 percent participation rate was assumed for included NSF parcels, with a failure rate of 70 percent of participating assets. Rehabilitation to replacement ratio of 50/50 was assumed for NSF assets.

A catchment qualified for NSF R/R if either of the following was true:

- The catchment was within the top 30% of leakiest catchments (in gpad) within the TP Service Area. See Table 8-3 for threshold values by TP.
- Private NSF Equivalent Length was greater than 50 percent of assets within the catchment (see Section 4 for equivalent length definition). Judgment was used in determining whether NSF R/R was included where Private NSF Equivalent Length was between 40% and 50% of assets within the catchment.

Table 8-3. I/I Density Threshold for NSF R/R

TP	NSF GPAD Minimum
Army Base	9,900
Atlantic	12,400
Boat Harbor	18,950
James River	13,700
Nansemond	7,780
VIP	19,100
Williamsburg	9,200
York River	7,800

8.3 I/I Reduction Estimate

The proposed amount of I/I reduction for each catchment was proportional to the equivalent length of assets identified in the R/R scope of work. The equivalent length approach allocated I/I to pipes and manholes using a standard unit based on the concept that surface area is a key indicator of the potential of I/I. Equivalent lengths of public and private sanitary sewer were developed from best available GIS data. Estimates of sanitary sewer lengths were developed for NSF parcels based on parcel size, number of buildings and other relevant factors.

Peak I/I at the 10-year flow recurrence were allocated to public and private assets in each catchment (including single family and non-single family) based on the respective equivalent length of each type of asset in the catchment. For example, if the public equivalent length value is 75 percent of the overall equivalent length for the catchment then the public peak I/I contribution was assumed to be 75 percent. Figure 8-1 presents an example of a peak I/I hydrograph broken down into public and private components.

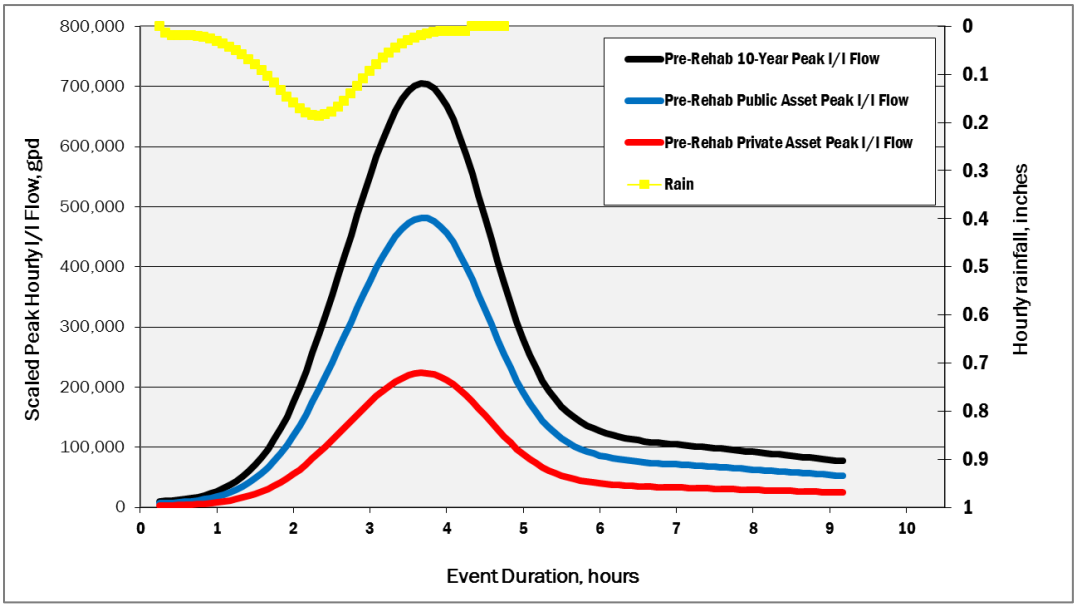

Figure 8-1. Example Peak I/I Flow Hydrograph

An Excel tool was developed that used the existing conditions RHM flow parameters and representative 10-year synthetic event to simulate the peak I/I flow for each catchment. The tool estimated the post-rehabilitation peak I/I flow reduction and associated flow parameters based on either the scoped assets (in the case of data-driven scopes) or percent of planned R/R (for comprehensive and general scopes).

The tool used public/private asset allocations to delineate the flow parameter values for the catchment into respective contributions to the overall rainfall dependent I/I (RDII). Post-rehabilitation flow parameter values were determined by reducing the decomposed pre-rehab values using the flow reduction estimating strategies described in this Section. The flow parameters were then combined to obtain a single post-rehabilitation value for the catchment. I/I reduction amounts were determined by comparing the hydrograph peak hourly flow values generated with the pre- and post-rehab flow values.

8.3.1 Equivalent Length Assumptions

For assets lacking size and/or dimension data, the following assumptions were made to facilitate the equivalent length calculations. These assumptions were made based on system wide averages.

- The equivalent length for public manholes was assumed to be 26.5 feet per manhole. The equivalent length assumed that a typical manhole is 4-foot diameter and has a depth of 6.6 feet. The depth assumption was taken from a sampling of available Locality data. A 12-inch diameter pipe with a length of 26.5 feet would have the same surface area as a manhole with the assumed dimensions.
- Publicly owned mainline cleanouts were not included in equivalent length calculations and no peak I/I was allocated to them, as they generally are not a significant source of I/I from the walls of the cleanout themselves. Therefore, no I/I reduction credit will be taken for the replacement of mainline cleanouts with manholes.
- Public lateral equivalent length calculations assumed that each parcel has a public side lateral length of 25 feet and diameter of 6 inches for single family parcels, and 8 inches for NSF parcels.
- Private asset calculations depended on several factors, including parcel area and classification (i.e., single family, multi-family, or commercial), vacancy classification, and the number of buildings on the parcel. Table 8-4 presents the assumptions used for private infrastructure equivalent length calculations. These equations were developed empirically as part of the HRSD Private Property I/I Reduction Program.

Table 8-4. Private Infrastructure Equivalent Length Assumptions

Asset Type	Private Single Family	Private Non-Single Family < 1 Acre	Private Non-Single Family > 1 Acre
Gravity System Length, Feet	N/A	Multi-Family Parcels N/A	Multi-Family Parcels Max Calculation Area = 15 acres Diameter = 8 inches Length = (126.2 x Parcel Area) + 208.9
		Commercial Parcels Diameter = 6 inches Length = (242.2 x Parcel Area) + 34.8	Commercial Parcels Max Calculation Area = 15 acres Diameter = 8 inches Length = (68.3 x Parcel Area) + 208.7
Lateral Length, Feet	Diameter = 4 inches Length = (58.1 x Parcel Area) + 19.8 Length ranges from 25 to 120 ft. Max Calculation Area = 1.7 acres	Multi-Family Parcels Diameter = 6 inches Length = 40 ft. per building located within parcel	Multi-Family Parcels Diameter = 6 inches Length = 40 ft. per building located within parcel
		Commercial Parcels N/A	Commercial Parcels Diameter = 8 inches Length = 40 ft. per building located within parcel if building count >1
Manhole Length, Feet Manhole Length, Feet	NA	N/A	Multi-Family Parcels Manhole Spacing = 150 ft. Manhole Depth = 5 ft. Manhole Diameter = 48 inches
			Commercial Parcels Manhole Spacing = 200 ft. Manhole Depth = 5 ft. Manhole Diameter = 48 inches

8.3.2 I/I Reduction Assumptions

Peak I/I reduction was estimated using quantity of infrastructure R/R identified per the different scoping approaches described in Section 8.2. Assumptions used to quantify I/I reduction associated with the corresponding asset types are described below.

Public I/I – Flow reduction was estimated according to the portion of the system that has been scoped for rehabilitation. The percent equivalent length of assets included in the scope relative to the total equivalent length multiplied by an I/I removal efficiency of 70% was used to determine the I/I reduction.

Additional flow reduction was calculated for Data-Driven plans with notable inflow-specific issues identified from condition data. Catchments with a significant number of these defects had additional reduction applied to the fast-response component of the public portion of the peak I/I hydrograph. The additional I/I reduction was equal to a 50% reduction of the fast-response flow parameter.

For General plans, a minimum of 30% public asset R/R was assumed, and a sliding scale of scoped assets to I/I reduction shown in Table 8-5 was used to develop post rehabilitation peak I/I flows.

Table 8-5. I/I Reduction Based on % R/R for General Plans

% R/R	Corresponding Peak I/I Flow Reduction
30%	21%
40%	28%
50%	35%
60%	42%
70%	49%
80%	56%
90%	63%

Private Single Family I/I – Laterals included in the plan scopes were assumed to have a 70% participation rate and a 70% I/I removal efficiency. For General plans, the same portion of % public R/R was applied to define the single family lateral R/R scope.

Private NSF I/I Reduction – If a catchment qualified for NSF inclusion in the R/R scope, the flow reduction was calculated utilizing a 70% participation rate for identified parcels. Table 8-6 presents the anticipated I/I reduction resulting from NSF R/R, which was applied to the peak I/I allocated to NSF parcels (based on equivalent length).

Table 8-6. NSF I/I Reduction % by Catchment I/I Density

Peak I/I Density (gpad)	Rank	% Reduction
< 3,000	Low	30%
> 3,000 but < 8,000	Medium	0.00008x + 0.06 where x = Peak I/I Density (gpad)
> 8,000	High	70%

Previously Rehabilitated Assets – If flow monitoring and peak flow estimation occurred prior to the repair, I/I reduction was estimated for the repair and incorporated into the post-rehab peak flow estimates for Data Driven plans. If flow monitoring was performed after the repair, it was assumed any benefit to the system would be reflected in the flows and no additional I/I reduction was taken for the repair.

For General plans, previous rehabilitation efforts were not considered in the flow reduction estimate. It was assumed future SSES and pre-design activities will focus the R/R scope of work and determine whether the identified defect has been appropriately remedied.

8.4 I/I Reduction Targets and Planning Level Costs

Table 8-7 summarizes the estimated I/I reduction to be achieved by TP service area. A detailed listing of I/I reduction plans are provided with accompanying maps for each Locality in Appendix B. The program is estimated to reduce the normalized 10-year peak flow by 124.8 MGD of I/I in 191 areas at an estimated cost of $852 million.

Table 8-7. Summary of I/I Reduction Program by TP Service Area

		Public		Private		Total	
Treatment Plant	Number of I/I Reduction Areas in Program	I/I Reduction (MGD)	Cost ($Million)	I/I Reduction (MGD)	Cost ($Million)	I/I Reduction (MGD)	Cost ($Million)
Army Base	0	0	$0	0	$0	0	$0
Atlantic	45	18.0	$141.3	9.2	$35.2	27.2	$176.5
Boat Harbor	28	7.7	$59.8	2.2	$6.6	9.9	$66.4
James River	16	4.8	$37.9	1.9	$6.7	6.7	$44.6
Nansemond	20	12.9	$112.5	5.5	$23.1	18.4	$135.6
VIP	50	34.3	$262.9	7.3	$22.7	41.6	$285.6
Williamsburg	26	14.2	$108.4	4.2	$15.4	18.4	$123.8
York River	6	1.7	$17.4	0.9	$2.4	2.6	$19.8
Total	**191**	**93.6**	**$740.2**	**31.2**	**$112.1**	**124.8**	**$852.3**

Figures 8-2 and 8-3 present the planned I/I reduction areas for North Shore and South Shore, respectively.

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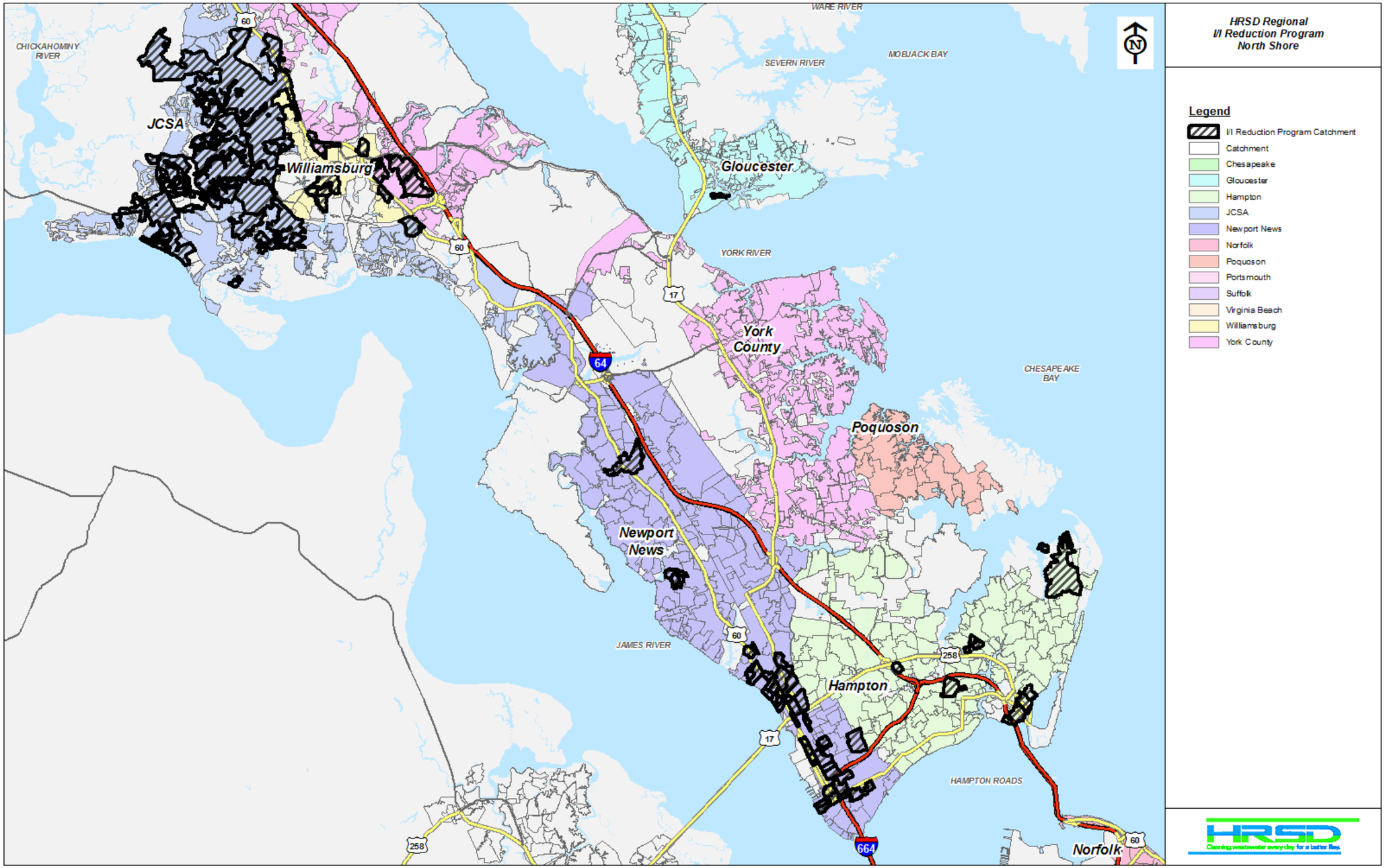

Figure 8-2. Planned North Shore I/I Reduction Areas

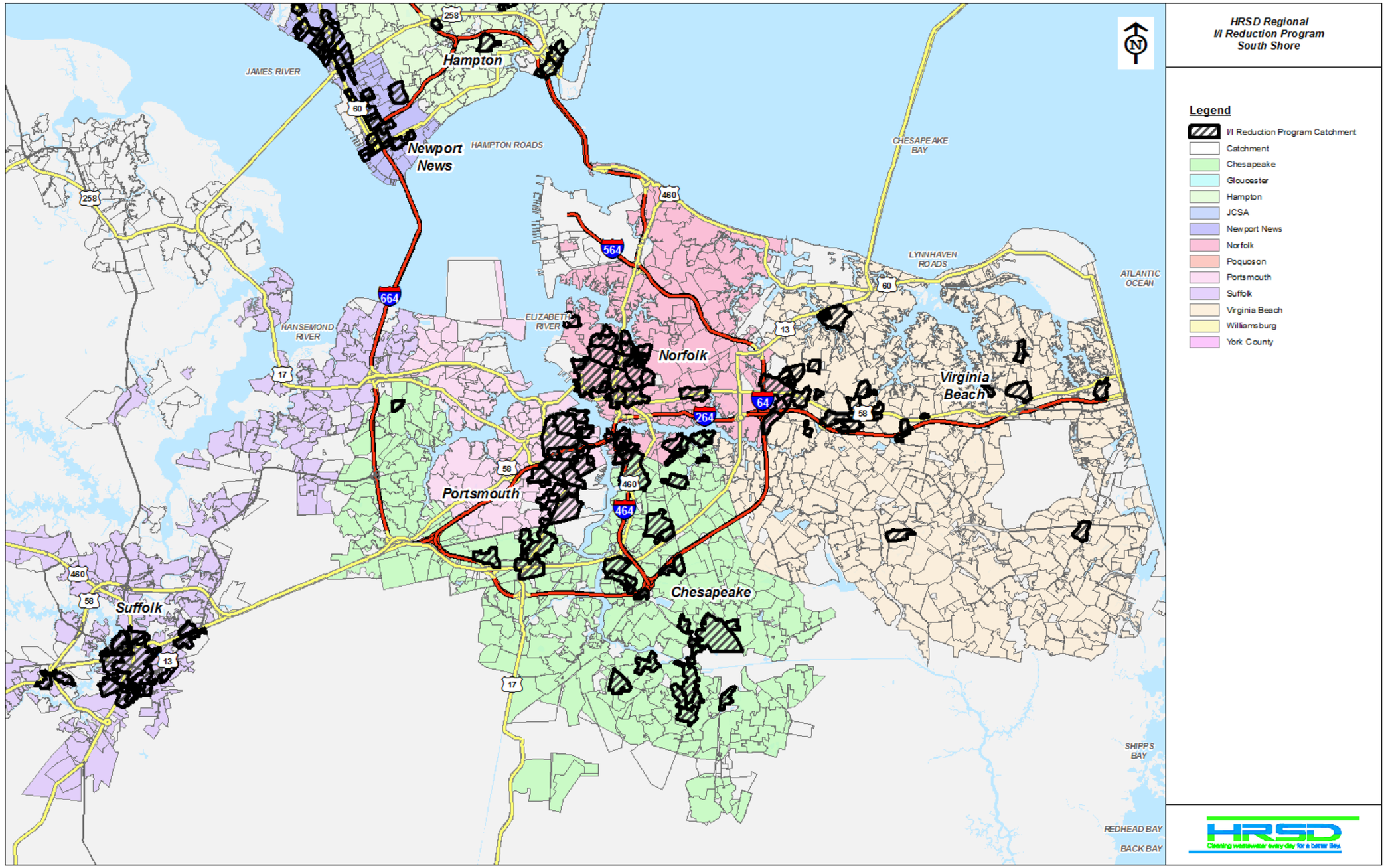

Figure 8-3. Planned South Shore I/I Reduction Areas

Section 9

RHM Conveyance System Capacity Enhancement Solutions

To meet the selected Level of Service, upgrades to existing facilities and new capacity projects in the regional system were identified to address the remaining peak wet weather flows (after the I/I Reduction Program) in order to avoid exceeding freeboard targets (within 1.5-feet of the lowest manhole rim) and SSOs.

The following sections provide an overview of the identified solutions for each treatment plant. The summaries and solution types of the enhancements developed in this section are listed in Table 9-1. For detailed maps and tables of the wet weather solutions for the selected Level of Service, see Appendix C. These solution sets include HRSD and Locality-owned facilities and are based on what was modeled in the extent of the RHM. On some maps, infrastructure is marked as "Assumed Operation" which may be different than how it is operated today, but is necessary to achieve the Level of Service. Section 10 covers upstream solutions that are only Locality-owned facilities.

Table 9-1. Summary of RHM Solution Types by Treatment Plant

Shore	Treatment Plant	Solution Type	RHM Capacity Solution Set Summary	
			HRSD	Localities
North Shore	Boat Harbor	New/Improved PRS (each)	0	0
		PS Improvement (each)	3	0
		Upsize FM (mi)	0	0.37
		Upsize GM (mi)	4.32	0
		Inverted Siphon Improvements (each)	2	0
		Storage Facilities (each)	2	0
		Storage Volume (MG)	6.8	0
	James River	New/Improved PRS (each)	2	0
		PS Improvement (each)	1	4
		Upsize FM (mi)	1.23	0
		Upsize GM (mi)	0	0
		Storage Facilities (each)	1	0
		Storage Volume (MG)	1.0	0

Table 9-1. Summary of RHM Solution Types by Treatment Plant

Shore	Treatment Plant	Solution Type	RHM Capacity Solution Set Summary	
			HRSD	Localities
North Shore	Williamsburg	New/Improved PRS (each)	3	0
		PS Improvement (each)	0	5
		Upsize FM (mi)	0.40	0.91
		Upsize GM (mi)	0	0
		Storage Facilities (each)	3	0
		Storage Volume (MG)	2.0	0
	York River	New/Improved PRS (each)	1	0
		PS Improvement (each)	4	6
		Upsize FM (mi)	0.89	0
		Upsize GM (mi)	0	0
		Storage Facilities (each)	1	0
		Storage Volume (MG)	2.4	0
South Shore	Army Base	New/Improved PRS (each)	1	0
		PS Improvement (each)	0	3
		Upsize FM (mi)	1.38	0
		Upsize GM (mi)	0	0
		Storage Facilities (each)	0	0
		Storage Volume (MG)	0.0	0
	Atlantic	New/Improved PRS (each)	9	0
		PS Improvement (each)	1	7
		Upsize FM (mi)	22.35	0.37
		Upsize GM (mi)	0.81	0
		Storage Facilities (each)	2	0
		Storage Volume (MG)	8.0	0
	Nansemond	New/Improved PRS (each)	4	0
		PS Improvement (each)	3	8
		Upsize FM (mi)	1.53	0.99
		Upsize GM (mi)	1.79	0
		Storage Facilities (each)	1	0
		Storage Volume (MG)	2.9	0.0

Table 9-1. Summary of RHM Solution Types by Treatment Plant				
Shore	Treatment Plant	Solution Type	RHM Capacity Solution Set Summary	
			HRSD	Localities
South Shore	VIP	New/Improved PRS (each)	1	0
		PS Improvement (each)	12	8
		Upsize FM (mi)	1.48	1.94
		Upsize GM (mi)	2.13	0.81
		Storage Facilities (each)	2	0
		Storage Volume (MG)	4.2	0

9.1 North Shore

9.1.1 Boat Harbor

Two main branches service the Boat Harbor TP area, a northern branch serviced by the Jefferson Avenue trunk sewer and the eastern branch that receives sewage flow from Hampton.

The majority of the flow to the treatment plant comes from Hampton. In this branch, the 14th St. storage tank assists in shaving off any peak flow generated when accommodating the flow from the upgraded Claremont Pump Station. Two inverted siphons will be improved along Chesapeake Avenue upstream of this pump station.

In the northern branch along Jefferson Avenue, another tank located at 58th Street will shave off the increased peak flows generated from the upgraded Newmarket Creek Pump Station and control the flows downstream to accommodate the increased flow from the upgraded Copeland Park Pump Station.

Major upstream sewer trunk lines servicing the Washington Street, Copeland Park and Newmarket Creek Pump Stations are upsized to meet the capacity for the desired level service.

9.1.2 James River

Three main branches service the James River TP. The eastern branch receives sewage flow from Poquoson, the northern branch serves the north area of Newport News and the southern branch serves the central area of Newport News. Poquoson currently flows north to the York River TP but is anticipated to be shifted west to the James River TP due to nutrient and plant upgrade requirements that would be necessary.

Major improvements in the eastern branch consist of the routing of the flow from Poquoson through an improved Jefferson Ave force main to the new Middle Ground force main. In addition, the new Tabb PRS and storage tank assist in lowering the hydraulic grade line accommodating the proposed terminal station improvements; specifically, one in Poquoson and another in York River.

In the northern branch, the Lucas Creek PRS upgrade assists in lowering the grade line exerted by the northern service area of Newport News, and one Newport News terminal pump station located on the line west of the Patrick Henry area.

On the southern branch, the capacity upgrades of the Morrison Pump Station and one Newport News Pump Station allows the system to perform at the desired Level of Service.

9.1.3 Williamsburg

The area serviced by the Williamsburg TP is divided into six branches. The first branch is the main loop that starts from the treatment plant, connects to Route 199 and runs around the northwest side of Williamsburg. To provide sufficient capacity for the Level of Service, new PRS facilities at Williamsburg Crossing and Longhill have been identified, and upgrades in the existing Route 199 PRS are included to assist the upstream areas.

The second branch comes from Colonial Williamsburg Pump Station and joins the main loop by the Route 199 PRS. To assist in bringing the desired flow capacity to the TP, the second branch will have additional storage capacity added to the wet well at the Colonial Williamsburg Pump Station along with the upsize of a City of Williamsburg terminal pump station.

The third branch comes from JCSA and joins the main loop, in the first branch, by Jamestown Road. A storage tank at Williamsburg Crossing along with force main upgrades and the previously indicated PRS upgrades in the main loop will shave off the peak flows and lower the downstream pressures and also include three upgraded terminal pump stations in JCSA. Initially, these pump stations were classified as lift stations but their connecting force main was realigned to convert them into terminal facilities.

The fourth branch was identified as the line that captures flow from the western side of JCSA and connects to the main loop by Strawberry Plains. No major regional features were envisioned for the fourth branch but JCSA upgrades in the LHM.

The fifth branch was identified as the force main that comes from York County and connects with the main loop at Lodge Road. A major feature in this branch is the reroute of the manifolded force main that collects flow from two lift stations from York that discharge through a manifolded force main into the Lodge Rd. Pump Station which is shown to have an expanded wet well for additional storage.

The sixth branch collects flow from the northern service area of Newport News. The major feature in this branch consists of a force main upgrade that will assist three of the service areas in Newport News.

9.1.4 York River

Located in the middle of the regional serviced area, the York River TP splits the system in a northern branch and a southern branch.

Additional storage capacity at the existing Coliseum facility is the main feature in the southern branch of York River. This tank will aid to shave off peaks associated with the flows coming from the Langley/Bay Shore area. Under wet weather conditions, Bay Shore will be re-routed north towards Bloxom's Corner through a new discharge force main parallel to the influent gravity line along Seaboard Avenue and ultimately captured by the improved Langley Circle Pump Station. The force main that connects the Langley Circle Pump Station with the Coliseum PRS/storage also receives flow generated by the upgraded Freeman Pump Station and three upgraded City of Hampton terminal pump stations.

In the northern branch, the Yorktown PRS will assist in lowering the pressure and will accommodate flow from two upgraded terminal Gloucester County pump stations.

9.2 South Shore

9.2.1 Army Base

Major features in the Army Base TP service area include the upsize of the HRSD force main along Terminal Blvd. and Hampton Blvd. coupled with the HRSD Terminal PRS upgrade to assist in lowering the hydraulic grade line in the upstream system. Additionally, upgrades to three Norfolk terminal pump stations were necessary to provide the selected Level of Service.

9.2.2 Atlantic

For the purpose of analyzing the regional capacity upgrades, the Atlantic TP service area was divided into six major branches. The first branch is the influent segment from the Atlantic PRS to the sewer treatment plant in south east Virginia Beach. The first capacity project of the branch is the Atlantic PRS upgrade to reduce the grade line as low as possible at the beginning of the upstream receiving branches. This PRS also allows the head loss between the PRS and the TP to be higher than normal, keeping the velocities high and avoiding the replacement of the TP influent force main.

The second branch is the northeastern corridor along Birdneck Rd., Virginia Beach Blvd., and Independence Blvd. The main capacity projects in this branch are the new Birdneck – General Booth parallel force main and the Virginia Beach Blvd. force main upgrades that increases the conveyance capacity of the branch controlling the pressures between PRSs along the branch. Necessary upgrades are also recommended for three PRSs (Laskin Rd., Pine Tree and Independence Blvd.) to keep the hydraulic grade line as low as possible. One storage tank near the Naval Air Station Oceana will provide peak wet weather flow relief in the middle of this branch keeping under control the peak pressures in the downstream system. Lastly, one Virginia Beach terminal pump station is upgraded.

The third branch is the center corridor along Dam Neck Rd., Lynnhaven Pkwy., Ferrell Pkwy. and Indian River Rd. The main capacity upgrades in this branch are adding a storage facility adjacent to the Shipps Corner PRS which will provide peak wet weather flow relief while keeping the operating pressures under control; the Lynnhaven Pkwy. force main improvements that increases the conveyance capacity to accommodate higher peak wet weather flows in the middle of the branch, and the Kempsville PRS improvement that lowers the pressures for the upstream end of the system. Additionally, four City of Virginia Beach terminal pump stations need capacity upgrades to meet the selected Level of Service.

The fourth branch extends along South Military Hwy. from Providence Rd. to Great Bridge Blvd. in the vicinity of the HRSD Washington District PS. The capacity projects in this branch are the Great Bridge Blvd. gravity main improvements and the HRSD Dozier's Corner Pump Station upgrade that increases the conveyance capacity in this system to accommodate peak wet weather flows. Additionally, two Chesapeake terminal pump stations are included with capacity upgrades in the upstream system. Finally, a short force main jumper pipe connecting Chesapeake PS 073 directly to an HRSD force main was added to lower the pressures and increase the capacity for this pump station.

In the fifth branch along Shore Drive, Diamond Springs Rd. and Newtown Rd., only one Norfolk terminal pump station upgrade is necessary to meet the proposed Level of Service near the CE TP.

The sixth and final branch is the southern loop that transmits flows from south Chesapeake to the Atlantic TP along Elbow Rd. and Nimmo Pkwy. The major capacity projects here are the new Hillwell Rd. PRS and the two PRS upgrades (Elbow Rd. and Courthouse) to reduce the upstream hydraulic grade line and maintain lower pressures all the way to the upstream end of the line. Also, capacity upgrades are needed to the force mains along Battlefield Blvd. and the Great Bridge Blvd. force main. Additionally, one Chesapeake terminal pump station needs capacity upgrade along with some minor force main work to maintain wet weather capacity in the rest of the upstream system. Finally,

when approaching the projected growth flows in southern Chesapeake, the Chesapeake Southern Loop force main and the Dominion Blvd. PRS will provide the Level of Service in this area.

9.2.3 Nansemond

The Nansemond TP service area was divided into four major branches for the purpose of regional capacity upgrade analysis. The first branch is the segment that brings the flow from southern Isle of Wight and downtown Suffolk to the Nansemond TP. The main capacity projects in this branch are the new Wilroy PRS and storage tank and the new Constance Rd. PRS that will reduce the pressures in the entire branch and will shave off the peak flows controlling the headloss downstream in wet weather events. The next significant capacity project is in the Shingle Creek area where two new HRSD terminal pump stations and associated gravity mains and force mains are proposed that will increase the capacity in the area to meet the Level of Service. Additionally, one Isle of Wight pump station and three separate small segments of Suffolk force main require capacity upgrades.

The second branch serves the Bowers Hill area in Chesapeake along South Military Hwy. There are two Chesapeake terminal pump station upgrades, some associated Locality force main, and a small 16" Jumper from CHES-PS-41.

The third branch serves the Western Branch area in northern Chesapeake. The two main capacity projects in this branch are the Cedar Lane Pump Station upgrade (with associated gravity and force main improvements) and the new Western Branch PRS that lowers the grade line upstream (south of Western Branch Blvd.) keeping the operating pressures under control. Additionally, there are four Chesapeake terminal pump stations upgrades in the upstream system.

The fourth branch serving Smithfield and northern Isle of Wight extends along Route 17 and Route 258. The main capacity project in this branch is the new Nansemond River PRS that will be necessary to accommodate the projected growth in this area while maintaining low pressures during wet weather events. Additionally, one Isle of Wight terminal pump station is upgraded.

9.2.4 VIP

For the purpose of regional capacity upgrades, the VIP TP service area was divided into four major branches. The first branch runs along West Princess Anne Rd. and East Virginia Beach Blvd in central Norfolk. The main capacity project is the May Avenue Storage Tank. The storage tank will allow all the terminal pump stations from that point to the treatment plant to perform without any capacity upgrades. The next set of conveyance improvements are the Norchester St. Pump Station gravity main and the Seay Ave force main improvements that increases the capacity into the newly updated Norchester Pump Station. Finally, there are two HRSD and two Norfolk terminal pump stations that need upgrades along with some minor gravity and force main work.

The second branch serves the east side of Portsmouth. The main capacity improvements are the Camden Ave. Pump Station upgrade and two upstream gravity main segments. Additionally, there are four other Portsmouth terminal pump stations downstream of Camden with capacity improvements.

The third branch is the area upstream of State St. Pump Station generally between the Eastern and Southern branches of the Elizabeth River, the Indian River and South Military Highway. The main capacity improvements here are the proposed State St. PRS and Storage Tank. This enhancement allows all the terminal pump stations from here to the treatment plant to perform without any additional capacity upgrades. Also, improvements to the conveyance system upstream of the Park Ave. Pump Station along with the Park Ave. and Ferebee Pump Station upgrades and three associated gravity trunks to increase the peak wet weather capacity in this area. Finally, two Chesapeake terminal pump stations need capacity upgrades along with some minor HRSD gravity and force main work.

The fourth branch services the northern part of the VIP service area in Norfolk. There are no main significant capacity projects providing area wide benefits, but rather a group of isolated terminal pump stations and force main improvements. The upgrades include seven HRSD terminal pump stations that were already in the HRSD CIP along with two HRSD force main segments, and five Norfolk force main segments to provide the necessary wet weather capacity in localized areas.

9.3 System Operating Pressures

HRSD updated its pressure policy in December 2014. Unlike the former policy which often defaulted to a singular value within a treatment plant service area, the new policy more accurately represents the hydraulic grade lines that exist within the system. When a Locality decides to build a new pump station or perform significant modifications to an existing station, HRSD will issue a pressure letter with a range of operating pressures representing both dry and wet conditions to establish an envelope of HGL basis of design. Thus, future stations will meet the HGLs inherent in the system under a variety of conditions up to the selected LOS. HRSD has developed the solution sets to limit the swing of pressures that the terminal pumping facilities will experience.

For the purpose of reporting pressure, the one hour average hydraulic grade line elevation (HGL) was extracted at selected locations under the 4-yr, 4-hr wet weather event simulation using the bracketed RHM/UHM modeling approach. The number of reported locations and the maximum HGL for each sewer treatment plant are listed in Table 9-2. Note that the values provided in this RWWMP are using an alternative modeling approach (bracket RHM/UHM) than that used for determination of the pressure policy values and may be slightly different.

Table 9-2. Reported Locations and Maximum HGL by Treatment Plant

Shore	Treatment Plant	Number of Extracted Locations	Maximum HGL (feet NAVD 88)
North Shore	Boat Harbor	13	137
	James River	21	154
	Williamsburg	17	212
	York River	20	221
South Shore	Army Base	8	137
	Atlantic	66	148
	Nansemond	29	152
	VIP	43	167

The individual HGL values for the reported locations are documented in Appendix C. The values under the aforementioned simulated conditions are not to be considered maximums but merely projected peak values for the LOS.

Section 10

LHM Conveyance System Capacity Enhancement Solutions

The extent of the Locality assets in the LHM include the gravity mains, force mains and lift stations located upstream of the terminal pump stations. In some areas, the extent also includes the Locality assets upstream of the HRSD gravity trunk line (e.g., Jefferson Ave., Chesapeake Ave. trunk lines). Hydraulic grade line boundary conditions from the RHM/UHM simulations were specified at the tie-in locations in the LHM simulations to properly transfer the conditions represented by the selected Level of Service. Capacity enhancements in the LHM assets were added where necessary to avoid any freeboard violations or sanitary sewer overflows in the Locality system for the selected Level of Service.

For the most part, the force main upgrades in the LHM consist of either pipe extensions to mitigate the limited capacity in the receiving shallow gravity manhole or pipe size increase to lower the pressures on the upstream lift station. Gravity main upgrades generally consist of diameter upsizes that will allow the sewers to convey the desired flows.

The summaries and solution types of the enhancements developed in this section are listed in Table 10-1. For detailed maps and tables of the wet weather solutions, see Appendix D.

Table 10-1. Summary of LHM Solution Types by Treatment Plant

Shore	Treatment Plant	Solution Type	LHM Capacity Solution Set Summary
			Localities
North Shore	Boat Harbor	PS Improvement (each)	0
		Upsize FM (mi)	0.68
		Upsize GM (mi)	5.20
	James River	PS Improvement (each)	2
		Upsize FM (mi)	1.31
		Upsize GM (mi)	3.63
	Williamsburg	PS Improvement (each)	7
		Upsize FM (mi)	1.83
		Upsize GM (mi)	2.95
	York River	PS Improvement (each)	1
		Upsize FM (mi)	0.32
		Upsize GM (mi)	0.98

Table 10-1. Summary of LHM Solution Types by Treatment Plant			
Shore	Treatment Plant	Solution Type	LHM Capacity Solution Set Summary
			Localities
South Shore	Army Base	PS Improvement (each)	3
		Upsize FM (mi)	0.04
		Upsize GM (mi)	0.03
	Atlantic	PS Improvement (each)	2
		Upsize FM (mi)	1.18
		Upsize GM (mi)	1.68
	Nansemond	PS Improvement (each)	5
		Upsize FM (mi)	0.97
		Upsize GM (mi)	1.16
	VIP	PS Improvement (each)	11
		Upsize FM (mi)	1.99
		Upsize GM (mi)	2.68

10.1 North Shore

10.1.1 Boat Harbor

In the Boat Harbor TP service area, the upgrades include assets from two localities, Newport News and Hampton. Most of the upsizes in Hampton are located upstream of the Chesapeake Ave. and Newmarket Creek gravity trunk lines. In Newport News, improvements are located upstream of the service area NEWP-002 in the southeast part of the city.

No Locality lift stations upgrades were necessary in the Boat Harbor TP area.

10.1.2 James River

In the James River TP area, the upgrades include assets from two localities: Newport News and Poquoson.

In Poquoson, the solutions consist only of upsized gravity main segments.

For Newport News, improvements are located upstream of the service areas NEWP-044 and NEWP-037. Two lift station upgrades are needed and three force main segments are upsized.

10.1.3 Williamsburg

Williamsburg TP serves four localities, namely Williamsburg, York, JCSA and Newport News.

In JCSA, the upgrades consist of four lift station upgrades near Jamestown Rd. The sewer lines upgrades include gravity main upsizes that will allow to desired flow to get to the lift station wet well.

An additional discharge force main in the Two Rivers Country Club will allow the lift station to push the desired flow with lower headloss.

For York County, three upstream lift stations will be upgraded with one also requiring an improvement to the influent gravity main.

Only one lift station upgrade and a force main extension is required to meet the selected Level of Service in Williamsburg.

No LHM upgrades are proposed in Newport News assets for this TP area.

10.1.4 York River

The York River TP service area includes assets from Gloucester County and the City of Hampton.

The Hampton upgrades include one lift station along with discharge force main upsizes in a couple of different locations and sewer gravity main upsizes upstream service area served by the Langley Circle Pump Station. Additionally, a force main and gravity sewer main were upsized to convey the projected flow to the Bay Shore Lane Pump Station.

No LHM upgrades are proposed in Gloucester assets for this TP area.

10.2 South Shore

10.2.1 Army Base

In the Army Base TP area, LHM upgrades only include assets from Norfolk. Three lift stations, one small force main extension and one short gravity main were necessary to provide the desired Level of Service.

10.2.2 Atlantic

In the Atlantic TP area, the LHM upgrades include assets from three localities: Virginia Beach, Chesapeake and Norfolk.

In Norfolk, the solutions consist of two upsized gravity main segments and one force main segment near North Military Hwy.

For Chesapeake, in the area near South Military Hwy, there are one lift station upgrade with associated force main extension and two separate gravity main improvements. Additionally, two gravity main segments upgrades are necessary near the Chesapeake municipal center.

For the City of Virginia Beach, upgrades include one lift station with discharge force main upsizes in a couple of different locations. One sewer gravity main upsize near Rudy Inlet is required as well as a couple gravity main upsizes near the Independence Blvd PRS.

10.2.3 Nansemond

In the Nansemond TP area, the LHM upgrades include assets from two localities: Suffolk and Chesapeake.

In Suffolk, the first set of solutions consist of two upsized lift stations, one near the Nansemond TP with its associated force main extension and the other near one of the new regional PSs replacing the HRSD Suffolk PS. In addition, three gravity main segments upgrades are necessary.

For Chesapeake, the capacity projects include upgrades in three lift stations, two located in the Bower’s Hill area with its associated receiving gravity main upsize. The other one is located in the Western Branch area and includes its associated force main along with another force main improvement both discharging into an upsized gravity main.

10.2.4 VIP

In the VIP TP area, the LHM upgrades include assets from three localities: Portsmouth, Norfolk and Chesapeake.

In Portsmouth, the first set of solutions consists of four upsized lift stations upstream of the Camden Ave. Pump Station. Two of the lift stations require upgrade along with their associated force mains which discharge into an upsized gravity main. Additionally, five areas with gravity main improvements are included to control the hydraulic grade line in the upstream system.

For Norfolk, there are three gravity main upsizes in the downtown Norfolk area and one near Tait Terrace. In addition, two force main projects are shown: one upsize near Westminster Ave. and an extension in downtown Norfolk. Lastly, two small upstream lift station upgrades are included.

In Chesapeake, the LHM solutions are grouped in three main areas. The first is upstream of the Park Ave. Pump Station with two lift station upgrades. One of them includes its associated force main and receiving gravity sewer in the upstream end of this branch. The second area is near the east side of Indian River Rd. where two lift station upgrades along with associated force mains and downstream gravity mains increase the capacity to convey the peak flows coming from the Tanglewood area. The third and last area is in the West and South Munden area where one lift station upgrade is shown with its associated force main as well as gravity main upsizes.

Section 11

HRSD Treatment Plant Capacity Enhancements

Hydraulic modeling has been used to estimate the peak flow the treatment plants will experience under future conditions. Previous work conducted during the Alternatives Analysis Report and updated for the RWWMP established the limiting capacity features for each treatment plant. In some cases, the limiting factor is purely hydraulics while in others, it is unit process capacities. Table 11-1 displays the hydraulic capacities and expected peak flows along with recommended improvements.

Table 11-1. Treatment Plant RWWMP Improvements

TP	RWWMP Upgrades	Capital Cost, $2017
BH	None	
JR	Additional secondary clarifiers and return activated sludge pumping	$44,700,000
WB	None	
YR	None	
AB	None	
AT	4.1 MG equalization tank and additional influent screening	$24,400,000
NA	None	
VIP	Influent pumping and 1 MG equalization tank	$27,000,000
TOTAL		**$96,100,000**

**Simulated flow with RWWMP valving (2053)*

James River Treatment Plant will require additional secondary clarifiers and return activated sludge pumping to achieve the required capacity. There may also be some piping improvements necessary.

Atlantic Treatment Plant will require influent flow equalization to shave the peak flows and additional influent screening. The existing screens are rated by the manufacturer to be sufficient but actual operating performance has shown that they cannot pass the modeled peak flows.

VIP is nearing completion of a major upgrade to get the plant to a hydraulic capacity of 100 MGD. Modeled peak flows exceed that value by small amounts. Until the full expansion is in service and experiencing high flows, the exact capacity is uncertain. For planning purposes, additional flow equalization (1 MG) and influent pumping has been included.

Section 12

High-Priority Projects

12.1 RWWMP High-Priority Project Selection Process

HRSD developed an approach to recognize the highest-priority RWWMP projects to implement concurrently with SWIFT in the period of 2020 through 2030. These projects have been identified as having the greatest relative environmental benefit over the program implementation period.

12.1.1 Evaluation Criteria

Prioritization criteria used to establish a relative project ranking are listed in Table 12-1. These criteria were defined with the objective of highlighting which RWWMP projects could have the largest beneficial environmental impact.

The weight given to pollutant load reduction for screening recognizes the primary importance of water quality improvements. The secondary criterion, location, is scored and weighted to highlight spatial considerations of human health and living resource impacts. The final category focuses on I/I reduction due to the importance of relieving existing system capacity and reducing dry weather TP effluent flow.

Table 12-1. Criteria to Identify High-Priority RWWMP Projects

Criteria				Scoring	Weight
1	Pollutant load reduced (Gallons)			Scaled rank order	0.5
2	SSO location	Tier 1	Proximity to water used for public beaches	5	0.3
		Tier 2	Proximity to public surface drinking water sources	1	
			Proximity to open shellfish grounds	1	
			Proximity to high-priority waters	1	
		Tier 3	Drains to bacteria- impaired or bacteria TMDL watershed	0.5	
	Project Location		Reduces I/I to SWIFT-participating TP with affected shellfish grounds (Army Base, James River, VIP)	0.5	
3	I/I Reduction (peak gpd)			Scaled rank order	0.2

12.1.2 Load Reduction Estimation

For High-Priority Project screening purposes, a baseline of SSO locations and volumes were identified using the RHM. Primary variables included for the baseline simulation areas are indicated below:

- 5-year storm flows
- System valving configurations reflect the closure of the Chesapeake-Elizabeth (CE) TP
- Infrastructure projects needed to take CE off-line were modeled as complete
- All improvements identified for the RWWMP were excluded for baseline results

Capacity improvement and I/I reduction elements were then grouped for analysis per infrastructure connectivity, hydraulic interactions, and potential impact to location critical baseline SSOs. Locality capacity improvements identified via the LHM were not included as individual elements in the high-priority evaluation process. These elements are generally small in scope and would have a very localized impact in relation to baseline SSOs.

Resulting High-Priority Project groups were then modeled through a series of simulations to estimate a total potential load reduction against baseline overflows. Model results served as the basis of relative comparison between groups for load reduction criteria as well as providing a correlation to baseline SSOs for location ranking.

12.1.3 Project Scoring

Primary location ranking was based on the location of the affected SSOs rather than the location of the project itself. Simulated overflow points were evaluated with respect to proximity measures identified in Table 12-1 and assigned individual location scores. Project location scores were then developed for each group according to which baseline SSOs had reductions predicted from hydraulic model simulations. Additional location points were included for any project that also met the criteria of reducing I/I to a SWIFT-participating TP with affected shellfish grounds.

Total net load reduction, location, and I/I reduction rankings were weighted and summed for all analyzed project groups. Criterion scores for each project were normalized to a scale of 0-100 based on the range of scores for all projects. An overall project score was obtained by multiplying each normalized criterion score by its respective weighting factor and summing the values. Analyzed projects were then ranked based on an overall (weighted) score. The highest-ranking projects were reviewed for selection.

Selective exclusion from consideration as a High-Priority Project was implemented for cases where the impacted SSO locations and volume reductions overlapped significantly between project groups. In these cases, the lower ranking project was excluded as any incremental benefit would be slight after the higher-ranking project was executed. Additionally, some individual projects were indicated by simulation results to have potential adverse impact to system conditions when not executed in concert with numerous other RWWMP projects. These groupings were excluded from consideration in the ranking order in favor of projects without similar effects.

12.2 Prioritization Results

Six major project groups were identified as falling within the selection criteria and overall budget. Overall prioritization scores for these projects are indicated in Table 12-2. General project area locations are outlined in Figure 12-1.

Table 12-2. Selected High-Priority Project Ranking

High-Priority Project Group ID	Load Reduction Criteria (Weight 0.5)	Location Criteria (Weight 0.3)	I/I Reduction Criteria (Weight 0.2)	Overall (Weighted) Score	Project Rank	General Description
VIP-05_06_07	50.0	9.0	9.8	68.8	1	Camden Ave PS and GM Improvements; Portsmouth I/I Reduction; Locality PS Upgrades
NA-01	29.9	30	0.0	59.9	2	Wilroy PRS and Storage
NA-08	12.9	12.2	15.4	40.5	3	Chesapeake I/I Reduction; Jumper FM

Table 12-2. Selected High-Priority Project Ranking

High-Priority Project Group ID	Load Reduction Criteria (Weight 0.5)	Location Criteria (Weight 0.3)	I/I Reduction Criteria (Weight 0.2)	Overall (Weighted) Score	Project Rank	General Description
AT-02	18.4	6.5	13.9	38.8	4	Chesapeake I/I Reduction; Locality PS and FM Upgrades
BH-02_S	33.9	1.7	0.0	35.6	5	Claremont Ave GM, PS, and Siphon Improvements; 14th St Storage
VIP-11	16.5	15.4	0.0	31.9	6	State St PRS and Storage

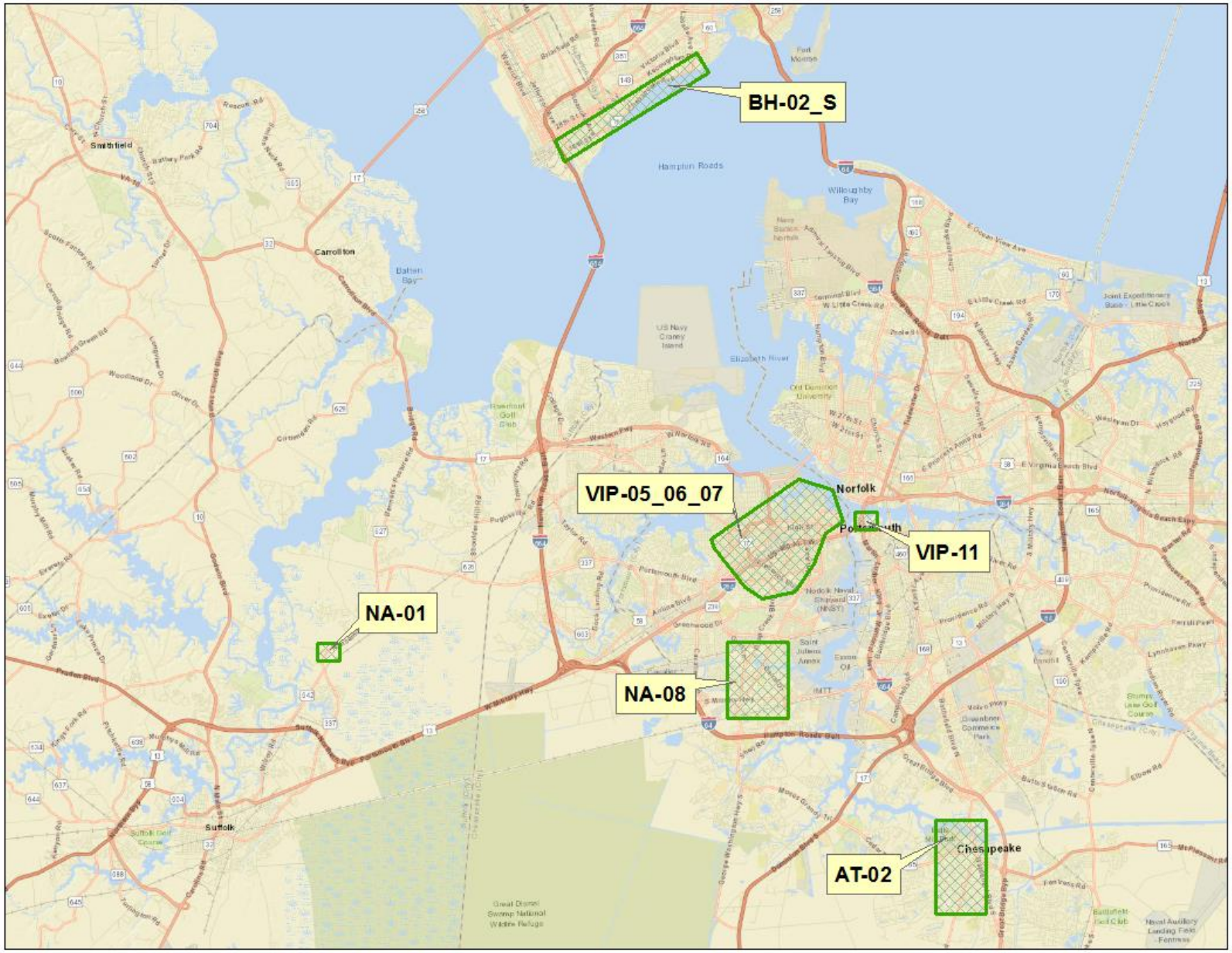

Figure 12-1. Selected High-Priority Project Locations

Capacity improvement and I/I reduction elements that comprise the High-Priority Projects are listed in Table 12-3. High-Priority Project maps are available with a more detailed view of selected elements in Figures 12-2 through 12-7.

Table 12-3. High-Priority Projects Summary

High-Priority Project Group ID	TP	Asset Ownership	Element Type	Element Name	Element Description
VIP-05_06_07	VIP	PORT	PS	PORT-PS-002	PORT-PS-002 (Glasgow St) Capacity Improvement
	VIP	PORT	I/I Reduc	PORT-01 Comprehensive I/I Reduction Plan	Catchment: PORT-001
	VIP	PORT	I/I Reduc	PORT-02 General I/I Reduction Plan	Catchments: PORT-002-V001; PORT-002-V002; PORT-002-V003; PORT-002-V004; PORT-002-V005
	VIP	PORT	GM	Camden Ave. GM Improvement - I	Upgrade 1,670 LF of 12" GM to 15" GM
	VIP	PORT	GM	Camden Ave. GM Improvement - II	Upgrade 2,170 LF of 17" GM to 21" GM and 370 LF of 15" to 18" GM
	VIP	HRSD	PS	Camden Ave. PS	SS-PS-146 Capacity Improvement
	VIP	PORT	I/I Reduc	PORT-04 General I/I Reduction Plan	Catchment: PORT-H-146-G001
	VIP	PORT	I/I Reduc	PORT-04-LOP65-1 Data-Driven I/I Reduction Plan	Catchment: PORT-H-146-G008
	VIP	PORT	I/I Reduc	PORT-04-LOP65-2 Data-Driven I/I Reduction Plan	Catchment: PORT-H-146-G009
	VIP	PORT	I/I Reduc	PORT-04-LOP65-3 Data-Driven I/I Reduction Plan	Catchment: PORT-H-146-G010
	VIP	PORT	PS	PORT-PS-008	PORT-PS-008 (Clifford Street PS) Capacity Improvement
NA-01	NA	HRSD	PRS	Wilroy PRS	Install new PRS with 80 ft of assistance - New Location
	NA	HRSD	Storage	Wilroy Storage	Install new 2.9 MG storage tank
NA-08	NA	HRSD	FM	Jumper FM CHES-PS-041	150 LF of 16" Jumper FM along Canal Dr to S. Military Hwy
	NA	CHES	I/I Reduc	CHES-016 Comprehensive I/I Reduction Plan	Catchment: CHES-016
	NA	CHES	I/I Reduc	CHES-018 Comprehensive I/I Reduction Plan	Catchment: CHES-018
	NA	CHES	I/I Reduc	CHES-227 Data-Driven I/I Reduction Plan	Catchment: CHES-227
AT-02	AT	CHES	FM	CHES-PS-067 FM	Install 1,930 LF of 10” FM
	AT	CHES	PS	CHES-PS-072	CHES-PS-072 Capacity Improvement
	AT	CHES	I/I Reduc	CHES-032 General I/I Reduction Plan	Catchment: CHES-032
	AT	CHES	I/I Reduc	CHES-047 Data-Driven I/I Reduction Plan	Catchment: CHES-047
	AT	CHES	I/I Reduc	CHES-067 Comprehensive I/I Reduction Plan	Catchment: CHES-067
	AT	CHES	I/I Reduc	CHES-111 General I/I Reduction Plan	Catchment: CHES-111
BH-02_S	BH	HRSD	GM	Claremont Ave GM Improvement - I	Upgrade 6,490 LF to 42" GM
	BH	HRSD	GM	Claremont Ave GM Improvement - II	Upgrade 2,180 LF of 24" GM to 36" GM

Table 12-3. High-Priority Projects Summary

High-Priority Project Group ID	TP	Asset Ownership	Element Type	Element Name	Element Description
	BH	HRSD	Storage	14th St Storage	Install new 4.3 MG storage tank
	BH	HRSD	PS	Claremont PS	NS-PS-208 Capacity Improvement
	BH	HRSD	Siphon	Claremont Siphon - Chesapeake Ave	Upgrade inverted siphon
	BH	HRSD	Siphon	Claremont Siphon - Indian River	Upgrade inverted siphon
VIP-11	VIP	HRSD	PRS	State St PRS	Install new PRS with 35ft of assistance - New Location
	VIP	HRSD	Storage	State Street Storage	Install new 2.3 MG storage tank

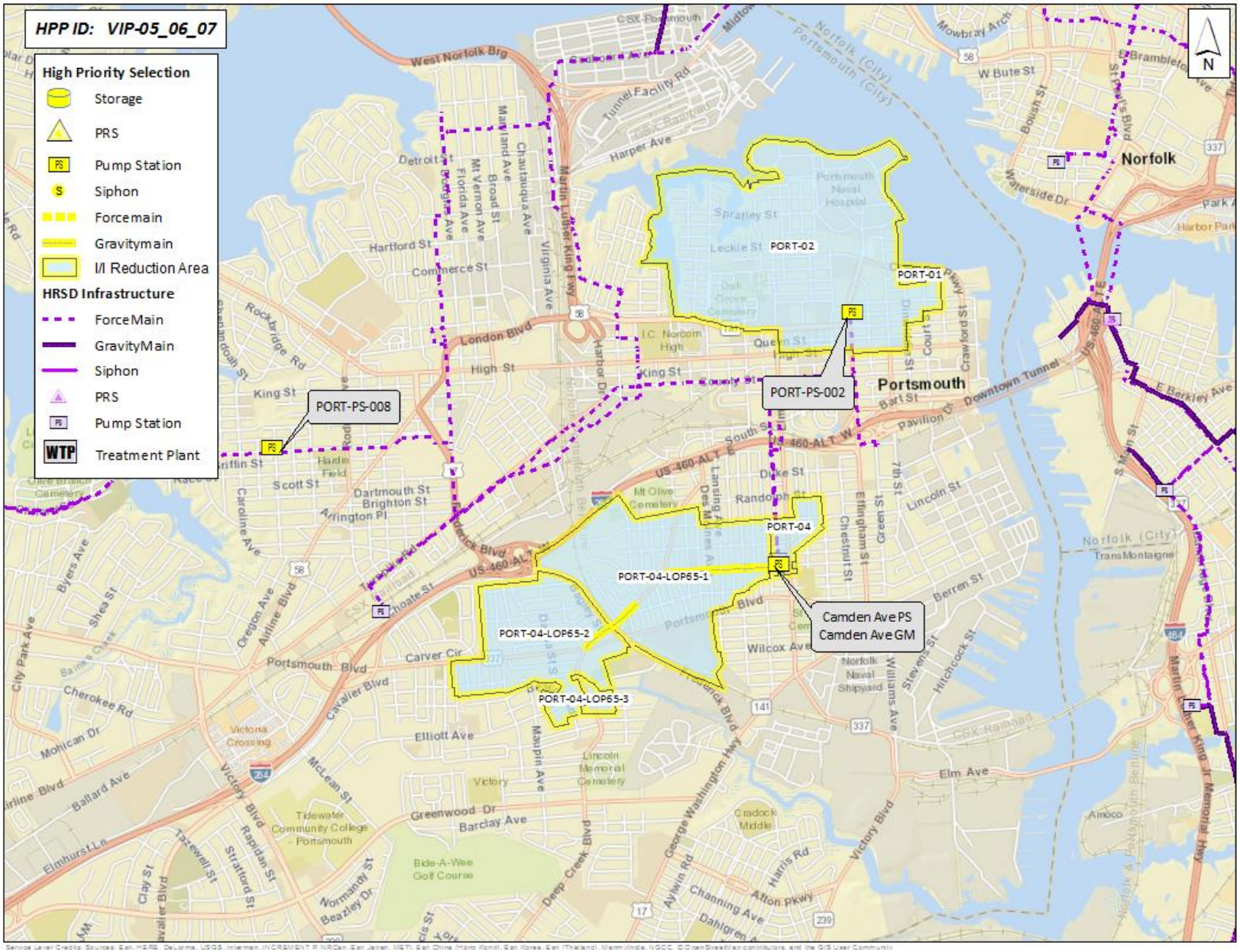

Figure 12-2. High-Priority Project VIP-05_06_07

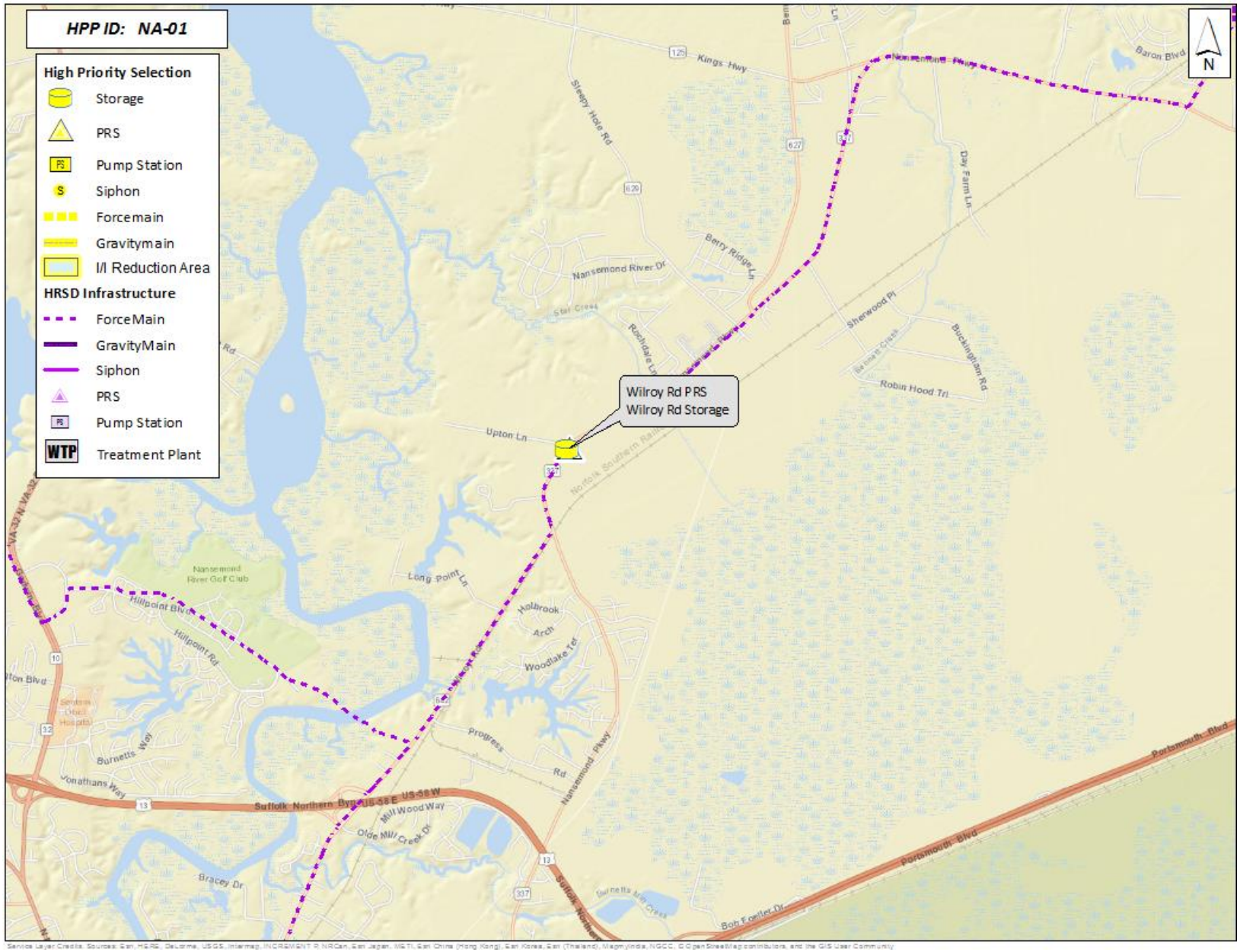

Figure 12-3. High-Priority Project NA-01

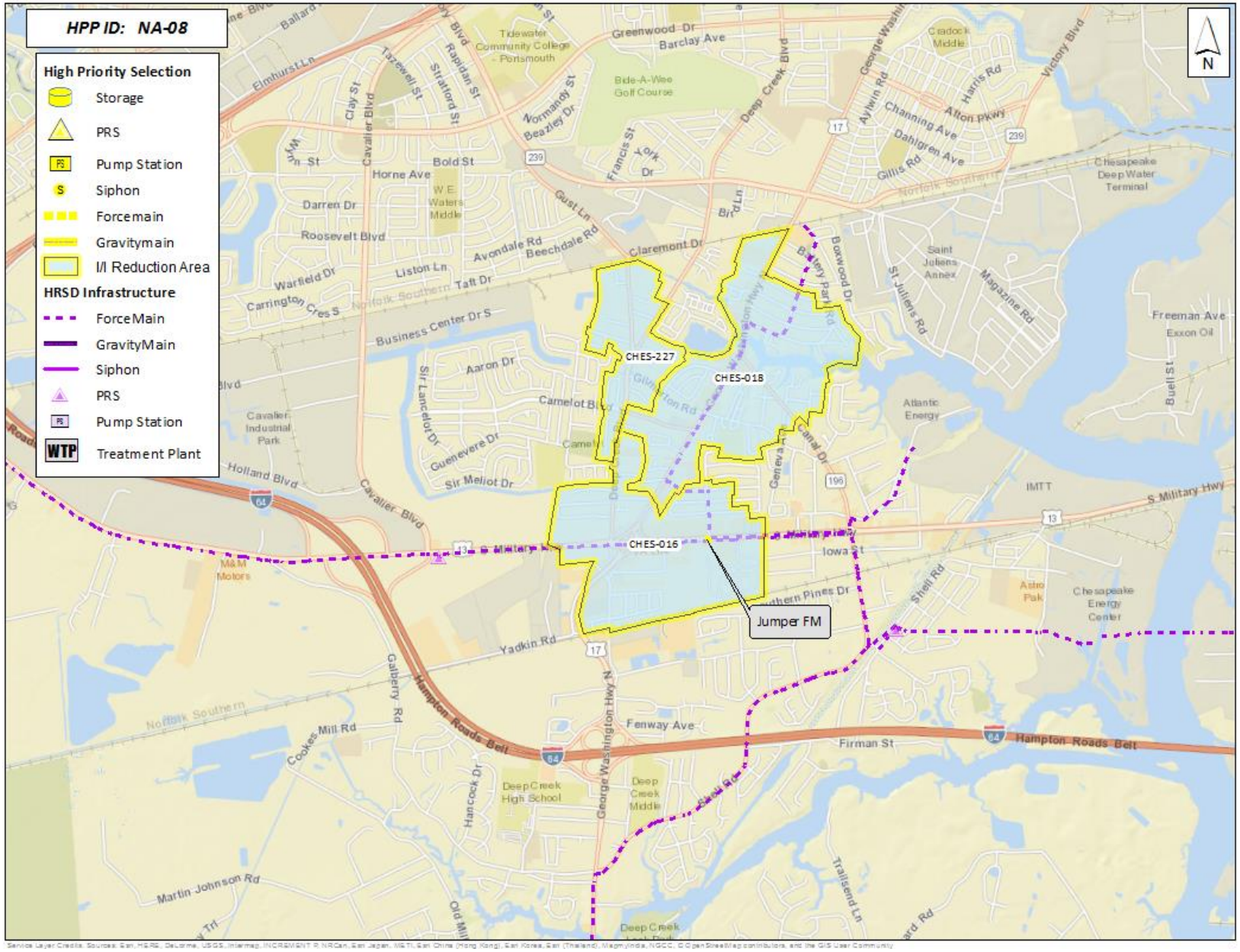

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Figure 12-4. High-Priority Project NA-08

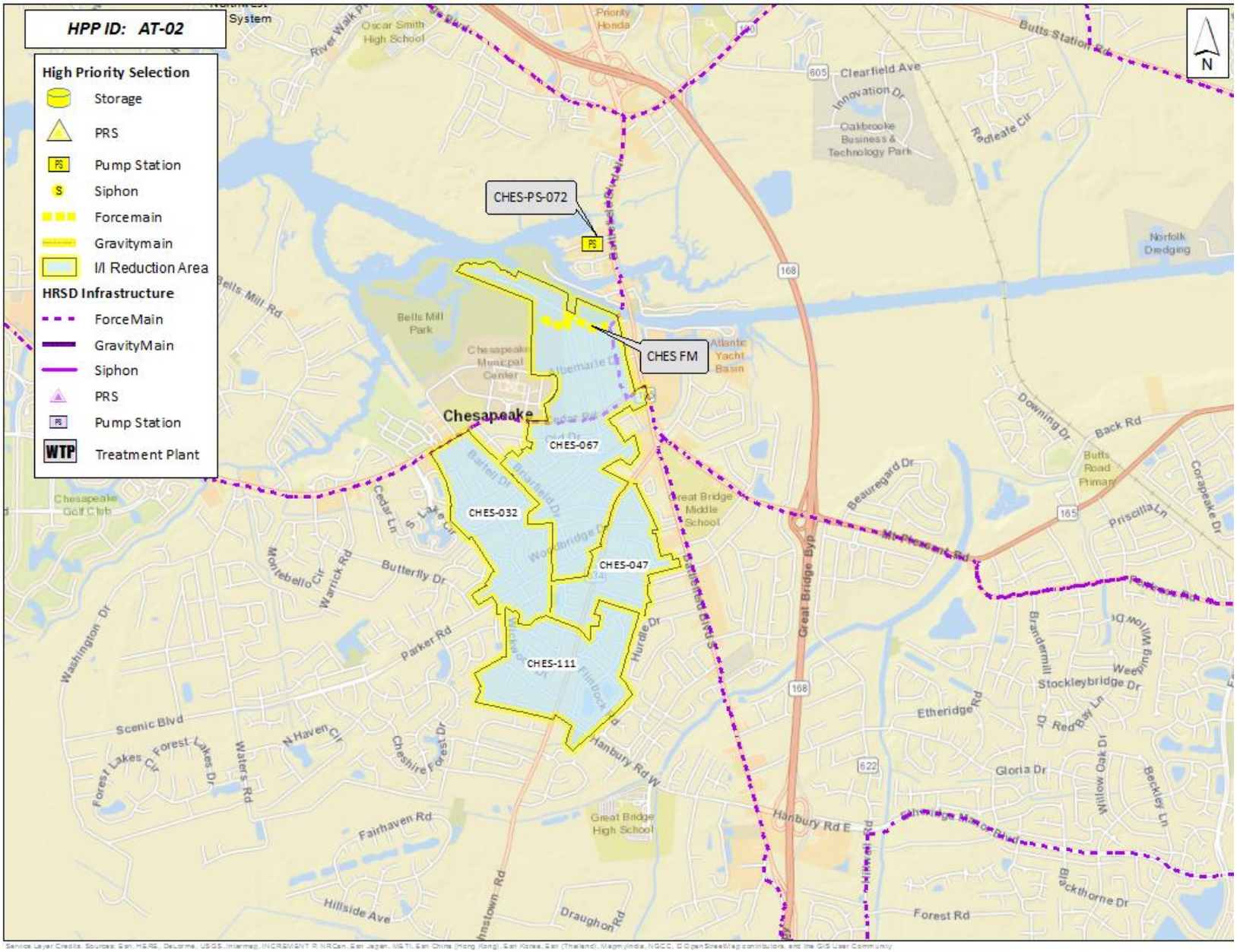

Figure 12-5. High-Priority Project AT-02

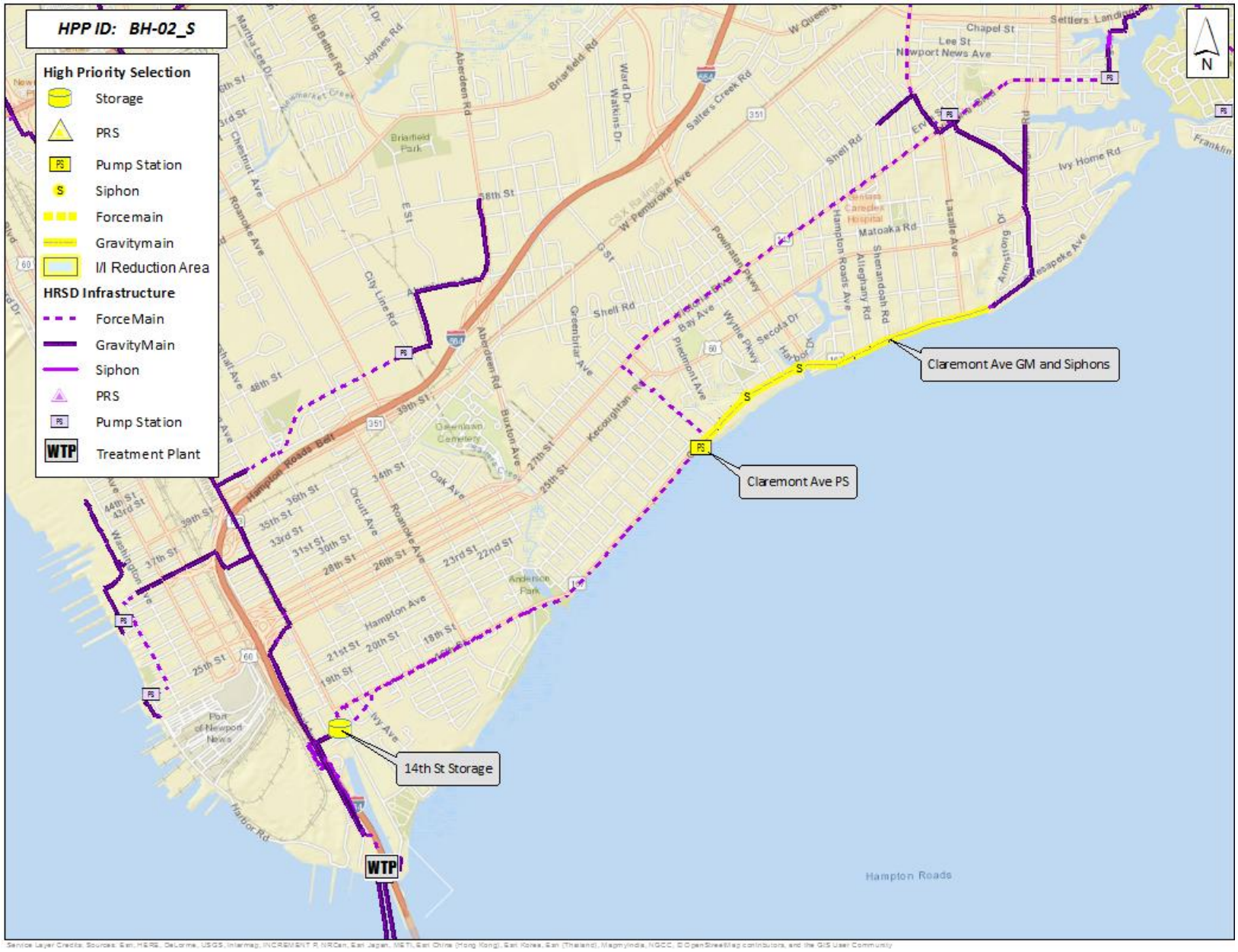

Figure 12-6. High-Priority Project BH-02_S

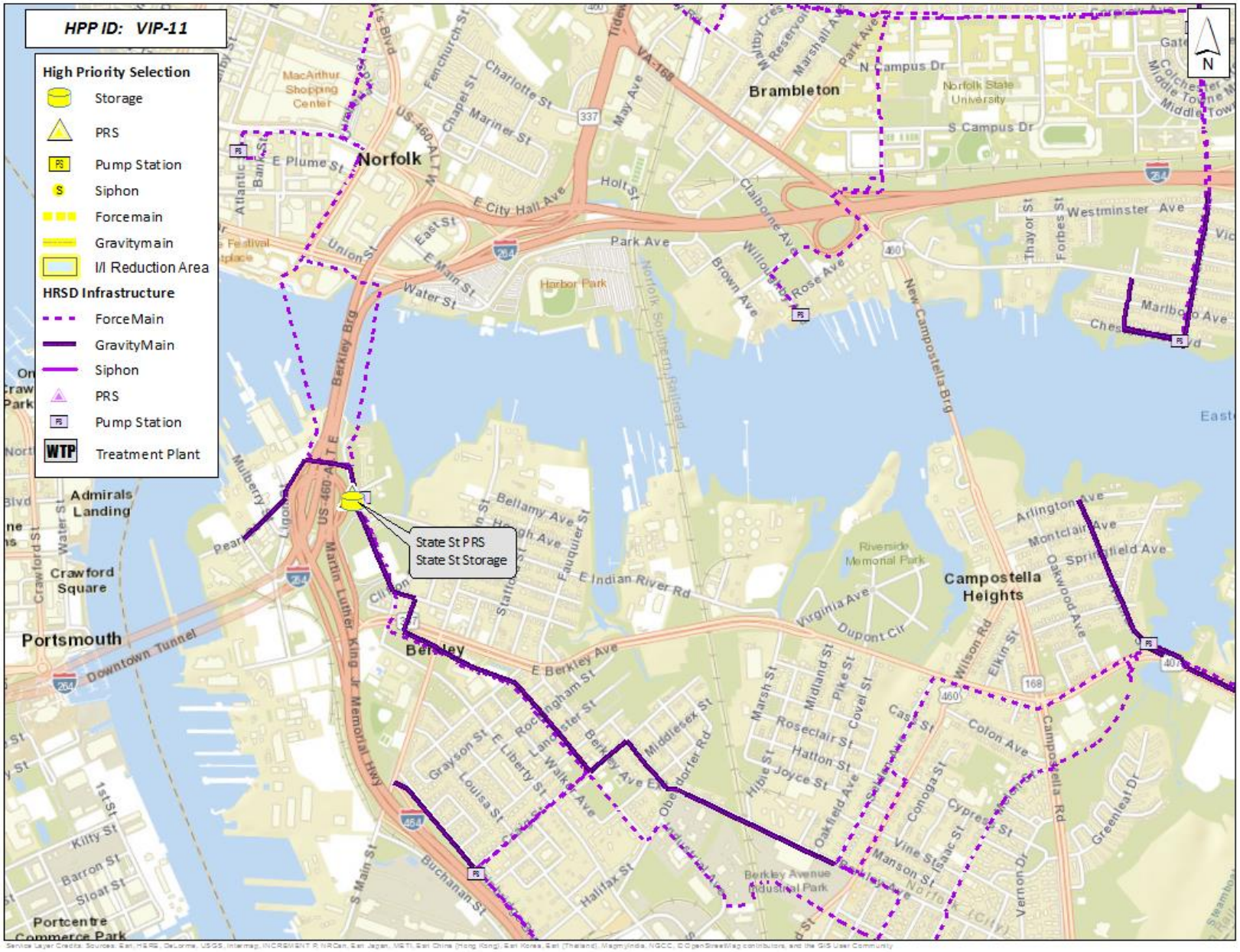

Figure 12-7. High-Priority Project VIP-11

12.3 Costs

Total costs for High-Priority Projects are estimated at $207.7 million. A breakdown of anticipated spending by asset type and ownership is depicted in Tables 12-4 and 12-5, respectively.

Table 12-4. High-Priority Projects by Asset Type

Asset Type	Cost ($ Millions)	% of Total
PRS	$13.0	6.3%
Storage Facilities	$38.8	18.7%
HRSD Pump Station	$35.2	16.9%
HRSD Conveyance	$17.7	8.5%
Locality Pump Station	$12.6	6.0%
Locality Conveyance	$3.9	1.9%
I/I Reduction	$86.5	41.7%
Total	$207.7	100%

Table 12-5. High-Priority Projects by Asset Ownership

Asset Ownership	Cost ($ Millions)	% of Total
HRSD	$104.7	50.4%
Locality	$92.1	44.3%
Private	$10.9	5.2%
Total	$207.7	100%

12.4 Schedule

These High-Priority Projects will be implemented concurrently with execution of the SWIFT projects following approval of the RWWMP. Note that the prioritization criteria only apply during the period when SWIFT is under construction. After 2030, RWWMP projects will be scheduled and sequenced based on a 2028-2030 reevaluation which will consider integrated planning, affordability, level of control, engineering, constructability, construction sequencing, and community disruption factors.

12.5 Targeted Approach to Address Bacteria Impairments

The regional sanitary sewer system has no chronic capacity-related overflow locations. Capacity-related overflows, infrequent as they are in the regional system, occur at various locations, largely dependent on the antecedent groundwater conditions, tidal effects and specific location of the most intense rainfall during a given event. The effect of these transient wet weather capacity-related overflows on water quality is minimal regarding both short and/or long-term impairments. While the RWWMP work will ultimately eliminate all of these capacity-related overflows up to the selected Level of Service, a focused approach to address local water bacteria impairments will be deployed during the entire implementation period of the Integrated Plan. These efforts will focus on identifying, locating and eliminating chronic and persistent non-SSO-related sources of human-sourced bacteria.

HRSD has invested heavily in the development of state-of-the-art molecular technologies for microbial source tracking that can be used to identify the presence of human sources of bacteria. These tools, when

coupled with a thorough understanding of the wastewater and stormwater infrastructure, can be used to identify the presence of human sources of bacteria within a waterway and have proven successful in tracking down failing or compromised infrastructure contributing to the impairment. Building upon the early successes of the program, HRSD intends to continue this work within the Hampton Roads region throughout the Integrated Plan implementation period, using the tools to identify chronic and persistent human sources contributing to bacteria impairments and focusing infrastructure investment in these areas to eliminate human source bacteria from impaired waterways. This program is focused to identify and address ongoing (daily) contributions of human-sourced bacteria. Accordingly, these efforts provide greater water quality and public health benefits than additional wet weather capacity-related investments. Table 12-6 depicts recently completed and underway projects in this program.

Table 12-6. HRSD Pathogen Source Tracking Projects

Waterbody	Partner(s)	Watershed/ Municipality	Status	Fecal Contamination Source	Corrective Action	Comments
Wayne Creek	City of Norfolk, Elizabeth River Project	Norfolk	Completed	Compromised Force Main	Immediate Repair	
Newport News Channel	Southeast Care Coalition, City of Newport News	SE Newport News	Completed	Compromised Gravity Sewer affecting Newport News Creek	Immediate temporary fix, then permanent bypass of this area of collection system	
Shingle Creek	City of Suffolk	Suffolk	Completed	Illicit connection to stormwater collection system	Plugged connection after identification of waste sources	
Hilton Beach	City of Newport News, Virginia Department of Health, Greater Hilton Citizen Group	Hilton Neighborhood	On-going	Identification of multiple compromised private side laterals	Immediate Repair	Currently Investigating any remaining sources
Indian River	Elizbeth River Project, City of Chesapeake	Chesapeake	Completed	No human source identified; Identification of dog, goose, and environmental sources of bacteria	Public education regarding domestic pet waste	

Table 12-6. HRSD Pathogen Source Tracking Projects

Waterbody	Partner(s)	Watershed/ Municipality	Status	Fecal Contamination Source	Corrective Action	Comments
Nansemond River	City of Suffolk; Virginia Department of Health--Shellfish Sanitation; Nansemond River Preservation Alliance	Nansemond River Watershed; Suffolk	On-going	Already identified multiple collapsed or compromised gravity sewer pipes that caused sewage infiltration in the SW collection system; Several failing septic systems also identified	Gravity sewer system repairs/replacement. Local health departments working with residents to repair failing septic systems	Large scale sampling still underway. Multiyear project.
Knitting Mill Creek	City of Norfolk, Lafayette Wetlands Partnership	Colonial Place and Ghent Norfolk	On-going	No apparent human fecal contamination identified; evidence of sporadic SSOs		Phase II being initiated
Broad Creek	City of Norfolk, Elizabeth River Project	Norfolk	Planning			
Lucas Creek	City of Newport News, USGS, Hampton Roads Planning District Commission	Newport News	On-going			Evidence of human fecal signal

Section 13

Summary of Projects

13.1 Element Grouping

In order to prepare reasonable project construction packages for RWWMP implementation, individual capacity and I/I reduction elements were grouped using a set of general guidelines. This evaluation included hydraulic connectivity considerations as well as geography and potential implementation logistics.

Primary guidelines are as follows:

- Concurrency of elements
  - Pump station upgrade built in concert with associated force main or upstream gravity main improvement
  - Manifolded force mains included in a single project
  - PRS capacity improvements grouped with co-located storage tanks
- Groupings by asset type for contractor specialties
  - I/I reduction areas grouped by connectivity, geography, and Locality; targeting project totals of $20 million or less
  - Pump station elements grouped by geography and ownership (individual Locality or HRSD); targeting project totals of $10 million or less.
  - Pipeline improvements grouped by geography and ownership; targeting project totals of $10 million or less.
- Avoid excessive time to complete a project; target durations of 3 to 5 years

Grouping evaluation resulted in a total of 174 projects scheduled for completion in the RWWMP. Projects are listed in Section 13.3, and a detailed accounting of both elements and associated projects is provided in Appendix E.

13.2 Cost Estimation Methodology

Cost estimation was performed at a Class 4 level representing concept study/feasibility level work. Unit prices were adjusted for the Hampton Roads area through the use of bid tabs and a local cost index.

Primary cost development categories are as follows:

- Storage Facilities were estimated based on a price per million gallons of storage with consideration for site area requirements.
- Pumping systems, including regional pressure reducing stations as well as Locality and regional wastewater pump stations, were estimated based on a unit cost per horsepower of installed maximum capacity with consideration for site area requirements.
- Regional Capacity Conveyance Improvements - For capacity-related projects on regional force main and gravity main pipelines, HRSD developed a cost model based on construction unit prices. The use of unit prices required assumptions on the means and methods to address various construction conditions as well as asset physical characteristic data such as pipe size, length, depth, number of assets, etc.

- Locality Capacity Conveyance Improvements - HRSD developed representative costs based on a unit value per foot of pipe.
- No additional costs were included for Locality gravity main capacity improvements that fell within a comprehensive I/I reduction area. These elements were included in the respective I/I reduction grouping with a zero-dollar value to track the requirement for a pipe size increase.
- HRSD I/I Reduction Program - Assumptions for developing budgetary investigation, design and R/R costs to support the I/I Reduction Program are based on standard costs per foot of rehabilitation/replacement, number of manholes, SSES/investigation costs, and pavement restoration.
- RWWMP projects, with full scope overlap of an existing HRSD Rehab Action Plan (RP) or CIP project, were assigned a zero-dollar cost to avoid double counting expenditures for affordability analysis considerations.

As part of the future design process for projects, HRSD will refine the scopes of individual elements and/or repackage contiguous projects. These costs are planning level estimates and actual completed costs will vary.

13.2.1 Pumping System Improvements and Storage Facilities

Construction costs for pump stations and PRSs were based on a calculation of horsepower using the flow and head at the facility as determined by the modeling. Power efficiencies (horsepower to work performed) for pumping stations and PRS were assumed to be 45% and 65%, respectively. Cost estimates were reviewed and adjusted based on recent HRSD project experience. Example cost projections for pump station and PRS project types are listed in Tables 13-1 and 13-2.

Table 13-1. Pump Station Construction Costs

Horsepower	Cost
25	$572,000
50	$893,000
75	$1,212,000
100	$1,530,000
125	$1,847,000
150	$2,163,000
200	$2,791,000
250	$3,413,000
300	$4,031,000
350	$4,644,000

Table 13-2. PRS Construction Costs

Horsepower	Cost
100	$3,165,000
150	$3,744,000
200	$4,321,000
250	$4,895,000
300	$5,468,000
350	$6,038,000
400	$6,606,000
450	$7,172,000
500	$7,735,000
600	$8,856,000

Storage facility costs were assigned as a variable cost per gallon of storage that declines inversely to total storage capacity (i.e., $2.5/gal at 0.5 MG and $1.5/gal at 5.0 MG). These costs include the storage tanks, odor control, tank cleaning appurtenances, and pipeline improvements onsite. Land acquisition was included at $200,000 per acre with an estimated site area requirement for each project. Pumping facilities associated with storage facility operations were assessed using the pump station cost methodology previously described; however, horsepower requirements for these pumps were calculated assuming a higher efficiency of 65% due to the focused equipment use.

Horsepower requirements for each facility are estimated based on head and typical flow rates determined through long-term simulations. Example costs of storage facilities and associated pumping costs are listed in Table 13-3 below. Additional costs are included in the total cost estimate for architectural treatments and other site improvements.

Table 13-3. Storage Facility Construction Costs

Size (MG)	Tank Cost	Conceptual Site Area Cost	Estimated Horsepower*	Pump Cost	Total Storage Facility Cost
1	$2,201,000	$266,000	50	$893,000	$3,360,000
2	$3,700,000	$395,000	60	$1,021,000	$5,116,000
3	$5,109,000	$523,000	110	$1,657,000	$7,289,000
4	$6,429,000	$652,000	170	$2,415,000	$9,496,000

** Horsepower is calculated from the required flow and TDH associated with pumping facilities*

13.2.2 Regional Capacity Conveyance Improvements

Regional capacity projects involving force mains and gravity mains were estimated using a cost model that included construction materials, labor, equipment and all aspects of project procurement including pre-planning, preliminary engineering report (PER), design, pre-construction and construction. This model was very similar to that used for the Rehab Action Plan projects.

Each individual project was reviewed and assigned potential project specific construction line items including, but not limited to: surveying, mobilization, traffic control, dewatering, bypassing, erosion/sedimentation control, demolition, excavation, pipe installation, jack and bore, sewer connections, line stops, valves, pipe fittings, appurtenance, joint restraints, paving, and site restoration. Special, project-specific considerations were added for paralleling existing lines, acquisition of new easements, directional drilling, sacrificial sheet piling, construction involving wetlands, and aerial crossings.

Inverted siphon lines were estimated separately from other gravity line project estimates. Each inverted siphon was assumed to require three parallel barrels, one for dry weather and two additional to accommodate wet weather flow. Due to specific project unknowns, a conservative unit price of $10,000/LF was applied to the replacement lengths.

13.2.3 Locality Capacity Conveyance Improvements

Tables 13-4 through 13-6 outline unit prices used in the development of cost estimates for capacity improvements to Locality force main and gravity main infrastructure. Representative costs were applied based on a unit value per foot of pipe.

Pipe replacement costs included mobilization, traffic control, bypass pumping up to 2 MGD for pipes less than 24-inch diameter and 4 MGD for pipes greater than 24-inch, demolition, excavation, fill and compaction. Pavement restoration costs include milling and surface restoration for the length of the pipe being replaced. In the absence of specific information, two lanes were included in pavement restoration estimates. Force main linear footage costs also included valves, bends, air vents and tees.

Table 13-4. Locality Gravity Asset Unit Construction Costs	
Item Description	Unit Price
Manhole Replacement	$10,969 EA (up to 10ft depth) +$1,028 /VLF >10ft
Public Lateral Replacement (up to 25ft length)	$4,000 EA
Pipe Replacement Up to 10 ft. Depth, applied to pipes less than 15" Dia	$145/ft + $12 in-dia/LF (> 10" dia)
Pipe Replacement 10 – 15 ft. Depth, applied to pipes between 15 and 18" Dia	$182/ft + $14 in-dia/LF (> 10" dia)
Pipe Replacement Depth >15 ft., applied to pipes greater than 18" Dia	$214/ft + $16 in-dia/LF (>10"dia)

Table 13-5. Locality Force Main Unit Construction Costs	
Diameter (inch)	Cost
4	$110
6	$150
8	$227
10	$330
12	$356
14	$454

Table 13-6. Restoration Unit Construction Costs	
Item Description	Unit Price
Pavement Restoration	$140,000 Lane-Mile
Curb and Gutter Replacement	$24/LF
General Site Restoration	$6/LF

13.2.4 HRSD I/I Reduction Program

Section 8 documents the procedures used to determine the I/I Reduction Program and costs.

Cost estimates for targeted catchments were developed with unit price structures similar to those outlined for Locality capacity conveyance improvements. A mixture of rehabilitation and replacement activities were included within each catchment specific reduction plan. Rehabilitation unit prices employed for planning estimates were approximately half of replacement unit costs for gravity assets. Pipe rehabilitation costs include lining, cleaning, pre- and post CCTV inspection, traffic control, and bypass pumping.

The timeframe of the RWWMP implementation will span over many years; thus, it was assumed that additional SSES activities would be required as part of predesign for system repairs. Associated SSES costs were included in each catchment-specific I/I Reduction Plan, regardless of the amount of data previously collected in that catchment.

Costs associated with SSES activities were based on the number of assets within the catchment, and the assumptions that 100% of public pipes will be smoke tested and CCTV-inspected and 100% of public manholes will be inspected. Table 13-7 below includes unit prices for field investigation activities used in SSES cost estimates.

Table 13-7. SSES Unit Costs	
Item Description	Unit Price
MACP Manhole Inspection	$100 EA
Smoke Testing	$0.40 LF
PACP Pipeline Inspection, CCTV w/ light cleaning	$3.00 LF
Lateral Inspection	$20 LF
Flow Monitoring	$20,000 Meter

Pavement restoration calculations assumed that only the replaced portion of pipe (50% of scoped pipes for data-driven and general plans, 70% for comprehensive) will require pavement restoration.

For general and comprehensive plans, the number of lanes was assumed to be two in the absence of specific information. Lane miles for data driven scopes were calculated using the specific R/R scoped pipes in conjunction with road centerline data from the Virginia Base Mapping Program (VBMP). A buffer of 25 ft. was used to intersect the road centerline with the gravity main targeted for replacement to estimate the length of pipe under the roadway. The number of lanes to restore was estimated based on the assumptions in Table 13-8.

Table 13-8. Lane Restoration Assumptions	
Road Section Speed Limit	Lanes to Restore
<35 mph	2
Between 35 mph and 45 mph	3
> 45 mph	4

The estimated cost for the I/I Reduction Program is $852 million.

13.2.5 Treatment Plant Improvements

Planning level costs were developed for each of the TP capacity solutions, and are listed in Table 13-9.

Table 13-9. TP Capacity Solutions Construction Costs		
Shore	Treatment Plant	TP Capacity Solution Costs ($ Millions)
North Shore	Boat Harbor	N/A
	James River	$44.7
	Williamsburg	N/A
	York River	N/A
South Shore	Army Base	N/A
	Atlantic	$24.4
	Nansemond	N/A
	VIP	$27.0

13.2.6 Engineering and Construction Administration/Inspection

Engineering costs were estimated to be 15% of capacity project construction costs. For I/I reduction projects, engineering costs were estimated to be 15% of construction costs for public assets and 25% for private infrastructure. Construction administration and inspection (CA/CI) were estimated to be 9% of construction costs for all project types.

13.2.7 Contingency

Contingency was estimated to be 25% of the construction cost for both I/I reduction and capacity improvement projects within the RWWMP. This level of contingency is for planning-level projects and would be refined through more detailed design.

13.3 RWWMP Project Summary

Total capital costs for RWWMP implementation, inclusive of High-Priority Projects, is estimated at $1.8 billion. A breakdown of anticipated spending by asset type is outlined in Table 13-10. Figure 13-1 provides the program cost estimate allocated by TP and asset ownership.

Table 13-10. RWWMP Capital Costs by Asset Type

Asset Type	Cost ($ Millions)	% of Total
PRS	$248.93	13.8%
Storage Facilities	$112.09	6.2%
HRSD Pump Station	$96.74	5.4%
HRSD Conveyance	$89.27	5.0%
TP Upgrades	$96.11	5.3%
Locality Pump Station	$114.45	6.4%
Locality Conveyance	$190.94	10.6%
I/I Reduction	$852.27	47.3%
Total	$1,800.8	100%

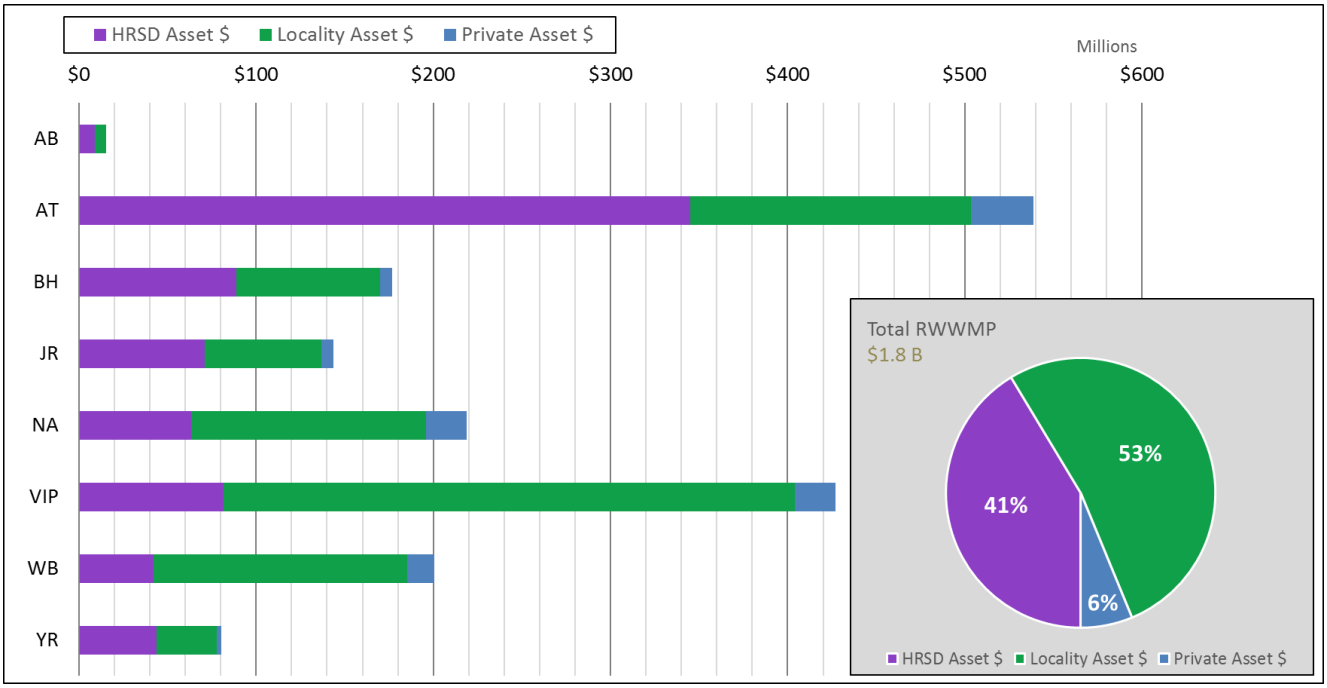

Figure 13-1. RWWMP Project Cost Estimates by TP

Table 13-11 provides a listing of RWWMP projects and costs. A more detailed summary of the RWWMP projects, corresponding elements, and descriptions can be found in Appendix E. Also, Section 13.2 explains general cost estimation methodology including why some projects show zero cost.

Table 13-11. RWWMP Project Cost Summary

RWWMP Project ID	Project Name	Description	Capital Cost ($ Thousands)
AB-RWWMP-01	Terminal Blvd/ Hampton Blvd Force Main Improvements	Upgrade 7,300 LF of 30" FM with 36" FM along Terminal Blvd. and Hampton Blvd. from Diven St. to Sewell's Point Elementary School	$0
AB-RWWMP-02	Terminal PRS Upgrade	Upgrade PRS to 55 ft. of assistance - Existing Location	$8,997
AB-RWWMP-03	Norfolk City System Improvements D	Norfolk Pump Station Upgrades PS016, PS022, PS047, PS068, and PS104	$5,122
AB-RWWMP-04	Norfolk City System Improvements E	Norfolk Pump Station Upgrade PS111; Various Norfolk GM and FM capacity improvements	$1,301
AT-RWWMP-01	Chesapeake High-Priority Project 1	Chesapeake Pump Station Upgrade PS072; Various Chesapeake FM and GM capacity improvements; I/I Reduction CHES-032, CHES-047, CHES-067, and CHES-111	$24,765
AT-RWWMP-02	VAB I/I Reduction Project A	I/I Reduction VAB-558 and VAB-602	$5,019
AT-RWWMP-03	Great Bridge Blvd. GM Improvement	Upgrade 3,530 LF of 18" GM with 24" GM; Upgrade 760 LF of 15" GM with 18" GM	$4,989
AT-RWWMP-04	Atlantic TP Equalization Tank and Effluent Screening	Equalization tank 4.1MG and additional effluent screening	$24,436
AT-RWWMP-05	Atlantic PRS Upgrade	Upgrade PRS to 80 ft of assistance - Existing Location	$38,996
AT-RWWMP-06	Birdneck-General Booth Blvd. Force Main Improvements	New parallel 19,810 LF 42" FM with existing 42"	$26,852
AT-RWWMP-07	Hillwell PRS	Install new PRS with 70 ft of assistance - New Location	$8,636

Table 13-11. RWWMP Project Cost Summary

RWWMP Project ID	Project Name	Description	Capital Cost ($ Thousands)
AT-RWWMP-08	Dozier's Corner PS Upgrade	HRSD Dozier's Corner Pump Station Upgrade (SS-PS-109)	$2,848
AT-RWWMP-09	Battlefield Blvd South IFM Improvements	Install 14,430 LF of 24" FM Along Battlefield Blvd South	$14,895
AT-RWWMP-10	Laskin Road PRS Upgrade	Upgrade PRS to 80 ft of assistance - Existing Location	$21,347
AT-RWWMP-11	Shipps Corner Storage Tank	Install new 3.1 MG storage tank	$12,192
AT-RWWMP-12	Oceana Storage Tank	Install new 4.9 MG storage tank	$16,900
AT-RWWMP-13	Lynnhaven Parkway Force Main Improvements	Upgrade 8,500 of 42" GM along Buckner Blvd from Lynnhaven Pkwy to Holland Rd	$20,341
AT-RWWMP-14	Kempsville PRS Upgrade	Upgrade PRS to 65 ft of assistance - Existing Location	$13,528
AT-RWWMP-15	Elbow Road PRS	Upgrade PRS to 80 ft of assistance – Existing Location	$15,330
AT-RWWMP-16	Virginia Beach Blvd. FM Improvements	Parallel 10,000 LF of new 30" and new 24" FM from Independence PRS to Lynn Shores Dr.; Parallel 6,300 LF of new 30" FM with existing 24" Lynn Shores Dr. to West of Groveland Rd.; Parallel 4,420 LF of new 36" FM with existing 24" from West of Groveland Rd. to Pine Tree PRS	$32,720
AT-RWWMP-17	Courthouse PRS	Upgrade PRS to 80 ft of assistance – Existing Location	$17,300
AT-RWWMP-18	Chesapeake City System Improvements D	Chesapeake Pump Station Upgrades PS011, PS012, and PS056; Chesapeake FM and GM capacity improvements; Install 30 LF of 6" Jumper pipe	$3,430
AT-RWWMP-19	Great Bridge Blvd IFM Improvement	Downsize 7,100 LF of 24" FM to 20" FM along Great Bridge Blvd from Battlefield Blvd to Willow Pt Arch to improve self -cleaning velocities	$5,470
AT-RWWMP-20	Chesapeake Southern Loop IFM (Cedar Rd. to Hillcrest Pkwy.)	Install 47,650 LF of 24" FM as part of the Chesapeake Southern Loop from Cedar Rd. to Battlefield Blvd.	$30,428
AT-RWWMP-21	Pine Tree PRS Upgrade	Upgrade PRS to 80 ft of assistance - Existing Location	$18,774
AT-RWWMP-22	Dominion Blvd. PRS	Install new PRS with 75 ft of assistance - New Location	$5,555
AT-RWWMP-23	Virginia Beach PS 120 Upgrade and Gravity Main Improvement	Virginia Beach Pump Station Upgrade PS 120; Virginia Beach GM capacity improvement	$4,754
AT-RWWMP-24	Independence PRS Upgrade	Upgrade PRS to 80 ft of assistance - Existing Location	$13,362
AT-RWWMP-25	Chesapeake I/I Reduction Project C	I/I Reduction CHES-072, CHES-074, CHES-116, CHES-220, and CHES-221	$17,300
AT-RWWMP-26	Virginia Beach PS 324 Upgrade and Five Point Rd FM Extension	Virginia Beach Pump Station Upgrade PS 324; Various Virginia Beach FM capacity improvements	$2,345
AT-RWWMP-27	VAB I/I Reduction Project C	I/I Reduction VAB-248, VAB-349, VAB-359, VAB-360, VAB-364, VAB-502, and VAB-509	$18,667
AT-RWWMP-28	Virginia Beach City System Improvements A	Virginia Beach Pump Station Upgrades PS455, PS508, and PS544	$4,561
AT-RWWMP-29	VAB I/I Reduction Project B	I/I Reduction VAB-318	$5,961
AT-RWWMP-30	VAB I/I Reduction Project D	I/I Reduction VAB-357, VAB-465, and VAB-466; Includes various Virginia Beach GM capacity improvements	$18,165
AT-RWWMP-31	Chesapeake I/I Reduction Project D	I/I Reduction CHES-063, CHES-197, and CHES-214	$4,756
AT-RWWMP-32	VAB I/I Reduction Project E	I/I Reduction VAB-218, VAB-256, and VAB-260	$9,021
AT-RWWMP-33	VAB I/I Reduction Project F	I/I Reduction VAB-007a, VAB-338, VAB-340 NSF Only, VAB-350, and VAB-401	$15,906
AT-RWWMP-34	Chesapeake I/I Reduction Project H	I/I Reduction CHES-009 and CHES-134	$14,101
AT-RWWMP-35	Chesapeake I/I Reduction Project F	I/I Reduction CHES-013, CHES-096, CHES-164, CHES-165, CHES-931-G1, and CHES-931-G2	$11,110

Table 13-11. RWWMP Project Cost Summary

RWWMP Project ID	Project Name	Description	Capital Cost ($ Thousands)
AT-RWWMP-36	Norfolk I/I Reduction Project M	I/I Reduction NORF-H-115 and NORF-PS-081	$21,866
AT-RWWMP-37	VAB I/I Reduction Project G	I/I Reduction VAB-343a and VAb-343b	$10,897
AT-RWWMP-38	Norfolk City System Improvements F	Various Norfolk FM and GM capacity improvements	$959
BH-RWWMP-01	Claremont PS Upgrade, Chesapeake Ave. Pipe Improvements and 14th St Storage Tank	Install new 4.3 MG storage tank; HRSD Claremont Pump Station Upgrade (NS-PS-208); Upgrade two inverted siphons along Chesapeake Ave.; Upgrade 6,490 LF to 42" GM; Upgrade 2,180 LF of 24" GM to 36" GM	$48,559
BH-RWWMP-02	Hampton I/I Reduction Project A	Extension of Hampton PS-006 discharge force main; I/I Reduction HAMP-225H-107, HAMP-225H-117, and HAMP-225H-124	$16,898
BH-RWWMP-03	Washington St Gravity Main Improvements	Install 1,040 LF of 24” GM; Install 2,380 LF of 30” GM	$4,291
BH-RWWMP-04	58th St Storage Tank	Install new 2.5 MG storage tank	$11,456
BH-RWWMP-05	Hampton I/I Reduction Project C	I/I Reduction HAMP-017	$5,781
BH-RWWMP-06	Copeland Park PS Upgrade	HRSD Copeland Park Pump Station Upgrade (NS-PS-209)	$4,900
BH-RWWMP-07	Newmarket Creek PS Upgrade	HRSD Newmarket Creek Pump Station Upgrade (NS-PS-219)	$7,645
BH-RWWMP-08	Mercury Blvd and Newmarket Gravity Main Improvements	Install 3,090 LF of 30” GM; Install 3,780 LF of 36” GM	$7,570
BH-RWWMP-09	Copeland Park Gravity Main Improvement	Upgrade 2,260 LF of 24" GM to 36" GM	$2,227
BH-RWWMP-10	Newport News I/I Reduction Project B	I/I Reduction NEWP-WCPSA001635, NEWP-WCPSA003200; NEWP-WCPSA003202, NEWP-WCPSA003401, and NEWP-WCPSA003402	$3,235
BH-RWWMP-11	35th Street Gravity Main Improvement	Upgrade 1,470 LF of 18” GM with 24” GM	$2,039
BH-RWWMP-12	Hampton City System Improvements B	Various Hampton FM and GM capacity improvements	$12,028
BH-RWWMP-13	Hampton City System Improvements C	Various Hampton GM capacity improvements	$4,428
BH-RWWMP-14	Newport News I/I Reduction Project F	I/I Reduction NEWP-WCPSA003300, NEWP-WCPSA003302, NEWP-WCPSA003303, NEWP-WCPSA003801, NEWP-WCPSA003802, NEWP-WCPSA003803, NEWP-WCPSA003804, NEWP-WCPSA004300, NEWP-WCPSA004301. And NEWP-WCPSA004302	$14,332
BH-RWWMP-15	Hampton City System Improvements D	Various Hampton FM and GM capacity improvements	$3,316
BH-RWWMP-16	Newport News I/I Reduction Project I	I/I Reduction NEWP-WCPSA001660, NEWP-WCPSA003601, NEWP-WCPSA003700, and NEWP-WCPSA003701	$20,776
BH-RWWMP-17	Newport News I/I Reduction Project H	I/I Reduction NEWP-WCPSA001705	$1,217
BH-RWWMP-18	Newport News I/I Reduction Project J	I/I Reduction NEWP-WCPSA003906, NEWP-WCPSA004100, NEWP-WCPSA004101, and NEWP-WCPSA004103	$4,614
JR-RWWMP-01	Jefferson Avenue IFM Improvement	Upgrade 6,520 LF of 12”, 14", 16" FM with 30 " FM	$0
JR-RWWMP-02	Tabb PRS and Storage Tank	Install new PRS with 80 ft. of assistance - New Location; Install new 1 MG storage tank	$10,060
JR-RWWMP-03	James River TP Secondary Clarifiers and RAS Pumps	Additional secondary clarifiers and RAS Pumps	$44,700
JR-RWWMP-04	Lucas Creek PRS Upgrade	Upgrade PRS to 65 ft. of assistance - Existing Location	$13,195
JR-RWWMP-05	Newport News PS 68 Upgrade and Gravity Main Improvement	Newport News Pump Station Upgrade PS068; Newport News GM capacity improvement	$2,056

Table 13-11. RWWMP Project Cost Summary

RWWMP Project ID	Project Name	Description	Capital Cost ($ Thousands)
JR-RWWMP-06	Newport News I/I Reduction Project A	I/I Reduction NEWP-WCPSA001565, NEWP-WCPSA003005, NEWP-WCPSA003007, NEWP-WCPSA003008, and NEWP-WCPSA003010	$8,766
JR-RWWMP-07	Newport News City System Improvements A	Various Newport News FM and GM capacity improvements	$9,648
JR-RWWMP-08	Newport News City System Improvements B	Newport News Pump Station Upgrades PS019, PS043, PS122; Various Newport News FM and GM capacity improvements	$9,838
JR-RWWMP-09	Poquoson PS 001 Upgrade	Poquoson Pump Station Upgrade PS001	$3,223
JR-RWWMP-10	Morrison PS Upgrade	HRSD Morrison Pump Station Upgrade (NS-PS-218)	$3,035
JR-RWWMP-11	Newport News I/I Reduction Project C	I/I Reduction NEWP-WCPSA001575 and NEWP-WCPSA001600; Includes Newport News GM capacity improvement	$17,092
JR-RWWMP-12	Newport News I/I Reduction Project D	I/I Reduction NEWP-WCPSA003002, NEWP-WCPSA003003, NEWP-WCPSA003004, NEWP-WCPSA003500, NEWP-WCPSA003502, NEWP-WCPSA003503, and NEWP-WCPSA003504	$12,272
JR-RWWMP-13	Newport News I/I Reduction Project E	I/I Reduction NEWP-WCPSA001430	$1,954
JR-RWWMP-14	Poquoson City System Improvements A	Various Poquoson GM capacity improvements	$2,051
JR-RWWMP-15	Newport News I/I Reduction Project G	I/I Reduction NEWP-WCPSA001180	$5,005
JR-RWWMP-16	York County PS 019 Upgrade	York County Pump Station Upgrade PS019	$2,469
NA-RWWMP-01	Chesapeake High-Priority Project 2	I/I Reduction CHES-016, CHES-018, and CHES-227; Includes Chesapeake GM capacity improvement; Install 150 LF of 16" Jumper FM	$36,167
NA-RWWMP-02	Shingle Creek Pump Stations and Force Main/Gravity Main Installations	SS-PS-SC1 (Shingle Creek PS 1) and SS-PS-SC2 (Shingle Creek PS 2); various Shingle Creek FM and GM Interceptor capacity improvements	$0
NA-RWWMP-03	Wilroy PRS and Storage Tank	Install new PRS with 80 ft of assistance - New Location; Install new 2.9 MG storage tank	$19,423
NA-RWWMP-04	Shingle Creek Interceptor Gravity Main Improvement	Upgrade 6,360 LF of 18" GM with 21" GM	$8,727
NA-RWWMP-05	Chesapeake I/I Reduction Project A	I/I Reduction CHES-089; Includes Chesapeake GM capacity improvement	$5,606
NA-RWWMP-06	Suffolk II Reduction Project A	I/I Reduction SUFF-017 and SUFF-023	$6,202
NA-RWWMP-07	Chesapeake City System Improvements A	Chesapeake Pump Station Upgrades PS089, PS121, PS158, and PS183; Chesapeake FM capacity improvement	$5,486
NA-RWWMP-08	Suffolk I/I Reduction Project B	I/I Reduction SUFF-004, SUFF-022	$15,255
NA-RWWMP-09	Suffolk I/I Reduction Project C	I/I Reduction SUFF-003, SUFF-032, SUFF-063, SUFF-076, and SUFF-146	$13,515
NA-RWWMP-10	Suffolk I/I Reduction Project D	I/I Reduction SUFF-048; Includes Suffolk GM capacity improvement	$30,367
NA-RWWMP-11	Constance Rd PRS	Install new PRS with 80 ft of assistance - New Location	$9,316
NA-RWWMP-12	Cedar Lane Gravity Main Improvement	Upgrade 910 LF from 18" to 24" GM upstream of Cedar Lane PS	$778
NA-RWWMP-13	Suffolk I/I Reduction Project E	I/I Reduction SUFF-064 and SUFF-Shingle Creek-Group	$18,303
NA-RWWMP-14	Cedar Lane PS Upgrade and Portsmouth PS 47 Force Main Jumper	HRSD Cedar Lane Pump Station Upgrade (SS-PS-104); Install 25 LF of 8" Jumper FM	$14,555
NA-RWWMP-15	Suffolk I/I Reduction Project F	I/I Reduction SUFF-027, SUFF-042, and SUFF-517	$5,684

Table 13-11. RWWMP Project Cost Summary

RWWMP Project ID	Project Name	Description	Capital Cost ($ Thousands)
NA-RWWMP-16	Western Branch PRS	Install new PRS with 80 ft of assistance - New Location	$4,691
NA-RWWMP-17	Suffolk City System Improvements A	Suffolk Pump Station Upgrades PS064 and PS125; Various Suffolk FM and GM capacity improvements	$5,869
NA-RWWMP-18	Chesapeake I/I Reduction Project E	I/I Reduction CHES-026	$4,412
NA-RWWMP-19	Chesapeake City System Improvements E	Chesapeake Pump Station Upgrades PS029, PS046, PS069, PS084, and PS246; Various Chesapeake FM and GM capacity improvements	$7,051
NA-RWWMP-20	Nansemond River PRS	Install new PRS with 80 ft of assistance - New Location	$6,072
NA-RWWMP-21	Isle of Wight PS 13 and PS 26 Upgrades	Isle of Wight Pump Station Upgrades PS013 and PS026	$1,514
VIP-RWWMP-01	Park Ave. PS, Ferebee Ave. PS Upgrades and Sanitary Sewer 1950 Gravity Main Improvements	HRSD Pump Station Upgrades Park Ave PS (SS-PS-110) and Ferebee Ave PS (SS-PS-119); Upgrade 3,720 LF of 18" and 24" to 30" GM; Upgrade 2,170 LF of 18" GM to 24" GM	$0
VIP-RWWMP-02	HRSD Larchmont Area Pump Station Upgrades	HRSD Pump Station Upgrades Monroe Place PS (SS-PS-114), Richmond Crescent PS (SS-PS-124), Hanover PS (SS-PS-141), and Jamestown Crescent PS (SS-PS-142)	$0
VIP-RWWMP-03	Chesapeake Blvd PS, Ashland Circle PS and City Park PS Upgrades	HRSD Pump Station Upgrades Chesapeake Blvd PS (SS-PS-105), Ashland Circle PS (SS-PS-102), and City Park PS (SS-PS-106)	$0
VIP-RWWMP-04	Portsmouth High-Priority Project 1	HRSD Camden Ave PS Upgrade (SS-PS-146), Portsmouth Pump Station Upgrades PS002 and PS008; Camden Ave. GM capacity improvements; I/I Reduction PORT-01, PORT-02, PORT-04, PORT-04-LOP65-1, PORT-04-LOP65-2, and PORT-04-LOP65-3	$64,108
VIP-RWWMP-05	State Street PRS and Storage Tank	Install new PRS with 35ft of assistance - New Location; Install new 2.3 MG storage tank	$14,661
VIP-RWWMP-06	Robin Hood Road Force Main Improvement	Upgrade 12” FM with 16” FM along Robin Hood Rd. from PS057 to Chesapeake Blvd.	$0
VIP-RWWMP-07	Ford Drive Gravity Main Improvement	Upgrade 560 LF of 8" GM with 10" GM	$0
VIP-RWWMP-08	Norfolk PS 20 Force Main Realignment	Connection to HRSD Portsmouth FM from NORF-PS-020	$428
VIP-RWWMP-09	Norfolk I/I Reduction Project A	I/I Reduction NORF-H-130	$4,423
VIP-RWWMP-10	Virginia Initiative Plant RWI Pumps and Equalization Tank	RWI pumps and Equalization Tank	$26,969
VIP-RWWMP-11	Portsmouth PS 6 and PS 55 Upgrades	Portsmouth Pump Station Upgrades PS006 and PS55	$5,291
VIP-RWWMP-12	May Ave Storage Tank	Install new 1.9 MG storage tank	$8,277
VIP-RWWMP-13	Willoughby Ave PS Upgrade	HRSD Willoughby Ave Pump Station Upgrade	$2,281
VIP-RWWMP-14	Norfolk City System Improvements A	Norfolk Pump Station Upgrades PS141 and PS149; Various Norfolk FM capacity improvements	$5,246
VIP-RWWMP-15	Norchester Gravity Main Improvement	Upgrade 2,930 LF of 24" GM to 27" GM	$3,231
VIP-RWWMP-16	Norfolk City System Improvements B	Norfolk Pump Station Upgrades PS091 and PS133; Norfolk FM capacity improvement	$2,978
VIP-RWWMP-17	Norfolk I/I Reduction Project B	I/I Reduction NORF-PS-005, NORF-PS-097; Includes Norfolk GM capacity improvement	$23,906
VIP-RWWMP-18	Seay Avenue Force Main Improvement	Upgrade 3,750 LF 8” FM with 12” FM from Seay Ave. PS to Virginia Beach Blvd.	$2,164
VIP-RWWMP-19	Ferebee Avenue PS Gravity Influent Improvement	Upgrade 1,100 LF of 18" GM with 24" GM along Ferebee Avenue	$1,072
VIP-RWWMP-20	Chesapeake PS 7 Upgrade	Chesapeake Pump Station Upgrade PS007	$2,090
VIP-RWWMP-21	Norfolk City System Improvements C	Various Norfolk FM capacity improvements	$2,594

Table 13-11. RWWMP Project Cost Summary

RWWMP Project ID	Project Name	Description	Capital Cost ($ Thousands)
VIP-RWWMP-22	Steamboat Creek PS and Chesapeake Blvd PS Force Main Improvements	Upgrade 110 ft of 12" to 16" FM downstream of Chesapeake Blvd PS; Install 340 LF of 16" FM downstream of Steamboat Creek PS	$445
VIP-RWWMP-23	Portsmouth I/I Reduction Project A	I/I Reduction PORT-10, PORT-12, PORT-04-LOP66-1, PORT-04-LOP72-1, PORT-04-LOP72-2, and PORT-04-LOP72-4	$20,514
VIP-RWWMP-24	Portsmouth I/I Reduction Project B	I/I Reduction PORT-03	$26,103
VIP-RWWMP-25	Ingleside Rd PS Upgrade	HRSD Ingleside Rd Pump Station Upgrade (SS-PS-148)	$0
VIP-RWWMP-26	Chesapeake City System Improvements B	Chesapeake Pump Station Upgrades PS004, PS008, and PS042; Various Chesapeake FM and GM capacity improvements	$7,178
VIP-RWWMP-27	Norfolk I/I Reduction Project C	I/I Reduction NORF-PS-008	$14,517
VIP-RWWMP-28	Bainbridge Blvd Gravity Main Improvement	Upgrade 760 LF of 8" GM with 12" GM along Bainbridge Blvd. between S Main St. and Lancaster St.	$555
VIP-RWWMP-29	Portsmouth I/I Reduction Project C	I/I Reduction PORT-03-LOP35-1 and PORT-03-LOP35-2; Various Portsmouth GM capacity improvements	$13,225
VIP-RWWMP-30	Norfolk I/I Reduction Project D	I/I Reduction NORF-PS-004	$10,903
VIP-RWWMP-31	Portsmouth City System Improvements A	Portsmouth Pump Station Upgrades PS010, PS013, PS018, and PS053; Various Portsmouth FM capacity improvements	$6,811
VIP-RWWMP-32	Norfolk I/I Reduction Project E	I/I Reduction NORF-PS-020	$3,569
VIP-RWWMP-33	Norfolk I/I Reduction Project I	I/I Reduction NORF-H-107; Includes Norfolk GM capacity improvements	$47,076
VIP-RWWMP-34	Norfolk I/I Reduction Project F	I/I Reduction NORF-003-G001	$4,167
VIP-RWWMP-35	Chesapeake City System Improvements C	Chesapeake Pump Station Upgrades PS060, PS102, and PS125; Various Chesapeake FM and GM capacity improvements	$5,158
VIP-RWWMP-36	Chesapeake I/I Reduction Project B	I/I Reduction CHES-919-G1	$8,407
VIP-RWWMP-37	Norfolk I/I Reduction Project H	I/I Reduction NORF-H-103	$9,007
VIP-RWWMP-38	Norfolk I/I Reduction Project G	I/I Reduction NORF-009-G001, NORF-009-G002, NORF-PS-012, and NORF-PS-037	$17,377
VIP-RWWMP-39	Norfolk I/I Reduction Project L	I/I Reduction NORF-PS-010	$21,721
VIP-RWWMP-40	Norfolk I/I Reduction Project J	I/I Reduction NORF-H122-G1 and NORF-H122-G2	$4,359
VIP-RWWMP-41	Norfolk I/I Reduction Project K	I/I Reduction MPRF-H-106, NORF-H106-G1, NORF-H-113, NORF-H113-G1, and NORF-H113-G2	$12,378
VIP-RWWMP-42	Chesapeake I/I Reduction Project G	I/I Reduction CHES-039, CHES-043, CHES-060, CHES-100, CHES-101, and CHES-124	$9,220
VIP-RWWMP-43	Norfolk I/I Reduction Project N	I/I Reduction NORF-H-127-10, NORF-H127-3, NORF-H127-4, NORF-H127-5, NORF-H127-G2, NORF-H128-G2, and NORF-PS-060	$11,618
VIP-RWWMP-44	Norfolk City System Improvements G	Various Norfolk FM and GM capacity improvements	$2,854
WB-RWWMP-01	JCSA I/I Reduction Project A	I/I Reduction JCSA-LSA3-3, JCSA-LSA3-6, JCSA-LSA3-8, JCSA-LSA4-5, and JCSA-LSA5-1	$18,648
WB-RWWMP-02	Williamsburg Crossing PRS, Force Main and Storage Tank	Install new PRS with 70 ft of assistance - New Location; Install 1.8 MG Storage Tank; Install 2,090 LF of 24" FM to reroute Jamestown Rd flow to Williamsburg Crossing	$19,985
WB-RWWMP-03	Route 199 PRS	Upgrade PRS to 80 ft of assistance - Existing Location	$14,025
WB-RWWMP-04	Colonial Williamsburg PS Extended Wet Well	Extended wet well storage at HRSD Colonial Williamsburg PS (NS-PS-226)	$225

Table 13-11. RWWMP Project Cost Summary

RWWMP Project ID	Project Name	Description	Capital Cost ($ Thousands)
WB-RWWMP-05	JCSA System Improvements A	JCSA Pump Station Upgrade PS008-4; Various JCSA FM and GM capacity improvements	$12,025
WB-RWWMP-06	Williamsburg I/I Reduction Project A	I/I Reduction WILL-005, WILL-12A-8, WILL-12A-9, WILL-14, and WILL-226A-5	$11,296
WB-RWWMP-07	York County I/I Reduction Project A	I/I Reduction YORK-006; Includes York County GM capacity improvement	$16,302
WB-RWWMP-08	Williamsburg PS 12 Upgrade and PS 14 FM Improvement	Williamsburg Pump Station Upgrade PS012; Williamsburg FM extension PS014	$3,550
WB-RWWMP-09	Longhill PRS	Install new PRS with 80 ft of assistance - New Location	$7,615
WB-RWWMP-10	JCSA System Improvements B	JCSA Pump Station Upgrades PS003-3, PS003-5, PS003-6, PS004-5, PS004-8, and PS005-2; Various JCSA FM and GM capacity improvements	$11,273
WB-RWWMP-11	JCSA PS 006-2 Upgrade	JCSA Pump Station Upgrade PS006-2	$2,281
WB-RWWMP-12	York County I/I Reduction Project B	I/I Reduction YORK-229-2	$7,724
WB-RWWMP-13	JCSA I/I Reduction Project B	I/I Reduction JCSA-LSA1-5 and JCSA-LSA6-2-A	$5,271
WB-RWWMP-14	York County I/I Reduction Project C	I/I Reduction YORK-001 and YORK-003	$9,172
WB-RWWMP-15	JCSA I/I Reduction Project C	I/I Reduction JCSA-LSA1-6 and JCSA-LSA6-9	$5,851
WB-RWWMP-16	JCSA I/I Reduction Project D	I/I Reduction JCSA-LSA10-4, JCSA-LSA4-1, and JCSA-LSA4-2	$9,584
WB-RWWMP-17	JCSA I/I Reduction Project E	I/I Reduction JCSA-LSA1-2, JCSA-LSA1-8, JCSA-LSA1-9, JCSA-LSA3-9	$13,056
WB-RWWMP-18	JCSA I/I Reduction Project F	I/I Reduction JCSA-LSA3-1	$26,855
WB-RWWMP-19	Lodge Rd PS Extended Wet Well	Extended wet well storage at Lodge Rd PS (NS-PS-233)	$225
WB-RWWMP-20	York County System Improvements A	York County Pump Station Upgrades PS006, PS065, and PS066; York County Manifold FM Realignment	$5,057
YR-RWWMP-01	Coliseum Storage Tank Addition	Add 2.4 MG Storage Tank to Coliseum site	$10,443
YR-RWWMP-02	Langley Circle PS Upgrade	HRSD Langley Circle Pump Station Upgrade (NS-PS-217)	$17,131
YR-RWWMP-03	Hampton I/I Reduction Project E	I/I Reduction HAMP-045 and HAMP-048	$13,809
YR-RWWMP-04	Freeman Drive PS Upgrade	HRSD Freeman Dr. Pump Station Upgrade (NS-PS-238)	$3,223
YR-RWWMP-05	Bay Shore Lane PS Upgrade and Force Main Improvement	HRSD Bay Shore Lane Pump Station Upgrade (NS-PS-203); Install 4,700 LF of 14” FM to route flow from new Bay Shore Ln PS	$7,594
YR-RWWMP-06	Hampton I/I Reduction Project D	I/I Reduction HAMP-024 and HAMP-217H-121; Includes Hampton GM capacity improvements	$4,083
YR-RWWMP-07	Hampton City System Improvements A	Hampton Pump Station Upgrades PS022, PS121, PS123, and PS134; Various Hampton FM and GM capacity improvements	$11,343
YR-RWWMP-08	Bloxom's Corner PS Upgrade	HRSD Bloxom’s Corner Pump Station Upgrade (NS-PS-204)	$947
YR-RWWMP-09	Hampton PS 130 Upgrade	Hampton Pump Station Upgrade PS130	$1,330
YR-RWWMP-10	Hampton I/I Reduction Project E	I/I Reduction HAMP-117	$1,056
YR-RWWMP-11	Yorktown PRS	Install new PRS with 80 ft of assistance - New Location	$4,518
YR-RWWMP-12	Gloucester County I/I Reduction Project A	I/I Reduction GLOU-016	$864
YR-RWWMP-13	Gloucester County PS 13 and PS 16 Upgrades	Gloucester County Pump Station Upgrades PS013 and PS016	$3,980

Section 14

Affordability Analysis

A critical element to successful implementation of the RWWMP is determining the financial impact on Hampton Roads communities. The following section details findings for RWWMP regional affordability impacts, modeled using currently available guidance from the EPA document for Financial Capability Assessment[1](FCA), and supplemental evaluation factors considered for a more complete representation of local financial capability.

14.1 Residential Indicator

The residential indicator component (RI) of the EPA matrix measures the financial impact of current and identified wastewater collection, treatment and wet weather control costs on residential users within a service area. The portion of costs related to the residential component is based on relative flow contribution. This cost is expressed as a percentage of overall median household income (MHI) and is then compared against three levels of financial impact as shown in Table 14-1.

Table 14-1. Financial Impact based on Residential Indicator

Financial Impact	Residential Indicator (% MHI)
Low	Less than 1 percent
Medium	1 percent to 2 percent
High	Greater than 2 percent

The peak residential indicator was calculated for infrastructure improvements needed to achieve the selected Level of Service for the RWWMP under an Integrated Plan scenario. Eligible wastewater and stormwater costs for current and projected annual operation, maintenance, and debt service were included in the calculation. The residential share of these eligible costs was calculated based on the residential portion of wastewater flows, which were determined to be 70% of the total wastewater flows.

Resulting peak costs per household (CPH) during the implementation timeframe and the calculated residential indicator are outlined in Table 14-2.

Table 14-2. Peak Residential Impact for Selected LOS

Scenario	Schedule Completion	Regional MHI[1]	Peak HHLD Cost, $/yr	Peak Year	Peak MHI Impact, %	HHLDS >2% HHLD Income	Financial Impact
Integrated Plan	2053	$61,908	$1,301	2049	2.10%	55%	High

[1] *Regional MHI is a weighted average of Locality incomes sourced from ACS 5-yr estimates (2011-2015) adjusted to 2017 values.*

[1] U.S. Environmental Protection Agency (EPA), Combined Sewer Overflow Guidance for Financial Capability Assessment and Schedule Development, USEPA-832-B-97-004, February 1997

14.2 Financial Capability Indicators

The second matrix component measures the financial capability of a service area by examining debt, financial management and certain socioeconomic factors. These categories are intended to evaluate the ability to issue debt for infrastructure project financing, assess general economic well-being of the residential users in an area, and measure the capability to manage financial operations.

EPA guidelines establish three levels for the financial capability measure:

Weak – Average score of below 1.5

Mid-Range – Average score between 1.5 and 2.5

Strong – Average score above 2.5

The benchmarks used in the assessment are listed with analysis results in Table 14-3. The financial capability indicator for the HRSD service area falls within the "mid-range".

Table 14-3. Financial Capability Indicators

Indicator	Actual Value	Weak	Mid-Range	Strong	Score
Bond Rating	AA	Ba, B, Caa, Ca, C	Baa	AAA, AA, A	3
Overall Net Debt as a Percent of Full Market Value, %	2.00%	Above 5%	2 to 5%	Below 2%	2
Unemployment Rate, %	-0.30%	More than 1% above National average	+/- 1% of national average	More than 1% below National average	2
Median Household Income 2017 Dollars	11.12%	More than 25% below National MHI	+/- 25% of national MHI	More than 25% above National MHI	2
Property Tax as a Percent of Full Market Value, %	1.16%	Above 4%	2 to 4%	Below 2%	3
Property Tax Collection Rate, %	95.60%	Below 94%	94 to 98%	Above 98%	2
				Average Score	2.3

It should be noted that both Fitch and Standard and Poor's rating agencies stress that HRSD's bond rating is dependent upon them maintaining adequate liquidity and a stable or rising debt service coverage ratio. Recent credit agency issued analysis of HRSD identifies those factors as critical to HRSD maintaining current ratings. Standard and Poor's included a downside scenario "Although also not likely in the near term, we could lower the ratings in the next two years if the district's all-in coverage (Standard and Poor's calculated) falls to levels we consider adequate or its liquidity position falls to levels we consider strong or adequate." Fitch's warning was equally stern, "Escalation of current SSO cost estimates and or compression or acceleration of the SSO program costs could result in negative credit pressure." A rating downgrade will increase the debt service costs significantly on the total Integrated Plan and negatively impact program affordability.

When considering the income metric of the financial capability indicators, the high cost of living for residents of Hampton Roads should also play a role. The Economic Policy Institute's family budget calculator[2] provides the income level a family needs to maintain an adequate and modest standard of living. This tool was used as a cost of living gauge for comparison of Hampton Roads to other geographic areas. The high cost of living, as indicated in Table 14-4, for regional households results in lower

[2] Economic Policy Institute, What Families Need to Get By: EPI's 2015 Family Budget Calculator, Issue Brief #403, August 26, 2015

disposable incomes. A median income comparison to national levels does not adequately capture the community specific household economic capacity.

Table 14-4. Cost of Living Evaluation

Area	MSA MHI[1]	Family Budget (1 adult, 2 children)[1]	Cost of Living as % of MHI	Cost of Living Relative to US Median	Estimated Discretionary Income[2]
Hampton Roads	$59,369	$66,979	113%	118%	$3,830
Detroit, MI	$52,305	$56,962	109%	100%	$5,072
Cleveland, OH	$49,551	$53,014	107%	93%	$5,592
Akron, OH	$50,776	$53,429	105%	94%	$6,473
Columbus, OH	$55,115	$56,497	103%	99%	$8,268
Austin, TX	$61,900	$57,358	93%	101%	$14,339
Nashville, TN	$52,805	$47,099	89%	83%	$13,751

[1] Incomes and EPI Family Budget estimates are expressed in 2014 dollars
[2] Discretionary Income estimates provided by Economics Center, University of Cincinnati

Hampton Roads has the second highest MHI of the comparison areas. By a substantial margin, however, the region also has the highest cost of living and the lowest discretionary income. Figure 14-1 reflects these values (point size indicative of discretionary income) and highlights the offset distance from a 1:1 relationship with median household income. This demonstrates that the region has less capacity to handle substantial utility burdens than an MHI comparison would indicate.

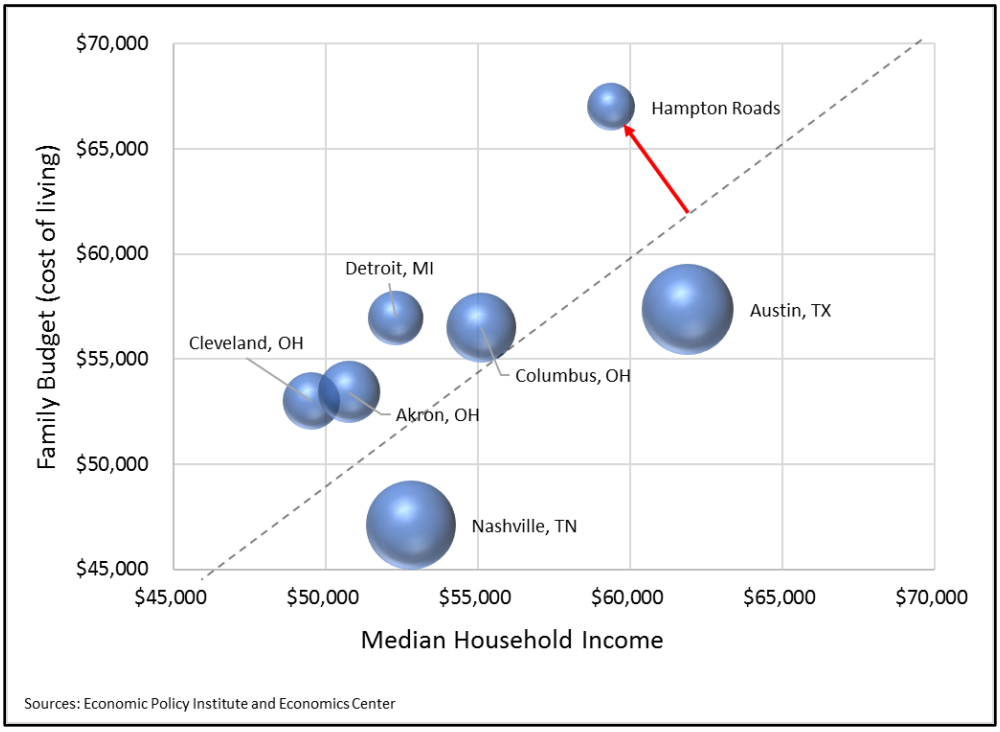

Figure 14-1. Cost of Living Comparison

14.3 Measurement of Financial Capability

The residential indicator is considered together with the financial capability indicator to establish a total economic burden (low, medium or high) as shown in Table 14-5. This leads to an overall program classification of "high burden" for the Integrated Plan/RWWMP schedule as reviewed.

Table 14-5. Financial Capability Matrix

Financial Capability	Low Impact Residential Indicator <1 percent	Mid-Range Impact Residential Indicator	High Impact Residential Indicator >2 percent
Weak <1.5	Medium Burden	High Burden	High Burden
Mid-Range	Low Burden	Medium Burden	High Burden
Strong >2.5	Low Burden	Low Burden	Medium Burden

14.4 Additional Evaluation Criteria

The application of EPA's matrix to the circumstances of the HRSD service area allows for comparison of standardized affordability criteria, but it does not provide a complete picture of the region's financial capability. In order to conduct a more in-depth review, additional information was examined to assess Hampton Roads ability to support funding for RWWMP infrastructure improvements without excessive customer burden.

14.4.1 Income

The residential indicator component of the affordability assessment utilizes a regional MHI to develop a cost burden for program execution. However, MHI does not capture the sometimes-broad variations across household types and localities within the service area.

14.4.1.1 Census Tract

Census tract level comparison of residential impact for wastewater and stormwater expenditures using the current CPH and peak RWWMP CPH are displayed in Figures 14-2 and 14-3. Percent MHI values are based on the median household income within the census tract per ACS 5-year estimates (2011-2015), adjusted to 2017 values.

Pockets of existing high burden manifest under even current utility expenses. As demonstrated by the saturation represented in Figure 14-3, the peak implementation cost burden for the program is substantial and widespread across the service area.

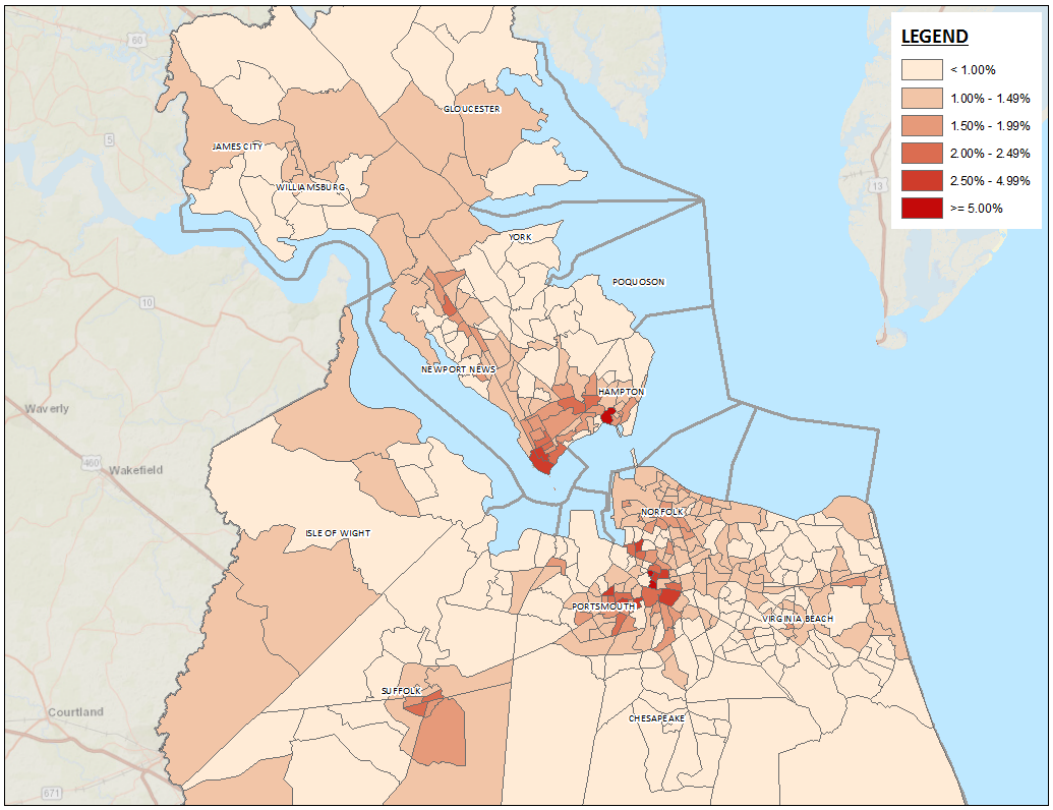

Figure 14-2. Current Residential Indicator by Census Tract Level MHI

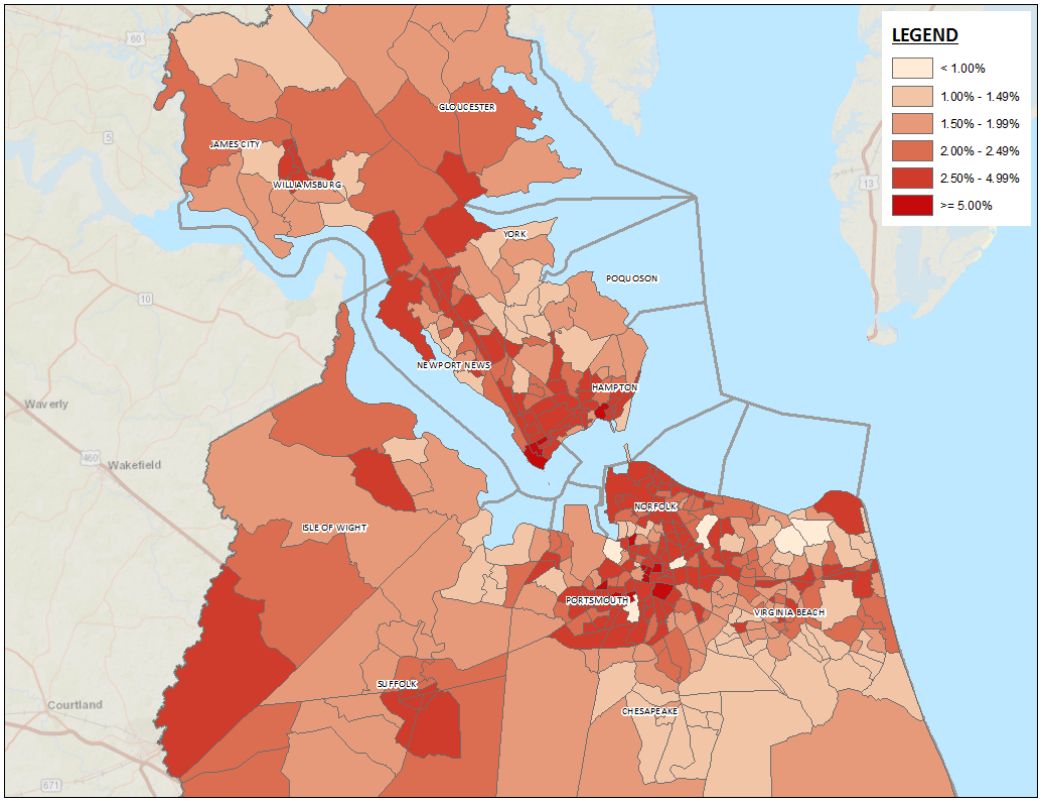

Figure 14-3. Peak Residential Indicator by Census Tract Level MHI

14.4.1.2 Income Brackets

Using the calculated peak CPH, Table 14-6 displays impact across regional income distribution brackets. The peak percent MHI is presented for combined wastewater and storm water spending. More than half of households in the region would experience high cost burdens of >2% MHI.

Table 14-6. Program Implementation - Percent MHI Across Income Brackets

Residential Indicator (% MHI using median of each income bracket)					
Income Distribution	2017 RI*	Peak Year RI*	Occupied Households	Cumulative Households	Cumulative % Households
Less than $10,000	12.23%	25.17%	36,340	36,340	5.9%
$10,000 to $14,999	4.89%	10.07%	25,493	61,833	10.1%
$15,000 to $19,999	3.50%	7.19%	25,802	87,635	14.3%
$20,000 to $24,999	2.72%	5.59%	28,164	115,799	18.9%
$25,000 to $29,999	2.22%	4.58%	27,437	143,236	23.3%
$30,000 to $34,999	1.88%	3.87%	30,488	173,724	28.3%
$35,000 to $39,999	1.63%	3.36%	28,634	202,358	33.0%
$40,000 to $44,999	1.44%	2.96%	29,395	231,753	37.8%
$45,000 to $49,999	1.29%	2.65%	26,698	258,451	42.1%
$50,000 to $54,999	1.17%	2.40%	27,012	285,463	46.5%
$55,000 to $59,999	1.06%	2.19%	26,395	311,858	50.8%
$60,000 to $64,999	0.98%	2.01%	23,890	335,748	54.7%
$65,000 to $69,999	0.91%	1.86%	22,549	358,297	58.4%
$70,000 to $74,999	0.84%	1.74%	21,159	379,456	61.8%
$75,000 to $79,999	0.79%	1.62%	19,343	398,799	65.0%
$80,000 to $84,999	0.74%	1.53%	18,134	416,933	67.9%
$85,000 to $89,999	0.70%	1.44%	16,901	433,834	70.7%
$90,000 to $94,999	0.66%	1.36%	15,692	449,526	73.2%
$95,000 to $99,999	0.63%	1.29%	14,478	464,004	75.6%
$100,000 to $124,999	0.54%	1.12%	57,490	521,494	85.0%
$125,000 to $149,999	0.44%	0.92%	34,982	556,476	90.7%
$150,000 to $199,999	0.35%	0.72%	32,858	589,334	96.0%
$200,000 or more	0.15%	0.31%	24,457	613,791	100.0%
Residential Indicator	Low (<1%)	Medium (1% to 2%)	High (>2%)		

** 2017 RI and Peak RI calculated using the median income of each bracket*

On a regional basis, 55% of the households will be high burdened with the selected LOS under an Integrated Plan. When examined at a Locality level however, eight communities have a high burden impact ranging from 46% to 64% of total households. These eight localities include three of the five largest cities in the region, and represent a population of more than 830,000 – nearly half of the entire Hampton Roads population.

14.4.1.3 Income Inequality

Median household income for the region does not consider income inequality between communities or within each community. Residents falling into potentially vulnerable populations would experience a vastly different economic burden from increases to non-discretionary expenses than median household income alone would indicate.

In an effort to quantify the true impact to the region, the peak financial burden was evaluated relative to income quintiles. Each of the quintile brackets contain approximately 20% of the population. The results of a residential impact assessment of these brackets are shown in Table 14-7. For the peak CPH under the Integrated Plan scenario, the lowest two quintiles (40% of the population) were calculated with residential impacts of 9.2% and 3.5%, respectively.

Table 14-7. Regional Quintile Analysis of RI for the Selected LOS

Quintile [1]	Mean HHLD Income	Upper Limit	Peak RI, Integrated Plan[2]
Lowest Quintile	$14,183	$26,219	9.2%
Second Quintile	$36,722	$47,510	3.5%
Third Quintile	$59,118	$72,168	2.2%
Fourth Quintile	$89,292	$109,998	1.5%
Highest Quintile	$176,797	N/A	0.7%

[1] Quintile data per ACS 5-Yr (2011-2015); MSA: Virginia Beach-Norfolk-Newport News, VA-NC

[2] Peak RI associated with Quintile mean income

The evaluation above was done at the regional level. When reviewed at the Locality level, there is considerable variation, as shown in Table 14-8. In every Locality, at least 20%, but in some cases more than 60%, of the population will be high burdened under the program.

Table 14-8. Locality Quintile Analysis of RI for the Selected LOS

	Population	Bottom Quintile		Second Quintile		Third Quintile		Fourth Quintile		Estimated Population above RI of 2%
		Mean Income, $	Peak RI	Mean Income, $	Peak RI	Mean Income, $	Peak RI	Mean Income, $	Peak RI	Integrated Plan
Chesapeake	230,601	$17,719	7.34%	$43,763	2.97%	$69,003	1.89%	$100,854	1.29%	92,240
Gloucester County	37,001	$17,121	7.60%	$40,420	3.22%	$61,926	2.10%	$91,387	1.42%	29,601
Hampton	137,081	$12,006	10.84%	$29,746	4.37%	$49,306	2.64%	$75,262	1.73%	109,665
Isle of Wight County	35,740	$14,125	9.21%	$39,157	3.32%	$66,201	1.97%	$101,765	1.28%	14,296
James City County	70,673	$19,958	6.52%	$48,900	2.66%	$75,743	1.72%	$112,576	1.16%	28,269
Newport News	181,323	$11,653	11.16%	$31,038	4.19%	$49,718	2.62%	$74,062	1.76%	145,058
Norfolk	245,452	$9,104	14.29%	$26,311	4.94%	$44,532	2.92%	$68,865	1.89%	196,362
Poquoson	12,077	$22,515	5.78%	$52,639	2.47%	$82,610	1.57%	$118,627	1.10%	4,831
Portsmouth	96,135	$10,436	12.47%	$27,349	4.76%	$45,580	2.85%	$69,485	1.87%	76,908
Suffolk	86,184	$15,075	8.63%	$40,169	3.24%	$65,132	2.00%	$95,746	1.36%	34,474

Table 14-8. Locality Quintile Analysis of RI for the Selected LOS

	Population	Bottom Quintile		Second Quintile		Third Quintile		Fourth Quintile		Estimated Population above RI of 2%
		Mean Income, $	Peak RI	Mean Income, $	Peak RI	Mean Income, $	Peak RI	Mean Income, $	Peak RI	Integrated Plan
Virginia Beach	448,290	$18,971	6.86%	$43,609	2.98%	$66,914	1.94%	$97,476	1.33%	179,316
Williamsburg	14,754	$7,983	16.30%	$28,800	4.52%	$48,760	2.67%	$79,210	1.64%	11,803
York County	66,471	$23,072	5.64%	$52,177	2.49%	$82,192	1.58%	118,089	1.10%	26,588
Total	1,661,782									949,411

Utility rate increases will have a much larger impact on residents within the economically vulnerable population than a median income analysis indicates. This also increases the potential for billing delinquencies and the loss of revenue as households experience a growing inability to pay under cumulative rate increases.

14.4.2 Shelter Burden

According to the US Department of Housing and Urban Development (HUD), a household is considered housing cost burdened if more than 30 percent of the household income goes to rent and utilities. These households may already have difficulty affording necessities such as transportation and medical care. Figures 14-4 and 14-5 display the portions of owner and renter households by Locality that are already burdened, regardless of utility rate increases.

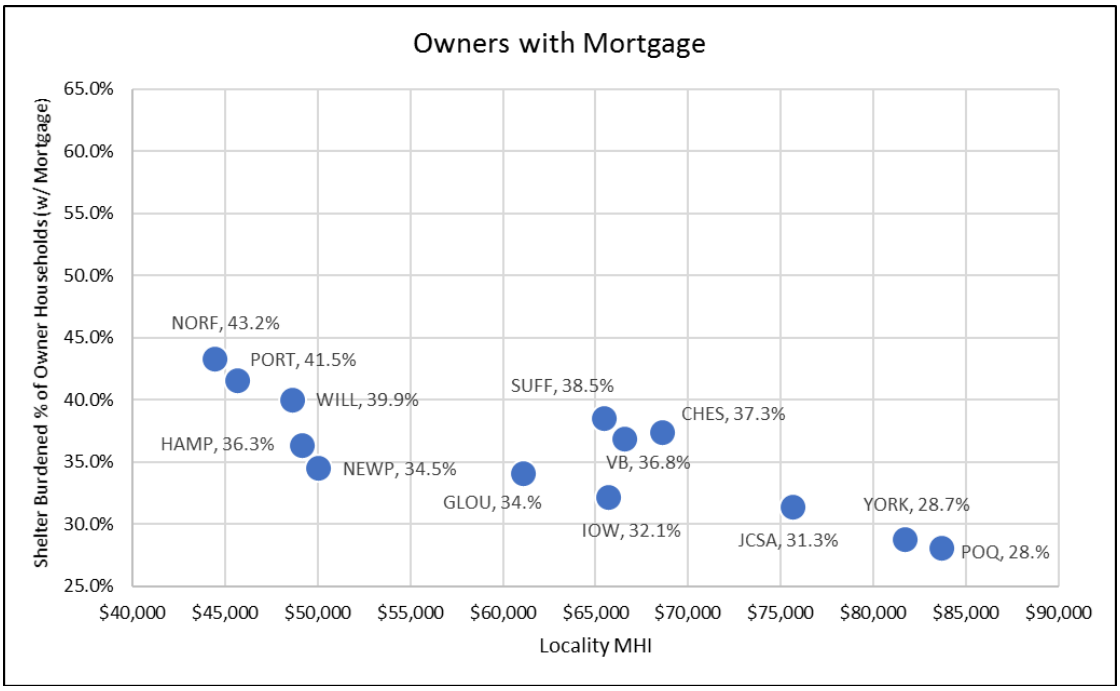

Figure 14-4. Housing Cost Burdened Owner Households

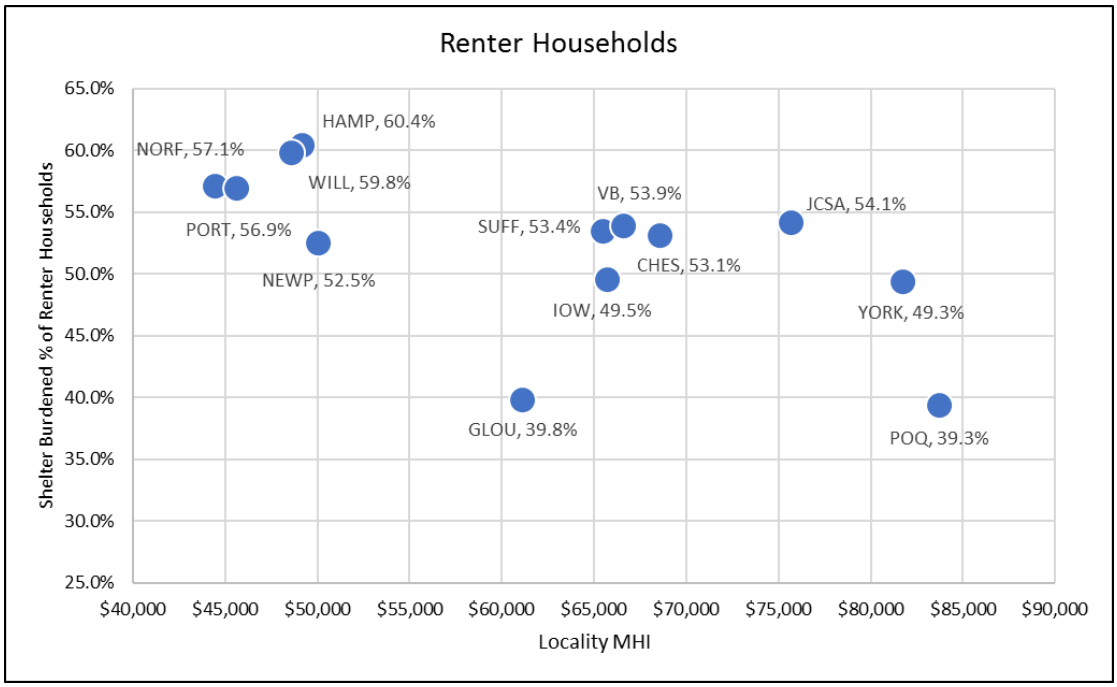

Figure 14-5. Housing Cost Burdened Renter Households

In the overall region and factoring in owners without a mortgage, approximately 28 percent of homeowners currently meet the definition of housing cost burdened. Additionally, renter households account for roughly 40 percent of occupied households in the region and have an MHI that is substantially less than the regional MHI. More than half of these renter households already spend more income on housing costs than is considered affordable.

When comparing housing tenure statistics for the area, recent years have shown renter household growth outpacing owner household growth. According to a 2016 HUD housing market analysis of trends in the Virginia Beach-Norfolk-Newport News, VA-NC housing market area, it was noted that "…Since April 2010, 78 percent of growth in the HMA has been among renter households, compared with 36 percent of the growth from 2000 to 2010."[3] For the three-year forecast period outlined in the report, renter households are projected to comprise the majority of total household growth in the near-term future as well.

As evidenced in the figures above, a significant number of households are already vulnerable to budget tensions, regardless of utility rate increases. The five poorest communities comprise more than 40 percent of total households in Hampton Roads. These five Localities have, on average, 45 percent of households already shelter cost burdened.

As a whole, the number of customers subject to this type of strain is too high to disregard when considering program impacts. Housing burdens, and the higher cost of living in general, adds to the fiscal stress of households in the service area, resulting in lower disposable incomes and increased sensitivity to utility rate growth.

14.4.3 Residents Below the Poverty Threshold

Median household income alone is inadequate to describe the ability of people to afford new utility costs. Information regarding poverty levels was also examined to assist in the understanding of the current state of economic conditions in the region.

[3] U.S. Department of Housing and Urban Development; Comprehensive Housing Market Analysis Virginia Beach-Norfolk-Newport News, Virginia-North Carolina, January 1, 2016

Figure 14-6 displays poverty levels for Hampton Roads, state and national populations. The area has an overall poverty rate trending above the state level but below national statistics. The population below poverty thresholds has averaged 11 percent over the last decade in Hampton Roads.

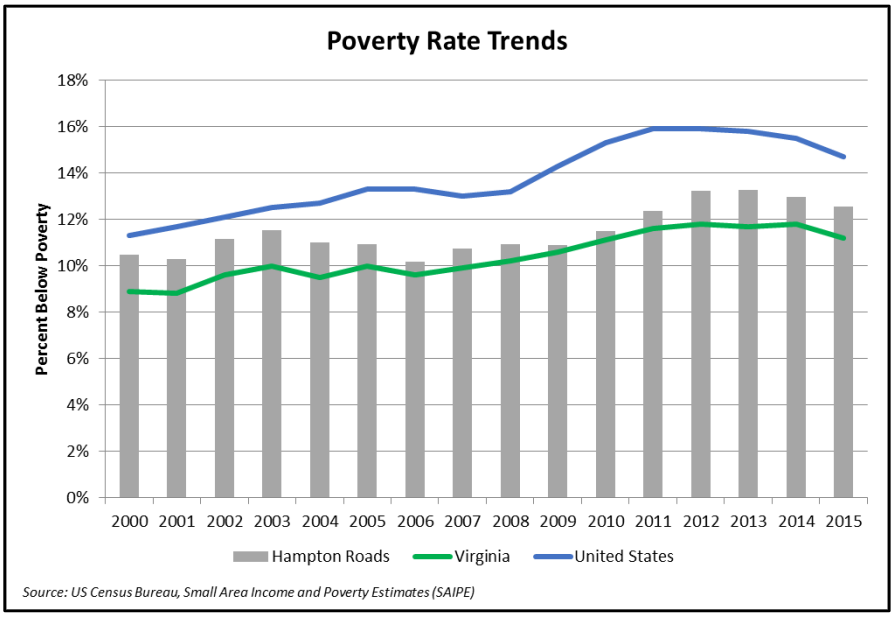

Figure 14-6. Poverty Rates by Population

Hampton Roads tends to reflect national trends and historically falls below national levels. However, due in part to slow job growth and recession recovery, the region has experienced an increase in poverty levels in seven of the last 10 years. Figures 14-7 and 14-8 display the shifting, spreading movement of census tract level poverty demographics within the region.

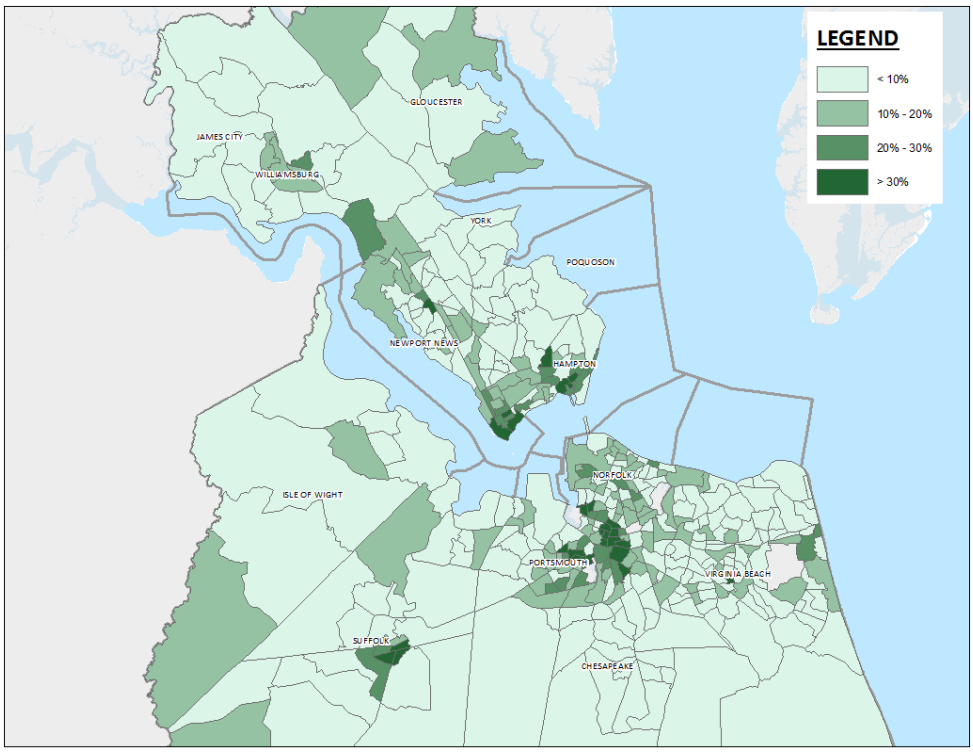

Figure 14-7. Poverty Level Demographics by Census Tract 2000

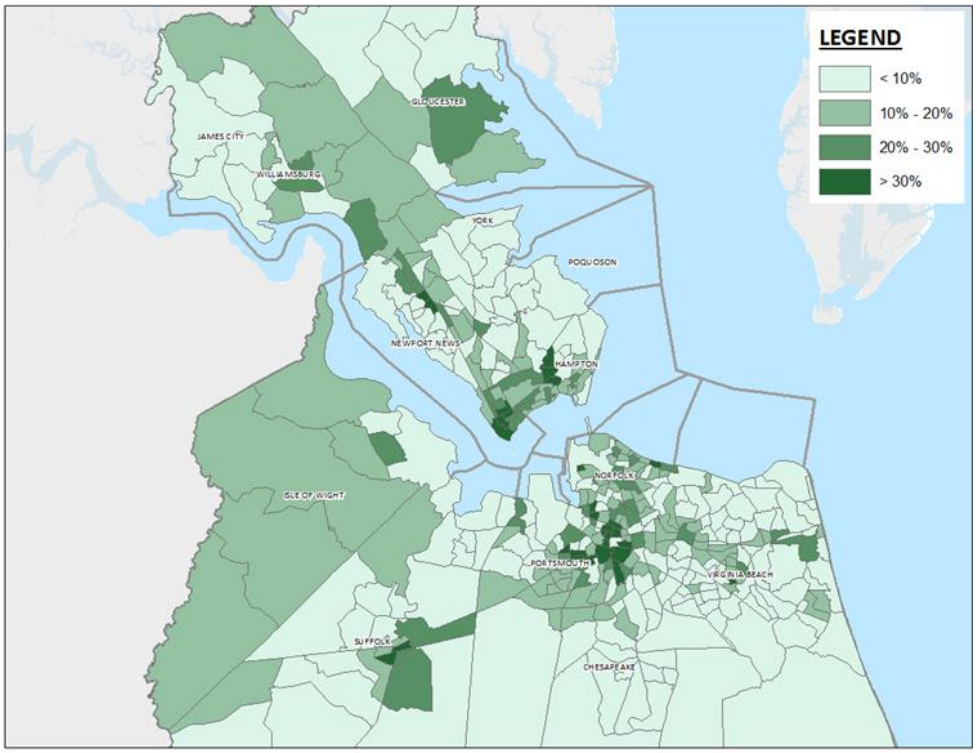

Figure 14-8. Poverty Level Demographics by Census Tract 2015

Between 2000 and 2015, the population of Hampton Roads below poverty levels has risen by 28%. This represents a fairly dramatic increase in the number of customers within the HRSD service area for whom utility bills are likely to be a financial burden. The overall 2015 poverty rate for the area, 12.5%, is decidedly higher than in than in any of the past three decennial censuses.

Some demographic groups within the service area experience poverty rates well above the regional statistic. For example, nearly 36 percent of female-headed households with children and more than 17 percent of the population with a disability are living below poverty thresholds. Even moderate rate increases can create extreme hardship for these groups.

As evidenced by the previous census tract illustrations in Figures 14-7 and 14-8, some communities are far more impacted by poverty status of its residents. These populations are concentrated largely in Williamsburg, and four of the six largest localities, Hampton, Norfolk, Newport News, and Portsmouth with poverty rates ranging from 15.2% to 22.0%. Table 14-9 provides comparisons for Locality level poverty statistics by households and population.

Table 14-9. Poverty Level Comparison by Locality

Locality	Households below Poverty Level	Percent of Total HHLDs below Poverty	Population below Poverty Level	Percent of Population below Poverty
Chesapeake	7,351	9.0%	22,442	9.7%
Gloucester	1,227	8.6%	3,402	9.3%
Hampton	7,334	13.9%	20,072	15.2%
Isle of Wight	1,582	11.5%	3,573	9.9%
James City County	2,056	7.3%	5,149	7.1%

Table 14-9. Poverty Level Comparison by Locality				
Locality	Households below Poverty Level	Percent of Total HHLDs below Poverty	Population below Poverty Level	Percent of Population below Poverty
Newport News	10,003	14.5%	29,248	16.8%
Norfolk	16,746	19.2%	45,756	21.5%
Poquoson	215	4.6%	652	5.4%
Portsmouth	5,914	16.1%	17,340	18.6%
Suffolk	3,346	10.8%	11,370	13.1%
Virginia Beach	12,815	7.7%	36,451	8.2%
Williamsburg	757	16.7%	2,331	22.0%
York	1,466	6.1%	3,570	5.3%

14.4.4 Local Economy / Business Health

The diversity and number of employers in a community is another measure of its financial health. Communities that have diversified industry can better adapt to changes in local and national employment conditions.

A breakdown of current non-farm payroll jobs by sector is outlined in Figure 14-9. The largest single category falls under Government at 20.8 percent of the labor force. The Government category as a proportion of payrolls has trended comparatively unchanged between 2000-2015. The second largest, Educational and Health Services, employs 14.2 percent.

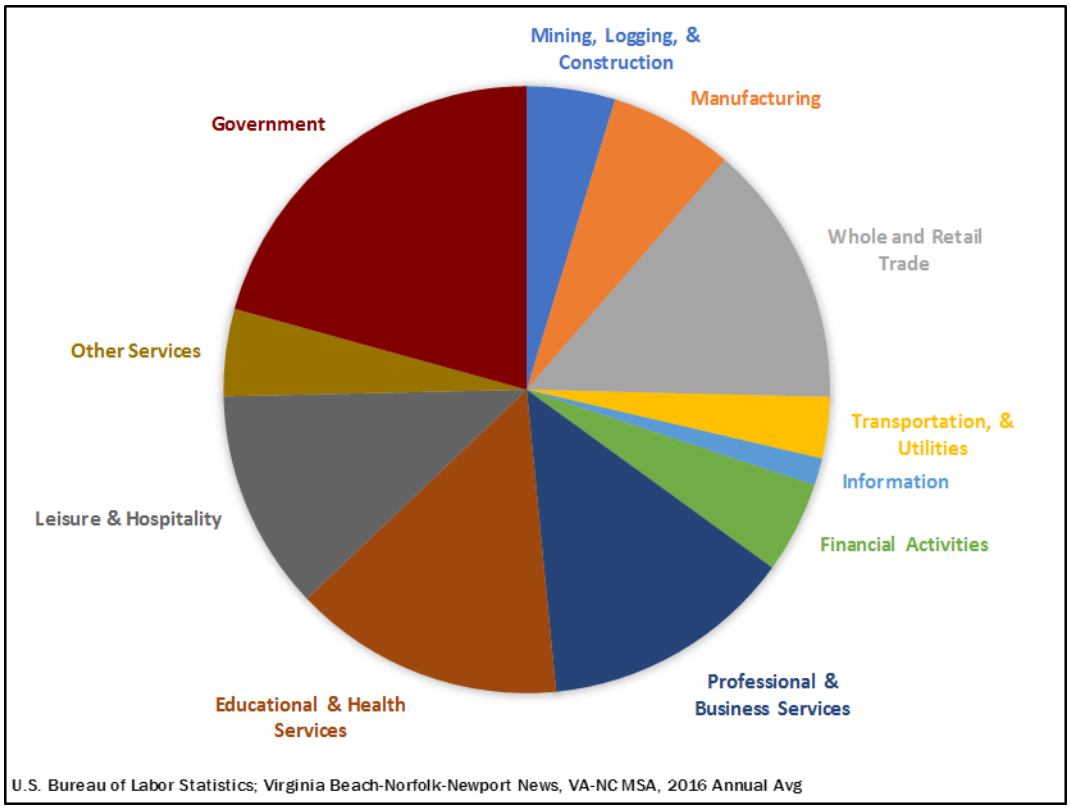

Figure 14-9. Employment by Industry

Table 14-10 lists the top ten employers within the area. This distribution represents a market that leans heavily towards the defense industry. This adds an element of risk and uncertainty to the local economy as such a significant portion of the labor force is vulnerable to federal decisions.

Table 14-10. Major Employers [1]

Employer Name	Industry Sector	Employees[2]
Naval Station Norfolk	Government	44,207
Huntington Ingalls Industries, Inc.	Government/Manufacturing	24,000
Sentara Healthcare	Education and Health Services	22,000
Joint Base Langley-Eustis	Government	11,884
Norfolk Naval Shipyard	Government	8,500
Riverside Health System	Education and Health Services	8,000
Joint Expeditionary Base Little Creek-Fort Story	Government	5,474
Naval Medical Center Portsmouth	Government	5,400
Naval Weapons Station Yorktown	Government	4,318
Naval Air Station Oceana	Government	3,851

[1] Sources: U.S. Department of Housing and Urban Development, 2016 Comprehensive Housing Market Analysis; Virginia Beach-Norfolk-Newport News, VA-NC; Defense Manpower Data Center, September 2015; Hampton Roads Economic Development Alliance, September 2015

[2] Excludes local school districts. Employees at military installations include military employment of active duty troops and do not contain civilian staff or independent contractors.

14.4.5 Population Growth

The growth and welfare of any area is dependent on the growth or at least stability of its population. Population tends to track with metrics of economic growth. If population were to experience a declining trend, it reflects directly on ability to pay for utility services and projects. If a population loss is a result of job loss, then income may also be negatively affected, which in turn influences the remaining population's ability to afford utilities.

The population within the Hampton Roads area has historically experienced fairly steady growth. More recently however, that growth has slowed to an average annual increase of just over 0.5 percent for the past 10 years.

According to a study of trends in state population data between decennial census years, 2000 to 2010, the Hampton Roads area as a whole experienced low growth over the course of the last decade. The report noted that "…five cities in Virginia with the largest net out-migration are all in Hampton Roads: Virginia Beach, Newport News, Hampton, Norfolk, and Portsmouth, even though more military population moved into the area during the decade."[4]

If population levels were to experience future stagnation or decline, so too will the region's capacity for utility cost burdens. Figure 14-10 displays the recent population trends for the area.

[4] Weldon Cooper Center for Public Service, University of Virginia; A Decade of Change in Virginia's Population, The Virginia News Letter, Vol. 87 No. 4, June 2011

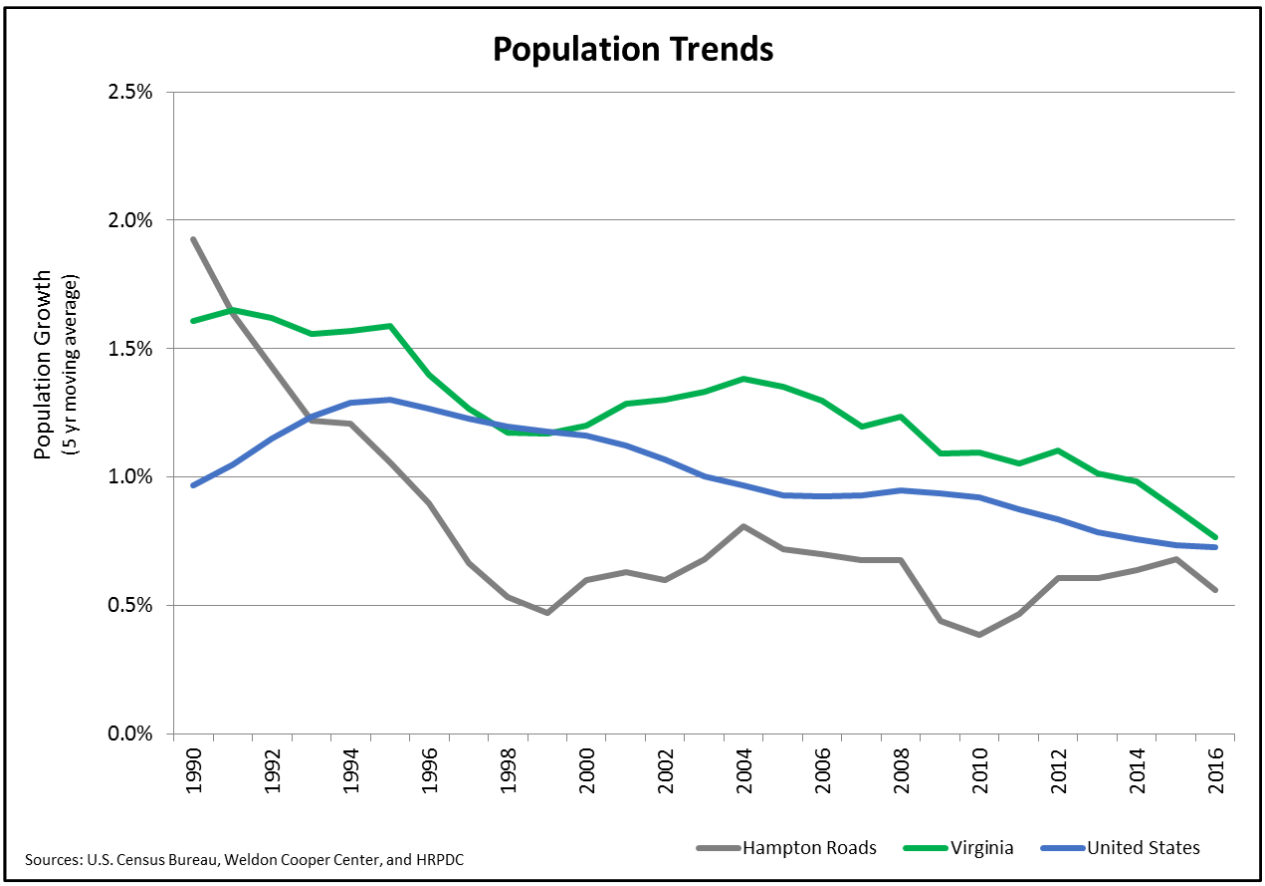

Figure 14-10. Hampton Roads Annual Population Growth

In addition to challenges posed by net migration out of the cities listed above, so does the pattern of projected growth into Suffolk, Chesapeake, and James City County where existing systems are unable to handle a different population. Generally, growth is projected in areas with less infrastructure capacity and population declines in areas with more capacity than will be needed for the future.

14.4.6 Unemployment

The level of employment and unemployment in an area is another measure of general financial health. Long-term trends in employment numbers are reflective of the economic health and competitiveness of surrounding communities.

Data sourced from the Bureau of Labor Statistics was used to compare Hampton Roads, Virginia, and national unemployment trends. Figure 14-11 displays unemployment rates for these geographies between 2000 and 2016. The unemployment rate in Hampton Roads has historically trended below national levels. However, the delta between the two metrics has been steadily closing since 2010.

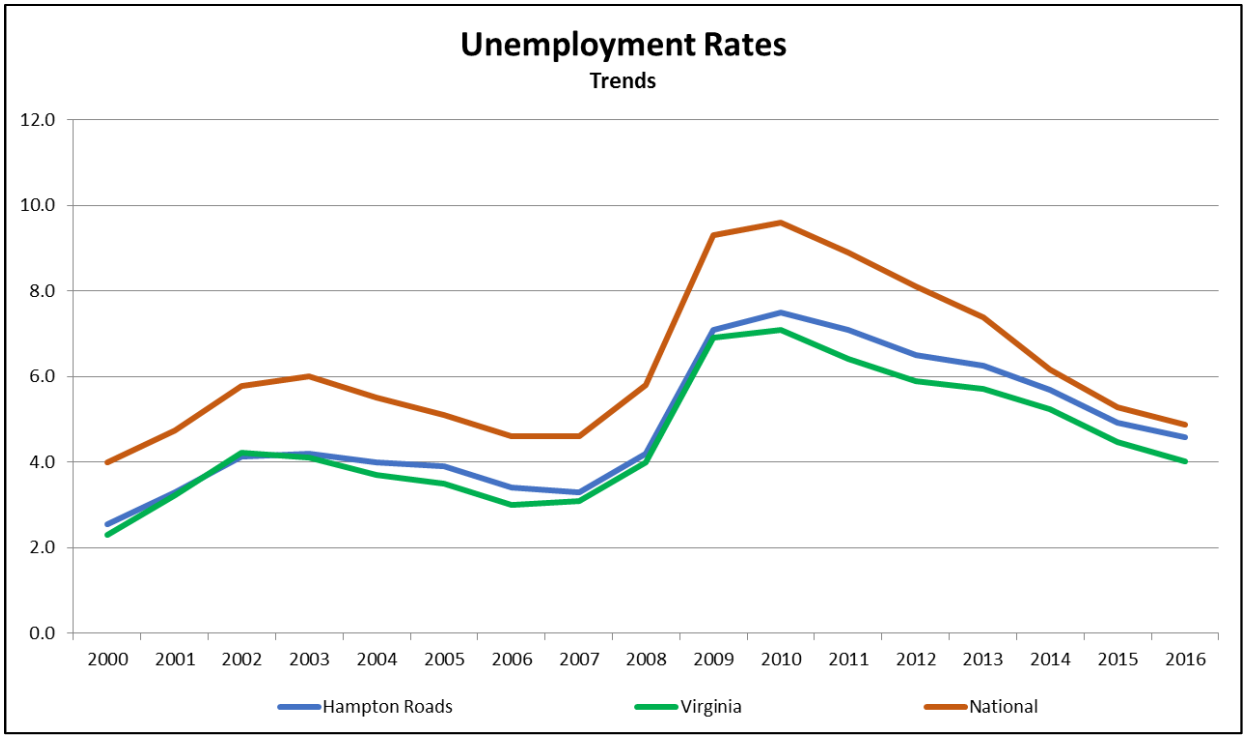

Figure 14-11. Unemployment Rate Trends

14.4.6.1 Virginia Fiscal Stress Rankings.

According to the latest published Virginia municipal fiscal stress rankings, the Cities of Portsmouth (12), Norfolk (13), Hampton (14), and Newport News (16) are ranked by the Commonwealth as having an existing high level of fiscal stress. The stress rankings noted are out of 133 communities assessed by the Commonwealth. See:
http://www.dhcd.virginia.gov/images/clg/publicfinance/Fiscal%20Stress%202014.pdf

These independent evaluations by the Commonwealth, which have been conducted for many years are far more important to understanding true community affordability than EPA's national guidance. These stress rankings reinforce that no further schedule acceleration is possible.

14.4.7 Financial Impacts Due to Project Components

Compression of the program schedule could result in cost increases due to:

- Contractor Availability/Competition
- Construction Labor Import
- Disruption/Congestion/Traffic
- Bond Rating
- Construction Coordination/Staffing Needs/Design/Project Management
- Operations Disruption/Accelerated Staffing

Completing nearly $3 billion worth of projects over the projected Integrated Plan implementation period will put a strain on the contracting capabilities within the region as well as a high level of construction impacts on the public. The work included in this report is in addition to the Rehabilitation Action plan projects, ongoing renewal and replacement projects, and all the projects the Localities need to continue performing.

HRSD will work with the contractor community to create a successful program implementation; however, any compression of this work into a shorter time period will undermine the ability to produce quality construction and will exacerbate impacts on residents living and working in the ongoing construction zones. It would result in additional pressure on the contracting community in terms of material/equipment availability, access to skilled workforce and adequate supply of general contractors with bonding capacity to ensure a competitive bidding environment. For large-scale or specialized projects, there could be a limited number of contractors with the necessary skill set and size to consider submitting bids. When there are multiple such projects going on simultaneously, it is conceivable that there could be no firm available or willing to bid on additional concurrent projects.

A shorter program schedule would also have major effects on the planning, engineering, construction management and general oversight of the project work. This could result in increased strain of existing management staff, impacts to required staffing/labor import, and potential issues with inspection and quality assurance/quality control. The resultant financial impact could be an increase in engineering/management costs for the overall program.

As with any major infrastructure program, regardless of the disruption caused by construction of new facilities, the existing assets and facilities must remain operational and receive the required maintenance. Successful O&M during heavy construction periods will require extra resources to maintain proper coordination and to address the inevitable problems.

14.4.8 HRSD's Financial Plan

HRSD currently has a 20-year budget and financial projection, which is updated annually. The most recent projection was published on July 1, 2017 and projects revenues and expenses through fiscal year 2037. This plan shows rates growing at an average annual increase of roughly 7% over the forecast period. These increases are in addition to the more than 200% aggregate increase that has occurred in HRSD rates over just the past 8 years. This level of sustained rate increases is unprecedented. Given the significant burdens, HRSD will relentlessly strive to find cost savings and federal and state grant/grant equivalent funding.

As of 2016, HRSD's bond rating was AA+ with both Fitch and Standard and Poor's. Both rating agencies note that HRSD's rating is dependent upon them maintaining adequate liquidity (i.e., cash) and maintaining a stable or rising debt service coverage ratio (DSCR). As mentioned previously in Section 14.2, recent analysis of HRSD issued by Standard and Poor's and Fitch identifies these factors as critical to HRSD maintaining these ratings. A one-notch rating downgrade will increase the debt service costs significantly on the total Integrated Plan and further affect the affordability.

Thus, the selected LOS for the RWWMP was analyzed against the existing financial plan through 2037 and a financial projection through 2057 to determine the shortest completion schedule that allowed adequate funding of all projected capital expenses and without causing the DSCR to drop below 2.0, a target set by the HRSD Commission in April 2016 as a result of the credit agency warnings and an independently performed analysis of the rating factors of peer utilities. Under the Integrated Plan, and HRSD's current and projected financial plan constraints, the RWWMP can be completed no earlier than 2053.

14.5 Conclusions

The financial burden resulting from stormwater and wastewater costs is substantial and widespread. It is also notable that EPA's service area-focused approach will have the primary effect of underpredicting financial burdens on environmental justice populations. The burden on vulnerable populations is crushing with people in the lowest income quintile paying more than 9% of their household income for stormwater and wastewater services. Regionwide 55% of households will be paying more than 2% (EPA's threshold for high burden) of their household income for stormwater and wastewater and in some communities, like Norfolk, 64% of households are in this high burden category. When the marginal environmental benefit of

SSO reduction is considered, the cost of the RWWMP is not justified and is a poor use of scarce resources. Figure 14-12 shows the impact by community and regionwide.

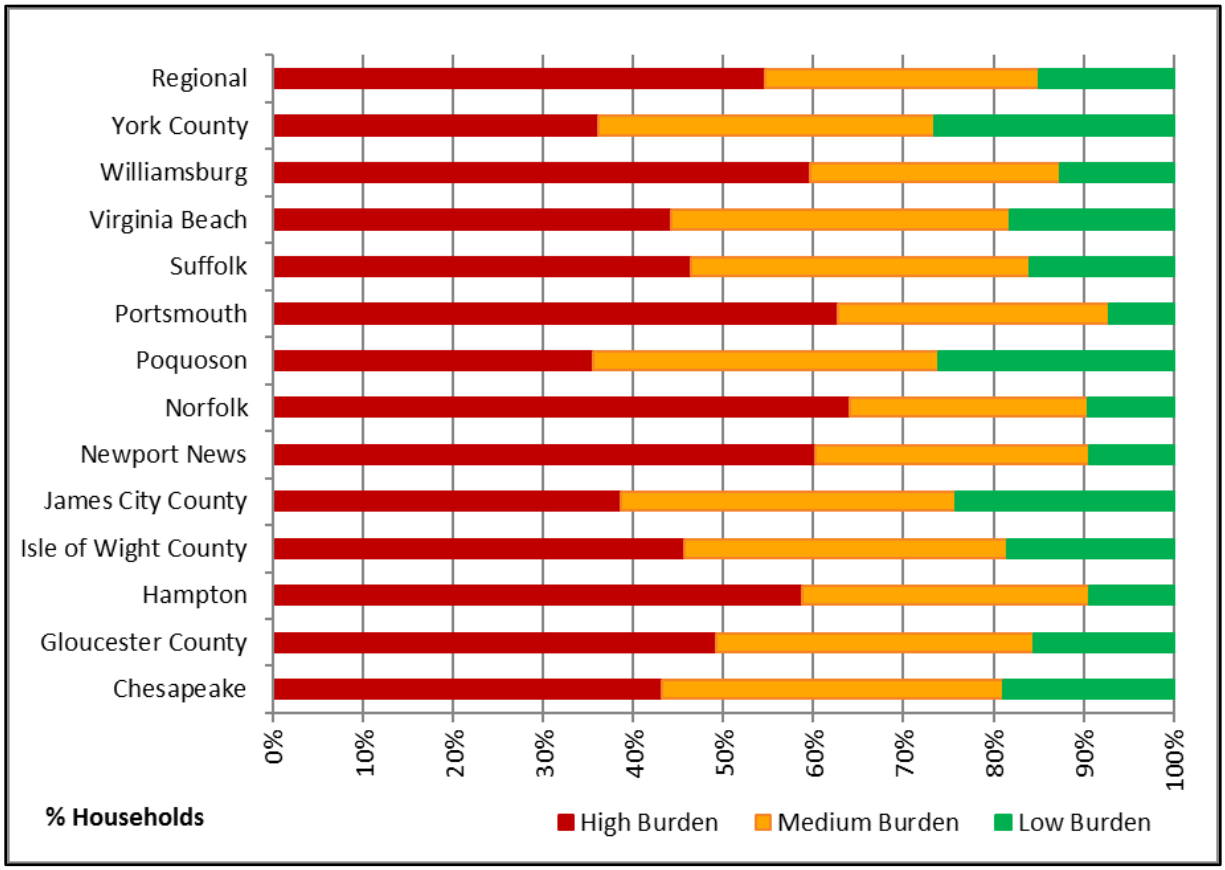

Figure 14-12. Peak Costs per Household Impacts by Locality

Section 15

Implementation Schedule Development Process

15.1 Process and Major Assumptions

As described in the previous sections, the Level of Service solution set project elements have been consolidated into a set of implementable projects which mimic HRSD's CIP process. The project elements have been evaluated in the High-Priority Project review to determine which have the greatest environmental and human health benefit. The modeling that was completed to determine load reduction helped inform which projects might have a negative impact if implemented alone or before complimentary projects are done. This consideration forms the basis for sequencing all the projects for the RWWMP.

Sequencing is the next logical step required after the elements are grouped into projects. In essence, HRSD is determining what project needs to come before another in an attempt to maintain or improve system pressures and potential for SSOs. Sequencing is also different from scheduling, which takes the strings of sequenced projects and applies them to a program schedule to meet cashflow and affordability limitations. Generally, sequencing happens at the treatment plant level and follows hydraulically interconnected projects.

A set of sequencing guidelines was developed as follows:

- Rehab Action Plan and High-Priority Projects follow their own schedule and will happen first;
- Work from downstream to upstream to remove downstream bottlenecks before more flow is added to the system upstream;
- Perform I/I reduction (followed by post-rehab flow monitoring and analysis) prior to associated terminal PS improvement in order to properly size the facility;
- Tanks can be built at any time in the sequence;
- Pipeline improvements prior to PRS if possible to avoid over pressurizing the system; and
- Locality Hydraulic Model projects (hydraulically independent) can be done at any time to fill cash flow gaps.

An example of this sequencing is shown in Figure 15-1 for a branch of the VIP system in the southeast part of Norfolk. The projects in this example include:

1. May Avenue Storage Tank
2. East Virginia Beach Blvd gravity main upsize (upstream of Norchester Pump Station)
3. Force Main downstream of Seay Avenue and Ingleside Road Pump Stations
4. Ingleside Road Pump Station Improvement

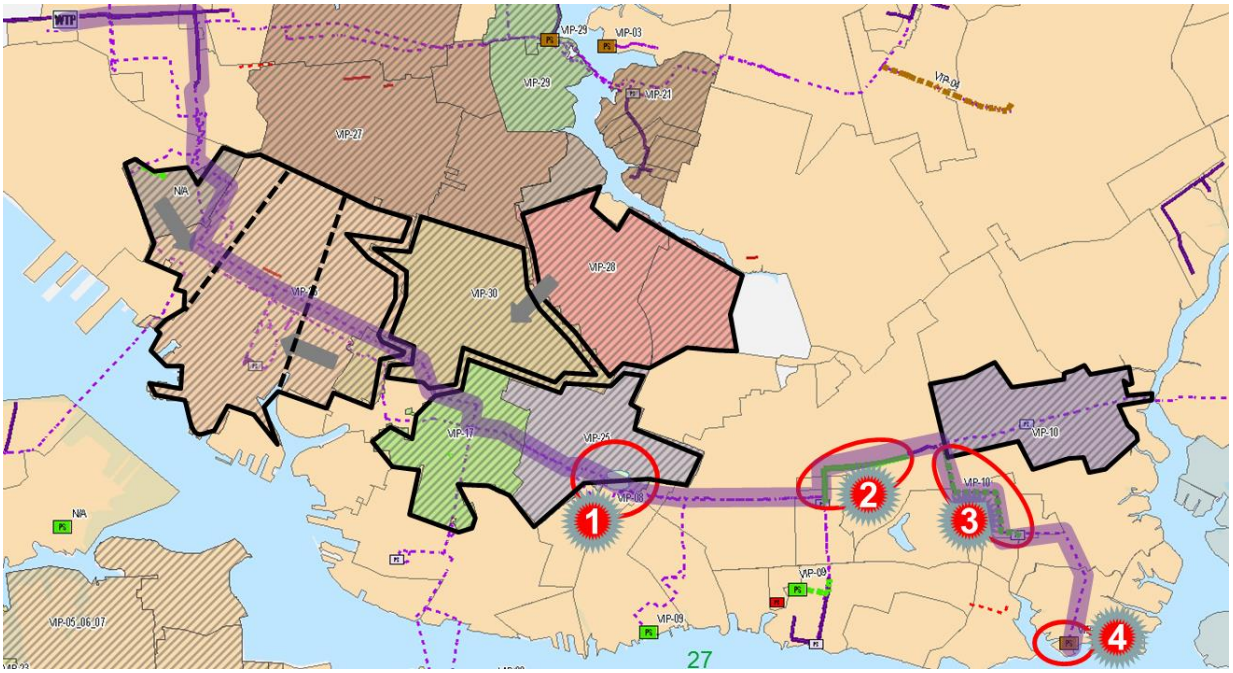

Figure 15-1. Sequencing Branch Example

In this example, the May Avenue Storage Tank (#1) will provide the most benefit downstream and upstream, and should be completed before the other projects. Next, the Virginia Beach Boulevard gravity main (#2) should be completed before any upstream work is done. If not, the capacity of the existing pipe will be further overstressed possibly increasing SSOs in the short-term. Similarly, the force main (#3) should be completed before the pump station (#4) to provide the piping capacity needed by the pumping improvement.

This exercise was completed for all 174 projects included in the RWWMP solution set.

15.2 Implementation Schedule

The RWWMP was scheduled with an overall implementation covering a 34-year period starting in 2020 through the end of 2053 for the Financial Capability Assessment. The High-Priority Project phase runs from 2020 through 2030, concurrent with the implementation of SWIFT, and the three remaining primary phases, of eight-years duration each, were scheduled for determining financial impact as follows:

- Phase 1: 2030 through 2037
- Phase 2: 2038 through 2045
- Phase 3: 2046 through 2053

High-Priority Projects are scheduled to be finished no later than the end of 2030. Between 2028 and 2030 the system and plan will be re-evaluated and a Final Remedial Measures Plan developed. The scope and schedule assumed above for financial capacity analysis will be revisited accordingly.

Section 17 presents the Adaptive Regional Plan in detail. The schedule associated with this plan is presented in Table 15-1 below.

Table 15-1. Four Phases of the Adaptive Regional Plan			
Phase	Description	Timeframe	Cost
1	Planning, Interim System Improvements, Condition Assessment and Repairs, Rehabilitation Action Plan	2008 – 2025	$700,000,000
2	SWIFT Implementation, Pathogen Source Tracking Program and High-Priority Projects	2020 - 2030	$1,318,000,000
3	Re-Evaluation and Preparation of a Final Remedial Measures Plan	2028 - 2030	$2,000,000
4	Implementation of the Final Remedial Measures Plan	2030-	To be determined

Year 2030 is an overlap year containing the completion phases of the High-Priority Projects and the beginning phases of the remaining wet weather projects subject to the Final Remedial Measures Plan schedule. RWWMP projects with full CIP/RP overlap are shown with completion dates as indicated in the HRSD Fiscal Year 2018 CIP. Those RWWMP projects with full scope overlap of an existing HRSD Rehab Action Plan (RP) project were assigned a zero-dollar cost in this plan to avoid double counting expenditures between the two documents.

Defining and scheduling these phases in this manner provides for identification of interim milestone completion dates within the program on the last day of the final year within the respective phases (relative sequencing and scheduling is subject to change in accordance with the approved Final Remedial Measures Plan). Table 15-2 shows the elements and total cost corresponding to each.

Table 15-2. RWWMP Projects by Implementation Phase for Financial Capability Assessment				
Phase	Completion Time Frame	Number of Projects	Number of Elements	Total RWWMP Project Costs ($ Millions)
RWWMP High-Priority	2020 – 2030	6	34	$207.7
Overlap RP/CIP	Completion date as indicated in CIP	8	24	$0.00
RWWMP Phase 1*	2030 – 2037	28	50	$326.8
RWWMP Phase 2*	2038 – 2045	73	242	$678.7
RWWMP Phase 3*	2046 – 2053	59	179	$587.6
	Total	174	529	$1,800.8

**Subject to change in accordance with the approved Final Remedial Measures Plan.*

Projects are spread out within each phase with the primary objective of keeping projected annual expenditures within projected cash flow limits. HRSD asset improvements generally occur earlier in the RWWMP because they also generally provide the most hydraulic benefit to the wider collection system. Nearly all HRSD assets improvements are completely accomplished by 2047 with final HRSD asset improvements finished by the end of 2051.

Locality asset improvements are scheduled as early as possible, contingent on hydraulic dependencies with respect to downstream improvements. The first Locality asset improvements occur in the first year of Phase 1 and final completion of all improvements is by the end of 2053. This scheduling reality is reflected in Figure 15-2 which shows the distribution of expenditures for HRSD asset improvements and Locality asset improvements within the overall cashflow for the RWWMP.

Since I/I reduction is by nature always beneficial to the collection and interceptor systems, they can be scheduled at any time, if there are no other constraints on them. Therefore, some I/I reduction projects

were scheduled to fill in projected cash flow gaps, resulting in a few such projects of comparatively lower cost occurring very early interspersed among other larger infrastructure projects.

Projects from each of the eight treatment plant service areas were scheduled across the entire RWWMP implementation duration. One notable exception is the Army Base Treatment Plant service area which has only four projects that can be completed within about a 4-year span and are so concentrated. This spread approach results in program implementation activities providing benefits broadly across the service areas. This approach is reflected in Figure 15-3 which shows the cash flow distribution per treatment plant service area.

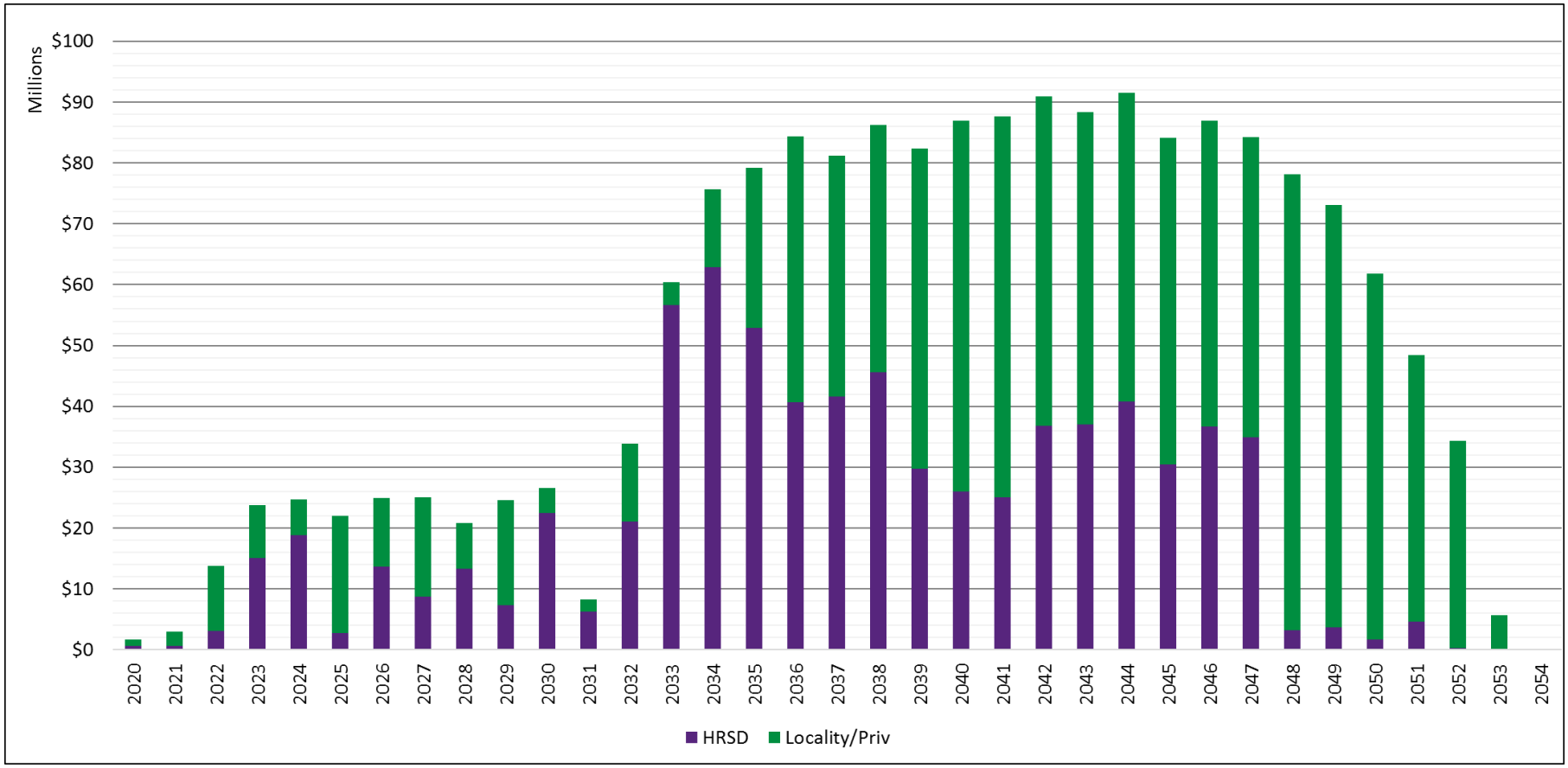

Figure 15-2. RWWMP Schedule Cash Distribution by Ownership

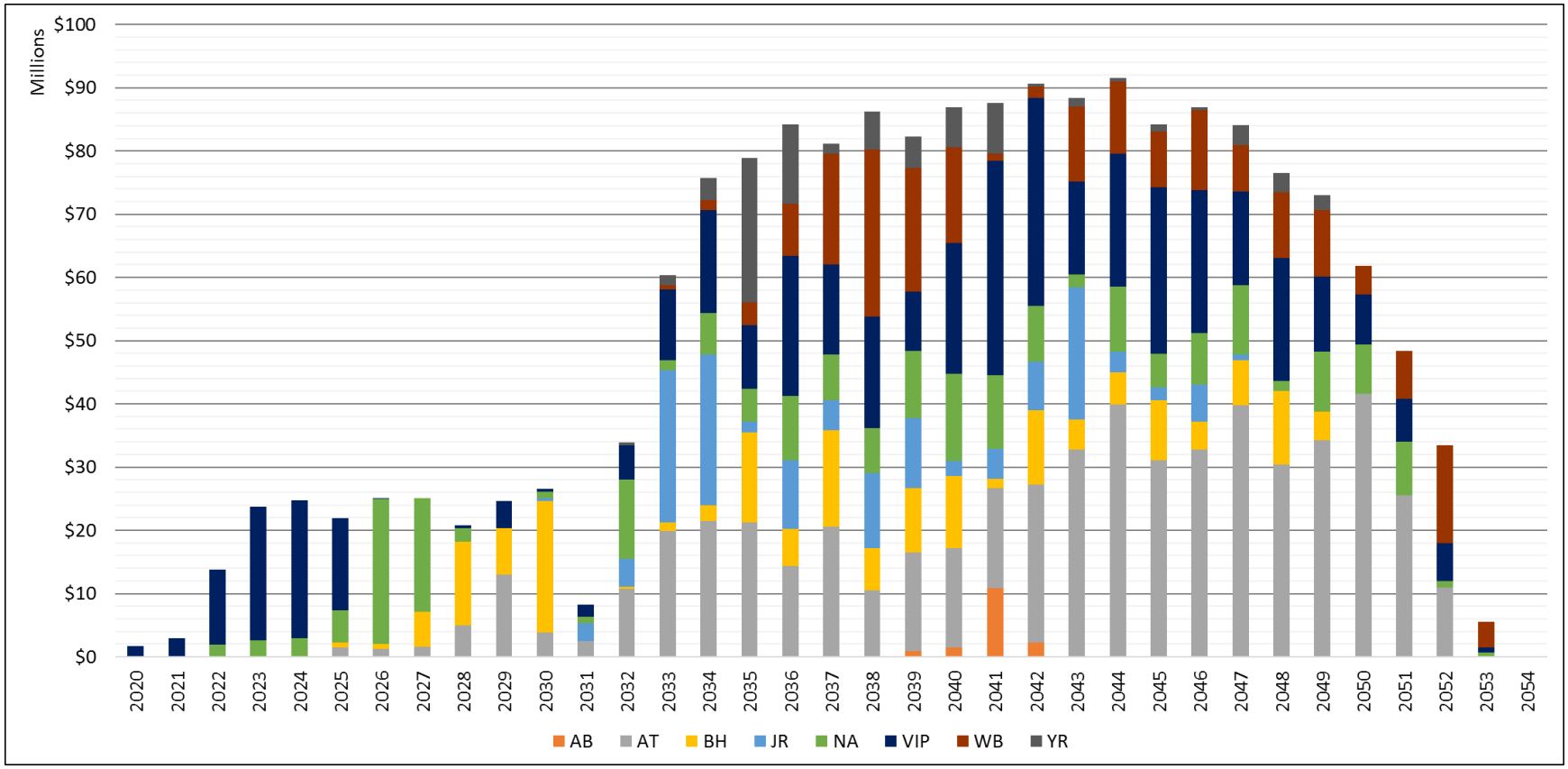

Figure 15-3. RWWMP Schedule Cash Distribution by TP

Durations for each project were generally based on the maximum element duration within the project. The duration for each element was established based on a template containing six generic phases: SSES, PER, Design, Pre-Construction, Construction and Flow Monitoring; however, not all phases are required for every element. For example, force main upsizing projects generally do not require SSES activities. Certain element types, such as I/I reduction efforts within project groups, required production rate assumptions and evaluation of an overall critical duration for their respective project group. Minimum duration for any element was set at 3 years to allow sufficient time for element planning. Maximum duration elements are I/I reduction efforts which for some sewersheds are estimated to take 6 to 8 years. Long duration projects that include such elements are generally also those with high expenditure totals, so had a significant impact on the timing of other projects in order to keep expenditures within projected cash flow limits. Generally, all elements within a project were given the same start and finish date since precise scheduling of the elements will be determined at the time of project implementation. The only exception is a single High-Priority Project whose elements have hydraulic dependencies with one another and so require different start dates.

Table 15-3 shows the list of RWWMP projects grouped by phase and sorted in chronological order by completion timeframe. Additional detail regarding the elements within these projects can be found in Appendix E and a schedule Gantt chart is available in Appendix F. The finish dates provided for the first group of RWWMP Overlap RP/CIP are provided for information only. These project schedules will be governed by the milestones set in the Rehab Plan.

Table 15-3. RWWMP Project Schedule for Financial Capability Assessment

	Project ID	Phase	Project Name	Start	Finish
RWWMP OVERLAP RP/CIP					
1	VIP-RWWMP-01	RP	Park Ave. PS, Ferebee Ave. PS Upgrades and Sanitary Sewer 1950 Gravity Main Improvements		09/2018
2	NA-RWWMP-02	RP	Shingle Creek Pump Stations and Force Main/Gravity Main Installations		07/2021
3	VIP-RWWMP-02	RP	HRSD Larchmont Area Pump Station Upgrades		11/2022
4	VIP-RWWMP-06	RP	Robin Hood Road Force Main Improvement		10/2023
5	VIP-RWWMP-07	RP	Ford Dr Gravity Main Improvement		11/2023
6	AB-RWWMP-01	RP	Terminal Blvd/ Hampton Blvd Force Main Improvements		12/2023
7	JR-RWWMP-01	RP	Jefferson Avenue IFM Improvement		01/2025
8	VIP-RWWMP-03	RP	Chesapeake Blvd PS, Ashland Circle PS and City Park PS Upgrades		12/2022
HIGH-PRIORITY PROJECTS					
9	VIP-RWWMP-05	HPP	State Street PRS and Storage Tank	01/2020	03/2024
10	NA-RWWMP-03	HPP	Wilroy PRS and Storage Tank	04/2023	06/2027
11	NA-RWWMP-01	HPP	Chesapeake High-Priority Project 2	12/2012	11/2028
12	VIP-RWWMP-04	HPP	Portsmouth High-Priority Project 1	01/2020	05/2030
13	BH-RWWMP-01	HPP	Claremont PS Upgrade, Chesapeake Ave. Pipe Improvements and 14th St Storage Tank	01/2025	12/2030
14	AT-RWWMP-01	HPP	Chesapeake High-Priority Project 1	01/2025	12/2030

Table 15-3. RWWMP Project Schedule for Financial Capability Assessment					
	Project ID	Phase	Project Name	Start	Finish
RWWMP PHASE 1 PROJECTS					
15	AT-RWWMP-02	1	VAB I/I Reduction Project A	01/2030	12/2032
16	AT-RWWMP-03	1	Great Bridge Blvd. GM Improvement	01/2030	12/2032
17	VIP-RWWMP-08	1	Norfolk PS 20 Force Main Realignment	01/2030	12/2032
18	NA-RWWMP-04	1	Shingle Creek Interceptor Gravity Main Improvement	01/2030	01/2033
19	NA-RWWMP-05	1	Chesapeake I/I Reduction Project A	01/2030	01/2033
20	VIP-RWWMP-09	1	Norfolk I/I Reduction Project A	01/2030	01/2033
21	JR-RWWMP-02	1	Tabb PRS and Storage Tank	01/2030	03/2034
22	AT-RWWMP-04	1	Atlantic TP Equalization Tank and Effluent Screening	07/2030	04/2034
23	VIP-RWWMP-10	1	Virginia Initiative Plant RWI Pumps and Equalization Tank	01/2031	09/2034
24	JR-RWWMP-03	1	James River TP Secondary Clarifiers and RAS Pumps	01/2031	10/2034
25	NA-RWWMP-06	1	Suffolk I/I Reduction Project A	01/2032	01/2035
26	AT-RWWMP-05	1	Atlantic PRS Upgrade	06/2032	08/2035
27	BH-RWWMP-03	1	Washington St Gravity Main Improvements	01/2033	01/2036
28	VIP-RWWMP-11	1	Portsmouth PS 6 and PS 55 Upgrades	01/2033	01/2036
29	YR-RWWMP-01	1	Coliseum Storage Tank Addition	09/2032	03/2036
30	YR-RWWMP-02	1	Langley Circle PS Upgrade	09/2032	03/2036
31	NA-RWWMP-07	1	Chesapeake City System Improvements A	01/2033	05/2036
32	VIP-RWWMP-12	1	May Ave Storage Tank	01/2033	10/2036
33	VIP-RWWMP-13	1	Willoughby Ave PS Upgrade	05/2033	10/2036
34	VIP-RWWMP-14	1	Norfolk City System Improvements A	11/2033	10/2036
35	VIP-RWWMP-15	1	Norchester Gravity Main Improvement	11/2033	10/2036
36	BH-RWWMP-02	1	Hampton I/I Reduction Project A	10/2032	12/2036
37	VIP-RWWMP-16	1	Norfolk City System Improvements B	01/2034	12/2036
38	VIP-RWWMP-18	1	Seay Avenue Force Main Improvement	03/2034	03/2037
39	JR-RWWMP-04	1	Lucas Creek PRS Upgrade	01/2034	04/2037
40	AT-RWWMP-07	1	Hillwell PRS	01/2034	08/2037
41	YR-RWWMP-03	1	Hampton I/I Reduction Project B	11/2033	09/2037
42	AT-RWWMP-06	1	Birdneck-General Booth Blvd. Force Main Improvements	01/2034	09/2037
RWWMP PHASE 2 PROJECTS					
43	BH-RWWMP-05	2	Hampton I/I Reduction Project C	01/2035	01/2038
44	NA-RWWMP-08	2	Suffolk I/I Reduction Project B	06/2033	01/2038
45	JR-RWWMP-05	2	Newport News PS 68 Upgrade and Gravity Main Improvement	03/2035	03/2038

Table 15-3. RWWMP Project Schedule for Financial Capability Assessment					
	Project ID	Phase	Project Name	Start	Finish
46	BH-RWWMP-04	2	58th St Storage Tank	06/2034	03/2038
47	WB-RWWMP-01	2	JCSA I/I Reduction Project A	07/2033	05/2038
48	VIP-RWWMP-19	2	Ferebee Avenue PS Gravity Influent Improvement	01/2035	07/2038
49	VIP-RWWMP-20	2	Chesapeake PS 7 Upgrade	07/2035	07/2038
50	BH-RWWMP-06	2	Copeland Park PS Upgrade	05/2035	10/2038
51	AT-RWWMP-08	2	Dozier's Corner PS Upgrade	06/2035	11/2038
52	WB-RWWMP-02	2	Williamsburg Crossing PRS, Force Main and Storage Tank	10/2034	12/2038
53	WB-RWWMP-03	2	Route 199 PRS	10/2035	12/2038
54	VIP-RWWMP-21	2	Norfolk City System Improvements C	01/2036	12/2038
55	VIP-RWWMP-22	2	Steamboat Creek PS and Chesapeake Blvd PS Force Main Improvements	01/2036	12/2038
56	JR-RWWMP-06	2	Newport News I/I Reduction Project A	10/2035	05/2039
57	VIP-RWWMP-17	2	Norfolk I/I Reduction Project B	01/2034	06/2039
58	JR-RWWMP-07	2	Newport News City System Improvements A	06/2036	06/2039
59	YR-RWWMP-04	2	Freeman Drive PS Upgrade	01/2036	07/2039
60	YR-RWWMP-05	2	Bay Shore Lane PS Upgrade and Force Main Improvement	01/2036	07/2039
61	AT-RWWMP-09	2	Battlefield Blvd South IFM Improvements	01/2036	08/2039
62	WB-RWWMP-04	2	Colonial Williamsburg PS Extended Wet Well	05/2036	11/2039
63	WB-RWWMP-05	2	JCSA System Improvements A	01/2037	12/2039
64	NA-RWWMP-09	2	Suffolk I/I Reduction Project C	01/2036	02/2040
65	BH-RWWMP-09	2	Copeland Park Gravity Main Improvement	02/2037	02/2040
66	JR-RWWMP-08	2	Newport News City System Improvements B	03/2037	03/2040
67	AT-RWWMP-10	2	Laskin Road PRS Upgrade	07/2037	09/2040
68	BH-RWWMP-07	2	Newmarket Creek PS Upgrade	01/2037	09/2040
69	BH-RWWMP-08	2	Mercury Blvd and Newmarket Gravity Main Improvements	01/2037	09/2040
70	WB-RWWMP-06	2	Williamsburg I/I Reduction Project A	01/2037	10/2040
71	BH-RWWMP-10	2	Newport News I/I Reduction Project B	01/2038	12/2040
72	BH-RWWMP-11	2	35th Street Gravity Main Improvement	01/2038	12/2040
73	WB-RWWMP-07	2	York County I/I Reduction Project A	05/2037	07/2041
74	YR-RWWMP-06	2	Hampton I/I Reduction Project D	07/2038	07/2041
75	YR-RWWMP-07	2	Hampton City System Improvements A	09/2038	09/2041
76	VIP-RWWMP-23	2	Portsmouth I/I Reduction Project A	01/2036	09/2041
77	AT-RWWMP-11	2	Shipps Corner Storage Tank	01/2038	10/2041
78	VIP-RWWMP-26	2	Chesapeake City System Improvements B	01/2039	01/2042

Table 15-3. RWWMP Project Schedule for Financial Capability Assessment					
	Project ID	Phase	Project Name	Start	Finish
79	VIP-RWWMP-25	2	Ingleside Rd PS Upgrade	09/2038	03/2042
80	AB-RWWMP-02	2	Terminal PRS Upgrade	01/2039	04/2042
81	AB-RWWMP-03	2	Norfolk City System Improvements D	04/2039	04/2042
82	JR-RWWMP-09	2	Poquoson PS 001 Upgrade	04/2039	04/2042
83	NA-RWWMP-10	2	Suffolk II Reduction Project D	07/2036	05/2042
84	VIP-RWWMP-28	2	Bainbridge Blvd Gravity Main Improvement	06/2039	06/2042
85	AB-RWWMP-04	2	Norfolk City System Improvements E	09/2039	08/2042
86	AT-RWWMP-12	2	Oceana Storage Tank	01/2039	10/2042
87	BH-RWWMP-12	2	Hampton City System Improvements B	01/2040	01/2043
88	NA-RWWMP-11	2	Constance Rd PRS	07/2039	01/2043
89	VIP-RWWMP-24	2	Portsmouth I/I Reduction Project B	01/2037	01/2043
90	VIP-RWWMP-27	2	Norfolk I/I Reduction Project C	01/2039	01/2043
91	VIP-RWWMP-30	2	Norfolk I/I Reduction Project D	07/2039	01/2043
92	NA-RWWMP-12	2	Cedar Lane Gravity Main Improvement	01/2040	01/2043
93	VIP-RWWMP-31	2	Portsmouth City System Improvements A	02/2040	02/2043
94	JR-RWWMP-10	2	Morrison PS Upgrade	09/2039	03/2043
95	AT-RWWMP-13	2	Lynnhaven Parkway Force Main Improvements	07/2040	07/2043
96	YR-RWWMP-08	2	Bloxom's Corner PS Upgrade	01/2040	07/2043
97	VIP-RWWMP-29	2	Portsmouth I/I Reduction Project C	07/2039	10/2043
98	WB-RWWMP-08	2	Williamsburg PS 12 Upgrade and PS 14 FM Improvement	11/2040	11/2043
99	VIP-RWWMP-32	2	Norfolk I/I Reduction Project E	11/2040	11/2043
100	BH-RWWMP-13	2	Hampton City System Improvements C	01/2041	01/2044
101	VIP-RWWMP-34	2	Norfolk I/I Reduction Project F	01/2041	01/2044
102	AT-RWWMP-14	2	Kempsville PRS Upgrade	01/2041	04/2044
103	YR-RWWMP-09	2	Hampton PS 130 Upgrade	05/2041	05/2044
104	VIP-RWWMP-35	2	Chesapeake City System Improvements C	07/2041	06/2044
105	AT-RWWMP-15	2	Elbow Road PRS	01/2041	08/2044
106	WB-RWWMP-09	2	Longhill PRS	01/2041	08/2044
107	JR-RWWMP-11	2	Newport News I/I Reduction Project C	01/2040	08/2044
108	JR-RWWMP-12	2	Newport News I/I Reduction Project D	08/2040	08/2044
109	WB-RWWMP-10	2	JCSA System Improvements B	04/2041	08/2044
110	AT-RWWMP-18	2	Chesapeake City System Improvements D	01/2042	01/2045
111	AT-RWWMP-19	2	Great Bridge Blvd IFM Improvement	01/2042	01/2045

Table 15-3. RWWMP Project Schedule for Financial Capability Assessment					
	Project ID	Phase	Project Name	Start	Finish
112	WB-RWWMP-11	2	JCSA PS 006-2 Upgrade	04/2042	04/2045
113	JR-RWWMP-13	2	Newport News I/I Reduction Project E	04/2042	04/2045
114	AT-RWWMP-17	2	Courthouse PRS	01/2042	08/2045
115	AT-RWWMP-16	2	Virginia Beach Blvd. FM Improvements	10/2041	09/2045
RWWMP PHASE 3 PROJECTS					
116	NA-RWWMP-13	3	Suffolk I/I Reduction Project E	01/2041	01/2046
117	BH-RWWMP-14	3	Newport News I/I Reduction Project F	01/2042	04/2046
118	WB-RWWMP-12	3	York County I/I Reduction Project B	01/2043	04/2046
119	YR-RWWMP-10	3	Hampton I/I Reduction Project E	04/2043	04/2046
120	JR-RWWMP-14	3	Poquoson City System Improvements A	05/2043	05/2046
121	WB-RWWMP-13	3	JCSA I/I Reduction Project B	01/2043	01/2047
122	JR-RWWMP-15	3	Newport News I/I Reduction Project G	01/2044	03/2047
123	AT-RWWMP-21	3	Pine Tree PRS Upgrade	01/2044	04/2047
124	BH-RWWMP-15	3	Hampton City System Improvements D	04/2044	04/2047
125	JR-RWWMP-16	3	York County PS 019 Upgrade	06/2044	06/2047
126	NA-RWWMP-14	3	Cedar Lane PS Upgrade and Portsmouth PS 47 Force Main Jumper	01/2044	07/2047
127	WB-RWWMP-14	3	York County I/I Reduction Project C	08/2044	09/2047
128	BH-RWWMP-17	3	Newport News I/I Reduction Project H	10/2044	10/2047
129	VIP-RWWMP-38	3	Norfolk I/I Reduction Project G	01/2044	12/2047
130	AT-RWWMP-23	3	Virginia Beach PS 120 Upgrade and Gravity Main Improvement	12/2044	12/2047
131	AT-RWWMP-20	3	Chesapeake Southern Loop IFM (Cedar Rd. to Hillcrest Pkwy.)	01/2043	01/2048
132	AT-RWWMP-22	3	Dominion Blvd. PRS	06/2044	01/2048
133	VIP-RWWMP-36	3	Chesapeake I/I Reduction Project B	06/2043	01/2048
134	VIP-RWWMP-37	3	Norfolk I/I Reduction Project H	06/2043	01/2048
135	VIP-RWWMP-33	3	Norfolk I/I Reduction Project I	01/2041	01/2048
136	AT-RWWMP-24	3	Independence PRS Upgrade	01/2045	03/2048
137	WB-RWWMP-15	3	JCSA I/I Reduction Project C	01/2045	04/2048
138	NA-RWWMP-15	3	Suffolk I/I Reduction Project F	06/2045	06/2048
139	YR-RWWMP-11	3	Yorktown PRS	12/2044	07/2048
140	YR-RWWMP-12	3	Gloucester County II Reduction Project A	10/2045	10/2048
141	AT-RWWMP-26	3	Virginia Beach PS 324 Upgrade and Five Point Rd FM Extension	11/2045	11/2048
142	VIP-RWWMP-40	3	Norfolk I/I Reduction Project J	01/2046	12/2048
143	AT-RWWMP-28	3	Virginia Beach City System Improvements A	03/2046	03/2049

Table 15-3. RWWMP Project Schedule for Financial Capability Assessment					
	Project ID	Phase	Project Name	Start	Finish
144	WB-RWWMP-16	3	JCSA I/I Reduction Project D	01/2046	06/2049
145	AT-RWWMP-29	3	VAB I/I Reduction Project B	07/2046	07/2049
146	YR-RWWMP-13	3	Gloucester County PS 13 and PS 16 Upgrades	08/2046	08/2049
147	BH-RWWMP-16	3	Newport News I/I Reduction Project I	07/2044	08/2049
148	AT-RWWMP-25	3	Chesapeake I/I Reduction Project C	01/2045	12/2049
149	AT-RWWMP-31	3	Chesapeake I/I Reduction Project D	01/2047	12/2049
150	BH-RWWMP-18	3	Newport News I/I Reduction Project J	01/2047	12/2049
151	NA-RWWMP-17	3	Suffolk City System Improvements A	12/2046	01/2050
152	VIP-RWWMP-41	3	Norfolk I/I Reduction Project K	01/2046	03/2050
153	VIP-RWWMP-39	3	Norfolk I/I Reduction Project L	01/2045	05/2050
154	NA-RWWMP-16	3	Western Branch PRS	10/2046	05/2050
155	WB-RWWMP-17	3	JCSA I/I Reduction Project E	06/2046	12/2050
156	AT-RWWMP-27	3	VAB I/I Reduction Project C	01/2046	01/2051
157	AT-RWWMP-30	3	VAB I/I Reduction Project D	08/2046	01/2051
158	AT-RWWMP-32	3	VAB I/I Reduction Project E	05/2047	01/2051
159	NA-RWWMP-18	3	Chesapeake I/I Reduction Project E	02/2048	02/2051
160	AT-RWWMP-35	3	Chesapeake I/I Reduction Project F	07/2047	05/2051
161	NA-RWWMP-19	3	Chesapeake City System Improvements E	07/2048	08/2051
162	VIP-RWWMP-42	3	Chesapeake I/I Reduction Project G	01/2048	08/2051
163	AT-RWWMP-33	3	VAB I/I Reduction Project F	05/2047	10/2051
164	NA-RWWMP-20	3	Nansemond River PRS	07/2048	02/2052
165	AT-RWWMP-37	3	VAB I/I Reduction Project G	01/2049	07/2052
166	WB-RWWMP-19	3	Lodge Rd PS Extended Wet Well	02/2049	08/2052
167	AT-RWWMP-36	3	Norfolk I/I Reduction Project M	07/2047	08/2052
168	VIP-RWWMP-43	3	Norfolk I/I Reduction Project N	01/2049	11/2052
169	AT-RWWMP-38	3	Norfolk City System Improvements F	03/2050	03/2053
170	AT-RWWMP-34	3	Chesapeake I/I Reduction Project H	06/2049	04/2053
171	VIP-RWWMP-44	3	Norfolk City System Improvements G	05/2050	05/2053
172	NA-RWWMP-21	3	Isle of Wight PS 13 and PS 26 Upgrades	06/2050	06/2053
173	WB-RWWMP-18	3	JCSA I/I Reduction Project F	04/2048	08/2053
174	WB-RWWMP-20	3	York County System Improvements A	09/2050	09/2053

15.3 Relationship to SWIFT

In this Integrated Plan, HRSD is prioritizing the activities that provide the greatest environmental and human health benefits, namely SWIFT, the Pathogen Source Tracking Program, and the High-Priority RWWMP Projects. Because of affordability and financial constraints, this moves the remainder of the RWWMP projects to the period after 2030 when SWIFT and the High-Priority Projects are completed. From 2028 through 2030, a re-evaluation and preparation of a Final Remedial Measures Plan will be conducted to define the scope and schedule of additional improvements. As detailed further in Section 17, it is clear that the remainder of the RWWMP offers significantly diminishing environmental and public health benefits.

Section 16

Post-RWWMP Implementation Monitoring and Performance Assessment

16.1 Overview

As required by Paragraph 81 of the Consent Decree, HRSD will evaluate the effectiveness of the work performed through a Post-RWWMP Implementation Monitoring and Performance Assessment. This evaluation will be conducted in consultation with the Localities and be performed following completion of the work in the treatment plant service areas.

16.2 Proposed Monitoring Approach

HRSD operates an extensive flow, pressure, and rainfall (FPR) monitoring network in its system that relies on currently available FPR monitoring and modeling tools and techniques. There are more than 300 points throughout the HRSD network that are monitored and the Localities also maintain their own FPR monitoring systems.

Considering the advances in FPR monitoring tools as well as computer models over the past 20 years, it is difficult to predict what the tools and models will be capable of in the next 20 to 30 years. For this reason, HRSD is providing in this document a general approach that will be used for monitoring and the performance assessment.

As work is completed in sewer catchments, particularly I/I reduction, there will be site specific flow monitoring to confirm the post-reduction flow parameters. In addition, HRSD will establish a flow monitoring network based on major flow junction points, significant flow loading points, and major HRSD facilities like treatment plant, PRSs and storage facilities. Pressure will be monitored throughout the HRSD at upstream end-of-line points, PRSs (upstream and downstream), and other major intermediate points in the network to provide sufficient coverage for model calibration. Rainfall tools will likely evolve as well, but HRSD will maintain sufficient gauge coverage for modeling best-practices.

Data will be collected in density at least equal to the current available tools at 2-minute points for flow and pressure (15-minute for rainfall), and will undergo a thorough data quality review process to flag unreliable information.

For data collected by Localities at the sewer catchment level, HRSD will coordinate with each to review the data and make any appropriate updates to flow parameters.

16.3 Proposed Performance Assessment

Collection of data is the first step in validating the performance and effectiveness of the work completed. Evaluation of SSOs, peak system flows, and pressures will determine whether the projects completed by HRSD have achieved the desired effectiveness.

16.3.1 Target Peak Flows in the System

Similar to the Operating Pressures described in Section 9 of this plan, HRSD's Post-RWWMP Implementation is expected to create a regional sanitary sewer system that produces peak flows in line with the modeled values from this RWWMP development work. Because of the variable nature of the system, flows, and other factors, HRSD's modeling will not exactly replicate the final performance at the local catchment level or at the treatment plant level. The goal is to approximate the level of SSO control anticipated by this plan in the outcome.

Target peak flows, as described previously, have been developed at many points in the system for the 4-year Level of Service. These points have been identified in some places where an existing flow meter exists, and in others where no meter currently exists today.

Tables in Appendix G document the one hour average peak flow at selected locations for the 4-year, 4-hour wet weather event simulation with growth and with the selected RWWMP solutions and valving. The simulations applied the full Spatial Distribution Factor (SDF) bracket RHM / UHM modeling approach. The results for each location are for the SDF bracket in which the solution falls. Location-specific SDF simulations were performed report the peak flows at the Treatment Plants (TPs).

The RHM simulations include flow parameters, pump curves, pump settings and other data as simulated at the time that these values were prepared and with assumed values for planned facilities. Future simulated conditions will differ from those reported herein as the parameters and assumptions may change. The values are for the assumed 4-hour rainfall distribution where the rainfall occurs everywhere at the same time.

Three maps show the locations where flow is reported for each TP service area. Each location within a TP service area is given a unique ID called a FDP – Flow Documentation Point. The location identifier may include a suffix that provides further information where needed to further identify the location:

- D – Downstream or discharge
- U – Upstream or suction for Pressure Reducing Stations (PRSs)
- A number may be used when there is more than one upstream or downstream location

The peak one hour average flow in gallons per minute is reported at the following locations:

- TPs
- PRSs
- HRSD wastewater pump station inflow and effluent. Flows are reported for each inflow conduit when there is more than one.
- Upstream from all storage facilities. The simulated passing rate is reported downstream from storage facilities. This is the average flow rate over the duration that the storage facility is filling in the simulation.
- Upstream end of line (EOL) for all HRSD gravity mains that have inflow at the EOL location.
- Selected intermediate points in HRSD gravity and force mains where needed to identify peak flows in selected branches.

The peak one-hour average depth in feet is reported at the following locations:

- Influent to HRSD wastewater pump stations. This is the depth in the first manhole upstream from the pump station wet well. For the few pump stations where more than one HRSD gravity enters the wet well, the depth is report for all influent lines.
- Upstream EOL for all HRSD gravity mains.
- Locations where gravity storage facilities withdraw water from HRSD gravity mains.
- Selected intermediate locations of interest along HRSD gravity mains.

16.3.2 Analysis

Generally, the approach will be two-fold: evaluation of observed SSOs as well as performance testing using modeling tools.

16.3.2.1 Review of Capacity-Related SSOs within the Selected Level of Service

HRSD will continue to document all capacity-related SSOs from its system and coordinate with Localities to determine cause of SSOs in their systems. During the performance review period following RWWMP implementation, the SSOs which have occurred following completion of the RWWMP improvements will be thoroughly analyzed. Peak flows and rainfall events will be compared to the target peak flows identified in the previous section. If the recorded peak flows or rainfall event related to the SSO is clearly beyond the 4-year Level of Service, then no action is required. If the flows or rainfall event are within the range of the 4-year LOS, then further modeling will be required to test the system effectiveness.

16.3.2.2 Modeled Regional Sanitary Sewer Performance

Upon completion of the improvements in the RWWMP, HRSD will prepare a hydrologic and hydraulic model of the system. As mentioned previously, it is very likely that modeling approaches and sophistication will be much improved from that available today. The general approach that HRSD will follow is to prepare a model simulation of the system that includes updated flow inputs and facility data. This model will be calibrated against future FPR data collected post-RWWMP implementation. With a calibrated model, HRSD will run the 4-year Level of Service event to develop system flows, pressures, and SSOs.

16.3.2.3 Treatment Plant Performance

Treatment plants will also be evaluated for capacity improvements per the RWWMP. This will be done in two ways: observed flows and actual hydraulic performance. If the treatment plant is unable to process peak flows within the range of the 4-year Level of Service target flows without an unpermitted bypass or unauthorized plant discharges, then the LOS standard has not been met and additional improvements may be required to attain the LOS. Historical data will be evaluated for flows to each of the treatment plants for this analysis.

Based on the availability of modeling and testing in the future, plant performance may be evaluated using calibrated computer modeling to confirm the LOS has been achieved.

16.3.2.4 Measured and Modeled System Operating Pressures

Another means to evaluate the system performance is to compare measured system pressures to those simulated in the computer model. The Operating Pressures, as described in the previous section, have been developed using the hydraulic model with the estimated flows and facility configuration. Exceedance of these pressures does not necessarily mean the system has not achieved the LOS. Each wet weather event will impact the system differently and may or may not be within the LOS. HRSD will review the hourly average pressure data to identify any exceedance of the Operating Pressures for the performance assessment. Minimum and maximum pressures (with at least 2-minute granularity) that occur during each hour will be documented as well.

16.3.2.5 Determination of Adequate Capacity

The most appropriate way to determine if the Level of Service has been achieved is through simulation with a calibrated hydraulic model. Using the 4-year LOS event as described in the previous section, the model will identify capacity-related SSOs or surcharge violations. If any of these events occur within the 4-year LOS, then additional improvements may be necessary. In this case, HRSD will coordinate with the EPA and DEQ to submit a proposed course of action to attain adequate capacity.

16.4 Schedule

HRSD will prepare a Post-RWWMP Implementation Performance Assessment within each treatment plant service area upon completion of the projects in Phase 4 of the Adaptive Regional Plan (including post-I/I reduction flow monitoring). This will be an extensive effort but will be completed in an expeditious manner. The general steps required are as follows:

1. Conduct FPR monitoring – Minimum 6 months to 1 year
2. Develop updated hydrologic and hydraulic model – Completed concurrently with FPR monitoring
3. Calibrate the model – 6 months
4. Conduct system performance model runs with the 4-year LOS – 6 months
5. Documentation – 3 months

In total, the performance assessment in each treatment plant service area is expected to take 27 months.

Section 17

Adaptive Regional Plan

EPA has encouraged the use of adaptive management approaches in a wide variety of settings. Adaptive management features iterative decision making to manage uncertainty in addressing municipal environmental challenges. This approach has been particularly necessary with long-term community sewer rehabilitation and related programs. Almost every such program has needed multiple major modifications. In addition to responding to changing community circumstances, adaptive management also allows communities to continually prioritize the greatest public health and community benefits for the next public dollar invested. Given the scope, cost, complexity, and evolving nature of the challenges which HRSD and the Hampton Roads region face, the RWWMP necessarily features an adaptive management approach.

One of the most significant evolving integrated planning considerations which the Hampton Roads region faces is adaptation to rising sea level and increased frequency of recurrent flooding. The National Oceanic and Atmospheric Administration's Office for Coastal Management has identified Hampton Roads as experiencing the highest rate of sea level rise along the entire Atlantic seaboard and that the region is the second largest population center in the United States at risk due to the impacts of sea level rise. Addressing sea level rise poses enormous challenges for HRSD and all of the Hampton Roads communities. We must balance further investments in regional wet weather capacity with investment in adaptation and resiliency strategies, which will likely necessitate utility relocation and/or floodproofing.

Rising sea levels and the grave implications for Hampton Roads have really come into focus over the past decade since EPA began discussions with HRSD about the RWWMP. As frequency, the level and the amount of low lying lands impacted by sea level rise continue to increase, larger portions of the regional sanitary sewer system are at risk. Traditional capacity management strategies may not be effective or appropriate in these areas and future investments may be needed to develop new systems that can function in areas frequently inundated until a managed infrastructure retreat/resiliency strategy is developed for coastal land.

Additionally, there are a number of other adaptive management factors that create significant uncertainties (and opportunities) about any infrastructure investment plan that spans more than a decade. These uncertainties/opportunities include:

- The impact of sea level rise and recurrent flooding in the region's infrastructure, land use patterns and economy;
- Understanding the system response to almost $700 million in wet weather capacity-related investments and evaluation over the past ten years;
- Magnitude and spatial patterns of community growth and redevelopment;
- Future of the extensive DoD facilities in the Hampton Roads Region and HRSD priorities regarding these ubiquitous facilities throughout the service area;
- How effectively Locality and HRSD MOM programs will address sewer system degradation and I/I levels;
- Regional economic vitality and household income and employment levels;
- Changing regional environmental and public health priorities, specifically post implementation evaluation of the Chesapeake Bay TMDL after the 2025 completion;

- Changing technologies and opportunities to achieve multiple benefits for public sewer-related investments; and,
- Levels of federal and state financial support for unfunded environmental mandates.

These uncertainties will have a profound effect on the location, volume, significance and priority of future wet weather capacity-related overflows. This will particularly be the case for the capacity-related investment currently projected for the 2030-2053 program implementation period.

Figure 17-1 displays the comparison of reductions in total suspended solids (TSS), total phosphorous (TP) and total Kjeldahl nitrogen (TKN) for the RWWMP and SWIFT for a 50-year life cycle. The unprecedented reductions in nutrients and solids going to streams and the Chesapeake Bay from SWIFT are orders of magnitude greater than the reductions from the RWWMP. This graphic makes it crystal clear that the environmental benefits from SWIFT dwarf the benefits from the RWWMP.

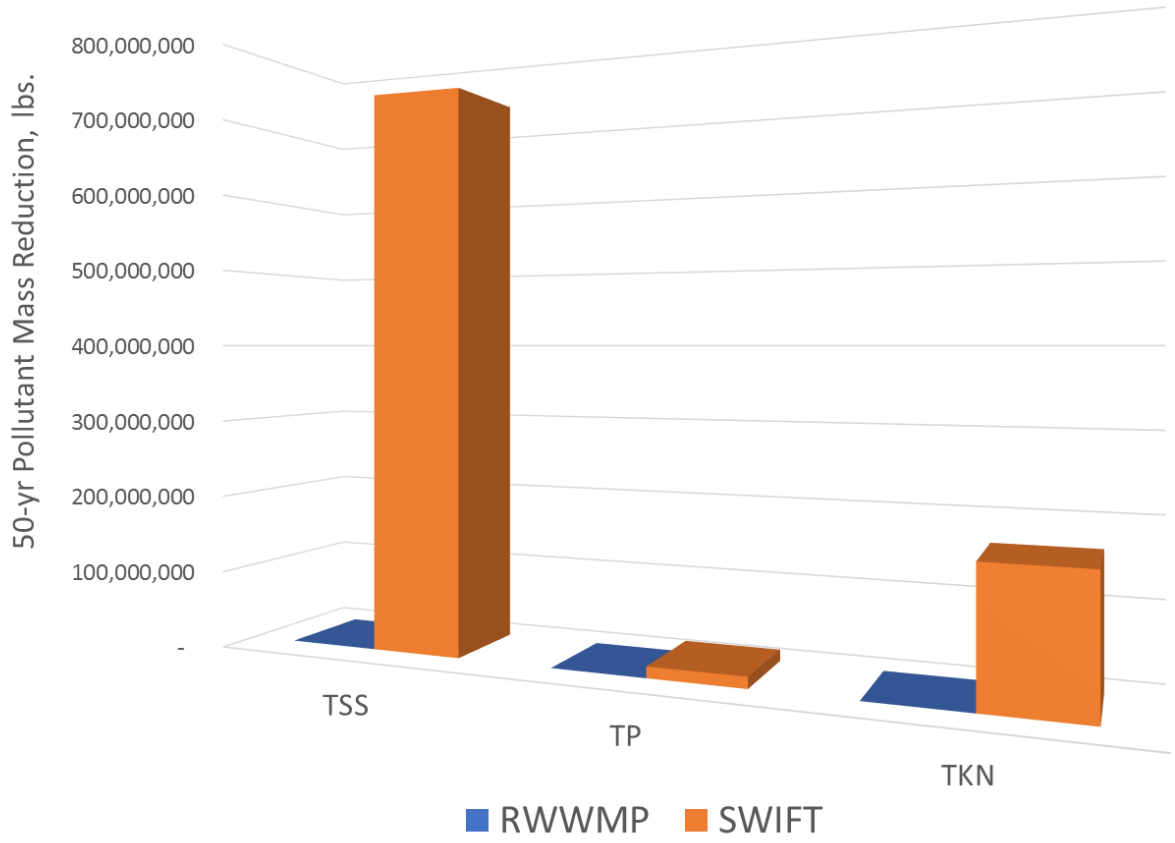

Figure 17-1. Pollutant Load Reductions – SWIFT vs. RWWMP

As part of HRSD's Integrated Plan, six High-Priority RWWMP projects will be constructed through 2030. These projects were selected based on their ability to provide the greatest environmental and human health benefits. Further, this $208 million investment will reduce SSO volume at the 5-year Level of Service by 47% - a significant reduction. Figure 17-2 depicts this reduction in modeled SSO volume at the 5-year Level of Service.

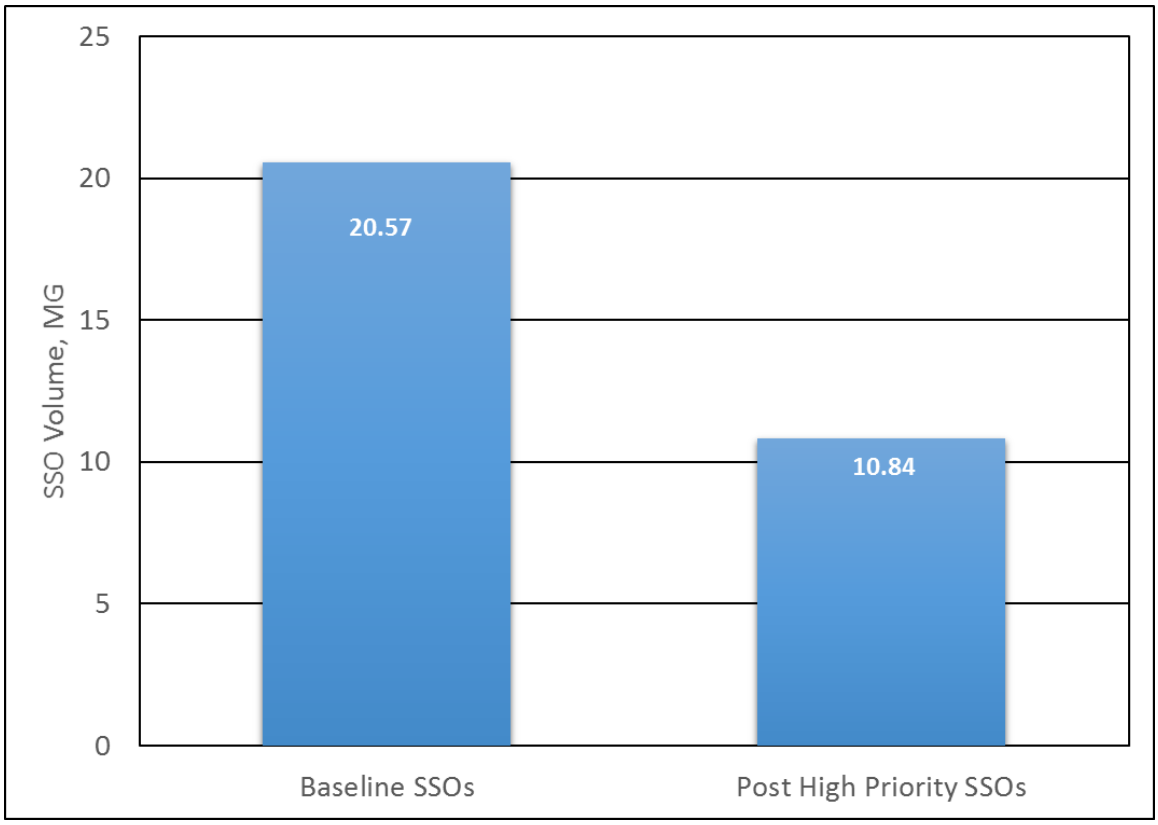

Figure 17-2. High-Priority Project SSO Reduction

In Section 14, the affordability of the RWWMP was described in detail. The financial burdens on residents of the region are widespread and significant. The impacts on vulnerable populations are particularly noteworthy with 55% of the region's households projected to pay more than 2% (the threshold considered by EPA's guidance to be high burden) of their household income for stormwater and wastewater costs. In the lowest quintile of income, households will be paying more than 9% of their household income for stormwater and wastewater services.

The economic stress, coupled with ever-changing environmental priorities necessitate an adaptive management approach to allow the region to make wise future investments through understanding and responding to the conditions as they exist in that future timeframe.

Accordingly, HRSD's plan features an Adaptive Regional Plan comprising four phases as follows:

Table 17-1. Four Phases of the Adaptive Regional Plan

Phase	Description	Timeframe	Cost
1	Planning, Interim System Improvements, Condition Assessment and Repairs, Rehabilitation Action Plan	2008 – 2025	$700,000,000
2	SWIFT Implementation, Pathogen Source Tracking Program and High-Priority Projects	2020 - 2030	$1,318,000,000
3	Re-Evaluation and Preparation of a Final Remedial Measures Plan	2028 - 2030	$2,000,000
4	Implementation of the Final Remedial Measures Plan	2030-	To be determined

17.1 Phase 1

Notwithstanding significant investments in prior years, Phase 1 of our regional wet weather program began during implementation of the Consent Decree in approximately 2008. Planning activities included implementation of a Flow, Pressure and Rainfall Monitoring system and hydraulic modeling of HRSD and 14 Locality sewer systems. Spending on these activities exceeded $70 million.

Another Phase 1 activity, Interim System Improvement (ISI) projects, has been and continues to be constructed through 2018. ISI projects consist of 45 conveyance and treatment projects that are forecast to cost approximately $400 million.

Another major component of Phase 1 is the Condition Assessment Program and the related Sewer System Prompt Repairs. HRSD performed a comprehensive assessment of the condition of its conveyance assets. Assets with defects which met certain criteria were placed into a program to ensure prompt repair. To date, 71 defects have been identified that meet the criteria and repairs have been complete or are under development. Estimated spending on these activities is approximately $50 million.

The other outcome of the Condition Assessment Program is preparation of a three-phase Rehabilitation Action Plan to be completed by 2025. Spending under the Plan is expected to cost approximately $180 million fully outside of the RWWMP.

Finally, Phase 1 will see both HRSD and the localities continued implementation of their MOM programs to address sewer system operation, maintenance and reliability.

Phase 1 activities have improved HRSD's knowledge of the condition and performance of their system and led to the repair of assets with priority defects. By 2025, Phase 1 will see upwards of $700 million invested toward the improvement of the regional sewer system.

17.2 Phase 2

Phase 2 consists of (1) constructing and putting into operation SWIFT, (2) Pathogen Source Tracking Program, (3) additional (post Phase 1) High-Priority Projects, and (4) continued MOM implementation.

The capital cost of SWIFT is currently estimated to be $1.1 billion and will include multiple Advanced Water Treatment (AWT) facilities along with associated pumping, piping and wellfields to distribute and inject the purified water into the aquifer. See Volume 1 for a more complete description of SWIFT.

There are six identified High-Priority Projects that are estimated to have a capital cost of $208 million. These projects will be built between RWWMP approval and 2030, assuming that the RWWMP is approved and entered with the Court not later than July 1, 2019. See Section 12 for more details on these projects.

The Pathogen Source Tracking Program is estimated to cost $10 million through 2030. Finally, Phase 2 will see continued HRSD and Locality implementation of their MOM programs to address sewer system operation, maintenance and reliability.

17.3 Phase 3

Phase 3 is a re-evaluation assessment and preparation of a Final Remedial Measure Plan for the review and approval of EPA and DEQ. This phase will take place between 2028 and 2030 and will culminate in submittal of a Final Remedial Measures Plan by December 31, 2030. This will provide the critical adaptive management review period while the investments in Phase 2 are ongoing.

Major activities envisioned as part of the re-evaluation include:

- Monitoring of flows and pressures in the HRSD system;
- Evaluate updated regional growth results and future projections;

- Evaluation of any remaining capacity related SSOs in the regional system;
- Hydraulic and/or hydrologic modeling using updated regional information;
- Collect and analyze available and updated data on sea level rise and precipitation trends (intensity and recurrence);
- Assessment of the impact of capacity-related overflows on water quality and human health and identification of any chronic capacity-limited locations;
- Regional collaboration to identify environmental priorities and needs;
- Develop projects and an implementation schedule to address capacity-related overflows consistent with regional priorities, financial capability, and applicable legal requirements;
- Assess regional economic trends in income and demographics and plans for DoD facilities;
- Assess the affordability impacts of performing additional work; and,
- Prepare a Final Remedial Measures Plan, in consultation with Localities, for submittal to EPA and DEQ for their review and approval. This plan will reflect both the then current realities in the Hampton Roads region and the economic health of its citizens focusing on those priority projects that provide the greatest environmental and/or human health benefits.

The Final Remedial Measures Plan may include the full suite of wet weather projects identified herein, identification of a more limited sub-set of projects providing the greatest environmental and public health benefits, abandoning further wet weather work and redirecting all resources to other regional environmental priorities or some combination of these potential outcomes.

17.4 Phase 4

Phase 4 will consist of implementing the Final Remedial Measures Plan as approved by EPA and DEQ in accordance with the schedule contained in the plan.

This Adaptive Regional Plan is an environmental and economic necessity and is consistent with EPA policy and guidance on adaptive management and integrated planning. In this plan, HRSD will have spent $2 billion by 2030 addressing the most pressing and important environmental challenges that the region faces. This spending will place a heavy burden on regional ratepayers. It is necessary to re-evaluate the needs and circumstances in 2030 to better identify the highest regional environmental priorities at that time as well as an expeditious implementation schedule for additional sewer system investments.

Appendix A: Locality Interaction

Capacity/Locality Team Meeting Attendance Sheets

Directors of Utilities Committee Meeting Agendas

Appendix A: Capacity/Locality Team Meeting Attendance Sheets

From January 2008 – August 2017

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Committee Meeting Sign-In Sheet
Committee(s): Capacity Team
Date: 14 Jan 2015

Name	Representing	E-mail	Phone No.	Fax No.
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WAYNE ROUNTREE	ISLE OF WIGHT			
Phil Hubbard	HRSD			

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Committee Meeting Sign-In Sheet
Committee(s): Capacity Team
Date: 4 Feb 2008

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WAYNE ROUNTREE	ISLE OF WIGHT			
CRAIG ZIESEMER	SUFFOLK			
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CAPACITY TEAM
FEB 11, 2008

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Steve Land	N.N.	sland@nngov.com
Stephen Williams	N.N.	SWilliams@NNGOV.COM
KEN TURNER	NORFOLK	KENNETH.TURNER@NORFOLK.GOV
JOHN CARLOCK	HRPDC	jcarlock@hrpdcva.gov
Richard Stahr	BC	rstahr@brwncald.com

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Committee Meeting Sign-In Sheet
Committee(s): CAPACITY TEAM
Date: 2/19/2008

Name	Representing	E-mail	Phone No.	Fax No.
Richard Stahr	Brown/Caldwell	rstahr@bruncald.com	704 906 7300	
Craig Zeseman	Suffolk			
Julia B. Hillegass	HRPDC			
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McCord Newsome	City of Hampton			
Ralph Patterson	City of WMBG			
Danny Poe	JCSA			
Bill Meyer	Chesapeake			
Stephen Williams	Naval Nav	swilliams@navy.com		
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Capacity Team Review of Consent Decree

2/25/08

Name	Org	Email
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Stephen Williams	Newport News	swilliams@nngov.com
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BILL MEYER	CHESAPEAKE	
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Committee Meeting Sign-In Sheet
Committee(s): CAPACITY TEAM
Date: March 3, 2008

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Richard Stahr	Brown/Caldwell	rstahr@brwncald.com		
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Chris Wilson	Brown and Caldwell	cwilson@brwncald.com	788-1854	
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PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408	-

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Committee Meeting Sign-In Sheet
Committee(s): CAPACITY TEAM
Date: 3/10/08

Name	Representing	E-mail	Phone No.	Fax No.
JOHN CARLOCK	HRPDC			
Paul Wilson	HRSD	pwilson@hrsd.com	460-7081	460-0637
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Courtney Shipley	Brown and Caldwell	cshipley@browncald.com		
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DION Walsh	JCSA	dionw@james-city.va.us	253-6820	253-6850
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DEAN PERRY	CHESAPEAKE	dperry@cityofchesapeake.net	382-6671	382-8352
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PHIL HUBBARD	HRSD	PHUBBARD@HRSD.COM	(757) 2~~82-8408~~	

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Committee Meeting Sign-In Sheet
Committee(s): Capacity Team
Date: 17 March 2008

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Richard Stahr	Brown Caldwell	rstahr@browncald.com	757 986 7300	
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Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996	
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Barry Dobbins	City of Hampton	bdobbins@hampton.gov	726-2944	
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Maray Garnett	DEQ	mggarnette deq.virginia.gov	518-2199	518-2103
KEN TURNER	NORFOLK	KENNETH.TURNER@NORFOLK.gov		664 6739
Steve Land	City of NN	sland@nngov.com	269-2751	269-2772
Kim Butler	DEQ	KSbutler@deq.virginia.gov	582148	
Maria Nold	DEQ	mrnold@deq.virginia.gov	518-2173	518-2003
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Chris Stephan	HRSD	cstephan@hrsd.com	318-4338	
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	4208300	523-4881

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Sign-In Sheet
Meeting: Capacity Team
Date: 24 March 2008

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BILL MEYER	CHESAPEAKE			
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STEVE MEDVICK	CVB - DSC	SMEDVICK@VBGOV.COM	385-8202	385-5789
Stephen Williams	Newport News	swilliams@NNGOV.COM	269-2493	269-2425
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Tony Wilson	IOW	twilson@isleofwightus.net	365-1657	
Steve Hatcher	IOW	shatcher@isleofwightus.net	365-1650	365-1662
WAYNE ROUNTREE	I of W	WROUNTRE@ISLEOFWIGHTUS.NET	365-1655	"
CRAIG ZIESEMER	SUFFOLK			
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1976	
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	420·8300	523·4881
Ken Tucker	Norfolk			

Capacity Team

4/14/08

Name	Org	Email
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Rick Dempsey	Norfolk	richard.dempsey@norfolk.g
Stephen Williams	Newport News	swilliams@nngov.com
McCord Newsome	HAMPTON	mnewsome@hampton.go
John Knowles	Chesapeake	jknowles@cityofchesapeake.net
BILL MEYER	CHESAPEAKE	
CRAIG ZIESEMER	SUFFOLK	
JOHN CARLOCK	HRPDC	

4/21/08

Capacity Team Mtg

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Phil Hubbard	HRSD	phubbard@hrsd.com
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Barry Dobbins	Hampton	bdobbins@hampton.gov
Steve Land	Newport News	sland@nngov.com
KEN TURNER	NORFOLK	KENNETH.TURNER@NORFOLK
Danny Poe	JCSA	
John Carlock	HRT→BC (late)	

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Sign-In Sheet
Meeting: Capacity Team Mtg.
Date: 5 May 2008

Name	Representing	E-mail	Phone No.	Fax No.
Julia B. Hillegass	HRPDC			
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Stephen Hatcher	Isle of Wight	shatcher@isleofwightva.net	365-1650	
Steve Williams	Newport News	swilliams@nngov.com	269-2493	269-2425
Steve Land	" "	sland@nngov.com	269-2751	269-2772
Eric Nice	CH2M Hill / Suffolk	eric.nice@ch2m.com	873-1442 x12	
Dan Holloway	CH2M Hill / Suffolk	dhollowa@ch2m.com	873-1442 x25	
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944	726-2836
McCord Newsome	City of Hampton	mnewsome@hampton.gov	727-8404	
Timothy Fortune	JCSA	tfortune@james-city.va.us	253-6836	253-6850
Bill Meyer	Chesapeake			
Chris Wilson	Brown and Caldwell	cwilson@browncald.com	518-2404	518-2401
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Capacity Team Mtg 6/9/08

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Joyce Heffington	City of NN PW	jheffington@NNgov.com

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Sign-In Sheet
Meeting: CAPACITY TEAM MTG.
Date: 16 JUNE 2008

Name	Representing	E-mail	Phone No.	Fax No.
Julia B. Hillegass	HRPDC			
Chris Wilson	Brown and Caldwell	cwilson@browncald.com	518-2404	
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Craig Ziesemer	Suffolk			
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CAPACITY TEAM
JULY 7, 2008

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Chris Wilson	Brown and Caldwell	cwilson@brwncald.com

Capacity Team Meeting
July 14, 2008
Hampton Roads PDC
1:30 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
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John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
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Stephen Williams	NN/ENG	swilliams@NNGOV.com	269-2493
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	664-6719
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Stephen Motley	Virginia Beach	smotley@vbgov.com	385-1996
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Steve Land	NN		
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2844
McCORD NEWSOME	HAMPTON	mnewsome@hampton.gov	727-6404

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Sign-In Sheet
Meeting: Capacity Team
Date: 21 July 2008

Name	Representing	E-mail	Phone No.	Fax No.
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Danny Poe	JCSA			
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CAPACITY TEAM
AUGUST 4, 2008

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STEVE LANTS	NN	
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Aug 18, 2008

Capacity Team Mtg

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Thera B. Hellegers	HRPDC	
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Danny Poe	JCSA	
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Stephen Williams	NN / GEC	swilliams@NNgov.com
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Steve Motley	Virginia Beach	smotley@vbgov.com

Capacity Team Meeting
August 25, 2008
HRPDC
1:30 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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Bill Meyer	CHESAPEAKE		
Pete Fortin	URS / York Co	pete_fortin@urscorp.com	499-4224
McCord Newsome	Hampton	mnewsome@hampton.gov	727-8404
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
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Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
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Forest Robertson	Timmons Group	forrest.robertson@timmons.com	757-236-[illegible]
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Danny Poe	JCSA	dannypoe@james-city.va.us	253-6810
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
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Phil Hubbard	HRSD	PHUBBARD@HRSD.COM	282-8408
Richard Stahr	BC	rstahr@browncald.com	804 906 7400
John Carlock	HRPDC	jcarlock@hrpdcva.gov	420-8300

Capacity Team Meeting
September 22, 2008
HRPDC
1:30 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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Bill Meyer	Chesapeake		
John Knowles	Chesapeake	jlknowles@cityofchesapeake.net	382-3405
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Kim Coffie	HRSD	kcoffie@hrsd.com	460-7089
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Pete Fortin	URS	pete_fortin@urscorp.com	499-4224
Brian Woodward	York		
Phil Hubbard	HRSD	phubbard@hrsd.com	282-8408
Ed Snyder	CH2M HILL	ed.snyder@ch2m.com	757.814.0788
Craig Ziesemer	Suffolk	cziesemer@city.suffolk.va.us	514-7024
Jay Bernas	HRSD	jbernas@hrsd.com	318-4335
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
Mel Hopkins	City of Norf	melvin.hopkins@norfolk.gov	664-6398
Joyce Heffington	NN	jheffington@nn.gov	269-2468
David Lane	HRSD	dlane@hrsd.com	460-4233
Mcord Mewsome	Hampton	mnewsome@hampton.gov	727-8404
Forest Robertson	Timmons	forest.robertson@timmons.com	213-6668
Richard Stahr	BC	rstahr@browncald.com	804 783[illegible]
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212 Ex. 11
Gary St. John	CDM	stjohnga@cdm.com	597-2624

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Sign-In Sheet Capacity Team
Meeting:
Date: 6 Oct 2008

Name	Representing	E-mail	Phone No.	Fax No.
Julia B Hillegass	HRPDC			
Richard Stahr	BC	rstahr@browncald.com	804 496 7300	
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408	
Steve Motley	CUB	smotley@vbgov.com	385-1996	
Chris Garrett	URS	christopher_garrett@urscorp.com	499-4224	
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810	
CRAIG ZIESEMER	SUFFOLK	CZIESEMER@CITY.SUFFOLK.VA.US	514-7024	
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	664-6719	
SCOTT SCHILLER	DAA / SMITHFIELD	SSCHILLER@DAA.com	804-264-2228	
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405	
Rick Underhill	Greeley + Hansen	runderhill@greeley-hansen.com	455-2212	
Joyce Heffington	NNPW WW	jheffington@nngov.com	269-2468	
Steve Land	NNPW-Wastewater	sland@nngov.com	269-2751	269-2772
McCORD NEWSOME	HAMPTON	mnewsome@hampton.gov	727-8404	
Chris Wilson	Brown and Caldwell	cwilson@browncald.com	518-2404	518-2401

Capacity Team Mtg

11/3/08

Name	Org	Email
Chris Wilson	Brown and Caldwell	cwilson@bruncald.com
Julia Billegas	HRPDC	jbillegas@hrpdcva.g
Bill Meyer	CHESAPEAKE	
Pete Fortin	URS / York Co	pete_fortin@urscorp.com
Craig Ziesemer	Suffolk	czieseme@cityofsuffolk.va.u
Stephen Williams	Newport News	swilliams@nngov.com
Scott Schiller	DAA	sschiller@daa.com
McCord Mensome	Hampton	mnewsome@hampton.gov
Patrick Marbas	Greeley & Hansen	pmarbas@greeleyhansen.co
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov
MEL HOPKINS	NORFOLK	melvin.hopkins@norfolk.gov
Robert Martz	HRSD	RMARTZ@HRSD.COM
Steve Motley	Virginia Beach	smotley@vbgov.com
Chuck Moore	CDM	MOORECI@CDM.COM
Richard Stahr	BC	rstahr@bruncald.com
David Lane	HRSD	
Danny Poe	JCSA	dannyp@james-city.va.us
James Canning	JCSA	jcanning@james-city.va.
Steve Land	City of NN	sland@nngov.com
Joyce Heffington	"	jheffington@nngov.com

Capacity Team Meeting

11/10/08

Name	Org	Email
Chris Wilson	Brown and Caldwell	cwilson@browncald.com
Steve Motley	Virginia Beach	smotley@vbgov.com
CRAIG ZIESEMER	SUFFOLK	
Dan Holloway	CH2MHill	dhalloway@ch2m.com
Joyce Heffington	NN PW WW	jheffington@nngov.com
Stephen Wallinnus	NN ENG	swallinnus@NNgov.com
DeWayne Craddock	NN ENG	—
Barry Dobbins	Hampton	bdobbins@hampton.gov
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov
BILL MEYER	CHESAPEAKE	
PETE FORTIN	URS / Y.C	pete_fortin@urscorp.com
Danny Poe	JCSA	dannyp@james-city.va.us
SCOTT SCHILLER	DRAPER ADEN	SSCHILLER@DAA.com
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov
PHIL HUBBARD	HRSD	phubbard@HRSD.com
Richard Stalar	BC	rstalar@browncald.com
Steve Land	city of NN-WW	sland@NNgov.com

Capacity Team Meeting
December 1, 2008
HRPDC
1:30 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Rick Underwill	Greeley & Hansen	runderwill@greeley-hansen.com	455-2212
Alex Echols	Chesapeake	aechols@cityofchesapeake.net	382-3401
Danny Poe	JCSA		
Pete Fortin	URS		499-4224
Steve Land	City of NN/PW	sland@nngov.com	269-2751
Joyce Heffington	NN PW	jheffington@nngov.com	269 2468
Stephen Williams	City of NN	swilliams@NNGOV.com	269-2499
DeWayne Craddock	City of NN	dcraddock@nngov.com	269-2488
Barry Dobbins	City of Hampton	bdobbins@hampton.gov	726-2944
McCord Newsome	Hampton	mnewsome@hampton.gov	727-0404
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	664-6719
Craig Ziesemer	Suffolk	czieseme@city.suffolk.va.us	514-7024
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Peter Hubbard	HRSD	phubbard@hrsd.com	282-8[illegible]
JB Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
Richard Stalur	BC	rstalur@brwncald.com	518-2400
Chris Wilson	BC	cwilson@brwncald.com	518-2404

Capacity Team Meeting
December 15, 2008
HRPDC
1:30 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
Pete FORTIN	URS	pete-FORTIN@URSCORP.COM	499-4224
Joyce Heffington	NN	jheffington@nngov.com	269-2468
Stephen Williams	NN	swilliams@NNGov.com	269-2453
Barry Dabbins	Hampton	bdabbins@hampton.gov	757-726-2944
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	757-664-6719
CRAIG EIESEMER	SUFFOLK	CEIESEMER@CITY.SUFFOLK.VA.US	514-7024
Steve Motley	Virginia Beach	smotley@vbgov.com	757-385-1996
PHIL HUBBARD	HRSD	phubbard@HRSD.com	282-8408
Richard Stahr	BC	rstahr@brunswick.va	576 2400
Chris Wilson	BC	cwilson@brunswick.com	518-2404
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
DeWayne Craddock	NN	dcraddock@NNgov.com	269-2488
Steve Land	NN-PW-WW	sland@nngov.com	269-2751
Grant Culbertson	Parsons Brinckerhoff	culbertson@pbworld.com	466-9670

Capacity Team Meeting
January 5, 2009
HRPDC
1:30 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	4208300
Bill Meyer	Chesapeake		
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
Danny Poe			
Pete Fortin	URS	pete_fortin@urscorp.com	
Steve Land	NN-Wastewater	sland@nngov.com	269-2751
DeWayne Craddock	NN-Eng Ops	dcraddock@nngov.com	269-8824
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	664-6719
Craig Ziesemer	Suffolk	czieseme@ci.suffolk.va.us	514-7024
Eddie Wrightson	TOW - GS	ewrightson@cityofwinterhaven.net	365-1655
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Phil Hubbard	HRSD	phubbard@hrsd.com	460-7089
Richard Stahr	BC	rstahr@brunecalc.com	518-2410
Chris Wilson	BC	cwilson@brunecalc.com	518-2404
Joyce Heffington	NN	jheffington@nngov.com	2692468
Stephen Williams	N.N.	swilliams@nngov.com	269-2493

CAPACITY TEAM
1/12/2009

Name	Org.	email
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com
Danny Poe	JCSA	
Pete FORTIN	URS	
Steve Land	City of NN/WW	sland@nngov.com
Joyce Heffington	" "	jheffington@nngov.com
Stephen Williams	" "	swilliams@nngov.com
DeWayne Craddock	NN - Eng. Ops.	Dcraddock@nngov.com
Barry Dobbins	City of Hampton	bdobbins@hampton.gov
McCORD NEWSOME	HAMPTON	mnewsome@hampton.gov
SCOTT SCHILLER	DENEE ADAM ASSOCIATES	SSCHILLER@DAA.COM
CRAIG ZIESEMER	SUFFOLK	CZIESEMER@CITY.SUFFOLK.VA.US
Steve Motley	Virginia Beach	smotley@vbgov.com
PHIL HUBBARD	HRSD	phubbard@HRSD.com
Richard Stalnr	BC	rstalnr@brwncald.com
[illegible]	HRPDC	
JOHN CARLOCK	HRPDC	

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

Sign-In Sheet
Meeting: Capacity Team
Date: 2 Feb 2009

Name	Representing	E-mail	Phone No.	Fax No.
Julia B. Hillegass	HRPDC			
PHIL HUBBARD	HRSD			
Steve Motley	Virginia Beach			
EDDIE WRIGHTSON	IOW			
CRAIG ZIESEMER	SUFFOLK			
Ed Simpson	CH2M HILL			
McCORD MENSOME	HAMPTON			
MEL HOPKINS	CITY OF NORFOLK	melvin.hopkins@norfolk.gov		
Barry Dobbins	Hampton			
DeWayne Craddock	Newport News	dcraddock@nngov.com		
Steve Land	N.N - P.W - WW	sland@nngov.com	757-269-2751	
Joyce Heffington	"	jheffington@nngov.com	2692468	
PETE FORTIN	URS		499-4224	
Danny Poe	JCSA			
Rick Anderson	Greeley & Hansen			
Richard Stahr	BC	rstahr@brincall.com		

Capacity Team Meeting
March 2, 2009
HRPDC
1:30 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
CRAIG ZIEDEMER	SUFFOLK	CZIEDEMER@CITY.SUFFOLK.VA.US	514-7024
Pete FORTIN	URS	pete-FORTIN@URSCORP.com	499-4224
BILL MEYER	CHESAPEAKE		
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
DeWayne Craddock	NN	dcraddock@nngov.com	269-2488
Stephen Williams	NN	swilliams@nngov.com	269-2491
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	664-6719
EDDIE WRIGHTSON	JCW		
Steve Land	NN-PW-WW	sland@nngov.com	269-2751
Steve Motley	Va Beach	smotley@vbgov.com	385-1996
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8499
Richard Stehr	BC	rstehr@brownald.com	518-2400
Chris Wilson	BC	cwilson@brownald.com	518-2404
JULIA P. Hillegass	HRPDC	jhillegass@hrpdcva.gov	4208300

CAPACITY TEAM
MARCH 9, 2009

Name	Org	email
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com
James Canning	JCSA	jcanning@james-city.va.us
~~Pete Fortin~~		
Pete Fortin	URS	pete_fortin@urscorp.com
Joyce Heffington	NNPW	jheffington@nngov.com
Steve Land	NNPW-WW	sland@nngov.com
DeWayne Craddock	NNENG	dcraddock@nngov.com
Barry Dobbins	Hampton	bdobbins@hampton.gov
McCord Newsome	HAMPTON	mnewsome@hampton.gov
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov
CRAIG ZIESEMER	SUFFOLK	CZIESEMER@CITY.SUFFOLK.VA.US
EDDIE WRIGHTSON	IOW	ewrightson@isleofwightus.NET
BRIAN WOODWARD	YORK	woodward@yorkcounty.gov
PHIL HUBBARD	HRSD	phubbard@HRSD.COM
Julia Billegas	HRPDC	jbillegas@hrpdcva.gov
Richard Stahr	BC	rstahr@browncald.com
John Knowles	Chesapeake	jknowles@cityofchesapeake.net

Capacity Team Meeting
March 16, 2009
HRPDC
12:00 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Danny Poe	JCSA		
Rick Underwill	Greeley & Hansen	runderwill@gr@greeley-hansen.com	455-2212
Pete Fortin	URS	pete_fortin@urscorp.com	499-4224
Joyce Heffington	NN	jheffington@nngov.com	269-2468
Steve Land	NN	SLand@nngov.com	
Bill Meyer	Chesapeake		
John Knowles	Chesapeake	jknowles@city-of-chesapeake.net	382-3405
DeWayne Craddock	NN	dcraddock@nngov.com	269-2488
Stephen Williams	NN	swilliams@nngov.com	269-2493
McCord Newsome	Hampton	mnewsome@hampton.gov	727-8404
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	664-6719
Eddie Wright	IOW	ewright@isle-of-wight-us.net	
Craig C. Ziesemer	Suffolk	CZIESEMER@CITY.SUFFOLK.VA.US	514-7024
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Phil Hubbard	HRSD	phubbard@hrsd.com	282-8408
Richard Stahr	BC	rstahr@brunwald.com	518-2400
Julie Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
Chris Wilson	BC	cwilson@brunwald.com	518-2404
Federico Maisch	Greeley and Hansen	fmaisch@greeley-hansen.com	455-2212

Capacity Team Meeting
April 6, 2009
HRPDC
1:30 to 4:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	cwilson@brunscalb.com	518-2404
Steve Motley	Va Beach	smotley@vbgov.com	385-1996
EDDIE WRIGHTSON	IOW	ewrightson@isleofwightus.net	365-7655
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
McCORD HENSOME	HAMPTON	mhensome@hampton.gov	727-8404
Stephen Williams	Newport HCWS	SWILLIAMS@NNVA.GOV	268-2493
DeWayne Craddock	Newport News	dcraddock@nngov.com	269-2488
Joyce Heffington	NN PW WW	jheffington@nngov.com	269 2468
Steve Land	NN PW-WW	sland@nngov.com	269-2751
Pete FORTIN	URS	pete_fortin@urscorp.com	499-4224
CRAIG ZIESEMER	SUFFOLK	SUFFOLKVA.US CZIESEMER@CITY.	514-7024
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408
RICHARD STAHR	BC	rstahr@brunscalb.com	518-2400

Capacity Team Meeting
May 4, 2009
HRPDC
1:30 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	Brown and Caldwell	Cwilson@brwncald.com	518-2404
Marty Schlesinger	Gloucester County	MSchlesi@Gloucesterva.info	(804)693-1230
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Bill Meyer	CHESAPEAKE		
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
Pete Fortin	URS	pete_fortin@urscorp.com	499-4224
Joyce Heffington	NN PW	jheffington@nngov.com	269-2468
Steve Land	NN-PW-WW	sland@nngov.com	269-2751
Stephen Williams	NN-ENG	SWilliams@NNGOV.com	269 2493
DeWayne Craddock	NN-ENG	dcraddock@nngov.com	269-2488
McCord Newsome	Hampton	mnewsome@hampton.gov	727-0404
Scott Schiller	Draper Aden Assoc.	sschiller@DAA.com	804-264-2278
Craig Ziesemer	Suffolk	czieseme@City.Suffolk.va.us	514-7024
Eddie Wright Sr	IoW	ewrightsr@isleofwight-us.net	365-1655
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
Stephen Motley	Va Beach	smotley@vbgov.com	385-1996
Phil Hubbard	HRSD	phubbard@hrsd.com	282-6408
Julia Billegass	HRPDC	jbillegass@hrpdcva.gov	420-8300
Richard Stahr	BC	rstahr@brwncald.com	518-2400

Capacity Team Meeting
June 15, 2009
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	Brown and Caldwell	Cwilson@browncald.com	518-2404
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
Bill Meyer Jr.	CHESAPEAKE		
ARNIE FRANCIS	GLOUCESTER	sfrancis@gloucestervainfo.com	804 693-1230
Pete Fortin	URS	pete_fortin@urscorp.com	499-4224
DeWayne Craddock	NNGOV	dcraddock@nngov.com	269-2488
Joyce Heffington	NN PW	jheffington@nngov.com	2692468
Stephen Williams	NN Engr.	swilliams@nngov.com	
Steve Land	NN - Wastewater	sland@nngov.com	269-2751
McCord Newsome	Hampton	mnewsome@hampton.gov	727-8404
Barry Dobbins	Hampton	bdobbins@hampton.gov	727-2944
CRAIG ZIESEMER	SUFFOLK	CZIESEMER@CITY.SUFFOLK.VA.US	514-7024
Danny Poe	JCSA		
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408
Richard Stahr	BC	rstahr@browncald.com	518-2400

Capacity Team Meeting
July 6, 2009
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Julia B Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8301
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
MEL HOPKINS	NORFOLK	mel.hopkins@norfolk.gov	664-6398
ARNIE FRANCIS	GLOUCESTER	sfrancis@gloucesterva.info	804 693-1230
Pete FORTIN	URS	pete_fortin@urscorp.com	499-4224
DeWayne Craddock	NN ENG	dcraddock@nngov.com	269-2488
Stephen Williams	NN ENGINEERING	swilliams@nngov.com	269-2497
Joyce Heffington	NN PW	jheffington@nngov.com	269-2468
Steve Land	NN PW - WW	sland@nngov.com	757-269-2751
McCORD MENSOME	HAMPTON	mmensome@hampton.gov	727-0404
EDDIE WRIGHTSON	JCC	awrightson@kleinwrightus.net	625-1655
Danny Poe	JCSA		
CRAIG ZIESEMER	SUFFOLK		
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8708
Richard Stehr	BC		518-2400
Chris Wilson	BC	cwilson@bowcalb.com	518-2404

Capacity Team Meeting
August 17, 2009
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	Cwilson@brownculd.com	518-2404
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
BILL MEYER	CHESAPEAKE		
Rick Underwood	Greeley & Hansen	runderwood@greeley-hansen.com	455-2212
ARNIE FRANCIS	GLOUCESTER	sfrancis@gloucesterva.info	693-4044
PETE FORTIN	URS	PETE_FORTIN@URSCORP.COM	499-4224
Stephen Williams	NN/ENG	SWILLIAMS@NNGOV.COM	269 2493
DeWayne Craddock	NN/ENG	dcraddock@nngov.com	269-2488
Barry Dobbins	City of Hampton	bdobbins@hampton.gov	726-2944
ACCORD NEWSOME	HAMPTON	mnewsome@hampton.gov	727-6404
[illegible] WRIGHTSON	TOW	[illegible]@[illegible]wrightus.net	365-1655
MEL HOPKINS	CON	melvin.hopkins@norfolk.gov	664-6398
CRAIG ZIESEMER	SUFFOLK		
Stephen Motley	Virginia Beach	smotley@vbgov.com	226-0884
PHIL HUBBARD	HOLSD	phubbard@hrsd.com	282-8400
Richard Stalur	BC	rstalur@brownculd.com	518-2400
Steve Land	NN-WW	sland@nngov.com	269-2751
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Danny Poe	JCSA		

Capacity Team Meeting
October 5, 2009
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
BILL MEYER	CHESAPEAKE		
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
ARNIE FRANCIS	GLOUCESTER	sfrancis@gloucesterva.info	804 693-4044
PETE FORTIN	URS	pete_fortin@urscorp.com	499-4224
CRAIG ZIESEMER	SUFFOLK		
DeWayne Craddock	Newport News	dcraddock@nngov.com	269-2488
Stephen Williams	Newport News	swilliams@nngov.com	269-2493
MICCORD NEWSOME	HAMPTON	mnewsome@hampton.gov	727-6404
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
FRANK HALTOM	ISLE OF WIGHT	Fhaltom@isleofwightus.net	365-6385
MEL HOPKINS	CON	melvin.hopkins@norfolk.gov	664-6398
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8708
Richard Stalw	BC	rstalw@brunwald.com	518-2400
Chris Wilson	BC	cwilson@brunwald.com	518-2404
Joyce Heffington	NNPW WW	jheffington@nngov.com	269-2468
Steve Land	NNPW-WW	sland@nngov.com	269-2751
Bill Hopkins	Town of Smithfield	bhopkins@smithfieldva.gov	365-4233

Capacity Team Meeting
November 2, 2009
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Rick Underwell	Greeley and Hansen	runderwell@greeley-hansen.com	455-2212
BILL MEYER	CHESAPEAKE		
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	
Pete FORTIN	URS	pete_fortin@urscorp.com	499-4224
Joyce Heffington	NN PW	jheffington@nngov.com	269-2468
DeWayne Craddock	NN ENG	dcraddock@nngov.com	269-2488
Stephen Williams	NN ENG	swilliams@nngov.com	269-2493
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
McCord Newsome	Hampton	mnewsome@hampton.gov	727-0404
FRANK HALTOM	ISLE OF WIGHT	fhaltom@isleofwightus.net	365-6388
MEL HOPKINS	CON	melvin.hopkins@norfolk.gov	664-6398
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
Danny Poe	JCSA		
CRAIG ZIESEMER	SUFFOLK		
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408
Richard Stahr	BC	rstahr@brwncald.com	518-2400
Chris Wilson	BC	cwilson@brwncald.com	518-2404

Capacity Team Meeting
November 16, 2009
HRPDC
~~1:00~~ 1:30 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
CRAIG ZIESEMER	SUFFOLK		
PHIL HUBBARD	HRSD	PHUBBARD@HRSD.com	282-8408
Richard Stabler	BC	rstabler@brancalle.com	518-2400
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
BILL MEYER	CHESAPEAKE		
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Pete FORTIN	URS	pete_FORTIN@URSCORP.com	498-4224
Steve Land	NN-PW-WW	sland@nngov.com	269-2751
Joyce Heffington	NN PW WW	jheffington@nngov.com	269-2468
Stephen Williams	NN-EWB	swilliams@NNGOV.com	269-2493
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
McCord Newsome	Hampton	mnewsome@hampton.gov	727-8404
FRANK HALTOM	I.O.W.	fhaltom@IWUS.net	365-6388
KEN TURNER	NORFOLK	KENNETH.TURNER@NORFOLK.GOV	664-6701
Danny Poe	JCSA	dannyp@james-city.va.us	757 253-6810
Chris Wilson	BC	cwilson@brwcalle.com	757-518-2400

Capacity Team Meeting
December 7, 2009
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	cwilson@bruncald.com	518-2404
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
BILL MEYER	CHESAPEAKE		
Rick Underwill	Greeley & Hansen	runderwill@greeley-hansen.com	455-2212
PETE FORTIN	URS	PETE_FORTIN@URSCORP.COM	499-4224
ARNIE FRANCIS	GLOUCESTER COUNTY	sfrancis@gloucesterva.info	804 693-1230
Joyce Heffington	NN PW WW	jheffington@nngov.com	2692468
Stephen Williams	NN ENG	swilliams@NNGOV	269-2493
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
FRANK HALTOM	IOW	fhaltom@iwus.net	365-6388
Shelly Frie	CH2M HILL	shelly.frie@ch2m.com	671-6222
CRAIG ZIEDEMER	SUFFOLK		
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-6408
RICHARD STAHR	B&C	RSTAHR@BRUNCALD.COM	(704) 906-7300
Steve Land	NN-PW-WW	sland@nngov.com	269-2751

Capacity Team Meeting
March 1, 2010
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Rick Underwood	Greeley & Hansen	runderwood@greeleyhansen.com	455-2212
Pete Fortin	URS	pete_fortin@urscorp.com	499-4224
Joycelle Ffington	NNPW aw	jheffington@nngov.com	269-2468
Steve Land	NN-PW-WW	sland@nngov.com	269-2751
Stephen Williams	NN / Engl	swilliams@nngov.com	269-2483
McCord Newsome	Hampton	mnewsome@hampton.gov	727-0404
NICK MAGURNEY	VA BEACH	nmagurne@vbgov.com	385-4352
FRANK HALTOM	I.OW	fhaltom@IWUS.NET	365-6388
Danny Poe	JCSA	dannyp@james-city.va.us	253
CRAIG ZIESEMER	SUFFOLK		
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Julia B. Hillegass	HRPDC	jhillegass@hrpdcva.gov	420-8300
PHIL HUBBARD	HRSD	phubbard@HRSD.COM	282-8408
Richard Stahr	BC	rstahr@brunwald.com	518-2400
Chris Wilson	BC	cwilson@brunwald.com	518-2404

Capacity Team Meeting
June 7, 2010
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	387-3405
Bill Meyer	Chesapeake		
Rick Underwill	Greeley + Hansen	runderwill@greeley-hansen.com	455-2215
Pete Fortin	URS	pete_fortin@urscorp.com	499-4224
Arnie Francis	Gloucester	sfrancis@gloucesterva.info	804 693 1230
Stephen Williams	Newport News Waterworks	swilliams@nnwater.com	269-2493
Joyce Heffington	NN PW WW	jheffington@nngov.com	269 2468
McCord Newsome	Hampton	mnewsome@hampton.gov	727-8404
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
Craig Ziesemer	Suffolk		
Nick Nagurney	VB	nnagurney@vbgov.com	385-4352
Rich Nettleton	VB	rnettleton@vbgov.com	385-8487
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
Steve Motley	CVB/PU	smotley@vbgov.com	385-1996
Frank Haltom	IOW	fhaltom@iwus.net	365-6385
Eric Rosser	IOW	erosser@iwus.net	357-5442
Pete Hubbard	HRSD	phubbard@HRSD.com	282-8408
Richard Stahr	BC	RStahr@brunswickco.va	578-2400
Chris Wilson	BC	cwilson@brunswickco.va.com	518-2404

Capacity Team Meeting
June 21, 2010
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Bill Meyer	Chesapeake		
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	455-2212
Pete Fortin	URS	pete_fortin@urscorp.com	499-4224
Andre Francis	Gloucester	sfrancis@gloucesterva.info	804 693 1230
Stephen Williams	Newport News	swilliams@nngov.com	269-2493
Joyce Heffington	NN PWWW	jheffington@nngov.com	269-2468
Julia Billegass	HRPDC	jbillegass@hrpdcva.gov	420-8300
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
Eric Prosser	IOW	eprosser@isle-of-wight.us.net	357-5442
Craig Ziegemeier	Suffolk		
Nick Nagurney	VB		385-4352
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Phil Hubbard	HRSD	phubbard@hrsd.com	282-8488
Chris Wilson	AC	cwilson@bruncald.com	518-2404

CAPACITY TEAM MTG
JULY 19, 2010

NAME	ORG	Email
Jenny Tribo	HRPDC	jtribo@hrpdva.gov
Rick Underhill	Greeley and Hansen	runderhill@greeley-hansen.com
John Knowles	Chesapeake	jknowles@cityofchesapeake.net
NICK NAGURNEY	VB	nnagurney@vbgov.com
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Stephen Williams	Newport News Eng.	SWilliams@NNGov.com
Joyce Heffington	NNPW WW	jheffington@nngov.com
Steve Land	NN-PW-WW	sland@nngov.com
Chip Smith	Woolpert/Hampton	Chip.smith@woolpert.com
David Powell	Woolpert/Hampton	david.powell@woolpert.com
Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov
Eric Rosser	I.O.W.	erosser@isle of wight.net
Bill Walker	URS/Suffolk	bill_walker@urscorp.com
Shelly Frie	CH2M HILL/Suffolk	shelly.frie@ch2m.com
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Rich Nettleton	CVB/FHEN	rnettle@vbgov.com
Steve Motley	Virginia Beach	smotley@vbgov.com
PHIL HUBBARD	HRSD	phubbard@HRSD.com
Richard Stahr	BC	rstahr@brownveatch.com

Capacity Team Meeting
August 16, 2010
HRPDC
1:00 to 2:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
MIKE MORGAN	CDM	morganmc@cdm.com	318.9826
BILL MEYER	CHESAPEAKE		
Rick Underwill	GHD	runderwill@greeley-hansen.com	455-2212
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
PETE FORTIN	URS	pete_fortin@urscorp.com	499-4224
ARNIE FRANCIS	GLOUCESTER	jfrancis@gloucesterva.info	804 693-1230
Steve Land	City of NN	sland@nngov.com	757-269-2751
Joyce Heffington	" "	jheffington@nngov.com	269-2468
Steve Williams	City of NN	swilliams@nngov.com	269-2493
Barry Dobbins	City of Hampton	bdobbins@hampton.gov	726-2944
David Powell	Woolpert	david.powell@woolpert.com	398-6878
CHIP SMITH	WOOLPERT	chip.smith@woolpert.com	704-519-5472
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Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
CRAIG ZIESEMER	SUFFOLK	~~czieseme@city.suffolk.va.us~~	514-7024
Stephen Motley	Virginia Beach	smotley@vbgov.com	385-1996
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408
Richard Stahr	BC	rstahr@brwncald.com	518-2400
Chris Wilson	BC	cwilson@brwncald.com	518-2400

Capacity Team Meeting
August 23, 2010
HRPDC
1:30 to 4:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
BILL MEYER	CHESAPEAKE		
MIKE MORGAN	CDM	morganmc@cdm.com	313.9826
Rick Underhill	G+H	runderhill@gresham-hansen.com	455-2212
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	383-3405
PETE FORTIN	URS	PETE-FORTIN@URSCORP.COM	499-4224
Stephen Williams	NN/TREB		
Steve Land	NN-PW-WW	sland@nn.gov.com	757-269-2751
Joyce Heffington	NN PW WW	jheffington@nngov.com	2692468
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
CHIP SMITH	WOOLPERT	Chip.smith@woolpert.com	704-519-5978
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Brian Rosser	I.O.W.	erosser@isleofwightus.net	357-5402
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
CRAIG ZIESEMER	SUFFOLK		
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
CARLOS TOPO	BC.	ctopo@brunconcld.com	407.661-9562
Richard Stahr	BC	RStahr@brunconcld.com	518-2400
Chris Wilson	BC	cwilson@brunconcld.com	518-2404

Special Capacity Team Meeting
September 13, 2010
HRPDC
1:00 to 3:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
GARY ST. JOHN	CDM	stjohnga@cdm.com	597-2624
MIKE MORGAN	CDM	morganmc@cdm.com	318.9826
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BILL MEYER	CHESAPEAKE		
PETE FORTIN	URS	PETE_FORTIN@URSCORP.COM	499-4224
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Harold Tenney	Poquoson	atenney@prismcc.com	874-5670
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David Powell	Woolpert	david.powell@woolpert.com	549-5382
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PHIL HUBBARD	HRSD	phubbard@HRSD.COM	282-8408
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Name	Org/Department	Email	Phone
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Stephen Williams	NN/EMG	swilliams@NNGOV.com	269-2493
Aaron Nelson	Brown&Caldwell	anelson@brwncald.com	518-2410
Damien Smith	Newport News	dasmith@nngov.com	269-2488
Chris Wilson	BC	cwilson@brwncald.com	518-2400
Richard Stahr	BC	rstahr@brwncald.com	518-2400

Special Capacity Team Meeting
October 12, 2010
HRPDC
1:00 to 3:30 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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Maria Nold	DEQ	maria.nold@deq.virginia.gov	518 2173
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Paul Meyer	Chesapeake		
Rick Underhill	GKH	runderhill@greatley-hansen.com	455-2212
Steve Land	NN-PW-WW	sland@nngov.com	269-2751
Joyce Heffington	NN PW WW	jheffington@nngov.com	2692468
Stephen Williams	NNCMG	swilliams	269-2493
Aaron Tenney	Prism C.E.	atenney@prismce.com	570-1722
David Powell	Woolpert	david.powell@woolpert.com	549-5382
CHIP SMITH	WOOLPERT	chip.smith@woolpert.com	704-519-5478
ARNIE FRANCIS	Gloucester	sfrancis@gloucesterva.info	804 693 1230
FRANK HALTOM	IOW	fhaltom@iwus.net	757 365-6388
Eric Rossner	IOW	erossner@iwus.net	757-357-5442
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CRAIG ZIESENER	SUFFOLK	czieseneR@CI.TI.SUFFOLK.VA.US	514-7024
Stephen Motley	Virginia Beach	smotley@vbgov.com	385-1596
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408
Richard Stoker	BC	RStoker@brownandca	518-2400
Chris Wilson	BC	cwilson@brownald.com	518-2404

Capacity Team Meeting
October 18, 2010
HRPDC
1:30 to 4:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	cwilson@bruncald.com	518-2404
Aaron Nelson	BC	anelson@bruncald.com	518-2410
Mike Morgan	CDM	morganmc@cdm..com	318-9826
Bill Meyer	Chesapeake		
Rick Underhill	G&H	runderhill@greeley-hansen.com	455-2212
Pete Fortin	URS	pete-fortin@urscorp.com	499-4224
Arnie Francis	Gloucester	jfrancis@gloucestercva.info	804 693 12300
David Powell	Woolpert	david.powell@woolpert.com	549-5382
Barry Dabbs	Hampton	bdabbs@hampton.gov	726-2944
Chip Smith	Woolpert	chip.smith@woolpert.com	704-519-5478
Shelly Frie	CH2M Hill	shelly.frie@ch2m.com	757-671-6222
Craig Fiesemer	Suffolk		
Danny Poe	JCSA	dannyp@james-city.va.us	253-6810
Rich Nettleton	CVB	rnettlet@vbgov.com	757-385-8487
Nick Haguerney	CVB	nhaguerne@vbgov.com	757-385-4352
Gary St. John	CDM	stjohnga@cdm.com	597-2624
Stephen Motley	Virginia Beach	smotley@vbgov.com	757-385-1996
Robert Martz	HRSD	RMARTZ@HRSD.com	757.460.7009
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Brian Woodward	York	woodwarb@yorkcounty.gov	890-3241
Stephen Williams	Newport News/E&G	swilliams@nngov.com	269-2493
Joyce Heffington	NNPW WW	jheffington@nngov.com	269 2468
Steve Land	NNPW WW	sland@nngov.com	269-2751
Aaron Tenney	Prism C.E.	atenney@prismce.com	570-1922
Richard Stahr	BC	rstahr@bruncald.com	518-2400
Carlos Toro	BC	ctoro@bruncald.com	407-923-6609

Capacity Team Meeting
November 1, 2010
HRPDC
1:00 PM
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	cwilson@brownald.com	518-2404
Rick Vanderhill	GHI	randerhill@greeley-hansen.com	455-2212
Bill Moyer	CHESAPEAKE		
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Pete Fortin	URS	pete-fortin@urscorp.com	499-4224
ARNIE FRANCIS	GLOUCESTER	sfrancis@gloucesterva.info	804 693 1230
Joycette Effington	NN PW WW	jeffington@nngov.com	269-2468
Steve Land	NN-PW-WW	sland@nngov.com	269-2751
Stephen Walthnes	NN/E&G	swalthnes@nn.gov.com	269-2493
Aaron Tenney	Prism C.E.	atenney@prismce.com	874-5670
David Powell	Woolpert	david.powell@woolpert.com	549-5382
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	664-6719
Eric Rosser	I.O.W.	e.rosser@isleofwightus.net	357-5442
Danny Poe	JCSA	danny.p@james-city.va.us	253-6810
CRAIG ZIESEMER	SUFFOLK	CZIESEMER@CITY.SUFFOLK.VA.US	514-7024
NICK MAGURNEY	VA BEACH	nmagurney@vbgov.com	385-4352
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8400
Richard Stahr	BC	rstahr@brownald.com	518-2400
MIKE MORGAN	CDM	morganmc@cdm.com	318-9826

Capacity Team Meeting
November 15, 2010
HRPDC
1:00 PM
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	cwilson@bruncald.com	518-2404
Rick Underwood	G+H	runderwd@gcccy-hansen.com	455-2212
Bill Meyer	CHESAPEAKE		
Pete Fortin	URS	pete.fortin@urscorp.com	489-4224
Whitney Katchmark	HRPDC		
TIFFANY SMITH	HRPDC		
Steve Lewis	NN PW-WW	slandon@nngov.com	269-3751
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Ed Snyder	CH2M HILL	edsnyder@ch2m.com	757.814.6786
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PHIL HUBBARD	HRSD	phubbard@HRSD.com	282-8408
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Richard Stahr	BC	rstahr@bruncald.com	518-2400

Capacity Team Meeting
November 22, 2010
HRPDC
1:00 PM
Attendance Sheet

Name	Org/Department	Email	Phone
MIKE MORGAN	CDM	morganmc@cdm.com	318.9826
ROBERT MARTZ	HRSD	RMARTZ@HRSD.COM	460.7009
BILL MEYER	CHESAPEAKE		
Rick Underhill	G&W	runderhill@gnaedinger-hansen.com	455-2212
ARNIE FRANCIS	GLOUCESTER	Jfrancis@gloucesterva.info.	804 693 1230
MICK MAGURNEY	VB	mmagurney@vbgov.com	385-4352
Stephen Williams	Newport News	Swilliams@nnva.com	269-2493
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David Powell	Woolpert	david.powell@woolpert.com	549-5382
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TIFFANY SMITH	HRPDC	tsmith@hrpdcva.gov	420-8300
Danny Poe	JCSA	james-city.va.us	253-6510
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CRAIG ZIESEMER	SUFFOLK	CZIESEMER@SUFFOLKVA.US	514-7026 NEW E-MAIL
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Richard Stabler	BC	rstabler@brunswickco.com	518-2400
Chris Wilson	BC	cwilson@brunswickco.com	518-2404

Capacity Team Meeting
December 6, 2010
HRPDC
1:00 PM
Attendance Sheet

Name	Org/Department	Email	Phone
CARLOS TORO	BROWN AND CALDWELL	ctoro@browncald.com	407-661-9500
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Rick Underhill	GH	runderhill@greeley-hansen.com	455-2212
Ted Garty	Chesapeake	tgarty@cityofchesapeake.net	382-3402
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Joyce Heffington	NNPW	jheffington@nngov.com	269-2468
Stephen Williams	NNPW	swilliams@nngov.com	269-2483
Aaron Tenney	Prism C.E.	atenney@prismce.com	874-5670
Eric Rosser	I.O.W.	erosser@isleofwightus.net	357-5442
David Powell	Woolpert	david.powell@woolpert.com	549-5382
Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov	365-4233
Rick Dempsey	Norfolk	richard.dempsey@norfolk.gov	664-6719
James Canning	JCSA		
MIKE MORGAN	CDM	morganmc@cdm.com	318-9826
Danny Poe	JCSA	dannypo@james-city.va.us	253-6810
RICK NETTLETON	CVB/PWSA	rnettleton@vbgov.com	385-[illegible]
Ed Snyder	CH2M HILL	edsnyder@ch2m.com	757-814-0788
CRAIG ZIESEMER	SUFFOLK	czieseme@suffolkva.us	514-7024
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408
Richard Stahr	BC	rstahr@browncald.com	518-2400
Chris Wilson	BC	cwilson@browncald.com	518-2404
Steve Land	NN-PW-WW	sland@nngov.com	269-2751

Capacity Team Meeting
December 13, 2010
HRPDC
1:00 PM
Attendance Sheet

Name	Org/Department	Email	Phone
CARLOS TORO	BROWN AND CALD.	ctoro@browncald.com	407-661-9562
BILL MEYER	CHESAPEAKE		
Rick Underhill	Q+A	runderhill@greeley-hanger.com	455-2212
Pete Fortin	URS	pete_fortin@urscorp.com	4994774
ARNIE FRANCIS	GLOUCESTER	jfrancis@gloucesterva.info	804 693 1230
Steve Land	NN-PW-WW	sland@nngov.com	757-269-2791
Joyce Heffington	NN PW WW	jheffington@nngov.com	269-2468
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Chris Wilson	BC	cwilson@browncald.com	518-2404

Capacity Team Meeting
December 20, 2010
HRPDC
1:00 PM
Attendance Sheet

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John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
BILL MEYER	CHESAPEAKE		
ARNIE FRANCIS	Gloucester	sfrancis@gloucesterva.info	804 693 12-30
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Joyce Heffington	NNPW WW	jheffington@nngov.com	2692468
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Evan Rosser	I.O.W.	erosser@isleofwightus.net	357-5442
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Capacity Team Meeting
January 3, 2011
HRPDC
1:00 PM
Attendance Sheet

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MIKE MORGAN	CDM	morganmc@cdm.com	318-9826
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Capacity Team Meeting
January 10, 2011
HRPDC
1:00 PM
Attendance Sheet

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Stephen Williams	NN/ENG	SWILLIAMS@NNGOV.COM	269-2493
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Capacity Team Meeting
January 18, 2011
HRPDC
1:00 PM
Attendance Sheet

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Chris Wilson	BC	cwilson@brunswickcounty.com	518-2404

Capacity Team Meeting
February 7, 2011
HRPDC
1:00 PM
Attendance Sheet

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Danny Poe	VDOT		
CRAIG ZIESEMER	SUFFOLK		
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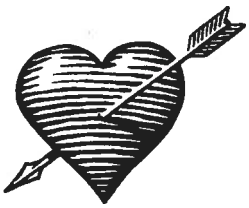
Capacity Team Meeting
February 14, 2011
HRPDC
1:00 PM
Attendance Sheet



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By phone			
Richard Stahr	BC		
Carlos Toro	BC		

Capacity Team Meeting
February 22, 2011
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
March 7, 2011
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
March 14, 2011
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
March 21, 2011
HRPDC
1:00 PM
Attendance Sheet

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Whitney Katchmark	HRPDC		
Tiffany Smith	HRPDC		
John Carlock	HRPDC		
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Special Capacity Team Meeting
April 4, 2011
HRPDC
1:00 to 3:30 pm
Attendance Sheet

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Richard Stein	RC		

Capacity Team Meeting
April 11, 2011
HRPDC
1:00 PM
Attendance Sheet

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Stephen Williams	NN/GW	swilliams@nngov.com	269-2493
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Capacity Team Meeting
April 18, 2011
HRPDC
1:00 PM
Attendance Sheet

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Steve Land	NN/PW/WW	sland@nngov.com	269-2751
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Capacity Team Meeting
May 2, 2011
HRPDC
1:00 PM
Attendance Sheet

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Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov	365-4233

Capacity Team Meeting
May 16, 2011
HRPDC
1:00 PM
Attendance Sheet

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John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Bill McFee	Chesapeake		
Marty Schlesinger	Gloucester		
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Andie Francis	Gloucester	jfrancis@gloucesterva.info	804 693-1230
Aaron Nelson	Brownand Caldwell	anelson@brownceald.com	493-1528
Stephen Williams	NN/Eng	swilliams@nnengineering	269-2993
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David Powell	Woolpert	david.powell@woolpert.com	549-5382
Chip Smith	Woolpert	chip.smith@woolpert.com	704-519-5478
Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov	365-4233
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Phil Hubbard	HRSD	phubbard@hrsd.com	282-0400
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Chris Wilson	BC	cwilson@brwncald.com	518-2404
Rick Underhill	GHH	runderhill@greeley-hansen.com	455-2212
Steve Land	NN-PW-WW	sland@nnsgov.com	269-2751

Capacity Team Meeting
May 23, 2011
HRPDC
1:00 PM
Attendance Sheet

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Bill Meyer	Chesapeake		
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Steve Land	NN-PW-WW	sland@nngov.com	757-269-2751
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Maria Nold	DEQ	maria.nold@deq.virginia.gov	518-2173
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TIFFANY SMITH	HRPDC	tsmith@hrpdcva.gov	420-8300
Chris Wilson	BC	cwilson@browncald.com	518-2404

Capacity Team Meeting
June 6, 2011
HRPDC
1:00 PM
Attendance Sheet

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Stephen Williams	City of NN	swilliams@nngov.com	269 2493
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ROBERT MARTZ	HRSD	RMARTZ@HRSD.COM	460.7009
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Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov	365-4233

Capacity Team Meeting
June 20, 2011
HRPDC
1:00 PM
Attendance Sheet

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Tiffany Smith	HRPDC	tsmith@hrpdcva.gov	413-9302

Capacity Team Meeting
July 11, 2011
HRPDC
1:00 PM
Attendance Sheet

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MARTY SCHLESINGER	Gloucester		
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STEVE LAND			
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MIKE MORGAN	CDM	morganmc@cdm.com	318-9826

Capacity Team Meeting
July 18, 2011
HRPDC
1:00 PM
Attendance Sheet

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Stephen Williams	NN/ENG	swilliams@nngov.com	269 2493
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Chris Wilson	BC	cwilson@brwncald.com	518-2404

Capacity Team Meeting
August 1, 2011
HRPDC
1:00 PM
Attendance Sheet

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Special Capacity Team Meeting
August 1, 2011
HRPDC
11:00 am to 1:00 pm
Attendance Sheet

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Joyce Heffington	NN	jheffington@nngov.com	269 2468
Stephen Williams	NN/ENG	swilliams@nngov.com	269-2493
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Aaron Tenney	Prism C.E.	atenney@prismce.com	874-5670
David Powell	Woolpert	david.powell@woolpert.com	549-5382
Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov	365-4233
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RICHARD STAHR	BC	RSTAHR@BRWNCALD.COM	(704) 906-7302

Capacity Team Meeting
August 15, 2011
HRPDC
1:00 PM
Attendance Sheet

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Stephen Williams	NN / EWC	swilliams@nngov.com	269-2493
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David Powell	Woolpert	david.powell@woolpert.com	549-5382
Chip Smith	Woolpert	chip.smith@woolpert.com	704-519-5478
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Stephen Motley	VB	smotley@vbgov.com	385-1996
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RICHARD STAHR	BC	RSTAHR@BRUNWALD.COM	704-906-7300

Capacity Team Meeting
August 22, 2011
HRPDC
1:00 PM
Attendance Sheet

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BILL MEYER	CHESAPEAKE		
John Knowles	Chesapeake		382-3405
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Steve Land	NN-PW	sland@nngov.com	269-2751
Stephanie Williams	NN Eng	swilliams@NNGOV.com	269 2493
Aaron Nelson	BC	anelson@browncald.com	518-2410
Aaron Tenney	Prism C.E.	atenney@prismce.com	874-5670
Barry Dobbins	Hampton		
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ANDY SNYDER	DRAPER ADEN	ASNYDER@DAA.com	
VICTOR VALENZUELA	DRAPER ADEN	VVALENZUELA@DAA.COM	804-264-2228
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CRAIG ZIESEMER	SUFFOLK	CZIESEMER@SUFFOLKVA.US	514-7024
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PHIL HUBBARD	HRSD	PHUBBARD@HRSD2.com	282-8408
RICHARD STAHR	BC	RSTAHR@BROWNCALD.COM	704 904-7302

Special Capacity Team Meeting
August 22, 2011
HRPDC
11:30 am to 1:00 pm
Attendance Sheet

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BILL MEYER	CHESAPEAKE		
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
BRIAN WOODWARD	YORK	woodwarb@yorkcounty.gov	890-3241
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Steve Land	NN-PW	sland@nngov.com	269-2751
Steve Williams	NN ENG	swilliams@nngov.com	269-2493
Aaron Nelson	BC	anelson@brwncald.com	518-2410
Aaron Tenney	Prism C.E.	atenney@prismce.com	874-5670
Barry Dobbins	Hampton	bdobbins@hampton.gov	726-2944
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Chris Wilson	BC	cwilson@brwncald.com	518-2404

Special Capacity Team Meeting
August 31, 2011
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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MIKE MORGAN	CDM	morganmc@cdm.com	318.9826
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RALPH PATTERSON	WMBG		
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PETE FORTIN	URS	pete_fortin@urscorp.com	499-4224
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Stephen Williams	NN/EGG	swilliams@nngov.com	262-2493
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Ellen Roberts	POQUOSON	eroberts@poquoson-va.gov	868 3025
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Capacity Team Meeting
September 12, 2011
HRPDC
1:00 PM
Attendance Sheet

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Whitney Katchmark	HRPDC		
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Capacity Team Meeting
September 19, 2011
HRPDC
1:00 PM
Attendance Sheet

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Chris Wilson	BC	cwilson@bruncald.com	
Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov	365-4233

Capacity Team Meeting
October 3, 2011
HRPDC
1:00 PM
Attendance Sheet

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Richard Stahr	BC	RStahr@brwncald.com	518-2400

Capacity Team Meeting
October 24, 2011
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
November 14, 2011
HRPDC
1:00 PM
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Capacity Team Meeting
November 7, 2011
HRPDC
1:00 PM
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Capacity Team Meeting
December 5, 2011
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
December 12, 2011
HRPDC
1:00 PM
Attendance Sheet

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Richard Stahr	BC	rstahr@browncald.com	(704) 906-7300

Capacity Team Meeting
December 19, 2011
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
January 9, 2012
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
January 23, 2012
HRPDC
1:00 PM
Attendance Sheet

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Everett Skipper	NN Engineering	eskipper@nngov.com	926-8611
Stephen Williams	NN/Eng	swilliams@nngov.com	269-2493
Steve Land	NN-PW-WW	sland@nngov.com	269-2751
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Chip Smith	Woolpert / Hampton	chip.smith@woolpert.com	704-519-5478
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Special Capacity Team Meeting
January 30, 2012
HRPDC
12:00 pm
Attendance Sheet

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Rick Chadwell	GWH	rchadwell@greatay-hansen.com	455-2212
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Chip Smith	Woolpert	chip.smith@woolpert.com	704-519-5478
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Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
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Chris Wilson	BC	cwilson@brwncald.com	518-2404

Capacity Team Meeting
February 6, 2012
HRPDC
1:00 PM
Attendance Sheet

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Special Capacity Team Meeting
February 13, 2012
HRPDC
12:00 pm
Attendance Sheet

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Special Capacity Team Meeting
February 21, 2012
HRPDC
1:00 pm
Attendance Sheet

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Reed Fowler	NN PW	rfowler@nncv.com	
Joyce Heffington	NN PW	jheffington@nngov.com	2692465
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FRANK HALTOM	I.O.W.	fhaltom@iwvs.net	365-6388

Special Capacity Team Meeting
February 27, 2012
HRPDC
12:00 pm
Attendance Sheet

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Special Capacity Team Meeting
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HRPDC
12:00 pm
Attendance Sheet

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Capacity Team Meeting
March 19, 2012
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
March 26, 2012
HRPDC
1:00 PM
Attendance Sheet

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Capacity Team Meeting
April 2, 2012
HRPDC
1:00 PM
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Capacity Team Meeting
April 9, 2012
HRPDC
1:00 pm
Attendance Sheet

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Rick Underhill	G+H	runderhill@greeley-hansen.com	455-2212
BILL MEYER	CHESAPEAKE		
PETE FORTIN	URS	pete.fortin@urs.com	499-4224
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Richard Stahr	BC	rstahr@bruncald.com	518-2400

Capacity Team Meeting
April 16, 2012
HRPDC
1:00 pm
Attendance Sheet

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Bill Walker	URS	bill.k.walker@urs.com	873-0559
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Reed Fowler	NN/PW	—	—
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Aaron Nelson	BC	anelson@broncald.com	518-2410
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RICHARD STAHL	BC	RSTAHL@BRONCALD.COM	(704) 906-7300

Capacity Team Meeting
April 23, 2012
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	cwilson@browncald.com	518-2404
MIKE MORGAN	CDM Smith	morganmc@cdmsmith.com	318-9826
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Ted Garty	Chesapeake	tgarty@cityofchesapeake.net	382-3402
BILL MEYER	CHESAPEAKE		
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PETE FORTIN	URS	pete.fortin@urs.com	499-4224
ARDIE FRANCIS	GLOUCESTER	jfrancis@gloucester-va.info	804 693-1230
Joyce Heffington	NNPWWW	jheffington@nngov.com	595-2468
Stephen Wallman	NN/EAG	swallman@nngov.com	269-2463
Aaron Nelson	BC	anelson@browncald.com	518-2410
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David Powell	Woolpert	david.powell@woolpert.com	549-5382
CHIP SMITH	WOOLPERT/HAMPTON	chip.smith@woolpert.com	704-519-5478
FRANK HALTOM	I.O.W.	fhaltom@iwus.net	365-6385
VICTOR VALENZUELA	DAA	~~VVICTOR~~ VVALENZUELA@DAA.COM	804-264-2228
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ERIN TRIMYER	Portsmouth	trimyere@portsmouthva.gov	393-8091
CRAIG ZIESEMER	SUFFOLK		
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
TIFFANY SMITH	HRPDC	tsmith@hrpdcva.gov	420-8300
Whitney Katchuck	HRPDC		

Capacity Team Meeting
May 7, 2012
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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MARTY SCHLESINGER	GLOUCESTER	mschlesi@gloucesterva.info	804 693-1230
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PETE FORTIN	URS	pete_fortin@urs.com	499-4224
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Steve Land	NN-PW-WW	sland@nngov.com	269-2751
Stephen Williams	NN / GWG	swilliams@nngov.com	269-2793
Reed Fowler	NN / PW	rfowler@nngov.com	269-2703
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BILL MEYER	CHESAPEAKE		
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Capacity Team Meeting
May 21, 2012
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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Bill Meyer	Chesapeake		
Rick Underhill	GH	runderhill@greeley-hansen.com	455-2212
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Arnie Francis	Gloucester	sfrancis@gloucesterva.info	804 693 1230
Joyce Heffington	NN	jheffington@nngov.com	269 2468
Stephen Lathem	NN	slathem@nngov.com	269-2493
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Greg Warren	POR / PENSM	GWARREN@PENSMCE.COM	874-5670
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Craig Ziesemer	Suffolk	CZIESEMER@SuffolkVA.US	514-7024
Shelly Frie	CH2M Hill	shelly.frie@ch2m.com	671-6222
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Ralph Pattiserson	WMBG		757 220-6040
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Erin Trimyer	Portsmouth	trimyere@portsmouthva.gov	393-8691
Victor Valenzuela	DAA	VVALENZUELA@DAA.COM	804-261-2228
Steve Motley	Virginia Beach	Smotley@vbgov.com	385-1996
Laura Harrell	HRSD	lharrell@hrsd.com	355-5018
Robert Martz	HRSD	RMARTZ@HRSD.COM	460.7009
Phil Hubbard	HRSD	PHUBBARD@HRSD.COM	282-8408
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Chris Wilson	BC	cwilson@broncald.com	518-2404

Capacity Team Meeting
June 4, 2012
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
GARY ST JOHN	CDM SMITH	stjohnga@cdmsmith.com	597-2624
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GREG WARREN	POB / PRISM	GWARREN@PRISMCE.COM	874-5670
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Stephen Walker	NN/Gale	swalker@NNGOV.com	269-2483
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ARNIE FRANCIS	GLOUCESTER	jfrancis@gloucesterva.info	804 693 1230
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BILL METER	CHESAPEAKE		
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Ree Fowler	City of NN	rfowler@nngov.com	269-2703

Capacity Team Meeting
June 18, 2012
HRPDC
1:00 pm
Attendance Sheet

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Steve Land	NN-PW-WW	Sland@nngov.com	269-2751
Stephen Walker	NN/GKN	swalker@NNGov.com	269-2493
Reed Fowler	NN-PW	rfowler@nngov.com	269-2703
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Ed Snyder	CH2M HILL	ed.snyder@ch2m.com	757.814.0788
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Everett Skipper	NN	eskipper@nngov.com	7579268611

Capacity Team Meeting
June 25, 2012
HRPDC
1:00 pm
Attendance Sheet

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Rick Underhill	GRH	runderhill@greeley-hansen.com	455-2212
PETE FORTIN	URS	pete_FORTIN@URS.COM	499-4224
ARNIE FRANCIS	GLOUCESTER	Jfrancis@gloucestervainfo	804 693 1238
Joyce Heffington	NN	jheffington@nngov.com	269-2468
Steve Land	NN-PW-WW	steland@nngov.com	269-2751
Christopher Pulliam	NN/ENG	SWilliam@NNGOV.com	269-2493
Aaron Nelson	BC	anelson@brownadd.com	518-2410
Ellen Roberts	PG County	ellen.roberts@pgcounty-va.gov	868 3025
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Erin Trimyer	Portsmouth	trimyere@portsmouthva.gov	393-8691
Danny Poe	JCSA	danny.poe@jamescitycountyva.gov	259-5452
Stewart Lassiter	Suffolk	slassiter@suffolkva.us	514-7019
Shelly Frie	CH2M Hill	shelly.frie@ch2m.com	671-6222
CRAIG ZIESEMER	SUFFOLK	CZIESEMER@SUFFOLKVA.US	514-7024
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
TIFFANY SMITH	HRPDC	tsmith@hrpdcva.gov	420-8300
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Bill Walker	URS	bill.k.walker@urs.com	873-0559

Capacity Team Meeting
July 16, 2012
HRPDC
1:00 pm
Attendance Sheet

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Stephen Williams	NN/EWR	swilliams@nnwater.com	269-2493
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Joyce Heffington	NN	jheffington@nngov.com	269-2468
TIFFANY SMITH	HRPDC	tsmith@hrpdcva.gov	420-8300.
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Ed Snyder	CH2M HILL	ed.snyder@ch2m.com	757-814-0788
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Paul Retel	Greeley and Hansen	pretel@greeley-hansen.com	455-2212
MIKE MORGAN	CDM Smith	morganmc@cdmsmith.com	318.9826
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Capacity Team Meeting
July 30, 2012
HRPDC
1:00 pm
Attendance Sheet

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Mike Morgan	CDM Smith	morganmc@cdmsmith.com	318-9826
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Bill Meyer	Chesapeake		
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Brent Payne	Gloucester	bpayne@gloucestervainfo	804-693-1230
Joyce Heffington	NN	jheffington@nngov.com	269 2468
Stephen Williams	NN/Gab	swilliams@nnwater.com	269 2493
Everett Skipper	NN/Eng	eskipper@nngov.com	926-8611
Aaron Nelson	BC	anelson@brownald.com	518-2410
David Powell	Woolpert	david.powell@woolpert.com	549-5382
Rick Underhill	GH	runderhill@greeley-hansen.com	455-2212
Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov	365-4233
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Paul Retel	Greeley and Hansen	pretel@greeley-hansen.com	354-7466
Shawnat Lassiter	Suffolk	slassiter@suffolkva.us	514-7016
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Steve Motley	Virginia Beach	smotley@vbgov.com	385-1994
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Whitney Katchmark	HRPDC	wkatchmark@hrpdcva.gov	"
Phill Hubbard	HRPD		
Richard Stahr	BC		

Capacity Team Meeting
August 6, 2012
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Mike Morgan	CDM Smith	morganm@cdmsmith.com	318.9826
Rick Underhill	GHH	runderhill@greatbay-hansen.com	455-2212
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Jason Garofalo	Draper Aden Assoc.	JGAROFALO@DAA.COM	804 264 2228
Pete Fortin	URS	pete.fortin@urs.com	499-4224
Arnie Francis	Gloucester	sfrancis@gloucesterva.info	804 693-1230
Melissa Lindgren	IOW	melissa.lindgren@isleofwightus.net	357-5442
Joyce Heffington	NN	jheffington@nngov.com	269-2468
Stephen Williams	NN/Eng	swilliams@nngov.com	269 2483
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Chip Smith	Woolpert/Hampton	chip.smith@woolpert.com	704-519-5478
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Danny Poe	JCSA	danny.poe@jamescitycountyva.gov	259-5452
Stewart Lassiter	Suffolk	slassiter@suffolkva.us	514-7019
Craig Ziesemer	Suffolk	czieseme@suffolkva.us	514-7024
Erin Trimyer	Portsmouth	trimyere@portsmouthva.gov	393-8891
Steve Motley	Va Beach	smotley@vbgov.com	385-1996
Tiffany Smith	HRPDC	tsmith@hrpdcva.com	420-8300
Richard Stahr	BC	rstahr@bmncolla	518-2400

Capacity Team Meeting
August 13, 2012
HRPDC
1:00 pm
Attendance Sheet

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MIKE MORGAN	CDM Smith	morganmc@cdmsmith.com	318.9826
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Rick Underwood	G+H	runderwood@greeley-hansen.com	445-2212
BILL MEYER	CHESAPEAKE		
PETE FORTIN	URS	PETE.FORTIN@URS.COM	499-4224
ARNIE FRANCIS	GLOUCESTER	Jfrancis@gloucesterva.info	804 693 2230
Aaron Nelson	BC	anelson@bruncald.com	518-2410
Joyce Heffington	NN	jheffington@hrgov.com	2692468
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CHIP SMITH	WOOLPERT / HAMPTON	chip.smith@woolpert.com	704.519-5478
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Stewart Lassiter	Suffolk	slassiter@suffolkvaus	514-7019
CRAIG ZIESEMER	SUFFOLK	CZIESEMER@SUFFOLKVA.US	514-7024
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Richard Stahr	BC	rstahr@bruncald.com	
st How Ted Heitfin	HRSD		

Capacity Team Meeting
August 27, 2012
HRPDC
1:00 pm
Attendance Sheet

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Ted Garty	Chesapeake	tgarty@cityofchesapeake.net	382-3402
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Pete Fortin	URS	pete.fortin@urs.com	499-4224
Andie Francis	Gloucester	sfrancis@gloucestervainfo	804 693 1238
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Paul Retel	Greeley and Hansen	pretel@greeley-hansen.com	
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Everett Skipper	NN	eskipper@nngov.com	9268241
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Tiffany Smith	HRPDC	tsmith@hrpdcva.gov	420-8300
Whitney Katchmark	HRPDC		
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Phil Hubbard	HRSD	phubbard@hrsd.com	282-6408
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Richard Stahr	BC	rstahr@browncald.com	518-2400

Capacity Team Meeting
September 17, 2012
HRPDC
1:00 pm
Attendance Sheet

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Ted Garty	Chesapeake	tgarty@cityofchesapeake.net	382-3402
BILL MEYER	"		
Rick Underhill	OTH	runderhill@gresley-hansen.com	455-2212
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	381-3405
Pete Forton	URS	pete_forton@urs.com	459-4224
ARNIE FRANCIS	GLOUCESTER	sfrancis@gloucesterva.info	693 1230
Joyce Heffington	NN	jheffington@nngov.com	268-2468
Stephen Williams	NN/ EMS	swilliams@nngov.com	269-2493
Aaron Nelson	BC	anelson@brwncald.com	518-2410
Everett Skipper	NN	eskipper@nngov.com	926-8611
GREG WARREN	PEKSM / POQ	GWARREN@PEKSMCE.COM	874-5670
David Powell	Woolpert	david.powell@woolpert.com	544-5382
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Capacity Team Meeting
September 24, 2012
HRPDC
1:00 pm
Attendance Sheet

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Chris Wilson	BC	cwilson@bruncald.com	518-2404
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Ted Garty	Chesapeake	tgarty@cityofchesapeake.net	382-3402
Rick Underhill	GPH	runderhill@greeley-hansen.com	455-2212
Brian Woodward	York	woodwarb@yorkcounty.gov	
Pete Fortin	URS	pete.fortin@urs.com	499-4224
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Joyce Heffington	NW PW	jheffington@nnpw.com	269-2466
Steve Walker	NN/CB	swalker@nnpw.com	269-2493
Aaron Nelson	BC	anelson@bruncald.com	518-2410
Reed Fowler	NN/PW	rfowler@nnpw.com	269-2703
Greg Warren	POA/Prism	gwarren@prismcei.com	874-5670
David Powell	Woolpert	david.powell@woolpert.com	549-5382
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Kimberly Butler	DEQ	kimberly.butler@deq.virginia.gov	518-2145
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Phil Hubbard	HRSD	phubbard@hrsd.com	282-8408
Robert Martz	HRSD	rmartz@hrsd.com	460-7009
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Dan Ruby	BC		

Capacity Team Meeting
October 15, 2012
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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Rick Underhill	GAN	runderhill@gnee/87-hansen.com	455-2212
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Ted Garty	Chesapeake		
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Steve Williams	NN Ecc	SWilliams@NNGov.com	2692493
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Reed Fowler	Newport News	rfowler@nnva.com	269-2703
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Peter Schuler	BC	pschuler@bruncald.com	704-936-6746
Anne Urenda	Draper Aden		

Capacity Team Meeting
November 5, 2012
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	cwilson@brunwald.com	518-2404
MIKE MORGAN	CDM Smith	morganme@cdmsmith.com	318.9326
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Steph Williams	NN Gov	swilliams@NNGov	269-2493
Reed Fowler	NNPW		
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Kim Butler	DEQ	Kimberly.Butler@deq.virginia.gov	518-2478
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Everett Skipper	NN		

Capacity Team Meeting
November 19, 2012
HRPDC
1:00 pm
Attendance Sheet

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BILL MEYER	CHESAPEAKE		
ARNIE Francis	Gloucester	sfrancis@gloucesterva.info	693-1230
Joyce Hoffington	NN PW	jhoffington@nngov.com	269 2468
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Anne Urenda	DAA	aurenda@doa.com	(804) 364-0630
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Capacity Team Meeting
December 2, 2012
HRPDC
1:00 pm
Attendance Sheet

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Carlos Toro	BC	ctoro@brwncald.com	518-2442
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Capacity Team Meeting
December 17, 2012
HRPDC
1:00 pm
Attendance Sheet

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Capacity Team Meeting
April 1, 2013
HRPDC
1:00 pm
Attendance Sheet

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TIFFANY SMITH	HRPDC	tsmith@hrpdcva.gov	(757) 420-8300

Capacity Team Meeting
April 15, 2013
HRPDC
1:00 pm
Attendance Sheet

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CRAIG ZIESEMER	SUFFOLK	CZIESEMER@SUFFOLKVA.US	514-7024
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Capacity Team
May 6, 2013

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Anne Urenda	Draper Aden	aurenda@daa.com
Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov
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Joyce Heffington	NN/PW	jheffington@nngov.com
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Rick Underhill	G+H	runderhill@greeley-hansen.c
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CARLOS TORO	BC	ctoro@brwncald.com
MIKE MORGAN	CDM Smith	morganmc@cdmsmith.com
Chris Wilson	BC	cwilson@brwncald.com
ROBERT MARTZ	HRSD	RMARTZ@HRSD.COM
TIFFANY SMITH	HRPDC	tsmith@hrpdcva.gov
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Richard Stein	BC	rstein@brwncald.com
Erin Trimyer	Portsmouth	trimyere@portsmouthva.gov

Reed Fowler Newport News

Capacity Team Meeting
June 3, 2013
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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Bill Meyer	"		382-6340
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Arnie Francis	Gloucester	sfrancis@gloucesterva.info	
Joyce Heffington	NN PW	jheffington@nngov.com	269 2468
Stephen Williams	NN Eng	swilliams@nngov.com	269-2493
Aaron Nelson	BC	anelson@bruncald.com	518-2410
Greg Warren	Poe! Prism	gwarren@prismce.com	874-5670
David Powell	Woolpert/Hampton	david.powell@woolpert.com	549-5387
Anne Urenda	Draper Aden Assoc.	aurenda@daa.com	(804) 364-2228
Bill Hopkins	Smithfield	bhopkins@smithfieldva.gov	365-4233
Mike Barbachem	URS Corp.	mike.barbachem@urs.com	321-1218
Kimberly Butler	DEQ	Kimberly.Butler@deq.virginia.gov	518 2148
Danny Poe	JCSA	danny.poe@jamescitycountyva.gov	757 259-5452
Stewart Lassiter	Suffolk	slassiter@suffolkvaus	514-7019
Craig Ziesemer	"	czesemer@suffolkvaus	514-7024
Steve Motley	Virginia Beach	smotley@vbgov.com	385-1996
Pete Hubbard	HRSD	phubbard@hrsd.com	282-8408
Carlos Toro	BC	ctoro@bruncald.com	518-2442
Robert Martz	HRSD	RMARTZ@HRSD.com	460 7009
Tiffany Smith	HRPDC	tsmith@hrpdcva.gov	420-8300
Richard Stahr	BC	rstahr@bruncald.com	518-2400

Capacity Team Meeting
June 17, 2013
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
Chris Wilson	BC	Cwilson@brunwald.com	518-2400
John Knowles	Chesapeake	jknowles@cityofchesapeake.net	382-3405
Paul Retel	Greeley and Hansen	pretel@greeley-hansen.com	804 643 1230
ARDIE FRANCIS	GLOUCESTER	jfrancis@gloucesterva.info	
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Stephen Williams	Newport News	swilliams@nngov.com	269-2493
Everett Skipper	NN	eskipper@nngov.com	926-8684
Reed Fowler	NN	rfowler@nngov.com	269-2703
Joyce Heffington	NN	jheffington@nngov.com	269-2468
GREG WARREN	ROSS/PRISM	GWARREN@PRISMCE.COM	814-5670
David Powell	Woolpert/Hampton	david.powell@woolpert.com	549-5382
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Kim Butler	DEQ	Kimberly.Butler@deq.virginia.gov	518 2148
Erin Trimyer	Portsmouth	trimyere@portsmouthva.gov	393-8691
Stewart Lassiter	Suffolk	slassiter@suffolkva.us	514-7019
CRAIG ZIESEMER	"	CZIESEMER@SUFFOLKVA.US	514-7024
~~HRSD~~			
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CARLOS TORO	BC	ctoro@brunwald.com	518-2442
Richard Stahr	BC	rstahr@brunwald.com	518-2400

Capacity Team Meeting
July 8, 2013
HRPDC
1:00 pm
Attendance Sheet

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MIKE MORGAN	CDM Smith	morganmc@cdmsmith.com	313.9326
Steve Motley	Va Beach	smotley@vbgov.com	385 1996
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Ted Garty	Chesapeake	tgarty@cityofchesapeake.net	382-3402
Rick Underhill	GHD	runderhill@greeley-hansen.com	455-2212
Shelly Frie	CH2M HILL	shelly.frie@ch2m.com	671-6222
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Stewart Lassiter	SUFFOLK	slassiter@suffolkva.us	574-7019
Whitney Katchmark	HRPDC		
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Capacity Team Meeting
July 22, 2013
HRPDC
1:00 pm
Attendance Sheet

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Steve Williams	" "	swilliams@NNGov.com	269-2493
GREG WARREN	POR / PRISM	GWARREN@PRISMCE.COM	874-5670
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Capacity Team Meeting
August 5, 2013
HRPDC
1:00 pm
Attendance Sheet

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Stephen Williams	Newport News	swilliams@nnva.gov	269-2493
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Capacity Team Meeting
December 1, 2014
HRPDC
1:00 pm
Attendance Sheet

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Stephen Williams	Newport News	swilliams@nnva	926-8113
ROBERT MARTZ	HRSD	RMARTZ@HRSD.com	460.7009
BRIAN WOODWARD	YORK Co	woodwarb@yorkcounty.gov	850-3241

Capacity Team Meeting
December 1, 2014
HRPDC
1:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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Aaron Nelson	BC	anelson@bruncald.com	518-2410

Capacity Team Meeting
June 2, 2014
HRPDC
1:00 pm
Attendance Sheet

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HRPDC
1:00 pm
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Whitney Katchmark	HRPDC		

CAPACITY TEAM
1/26/2015

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1/26/2015

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Rick Underhill	G+A	runderhill@greeley-hansen.com

Capacity Team Meeting
March 2, 2015
HRPDC
1:00 pm
Attendance Sheet

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Phil Hubbard	HRSD	phubbard@hrsd.com	282-5408
Richard Stahr	BC	rstahr@brungald.com	518-2400

Capacity Team Meeting
September 21, 2015
HRSD Office
1:00 pm
Attendance Sheet

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ADD TO INVITE LIST

Capacity Team Meeting
December 7, 2015

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TIFFANY SMITH	HRPDC	tsmith@hrpdcva.gov

Capacity Team Meeting
March 21, 2016
HRPDC
1:00 to 3:00 pm
Attendance Sheet

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WILL MORRIS	PORTSMOUTH PU	MORRISW@Portsmouthva.gov	393-8691
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Matthiar Wittenberg	—"—	wittenbergm@cdmsmith.com	318-9802

Capacity Team Meeting
July 18, 2016
HRPDC
1:00 to 3:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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Kate Bernatitus	City of Newport News	KBernatitus@nnva.go	269-2468
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Sherrett Lassiter	Suffolk	slassiter@suffolkva.us	574-7019
Anne Payne	Poquoson	anne.payne@poquoson-va.gov	810-6287
Sunil Khanal	City of Chesapeake	skhanal@cityofchesapeake.net	382-3416
JOHN DITTIG	CITY OF CHESAPEAKE	jdittig@C.O.C.NET	382-3405
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Seshadri Iyer	AECOM	seshadri.iyer@aecom.com	321-1273
CHIP SMITH	WOOLPERT/HAMPTON	chip.smith@woolpert.com	704-579-5478
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James Canning	JCSA	james.canning@jamescitycountyva.gov	(757) 259-4108
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Don Jennings	IOW	djennings@iwus.net	365-1655
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Matthias Wittenberg	CDM Smith	wittenbergm@cdmsmith.com	318.9802
BRIAN WOODWARD	YORK Co	woodwardb@yorkcounty.gov	890-3341

Name	Org/Department	Email	Phone
SCOTT SMITH	Brown + Caldwell	swsmith@bruncald.com	757. 518. 2417
Rick Underhill	Greeley & Hansen	runderhill@greeley-hansen.com	757-455-2212
Steve Hatcher	Isle of Wight	shatcher@ivvs.net	757-365-1650
Chris Wilson	Brown and Caldwell	cwilson@bruncald.com	757-518 2404

Capacity Team Meeting
September 19, 2016
HRPDC
1:00 to 3:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
PHIL HUBBARD	HRSD	phubbard@hrsd.com	282-8408
Jeff Scarano	BC	jscarano@broncaldi.com	518-2438
James Young	CNN	JJyoung@nnva.gov	269-2768
Kate Bernaditus	Newport News	KBernaditus@nnva.gov	269-2468
MARK SWILLEY	N.N. ENGINEERING	SSwilley@nnva.gov	926-3530
Bill Walker	AECOM	bill.k.walker@aecom.com	873-0559
Heather Stanton	Chesapeake	hstanton@cityofchesapeake.net	382-3402
LISA BASS	NORFOLK	lisa.bass@norfolk.gov	664.6398
Cherryl Barnett	Norfolk	cherryl.barnett@norfolk.gov	664.6745
Chad Edralin	Norfolk	chad.edralin@norfolk.gov	664-6736
Aaron Nelson	BC	anelson@broncaldi.com	493-1528
CHIP SMITH	WOOLPERT/HAMPTON	chip.smith@woolpert.com	704-519-5478
ANDY SNYDER	DAA/SMITHFIELD	ASNYDER@DAA.GOV	757/599-9800
Paul Retel	CH2M	paul.retel@ch2m.com	705-9954
Danny Poe	JCSA	danny.poe@jamescitycountyva.gov	259-5452
Stewart Lassiter	Suffolk DPU	slassiter@suffolkva.us	514-7019
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Brian Woodward	York County		
Sunil Khanal	Chesapeake	skhanal@cityofchesapeake.net	382-3416

Capacity Team Meeting
January 30, 2017
HRPDC
1:00 to 3:00 pm
Attendance Sheet

Name	Org/Department	Email	Phone
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CARLOS TORO	BC	ctoro@bruncald.com	518-2442
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MIKE MULL	WOOLPERT	MIKE.MULL@WOOLPERT.com	549-5396
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Will morris	Portsmouth DPU	morrisw@portsmouthva.gov	393-8691
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Steve Motley	VaBeach	smotley@vbgov.com	385-1996
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Richard Stahr	BC	rstahr@bruncald.com	518-2400

CAPACITY TEAM
APRIL 10, 2017

NAME	AGENCY	email
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Whitney Katchmark	HRPDC	
Everett Skipper	NN Engineering	eskipper@nnva.gov

Capacity Team Meeting
June 19, 2017
HRPDC
1:00 pm
Attendance Sheet

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Lisa Bass	Norfolk DPU	lisa.bass@Norfolk.Gov	664.6398
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Bill Walker	AECOM	bill.k.walker@aecom.com	383-6203
Erin Trimyer	Portsmouth	trimyere@portsmouthva.gov	393-8691
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Capacity Team Meeting
August 28, 2017
HRPDC
1:00 pm
Attendance Sheet

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Ted Garty	Chesapeake	tgarty@cityofchesapeake.net	382-6529
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Bud Curtis	Newport News	lwcurtis@nnva.gov	757-926-7891
Everett Skipper	NN	eskipper@nnva.gov	926-8684
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Richard Stahr	BC	rstahr@brwncald.com	757 518 2400

Appendix A: Directors of Utilities Committee Meeting Agendas

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

PAUL D. FRAIM, CHAIRMAN • BRUCE C. GOODSON, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

July 31, 2008

Memorandum #2008-128

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director, Physical Planning

RE: Meeting – August 6, 2008

This is to call the August Meeting of the Directors of Utilities Committee for **August 6, 2008, at 1:30 p.m.** The meeting will be held in the HRPDC Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake.

The Agenda and related materials are attached.

If you have any questions or need further information, please do not hesitate to call me or Whitney.

JMC/fh

Attachments

Copy: Capacity Team
Utilities Legal Team
Steve Land, NN
Craig Ziesemer, SU
Stephanie Tinsley, NO
Al Williams, PO
Eileen Leininger, NN
Jason L. Mitchell, HA
Richard H. Nettleton, VB
Stephen Watson, FR

HEADQUARTERS • THE REGIONAL BUILDING • 723 WOODLAKE DRIVE • CHESAPEAKE, VIRGINIA 23320 • (757)420-8300
PENINSULA OFFICE • 2101 EXECUTIVE DRIVE • SUITE C • HAMPTON, VIRGINIA 23666 • (757)262-0094

Utilities Committee

Jeffrey J. Bliemel, PQ
Daniel G. Clayton III, WM
Garrey W. Curry, Jr. GL
Lawrence A. Dame, New Kent
John B. Edwards, Jr., SY
Larry Foster, JCSA
H. Reed Fowler II, NN
J, Arnie Francis, GL
Edward G. Henifin, HRSD
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
Albert Moor II, SU
Russell Pace, FR
Brian Ramaley, NN
Wayne Rountree, IW
John Rowe, WN
James R. Spacek, PO
Peter M. Stephenson, SM
John Veneziano, HA
James K. Walski, CH
Brian K. Woodward, YK

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
AUGUST 6, 2008
CHESAPEAKE
1:30 PM

1. **Summary of July 9, 2008 Joint Meeting of the Directors of Utilities Committee.**

The Summary of the July 9, 2008 meeting of the Directors of Utilities Committee is attached for your review and approval.

ACTION: Approve the Meeting Summary.

2. **Climate Change Initiative**

As Committee members are aware, the Governor has appointed a Commission on Climate Change, which has been meeting since March. At its July meeting, Deputy Secretary of Natural Resources Nikki Rovner briefed the HRPDC on the work of the Climate Change Commission. HRPDC staff will brief the Committee on the Climate Change Commission's work and expected direction. The HRPDC staff briefing will also provide some preliminary information on scientific research related to this issue as it impacts Hampton Roads. This issue was identified during the Committee's retreat as one that should be addressed regionally during FY 2009. It is also the topic of a special grant that the HRPDC expects to receive from the Virginia Coastal Zone Management Program.

ACTION: According to discussion.

3. **Proposed Study of Impacts of Sea Level Rise on Utility Infrastructure**

As indicated at the July Committee meeting, the HRPDC staff has been contacted by Dr. Wade Smith at Noblis, Inc. concerning a proposed study of the impacts of sea level rise and storm surge flooding on water and wastewater infrastructure. Noblis is partnering with the Virginia Institute of Marine Science for this study, which has been submitted to EPA for funding. The proposal anticipates use of Poquoson and Virginia Beach as detailed study areas. At press time, HRPDC staff is attempting to finalize the logistics for a presentation on this topic. It is anticipated that Dr. Smith will brief the Committee on this effort and present related work that has been undertaken.

ACTION: None required.

4. **Marking of Private Sewer Laterals**

The Committee discussed this issue at its May and June 2008 meetings. Based on the Committee recommendation, the HRPDC, at its June 18, 2008 Executive Committee meeting, approved a letter to the State Corporation Commission indicating the region's objection to the current SCC staff interpretation of the SCC rules. Correspondence from the SCC was discussed at the July meeting.

Since that time, James City County has been cited by the SCC on the marking issue. Mr. Larry Foster, JCSA, will brief the Committee on this matter.

HRPDC staff is continuing to work with staff from VML, VACO and VAMWA to determine the best approach to address this issue. The staff anticipates having a report at the meeting.

In addition, a copy of correspondence from Delegate Cosgrove to Attorney General McDonnell concerning a contractor issue with utility line marking and enforcement. A copy is enclosed.

The Committee needs to discuss this situation and determine an appropriate course of action.

ACTION: According to discussion.

5. Capacity Team Report

The Capacity Team has continued to meet weekly. In addition, a Locality Coordination Meeting was held on July 28, 2008. A brief update will be provided by HRPDC and HRSD staff and Capacity Team members.

ACTION: According to discussion.

6. **HR FOG Report**

An expanded HR FOG committee has been meeting regularly for the past two months to develop a model FOG ordinance. The Committee is scheduled to meet on July 30, 2008. HRPDC staff will brief the Committee on the status of this effort. A draft model FOG ordinance, as developed through the HR FOG Committee, is attached for Committee review. The Committee is also developing an MOU and related technical materials. If the MOU and related efforts are completed prior to the meeting, the information will be emailed to Committee members in advance of the meeting.

ACTION: According to discussion.

7. UASI Grant

Committee members may be aware that the Hampton Roads region has been awarded $7.76 million in UASI funding for FY 2008. This is slightly less than the region received in FY 2007. At the present time, the grant includes the proposed Utilities Project that was developed by the HRPDC staff and the Committee earlier this year. HRPDC staff will brief the Committee on the regional grant and the process that is expected to be followed in finalizing individual projects to be funded through this program.

ACTION: According to discussion.

8. HRPDC Status Report

The HRPDC staff will provide a brief update on several ongoing regional activities. They include the Regional Water Supply Plan, HR WET, Grit and Grease projects,

Wetlands Training and Regional Wastewater Program. The staff does not presently anticipate reports from the Legal Team at this meeting.

ACTION: According to discussion.

9. Other Matters

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

*******RSVP – DECEMBER 2, 2008*******
*******PLEASE NOTE EARLY START TIME*******

November 26, 2008

Memorandum #2008-201

TO: Directors of Utilities Committee
Directors of Health

BY: John M. Carlock, Deputy Executive Director

RE: Meeting – December 3, 2008

This is to call the December Joint Meeting of the Directors of Utilities Committee and Directors of Health for **December 3, 2008, at 12:30 p.m.** The meeting will be held in the **HRPDC Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake**.

The Agenda and related materials are attached.

Please RSVP no later than December 2, 2008, so we may make appropriate arrangements for lunch.

The Health Directors will hold their regular meeting during the morning of December 3, 2008 in HRPDC Staff Conference Room E. A separate agenda package has been distributed for that meeting.

If you have any questions or need further information, please do not hesitate to call me or Whitney.

JMC/fh

Attachments

Copy: Capacity Team
Utilities Legal Team
Steve Land, NN
Craig Ziesemer, SU
Stephanie Tinsley, NO
Al Williams, PO
Eileen Leininger, NN
Jason L. Mitchell, HA
Richard H. Nettleton, VB
Stephen Watson, FR

Utilities Committee

Jeffrey J. Bliemel, PQ
Daniel G. Clayton III, WM
Garrey W. Curry, Jr. GL
Lawrence A. Dame, New Kent
John B. Edwards, Jr., SY
Larry Foster, JCSA
H. Reed Fowler II, NN
J, Arnie Francis, GL
Edward G. Henifin, HRSD
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
Albert Moor II, SU
Russell Pace, FR
Brian Ramaley, NN
John Rowe, WN
James R. Spacek, PO
Peter M. Stephenson, SM
John Veneziano, HA
James K. Walski, CH
Brian K. Woodward, YK
Edwin P. Wrightson, IW

Health Directors

Harry Bennett, VDH
S. William Berg, MPH, VDH
Daniel B. Horne, P.E., VDH
Wes Kleene, VDH
Demitria Lindsay, VDH
Suzanne S. Love, VDH
Lisa McCoy, VDH
Michele Monti, VDH
Venita Newby-Owens, MPH, VDH
Betty Rouse, VDH
Frank J. Scanlon, VDH
John Schellenberg, VDH
Valerie Stallings, MPH, VDH
David Trump, MPH, VDH
W. Ted Tweel, VDH
Nancy Welch, VDH

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
AGENDA
DECEMBER 3, 2008
12:30 PM

DELI BUFFET LUNCH

1. **Summary of June 4, 2008 Joint Meeting of the Directors of Utilities Committee and Directors of Health**

   The Summary of the June 4, 2008 joint meeting of the Directors of Utilities Committee and Directors of Health is attached for your review and approval.

   ACTION: Approve the Meeting Summary.

2. **Summary of November 5, 2008 Meeting of the Directors of Utilities Committee.**

   The Summary of the November 5, 2008 meeting of the Directors of Utilities Committee is attached for your review and approval.

   ACTION: Approve the Meeting Summary.

3. **VDH Regulatory Update**

   Staff from the Virginia Department of Health will provide an update on evolving regulatory issues affecting drinking water. Participants are requested to be prepared to address any other related topics that they may be aware are pending.

   ACTION: According to discussion.

4. **Roundtable Discussion**

   This is an opportunity for roundtable discussion of any issues that a Committee member wishes to bring up. At press time, no specific discussion topics have been raised.

   ACTION: According to discussion.

5. **Capacity Team Report**

   The Capacity Team has continued to meet weekly. A brief update will be provided by HRPDC and HRSD staff and Capacity Team members.

   ACTION: According to discussion.

6. HR FOG Report

As the Directors of Utilities Committee is aware, the HR FOG Program was approved by the HRPDC at its Executive Committee meeting on November 19, 2008 and referred to the localities for consideration and approval. HRPDC staff will brief the Committee on the status of this initiative. This briefing will reflect program details to ensure that the Health Directors are aware of the program.

ACTION: According to discussion.

7. Marking of Private Sewer Laterals

This issue has been discussed at several previous meetings. As Directors of Utilities are aware, the SCC held a meeting for interested stakeholders on November 17, 2008. Several Committee members participated in this discussion and may have comments on the status of this issue based on the meeting.

Also, as recommended at the November meeting, the HRPDC staff has nominated, on behalf of the Directors of Utilities Committee, Ms. Bettie Cahoon, CH, to the SCC to serve on its Damage Prevention Advisory Committee.

ACTION: According to discussion.

8. Water, Wastewater and Stormwater RFP

At the October meeting, the issue of potential consultant services to support the regional water and wastewater programs was discussed. It was recommended that the HRPDC develop a generic RFP in order to identify a list of qualified firms that could be used to support these programs when the need arises. One or more firms would be selected for continuing services agreements for regional projects or special projects to support local programs. Because similar needs exist to support regional and local stormwater management programs, the staff has included stormwater in the RFP.

The draft RFP discussed at the November 5, 2008 meeting is being revised. The HRPDC staff expects to email the revised RFP to the Committee for consideration on or about December 1, 2008. The HRPDC staff is requesting Committee input along with a recommendation that the RFP be presented to the HRPDC for approval.

ACTION: Recommend HRPDC approval of the RFP for continuing services in support of the water, wastewater and stormwater programs.

9. HRPDC Budget Report

The Subcommittee, representing the Directors of Utilities and Joint Environmental Committees to discuss the HRPDC Physical Planning Budget met on November 24, 2008. The HRPDC staff will report on the Subcommittee's deliberations and recommendations. Assuming concurrence from the Directors of Utilities and Joint

Environmental Committees at their December meetings, these recommendations will be reflected in draft program budgets to be presented at the Committee Retreats in January 2009.

ACTION: Concur with Subcommittee recommendations.

10. HRPDC Program Status Report

The HRPDC staff will provide a brief overview on several ongoing projects of interest to the Committee, including the Critical Infrastructure Resiliency Project, Ground Water Program, and impact fee legislation.

ACTION: None required.

11. Other Matters

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

*******RSVP – JANUARY 6, 2009*******
*******PLEASE NOTE EARLY START TIME AND ALTERNATE LOCATION*******

December 30, 2008

Memorandum #2008-216

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Meeting and Retreat – January 7, 2009
RSVP – January 6, 2009

This is to call the January Meeting of the Directors of Utilities Committee for **January 7, 2009, at 10:00 a.m.** The meeting will be held in the **Smithfield Center, 222 North Church Street, Smithfield, Virginia**. A location map and directions are attached.

The Agenda and related materials are attached.

This meeting is the Annual Directors of Utilities Committee Retreat. There are also several business items that will require consideration. Lunch will be provided. **Please RSVP no later than January 6, 2009**, so that we may make appropriate arrangements for lunch.

Members of the Legal Team are being provided with copies of this memorandum for information purposes. They are welcome to participate if they desire. At press time, it does not appear that any Agenda Items will require consideration by or input from the Legal Team

If you have any questions or need further information, please do not hesitate to call me or Whitney.

JMC/kg

Attachments

Copy: Capacity Team
Utilities Legal Team
Scott Kudlas, DEQ
Steve Land, NN
Eileen Leininger, NN
Jason L. Mitchell, HA
Richard H. Nettleton, VB
Stephanie Tinsley, NO
Stephen Watson, FR
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Richard H. Sedgley

MEETING AND ANNUAL RETREAT OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
JANUARY 7, 2009
10:00 AM

BUSINESS MEETING

SPECIAL PRESENTATION

1. Summary of December 3, 2008 Joint Meeting of the Directors of Utilities Committee and Directors of Health

The Summary of the December 3, 2008 joint meeting of the Directors of Utilities Committee and the Directors of Health is attached for your review and approval.

ACTION: Approve the Meeting Summary.

3. Urban Area Security Initiative (UASI) Briefing

In Spring 2008, the HRPDC, on behalf of the Directors of Utilities Committee, submitted a proposal for funding of a water system security project through the UASI Program. At the November meeting, the Committee generally agreed that the proposal should be refined and submitted for funding through the FY 09 UASI Program.

To facilitate Committee consideration of a revised or new proposal, Mr. Richard Flannery, HRPDC Emergency Management Administrator, will brief the Committee on the FY 09 UASI grant process and expectations for funding a water system project.

ACTION: According to discussion.

4. Regional Ground Water Management Program

Mr. Scott Kudlas, DEQ, will brief the Committee on the plan by the Department of Environmental Quality to contract certain aspects of the program to an outside consultant. This potential has been discussed by the Committee at its last two meetings.

As discussed at the December meeting, DEQ is requesting HRPDC financial support for this effort. At the present time, there are no uncommitted funds in the Regional Water Budget. All funds have been committed through contracts with the USGS, although some tasks in that contract have not been instituted. The Committee will need to determine whether this is an appropriate use of funding from the Regional Ground Water Management Program and, if so, the vehicle for funding the effort.

ACTION: According to discussion.

5. **Capacity Team Report**

The Capacity Team has continued to meet weekly. Mr. Richard Stahr, Brown and Caldwell, will provide the Capacity Team report, including discussion of pending issues and decisions that will need to be made.

ACTION: According to discussion.

6. **HR FOG Report**

As the Directors of Utilities Committee is aware, the HR FOG Program was approved by the HRPDC at its Executive Committee meeting on November 19, 2008 and referred to the localities for consideration and approval. HRPDC staff will brief the Committee on the status of this initiative. At press time, the HRPDC has received one (1) executed Memorandum of Agreement.

ACTION: According to discussion.

7. **Marking of Private Sewer Laterals**

This issue has been discussed at several previous meetings. As Directors of Utilities are aware, the SCC held a meeting for interested stakeholders on December 18, 2008. Materials from that meeting were circulated via email on December 23, 2008. Several Committee members participated in this discussion and may have comments on the status of this issue based on the meeting.

ACTION: According to discussion.

8. **HRPDC Program Status Report**

The HRPDC staff will provide a brief overview on several ongoing projects of interest to the Committee.

ACTION: None required.

9. **Other Matters**

COMMITTEE RETREAT

1. **Review of Program Progress - FY 2008 – 2009**

The committee will consider progress on regional water supply and wastewater activities that have been pursued over the past year. Successes, as well as areas for improvement, should be identified. HRPDC staff will provide a brief outline of activities undertaken through the committee process. Members should be prepared to discuss matters that may have been carried out through some other forum.

ACTION: According to discussion.

2. Committee Direction for FY 2009 - 2010

Committee members should be prepared to discuss water supply and wastewater issues of importance that could/should be addressed through the committee process. Thought should be given to state and national issues and initiatives that may influence potential local and regional activities. The results of this discussion will determine committee direction as well as play a significant role in shaping the Regional Water and Wastewater Program components of the HRPDC Unified Planning Work Program for FY 2009 – 2010.

At the December 2008 meeting, the Committee agreed that a flat budget should be proposed for FY 2009 – 2010 and that increased HRPDC administrative costs should be covered through use of carry-over funds from previous years. A copy of the proposed budget is attached. Level of funding from carry-over will be determined as the balance of the HRPDC budget is developed. The Committee previously indicated that any consultant costs should be handled during the year on a case-specific basis.

It can be expected that the committee and staff will need to continue to devote attention to water supply, water quality, climate change and environmental funding initiatives of the General Assembly and Administration. Regulatory initiatives such as changes to the Ground Water Withdrawal Regulation can also be expected. Evolving infrastructure funding issues at the federal level will also require staff and Committee attention during the coming months. Other issues will be identified through the Joint Environmental Committee and in informal discussions between HRPDC staff and committee members.

Based on discussions at the meeting, the staff will finalize the FY 2009 – 2010 Program and Budget, which will then be circulated via Letter Ballot for formal approval.

ACTION:

1. FY 2009 – 2010 Program elements and priorities will be determined according to discussion.
2. FY 2009 – 2010 Water and Wastewater Program Budgets will be determined in accordance with Action No. 1.

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

January 29, 2009

Memorandum #2009-21

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Meeting and Retreat – February 4, 2009
RSVP – February 3, 2009

This is to call the January Meeting of the Directors of Utilities Committee for **February 4, 2009, at 1:00 p.m.** The meeting will be held in the **HRPDC Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake**.

The Agenda and related materials are attached.

Members of the Legal Team are being provided with copies of this memorandum for information purposes. They are welcome to participate if they desire. At press time, it does not appear that any Agenda Items will require consideration by or input from the Legal Team.

If you have any questions or need further information, please do not hesitate to call me or Whitney.

JMC/fh

Attachments

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Sally Andrew, HA
William H. Riddick III
Leo P. Rogers, JC
James E. Ryan, Jr.
Richard H. Sedgley

MEETING
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
FEBRUARY 4, 2009
1:00 PM

1. Summary of December 3, 2008 Joint Meeting of the Directors of Utilities Committee and Directors of Health

The Summary of the December 3, 2008 joint meeting of the Directors of Utilities Committee and the Directors of Health is attached for your review and approval.

ACTION: Approve the Meeting Summary.

2. International Paper Briefing

Ms. Sheryl Raulston, Environmental, Health and Safety Manager at International Paper's Franklin facility, will brief the Committee on the company's water conservation and related activities.

ACTION: According to discussion.

3. Regional Ground Water Management Program

HRPDC staff will brief the Committee on the current status of the regional ground water management program, focusing on the ongoing USGS projects and discussions with DEQ on its proposed consultant initiative.

ACTION: According to discussion.

4. Regional Water Supply Plan

A. Drought Response Plan

Attached for your review is one copy of the draft Drought Response Plan, component of the regional water supply plan. This document has been prepared by HRPDC staff to conform to the Water Supply Planning Regulations and previous Committee discussions. A draft has been provided to DEQ for preliminary review. At press time, no comments have been received.

HRPDC staff will review the highlights of the report. The staff is looking for comments and concurrence from the Committee on the sufficiency of this document for inclusion in the Regional Water Supply Plan.

ACTION: Provide comments on the Drought Response Plan. Determine the sufficiency of this document as one component of the Regional Water Supply Plan.

B. DEQ Drought Web Page

DEQ has developed a drought web page that has been implemented in some portions of the Commonwealth. HRPDC staff will provide a brief overview and demonstration

of the web page. DEQ has requested regional input to the development of a companion page for Hampton Roads.

ACTION: According to discussion.

C. Regional Water Supply Plan Schedule

HRPDC will review the current schedule for development, review and completion of the draft Regional Water Supply Plan. Committee discussion and concurrence is being requested.

ACTION: According to discussion.

5. Bacteria Subcommittee Report

The Bacteria Subcommittee has continued to work on development of a regional program to examine alternative monitoring protocols and techniques for identifying bacteria sources. This work follows the spring 2009 presentations on bacteria monitoring techniques, presented by researchers from Virginia Tech, UNC and University of South Florida. A general study plan for a comprehensive regional study has been developed by the researchers and is attached. The goal of the study is to identify more definitive methodologies to differentiate between human and nonhuman sources of bacteria.

The Bacteria Subcommittee met on January 28, 2009 and will present its recommendations on going forward to the Committee for consideration. A similar briefing will be provided to the Joint Environmental Committee at its meeting on February 5, 2009.

ACTION: According to discussion.

6. Review of Committee Retreat

The January 7, 2009 meeting of the included the annual Committee retreat to address the HRPDC Work Program and Budget for FY 2010 and identification of critical issues for presentation to and discussion with the HRPDC at its Annual Retreat. The Retreat discussion is highlighted in the meeting summary (Item #1). HRPDC staff will briefly review the retreat discussion and highlight the next steps in this process.

ACTION: According to discussion.

7. Ratification of Letter Ballot on FY 2010 Regional Water and Wastewater Program Budgets

At the Retreat, the Committee reached consensus on the recommended Regional Water and Wastewater Management Program Budgets for FY 2010. Based on that consensus, the HRPDC staff distributed a Letter Ballot on the Budget to the Committee on January 22, 2009. At press time, Letter Ballots are still being received.

Assuming favorable action by Committee members prior to the meeting, the HRPDC staff will request ratification of the Letter Ballot.

ACTION: Ratify Letter Ballot approval of FY 2010 Regional Water and Wastewater Management Program Budgets.

8. Capacity Team Report

The Capacity Team has continued to meet weekly and will provide a brief status report.

ACTION: According to discussion.

9. HR FOG Report

The HR FOG Technical and Education Subcommittees are continuing to meet. HRPDC will provide a brief status report.

ACTION: According to discussion.

10. Marking of Private Sewer Laterals

The Committee's representatives to the SCC stakeholder process may have a report on activities since the January meeting.

As recommended previously by the Committee, HRPDC staff nominated Ms. Bettie Cahoon from the City of Chesapeake Department of Public Utilities to serve on the SCC Damage Prevention Committee. HRPDC staff was advised on January 28, 2009 that Ms. Cahoon has been appointed to serve on that Committee.

ACTION: According to discussion.

11. HRPDC Program Status Report

The HRPDC staff will provide a brief overview on several ongoing projects of interest to the Committee.

ACTION: None required.

12. Other Matters

For your information, the revised Water Quality Response Plan Contact List, updated as of January 2009 is attached.

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

*****ORGANIZATIONAL MEETING OF HAMPTON ROADS H2O – HELP TO OTHERS – PROGRAM – SEPARATE AGENDA TO FOLLOW *****

February 26, 2009

Memorandum #2009-38

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – March 4, 2009
RSVP – March 3, 2009

This is to call the March Meeting of the Directors of Utilities Committee for **March 4, 2009, at 1:00 p.m.** The meeting will be held in the **James Room, Fountain Plaza II, City Center, Newport News.**

The Agenda and related materials are attached.

The Board of Directors of the Hampton Roads H2O – Help To Others – Program will hold its organizational meeting. A separate Agenda package is being distributed for that meeting. The Directors of Utilities from the sixteen member localities, the Town Managers of Smithfield and Windsor and the General Manager of the Hampton Roads Sanitation District are named as the initial Board Members. Attendance by these individuals at this meeting is particularly important.

Members of the Legal Team are being provided with copies of this memorandum for information purposes. They are welcome to participate if they desire. At press time, it does not appear that any Agenda Items will require consideration by or input from the Legal Team.

If you have any questions or need further information, please do not hesitate to call me or Whitney.

JMC/fh

Attachments

Copy: Capacity Team
Utilities Legal Team
Steve Land, NN
Eileen Leininger, NN
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Richard H. Nettleton, VB
Stephanie Tinsley, NO
Stephen Watson, FR
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Joseph F. Phillips, Jr., WM
Bernard A. Pishko, NO
Nancy Reaves, GL
Sally Andrew, HA

MEETING
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
MARCH 4, 2009
1:00 PM

HAMPTON ROADS H2O – HELP TO OTHERS – PROGRAM ORGANIZATIONAL MEETING

The Board of Directors of the Hampton Roads H2O – Help To Others – Program will hold its organizational meeting. A separate Agenda package is being distributed for that meeting. The Directors of Utilities from the sixteen member localities, the Town Managers of Smithfield and Windsor and the General Manager of the Hampton Roads Sanitation District are named as the initial Board Members. Attendance by these individuals at this meeting is particularly important.

BUSINESS MEETING

1. Summary of February 4, 2008 Joint Meeting of the Directors of Utilities Committee

The Summary of the February 4, 2009 meeting of the Directors of Utilities Committee is attached for your review and approval.

ACTION: Approve the Meeting Summary.

2. Regional Water Supply Plan

A. Water Demand Management/Water Conservation Plan

Attached for your review is one copy of the draft Water Demand Management/Water Conservation Plan, component of the regional water supply plan. This document has been prepared by HRPDC staff to conform to the Water Supply Planning Regulations and previous Committee discussions.

HRPDC staff will review the highlights of the report. HRPDC staff will brief HR WET, at its February 26th meeting, on the document and will have some comments, based on the discussion with HR WET. The staff is looking for comments and concurrence from the Committee on the sufficiency of this document for inclusion in the Regional Water Supply Plan.

ACTION: Provide comments on the Water Demand Management/Water Conservation Plan. Determine the sufficiency of this document as one component of the Regional Water Supply Plan.

B. DEQ Drought Web Page

As discussed at the February meeting, DEQ has developed a drought web page that has been implemented in some portions of the Commonwealth. DEQ has requested regional input to the development of a companion page for Hampton Roads. The HRPDC staff has discussed this matter with the Peninsula localities and identified indicators for the Peninsula sub-region. A discussion paper, describing a number of

indicators that could be included on the web page for the Southside and Western sub-regions is attached. The Committee needs to reach agreement on a set of indicators for use on the web page

ACTION: According to discussion.

C. Drought Response Plan

DEQ's comments on the draft Drought Response Plan indicated that the Hampton Roads Region had to include indicators for each stage of drought response. The HRPDC staff would like to revisit this issue.

ACTION: According to discussion.

3. Continuing Services Consultant

The Selection Subcommittee, consisting of representatives from the Directors of Utilities and Regional Stormwater Management Committee, met on February 17, 2009 to review the consultant proposals received in response to the RFP for Continuing Services. The Committee and staff have reached consensus on firms to be selected for this work. The HRPDC staff will brief the Committee on the recommendations. The HRPDC staff will recommend that the Committee concur with the Subcommittee's recommendations.

ACTION: Concur with HRPDC staff and Subcommittee recommendations.

4. Red Flag Rule

Attached for your information are copies of the RTC "Red Flag" Rule and the message indicating that enforcement of the rule was being delayed until May 2009. No action is required on this matter. It is being included as a reminder that, if you or your locality has not yet acted on this matter, the deadline is approaching.

ACTION: According to discussion.

5. Capacity Team Report

The Capacity Team has continued to meet weekly and will provide a brief status report.

ACTION: According to discussion.

6. HR FOG Report

The HR FOG Technical and Education Subcommittees are continuing to meet. HRPDC will provide a brief status report.

ACTION: According to discussion.

7. Marking of Private Sewer Laterals

The Committee's representatives to the SCC stakeholder process may have a report on activities since the February meeting.

ACTION: According to discussion.

8. HRPDC Program Status Report

The HRPDC staff will provide a brief overview on several ongoing projects of interest to the Committee.

ACTION: None required.

9. Other Matters

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURE
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETAI

March 25, 2009

Memorandum #2009-54

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting –April 1, 2009
RSVP – March 31, 2009

This is to call the April Meeting of the Directors of Utilities Committee for **April 1, 2009, at 1:00 p.m.** The meeting will be held in the HRPDC Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake.

The Agenda and related materials are attached.

Members of the Legal Team are being provided with copies of this memorandum for information purposes. They are welcome to participate if they desire. At press time, it does not appear that any Agenda Items will require consideration by or input from the Legal Team.

If you have any questions or need further information, please do not hesitate to call me or Whitney.

JMC/fh

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MEETING
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
APRIL 1, 2009
1:00 PM

1. Summary of March 4, 2009 Meeting of the Directors of Utilities Committee

The Summary of the March 4, 2009 meeting of the Directors of Utilities Committee is attached for your review and approval.

ACTION: Approve the Meeting Summary.

2. South Hampton Roads Grit and Grease Drying Facility

HRSD's contractor is proceeding with construction of the Grit and Grease Drying Facility to serve a portion of South Hampton Roads. This facility is located at the Nansemond Plant. Mr. Chris Stephan, HRSD, and other project representatives will provide the Committee with a project overview and schedule.

ACTION: None Required.

3. Regional Water Supply Plan

A. Drought Indicators

The Committee has discussed drought indicators for the past several months. HRPDC staff had three meetings with Peninsula, Southside and Western Sub-Regions and arrived at three very different indicator sets. A broad generalization of the meeting results is:

Peninsula – Established different indicators to consider drought stages.
Southside – May use the Drought Monitor to consider entering drought stages.
Western Region – Follow the guidance of the state to enter drought stages.

The plan can be submitted with three different sets of indicators for the three subregions. Remember, these indicators simply trigger the need for the Committee to begin discussion of the status of local water systems at the monthly meeting. This is no different from Committee action in the past. Earlier the Committee had discussed the idea of a Memorandum of Agreement among the localities (Directors of Utilities) and HRPDC, which would formalize the concept of Committee discussions of drought conditions. It would not formalize a uniform set of drought response actions.

DEQ expects every plan to include some form of indicators and not including indicators may result in a plan approval delay. The Committee needs to decide how to handle indicators in the drought plan.

ACTION: According to discussion.

B. Water Demand Projections

The Water Supply Planning Subcommittee met on March 17th and discussed possible methods of developing water demand projections. The subcommittee decided to collect and analyze the disaggregated use from 2000-2008 for all systems that can provide it. The residential per capita use in each system will be calculated over that time period with the goal of selecting a per capita factor to use in projections. The ratio of residential to non-residential use will be evaluated over time to see if the ratio is constant over time. HRPDC staff will review the subcommittee's discussion and analysis of the available data.

ACTION: According to discussion.

4. Groundwater Program

The Committee funded USGS to do several projects in FY09 that were delayed when DEQ considered funding the same work. Those projects included items 1, 6, and 7 which involve the steps needed to use the new model to evaluate Area of Impacts. HRPDC staff had a discussion with USGS about next year's projects and possibly reprioritizing the current year's projects. Staff provided USGS with the following list of projects that the region might be interested in supporting. USGS is developing more detailed proposals, a timeline, and budget.

1) Create input files for actual withdrawals and total permitted for 2004-2008.
2) Provide analysis and recommendation on how long to run the new transient model to establish relative steady state conditions.
3)Develop methodology to create Area of Impact maps for each aquifer.
4) Map the simulated head and compare with 80% criteria and top of the aquifer.
5) Use existing methods to estimate sustainable yield of the Coastal Plain aquifers and compare to 80% criteria. Focus on Potomac aquifer but consider others.
6) Investigate whether using heads at the top of the aquifer, vertically averaged head, or lowest head to evaluate the Area of Impact of a withdrawal has significantly different results.
7) Evaluate the performance of the model at simulating drawdowns in thin aquifers, particularly analyze Area of Impacts.
8) Piney Point study

HRPDC staff would like the Committee to provide input on interest in the listed projects and priorities. Also, staff would like to discuss reestablishing the Groundwater Subcommittee.

ACTION: According to discussion

5. **Capacity Team Report**

The Capacity Team has continued to meet weekly and will provide a brief status report.

ACTION: According to discussion.

6. **HR FOG Report**

The HR FOG Technical and Education Subcommittees are continuing to meet. HRPDC will provide a brief status report. Attached is an Excel spreadsheet documenting the status of local government consideration of the FOG Program. HRPDC staff asks that you complete the information on your program and return it to Julia at jhillegass@hrpdcva.gov

ACTION: According to discussion.

7. **Marking of Private Sewer Laterals**

The SCC Stakeholder Committee met on March 11, 2009. The Committee's representatives to the SCC stakeholder process will have a report on the Stakeholder Committee's discussions. A summary of the issues discussed at the meeting, which apparently will guide the SCC group's deliberations, are attached.

ACTION: According to discussion.

8. **Physical Planning Retreat**

At the November 2008 Committee meeting and at the January 2009 Committee Retreat, the Committee spent considerable time evaluating regional program activities and direction. Normally, a report would have been presented to the Committee for discussion at its February meeting, in preparation for the HRPDC Commission Retreat, which is normally held in February. In part, because of the emphasis this year on the reform of the MPO (transportation) function, the Commission Retreat has been delayed until May 2009.

Enclosed for your review and consideration is a summary of the Committee Retreat and related discussions. To provide adequate time for the HRPDC staff to prepare for the Commission Retreat, the HRPDC staff will be looking for Committee concurrence with the report and identification of any additional issues that the Committee believes should be highlighted in this discussion.

ACTION: Concur with Retreat Summary and recommend further issues for consideration.

9. **Stimulus Project Report**

The Committee discussed funding opportunities under the American Recovery and Reinvestment Act (ARRA), better known as the Stimulus. Attached for your information is a copy of a PowerPoint presentation given to the HRPDC by the

HRPDC Economics staff at the March 18, 2009 HRPDC Executive Committee meeting. Also, there are several web pages that provide information about the stimulus – funding opportunities, proposals submitted and project status. They include, but are not limited to the following:

http://www.epa.gov/water/eparecovery/
http://www.vaco.org/LEGISLATIVE/American%20Recovery%20and%20Reinvestment%20Act/
http://www.stimulus.virginia.gov/
http://www.governing.com/stimulus.htm

In addition, a copy of a recent summary of competitive grants, provided by VML, is attached.

At the March meeting, the Committee did not reach conclusion on what it wanted the HRPDC staff to do with respect to the stimulus projects. The Committee needs to determine, what tasks it wishes for the HRPDC to proceed with on its behalf. A similar discussion will occur at the Joint Environmental Committee meeting on April 2, 2009.

ACTION: According to discussion.

9. HRPDC Program Status Report

The HRPDC staff will provide a brief overview on several ongoing projects of interest to the Committee.

ACTION: None required.

10. Other Matters

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

September 29, 2009

Memorandum #2009-163

TO: **Directors of Utilities Committee**
Utilities Legal Team

BY: John M. Carlock, HRPDC Deputy Executive Director

RE: Committee Meeting – October 7, 2009
RSVP – October 5, 2009

This is to call the October meeting of the Directors of Utilities Committee for **October 7, 2009, at 1:30 p.m.** The meeting will be held in the **HRPDC Board Room, Chesapeake.**

The Agenda and related materials are attached.

If you have any questions or need further information, please do not hesitate to call me or Whitney.

WSK/fh

Attachments

Copy:

Capacity Team
Steve Land, NN
Eileen Leininger, NN
Jason L. Mitchell, HA
Richard H. Nettleton, VB
Chris Stephen, HRSD
Everett Skipper, NN
Stephanie Tinsley, NO
Stephen Watson, FR
Craig Ziesemer, SU
Stephen Motley, VB
Bob Speechly. PQ

Capacity Team

Edward G. Henifin, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
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Ralph Patterson, WM
Eric Tucker, NO
Danny Poe, JC
Richard Stahr
Phil Hubard, HRSD
Kenneth Turner, NO
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Frank Wilson, PO
Craig Ziesemer, SU

Utilities Committee

Jeffrey J. Bliemel, PQ
Daniel G. Clayton III, WM
Lawrence A. Dame, New Kent
John B. Edwards, Jr., SY
Larry Foster, JCSA
H. Reed Fowler II, NN
J. Arnie Francis, GL
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Michael Stallings, WN
Peter M. Stephenson, SM
Moses Thompson, PO
John Veneziano, HA
James K. Walski, CH
Brian K. Woodward, YK
Edwin P. Wrightson, IW

Utilities Legal

Cynthia Hudson, HA
James E. Barnett, YK
Wilfredo Bonilla, Jr., CH
Paul Burton, IW
Cheryl Carnevale, HA
Bernard A. Pishko, NO
Joseph M. DuRant, NN
G. Timothy Oksman, PO
Leo P. Rogers, JC
Karla C. Haynes, SU
William L. Macali, VB
Joseph F. Phillips, Jr., WM
Wayne Moore, Wayne Moore Law
David E. Evans, McGuire Woods
Henry Pollard V, Christian & Barton
Chris Pomeroy, Aqua Law
William H. Riddick, III, Attorney at Law
Scott Hart, Troutman Sanders
James R, Ryan, Jr. Troutman Sanders
Richard H. Sedgley, Aqua Law
Paul Calamita, Aqua Law
Peter Huber, Wilcox and Savage

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
OCTOBER 7, 2009
CHESAPEAKE
1:30 PM

1. **Summary of September 2, 2009 Meeting of the Directors of Utilities Committee**

   The Summary of the September 2, 2009 meeting of the Directors of Utilities Committee is attached as item 1A for your review and approval.

   Attachments:
   1A – September 2, 2009 meeting minutes
   1B – September 2, 2009 meeting sign-in sheet

   ACTION: Approve the Meeting Summary.

2. **SSO Consent Decree**

   HRSD signed a consent decree with EPA/DOJ on Wednesday, September 23, 2009. EPA/DOJ is gathering their required signatures and we expect the decree to be lodged before the October 7th Directors of Utilities Committee meeting.

   HRSD will provide a summary of the Consent Decree with an opportunity for Q & A and discussion. It may be appropriate for the region and localities to comment on the Consent Decree during the public review process. Based on the presentations and discussion, the Committee will need to determine a course of action regarding briefing the HRDPC and commenting on the Consent Order.

   ACTION: According to discussion.

3. **Urban Area Security Initiative (UASI) Proposals**

   At the July meeting, the Committee decided to develop two project proposals for the UASI grant:

   1. A planning study that would identify scenarios that could have regional impacts to the water systems, evaluate the existing response plans, conduct a gap analysis, and recommend solutions and a table top exercise based on the study findings.
   2. Purchase and install Water Quality Monitoring Panels.

   The one page project proposals must be submitted to the Urban Area Working Group by October 23rd. Hampton Roads received $7,373,100 for the FY 2009 UASI grant and expect about the same level of funding for FY 2010. The local working group will prioritize the proposals and select proposals to develop for the FY 2010

grant. If one or both of the Committee's proposals are selected, then the Committee must submit a more detailed proposal in November.

Attachments:
3A – FY10 Water Study.doc
3B – FY10 Water Quality Sensors.doc

ACTION: Approve the project proposals to be submitted to the UAWG.

4. **Groundwater Mitigation Memorandum of Agreement (MOA)**

Based on the discussion at the September meeting, the following proposed revisions to the Groundwater MOA were deleted: 1) Only wells that supply drinking water to a residence or business are eligible for mitigation. 2) Wells screened in the water table aquifer are not eligible for mitigation.

The only changes to the MOA that is currently in effect are 1) the possible future use of the Virginia Coastal Plain Groundwater Model for mitigation analysis, 2) the period of the MOA has been corrected to January 1, 2011 thru December 21, 2015 and 3) the Towns of Smithfield and Windsor have been added as signatories. HRPDC staff is working with the Towns to determine the extent of their participation and funding of the program.

Attachments:
4A – GW_MOA_DRAFT 0909.doc

ACTION: Recommend that the HRPDC approve the MOA and refer the MOA to the participating localities for signature.

5. **Committee Reports**

- Marking of Private Sewer Laterals
- Groundwater Regulatory Advisory Panel (RAP)

Attachments:
5A – Groundwater RAP 18Sept09.pdf

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

October 27, 2009

Memorandum #2009-182

TO: Directors of Utilities Committee

BY: John M. Carlock, HRPDC Deputy Executive Director

RE: Committee Meeting – November 4, 2009
RSVP – November 3, 2009

This is to call the November meeting of the Directors of Utilities Committee for **November 4, 2009, at 1:30 p.m.** The meeting will be held in the **James Room, Fountain Plaza II, City Center, Newport News.**

The Agenda and related materials are attached.

If you have any questions or need further information, please do not hesitate to call me or Whitney.

WSK/fh

Attachments

Copy:

Capacity Team
Steve Land, NN
Eileen Leininger, NN
Jason L. Mitchell, HA
Richard H. Nettleton, VB
Everett Skipper, NN
Stephanie Tinsley, NO
Stephen Watson, FR
Craig Ziesemer, SU

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Utilities Committee

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James K. Walski, CH
Brian K. Woodward, YK
Edwin P. Wrightson, IW

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
NOVEMBER 4, 2009
NEWPORT NEWS
1:30 PM

1. Summary of October 7, 2009 Meeting of the Directors of Utilities Committee

The Summary of the October 7, 2009 meeting of the Directors of Utilities Committee is attached as item 1A for your review and approval.

Attachments:
1A – October 7, 2009 meeting minutes
1B – October 7, 2009 meeting sign-in sheet

ACTION: Approve the Meeting Summary.

2. Infiltration/Inflow (I/I) Abatement Program

A workgroup has explored various program options for I/I abatement, both in Virginia and across the country. A list of options has been compiled by Brown and Caldwell based on this review with the workgroup. The Briefing Paper on this program is attached Richard Stahr will brief the Directors on the menu of options.

ACTION: Determine parameters of a model regional program.

Attachment

2 – Briefing Paper – Private Property Infiltration and Inflow Abatement

3. Regional Science Fair

For the past two years, the Directors of Utilities committee has opted to provide general funding to the regional science fair, rather than judge a special award category. The 2010 Regional Science Fair will be held again at ODU on March 13th. If you wish to have a special award category, staff will need commitment of judges for the day of the event.

ACTION: Decide on participation in Regional Science Fair

4. Value of Water Program

On several recent occasions, the Committee has discussed the idea of expanding the HR WET educational mission to include messages about the value of water, in addition to HR WET's traditional role in water conservation education. HR WET discussed this matter in detail at its meeting on October 22, 2009. HRPDC staff

will brief the Committee on these discussions and recommendations from HRPDC staff and HR WET. The Committee will need to provide further direction to the HRPDC staff and HR WET on the approach and level of effort to be taken.

ACTION: Provide direction to HRPDC staff and HR WET on the value of water effort.

5. Regional Groundwater Program

HRPDC staff and USGS are continuing efforts to compare the old and new Groundwater Models and evaluate the simulations from the new model. Efforts are underway to compare the groundwater implications of the recently announced closing of International Paper's mill at Franklin using the old and new groundwater models. HRPDC staff is also exploring with DEQ the regulatory issues associated with the closing. The HRPDC staff will brief the Committee on the model comparison and on regulatory issues based on the DEQ discussions.

The Groundwater Mitigation Program MOA was approved by the HRPDC at its Commission meeting on October 21, 2009. It has been distributed to the Chief Administrative Officers for signature.

ACTION: According to discussion

6. FY 2011 Water and Wastewater Program Budgets

The HRPDC staff is preparing its preliminary budget for FY 2011. Materials will be developed and provided directly to the Directors for review. This will include historic budget information, current work activities and list of pending activities. The Committee normally addresses this information in detail at the retreat in January. However, the HRPDC budget process for FY 2011 has been accelerated. The Committee needs to address priorities for the coming year to reflect local needs and fiscal realities.

ACTION: Discuss budget for FY 2011 and provide HRPDC staff with direction on budget and work priorities.

7. Committee Reports

- Marking of Private Sewer Laterals
- DEQ Groundwater RAP

8. Staff Reports

- Capacity Team
- Water Supply Plan – need demand projections from Isle of Wight, Portsmouth, and Windsor

9. Other Matters

- Plan Agenda for December Joint Meeting with the Directors of Health

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

November 24, 2009

Memorandum #2009-198

TO: Directors of Utilities Committee
Directors of Health

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – December 2, 2009
RSVP – December 1, 2009

This is to call the December Meeting of the joint Directors of Utilities and Health Directors Committee for **December 2, 2009, at 12:30 p.m.** Lunch begins at 12:30 p.m. The meeting will start at 1:30. The meeting will be held in the **HRPDC Regional Board Room, Chesapeake.**

The Health Directors will have a special meeting from 11-12:30 in conference room E.

The Agenda and related materials are attached.

A deli lunch will be provided. Please RSVP by December 1st so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney.

WSK/fh

Attachments

Copy:

Capacity Team
Steve Land, NN
Eileen Leininger, NN
Jason L. Mitchell, HA
Richard H. Nettleton, VB
Everett Skipper, NN
Stephanie Tinsley, NO
Stephen Watson, FR
Craig Ziesemer, SU

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Phil Hubard, HRSD
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Utilities Committee

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Peter M. Stephenson, SM
Moses Thompson, PO
John Veneziano, HA
James K. Walski, CH
Brian K. Woodward, YK
Edwin P. Wrightson, IW

Health Directors

Harry Bennett, VDH
S. William Berg, MPH, VDH
Anna Colon, VDH
Daniel B. Horne, P.E., VDH
Thomas Irunga, VDH
Wes Kleene, VDH
Demitria Lindsay, VDH
Lisa McCoy, VDH
Michele Monti, VDH
Venita Newby-Owens, MPH, VDH
Erin Sutton, VDH
John Schellenberg, VDH
David Trump, MPH, VDH
Nancy Welch, VDH

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
AGENDA
DECEMBER 2, 2009
CHESAPEAKE
12:30 PM

DELI BUFFET LUNCH

1. **Summary of November 4, 2009 Meeting of the Directors of Utilities Committee**

   The Summary of the November 4, 2009 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

   Attachments:
   1A – November 4, 2009 meeting minutes
   1B – November 4, 2009 meeting sign-in sheet

   ACTION: Approve the Meeting Summary.

2. **Summary of June 3, 2009 Meeting of the joint Directors of Utilities and Health Directors Committee.**

   The Summary of the June 3, 2009 meeting of the joint Directors of Utilities and Directors of Health Committee is attached as item 2A for your review and approval.

   Attachments:
   2A – June 3, 2009 meeting minutes
   2B - June 3, 2009 meeting sign-in sheet

   ACTION: Approve the Meeting Summary.

3. **VA WARN**

   Mr. Clarence Warnstaff will present an update on the VA WARN program. The Mutual Aid Agreement has been finalized and the website is active.

   Attachments:
   3A – VA WARN information nov 2009.pdf

   ACTION: According to discussion.

4. **VDH Regulatory Update**

Mr. Dan Horne will provide an update on regulatory issues. A roundtable discussion will follow. The Directors of Utilities and Health Directors will have an opportunity to discuss matters of mutual interest and concern.

ACTION: No action required.

5. **State Water Commission**

At the State Water Commission meeting held on November 9th, five proposed bills were presented to the commissioners. Attachment #5C will be dropped if DEQ and VDH voluntarily sign a MOA, which they agreed to do at the meeting. The Commission encouraged public comment on amendment #5E which attempts to tie permits to water supply plans:

Attachments:
5A - Establishes Regulatory Advisory Committee for State Water Supply Plan
5B - Allows SWCB to impose $1,000 fine for not reporting water use
5C - Directs DEQ and VDH to sign a MOA to share well construction information
5D - Increases Groundwater Withdrawal Permit from $6,000 to $12,000
5E - Allows SWCB to consider whether or not a proposed surface water withdrawal is consistent with the state water supply plan as part of the review of VWPP proposals.

ACTION: The Committee needs to discuss these proposals and decide whether or not to submit comments to the State Water Commission.

6. **Regional Groundwater Program**

The HRPDC staff will brief the Committee on the comments received regarding the proposed letter to Dave Paylor and the progress of the Groundwater RAP.

ACTION: The Committee needs to determine how to move forward on the letter to Dave Paylor and decide whether or not to invite RAP members to hear a presentation on the new model.

7. **FY 2011 HR FOG Budget**

The HRPDC staff will present a proposed budget for the staff time needed to conduct and manage the HR FOG program next year.

ACTION: Discuss HR FOG proposal for additional funding to be included in the FY 2011 budget.

8. Civil Penalties for Violations of Sewer/FOG Ordinances

Virginia Beach has drafted a proposal to take to the General Assembly that would allow localities under consent orders to impose civil penalties to address problems with their sewer systems. The proposal is attached for review and discussion. This was discussed at the November meeting and has been discussed by the Capacity Team.

Attachment:
4A - Fog Civil Penalties.pdf

ACTION: Determine Committee recommendation to the HRPDC Executive Committee on endorsing this proposal at its December 16, 2009 meeting.

9. Committee Reports

- SCC Lateral Marking
- Consent Order/Consent Decree

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

December 28, 2009

Memorandum #2009-211

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting and Annual Retreat – January 6, 2010
RSVP – December 30, 2009

This is to call the January Meeting of the Directors of Utilities Committee for **January 6, 2010 at 10:00 AM.** The meeting will be held in the **Conference Room, Nansemond Treatment Plant Administration Building, 6909 Armstead Road, Suffolk.** Directions are attached.

An invitation to the meeting was sent previously by Ted Henifin, HRSD. That invitation requested your RSVP by December 30, 2009.

The Agenda and related materials are attached. This meeting includes a number of business items, the ribbon cutting for the Regional Residuals Facility at the Nansemond Plant and the Annual Committee Retreat.

If you have any questions or need further information, please do not hesitate to call me or Whitney.

WSK/fh

Attachments

Copy:

Capacity Team
Steve Land, NN
Eileen Leininger, NN
Jason L. Mitchell, HA
Richard H. Nettleton, VB
Everett Skipper, NN
Stephanie Tinsley, NO
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Ralph Patterson, WM
Danny Poe, JC
Richard Stahr
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Utilities Committee

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Michael Stallings, WN
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Moses Thompson, PO
John Veneziano, HA
James K. Walski, CH
Brian K. Woodward, YK
Edwin P. Wrightson, IW

MEETING AND ANNUAL RETREAT OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
JANUARY 6, 2010
SUFFOLK
10:00 AM

BUSINESS MEETING – 10:00 AM

1. Summary of December 2, 2009 Joint Meeting of the Directors of Utilities Committee and Directors of Health

The Summary of the December 2, 2009 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:
1A – December 2, 2009 meeting minutes
1B – December 2, 2009 meeting sign-in sheet

ACTION: Approve the Meeting Summary.

2. Marking of Private Water and Sewer Laterals

As Committee members are aware, the SCC Sewer Lateral Working Group has completed draft language amending the Virginia Code to reflect the compromise on lateral marking. A copy of the draft legislative proposal is attached as Attachment 2. The Committee's representatives to the Working Group will brief the Committee on the compromise and the legislative approach to completing this work. The Committee needs to develop a position on this proposal for recommendation to the HRPDC for consideration at its meeting on January 20, 2010.

Attachment 2 – Draft Language – Locating Sewer Lines

ACTION: Develop recommended position on proposed "Locating Sewer Lines" legislation.

3. SCC Damage Committee

Ms. Bettie L. Cahoon, Engineering Specialist with the City of Chesapeake, has represented the region on the SCC Damage Prevention Advisory Committee. Ms Cahoon has advised the HRPDC staff that she is retiring on February 1. 2010 and will no longer be able to represent the region on this Committee. The Directors of Utilities Committee needs to recognize Ms. Cahoon's service to the region. The HRPDC staff will draft a letter to that effect. The Committee also needs to recommend a new representative to the SCC Committee.

ACTION:
a. Recognize Ms. Cahoon's service to the region.

b. Nominate new regional representative to serve on the SCC Committee.

4. Civil Penalties for Violations of Sewer/FOG Ordinances

Virginia Beach has drafted a proposal to take to the General Assembly that would allow localities under consent orders to impose civil penalties to address problems with their sewer systems. The proposal is attached for review and discussion. This was discussed at the November and December Committee meetings and has been discussed by the Capacity Team. The Committee needs to develop a position on this proposal for recommendation to the HRPDC for consideration at its meeting on January 20, 2010.

Attachment:
4 - Fog Civil Penalties.pdf

ACTION: Develop recommended position on proposed FOG Civil Penalties legislation.

5. HR FOG Program

The HRPDC staff will brief the Committee on the current status of the HR FOG Program – Educational and Technical Components. Committee members, representing communities that have not submitted executed FOG MOAs should be prepared to discuss the status of local consideration of the FOG MOA.

ACTION: According to discussion.

6. State Water Commission

At the State Water Commission meeting held on November 9th, five proposed bills were presented to the commissioners. Attachment #5C will be dropped if DEQ and VDH voluntarily sign a MOA, which they agreed to do at the meeting. The Commission encouraged public comment on amendment #5E which attempts to tie permits to water supply plans. The State Water Commission is scheduled to meeting on January 12, 2010. These proposals were discussed at the December meeting. At that time, there was general consensus that only the proposal contained in Attachment 5E warranted further consideration and potential comment. We have included all five proposals for your information.

The Committee needs to discuss the SWC legislative proposals and develop a position on the proposals for recommendation to the HRPDC for consideration at its meeting on January 20, 2010.

Attachments:
6A - Establishes Regulatory Advisory Committee for State Water Supply Plan
6B - Allows SWCB to impose $1,000 fine for not reporting water use
6C - Directs DEQ and VDH to sign a MOA to share well construction information

6D - Increases Groundwater Withdrawal Permit from $6,000 to $12,000
6E - Allows SWCB to consider whether or not a proposed surface water withdrawal is consistent with the state water supply plan as part of the review of VWPP proposals.

ACTION: Develop recommended position on one or more of the SWC legislative proposals.

7. UASI Proposals

As discussed previously, the process of developing Investment Justifications IJs or proposals) for funding under the UASI program is underway. The HRPDC staff is working on the IJs for projects that have been discussed previously with the Committee. They need to be submitted by the deadline of January 15, 2010, in accordance with the schedule developed by the Urban Area Working Group.

The HRPDC staff will brief the Committee on the UASI process and schedule. An overview of the two IJs that are underdevelopment will also be provided. The Committee needs to concur in the finalization and submission of these two proposals to the Urban Area Working Group for consideration in the 2010 UASI funding cycle.

ACTION: Approve two UASI Investment Justifications for submission to the UAWG.

Attachments:
7A – Contaminant Warning System
7B – Water Supply Risk Assessment and Emergency Response Training

8. Committee Reports

- Consent Order/Consent Decree
- HR WET

ACTION: None Required.

LUNCH and RRF BRIEFING – 12:00 NOON

COMMITTEE RETREAT – 1:00 PM

1. Review of Program Progress - FY 2009 – 2010

The committee will consider progress on regional water supply and wastewater activities that have been pursued over the past year. Successes, as well as areas for improvement, should be identified. HRPDC staff will provide a brief outline of activities undertaken through the committee process. Members should be prepared to discuss matters that may have been carried out through some other forum.

ACTION: According to discussion.

2. Committee Direction for FY 2010 - 2011

Committee members should be prepared to discuss water supply and wastewater issues of importance that could/should be addressed through the committee process. Thought should be given to state and national issues and initiatives that may influence potential local and regional activities. The results of this discussion will determine committee direction as well as play a significant role in shaping the Regional Water and Wastewater Program components of the HRPDC Unified Planning Work Program for FY 2010 – 2011.

At the November 2009 meeting, the Committee agreed that a flat budget should be proposed for FY 2010 – 2011 and that increased HRPDC administrative costs should be covered through use of carry-over funds from previous years. The level of funding from carry-over will be determined as the balance of the HRPDC budget is developed. At the December meeting, participants agreed to an increase in staff effort and level of funding for the HR FOG Program. The Committee previously indicated that any consultant costs should be handled during the year on a case-specific basis. The HRPDC staff is finalizing a draft budget proposal for separate email distribution in advance of the meeting.

It can be expected that the Committee and staff will need to continue to devote attention to water supply, water quality, climate change and initiatives of the General Assembly and Administration. Regulatory initiatives such as changes to the Ground Water Withdrawal Regulation and the TMDL Program, including the Chesapeake Bay TMDL, will continue. Evolving infrastructure funding issues at the federal level will also require staff and Committee attention during the coming months. Additional issues will be identified through the Joint Environmental Committee and in informal discussions between HRPDC staff and committee members.

As part of the ongoing HRPDC reorganization, a number of institutional issues are being considered by the Commission. In preparation for the HRPDC Retreat in February, the HRPDC staff will brief the Committee on these institutional considerations.

Based on discussions at the meeting, the staff will finalize the FY 2010 – 2011 Program and Budget, which will then be circulated via Letter Ballot for formal approval.

ACTION:
1. FY 2010 – 2011 Program elements and priorities will be determined according to discussion.
2. FY 2010 – 2011 Water and Wastewater Program Budgets will be determined in accordance with Action No. 1.

NANSEMOND TREATMENT PLANT TOUR (Optional)

HAMPTON ROADS
PLANNING DISTRICT COMMISSION

BRUCE C. GOODSON, CHAIRMAN • STAN D. CLARK, VICE CHAIRMAN • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

April 29, 2010

Memorandum #2010-66

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – May 5, 2010
RSVP – May 4, 2010

This is to call the May meeting of the Directors of Utilities Committee for May 5, 2010 at 1:30 p.m. This meeting will be held at **Newport News Waterworks' Lee Hall Maintenance & Operations Center, 425 Industrial Park Drive, Newport News** (directions attached).

The Agenda and related materials are attached. If you have any questions or need further information, please do not hesitate to call me or Whitney.

Please RSVP by May 4, 2010

WSK/fh

Attachments

Utilities Committee

Jeffrey J. Bliemel, PQ
Daniel G. Clayton III, WM
Lawrence A. Dame, New Kent
John B. Edwards, Jr., SY
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
J. Arnie Francis, GL
Richard Hartman, PO
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
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Kristen M. Lentz, NO
Lynn Allsworth, HA
Jason Mitchell, HA
Albert Moor II, SU
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Sonja Pruitt, SM
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Martin Schlesinger, GL
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Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Copy: Joseph Durant, NN
Frank Haltom, IW
Stephen K. Land, NN
Nettleton Richard, VB
Stephanie Tinsley, NO
Stephen Watson, FR
Craig Ziesemer SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
May 5, 2010
Newport News
1:30 PM

1. Summary of April 7, 2010 Directors of Utilities Committee Meeting

The Summary of the April 7, 2010 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:
1A – April 7, 2010 meeting minutes
1B – April 7, 2010 meeting sign-in sheet

ACTION: Approve the Meeting Summary.

2. HRSD Water and Wastewater Billing Service

Mr. Ted Henifin, HRSD, will brief the Committee on water and wastewater billing services. After nearly 15 years of regional billing effort, the Hampton Roads Utility Billing Service (HRUBS) only provides a true combined regional bill for 10% of the Hampton Roads wastewater customers. The attached slide describes the current billing practices in the region. The original concept of cost savings through a consolidated billing system may still have merit, but cannot be realized without significant business process change by all regional billing entities.

With water and wastewater rates continuing to escalate, HRSD would like the Directors to review this concept again as billing systems age, monthly billing is evaluated and automated meter reading technology continues to improve.

Attachment:
2 – Jurisdiction Profile.pdf

ACTION: According to discussion.

3. Elizabeth River TMDL for Bacteria

At the April 7, 2010 DUC meeting, HRPDC staff gave a presentation on the final draft of the Bacteria TMDL for the Elizabeth River Watershed. The Committee requested that the HRPDC staff draft a letter to the DEQ that details the Committee's concerns regarding the assumptions used for the SSO daily loads. The letter was approved by the Committee and submitted to the DEQ. Various utilities have taken samples and tested for enterococcus. Staff has submitted the results to the DEQ for those utilities that have requested the results be submitted. Staff will update the Committee on the TMDL development and DEQ's response to comments.

ACTION: According to discussion.

4. **June Agenda for Joint Meeting of Directors of Utilities Committee and Directors of Health Committee**

June 2, 2010 is the joint meeting of the Directors of Utilities and Directors of Health.

ACTION: Set agenda items for June joint meeting of Directors of Utilities and Directors of Health.

5. **Advisory Committees**

At the February HRPDC retreat, the Commission discussed the role of advisory committees and their responsibilities as a public body. The Commission asked the HRPDC staff to provide recommendations on how to best ensure that the Commission and its committees meet the requirements of FOIA.

The HRPDC staff has drafted three options to be discussed with all of the committees that might be impacted (e.g., Joint Environmental Committee, DUC, Stormwater Committee, etc.). The staff will consider the input and recommendations of the committees when compiling a final recommendation for the Commission.

Attachment will be emailed to Committee before May 5, 2010 meeting.

ACTION: Provide feedback to the HRPDC staff on the advantages and disadvantages of the three options.

6. **Staff Reports**

- Help – To – Others Program
- Groundwater DRAFT Regulations
- HR WET
- Water/Sewer bill matrix
- Contact list for water quality response plan

7. **Roundtable Discussion**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES O. McREYNOLDS, TREASURER
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SURRY

VIRGINIA BEACH

WILLIAMSBURG

YORK

January 26, 2011

Memorandum #2011-17

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – February 2, 2011
RSVP – February 1, 2011

This is to call the February meeting of the Directors of Utilities Committee for **February 2, 2011, at 1:30 p.m.** The meeting will be held in the **HRPDC Regional Board Room, Chesapeake.**

The Agenda and related materials are attached.

Please RSVP by February 1, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by February 1, 2011

TS/fh

Attachments

Utilities Committee

Lynn Allsbrook, HA
Daniel G. Clayton III, WM
Lawrence A. Dame, New Kent
John B. Edwards, Jr., SY
Bryan Foster, PO
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Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
February 2, 2011
Chesapeake
1:30 PM

1. Summary of January 5, 2011 Meeting and Annual Retreat of the Directors of Utilities Committee

The Summary of the January 5, 2010 meeting and annual retreat of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:
1A January 5, 2011 meeting minutes
1B January 5, 2010 meeting sign-in sheet
1C HRPDC – Virginia Coastal Plain Groundwater Modeling FY2011 Work Plan
1D FY 2011-12 and FY 2010-11 Regional Water and Wastewater Program Budgets
1E USGS Groundwater Program
1F Water and Wastewater Programs – Retreat
1G Work Proposal: Determination of Sea-Level Rise in the Virginia Coastal Plan and Development of Planning Tools

ACTION: Approve the Meeting Summary.

2. Private Property Infiltration and Inflow (I/I) Abatement Program

At the October 13, 2010 Committee Meeting, the Directors reviewed materials developed by the Capacity Team to support the development of private property I/I abatement programs. Materials developed include proposed legislation to require disclosures regarding the wastewater system on property offered for sale; proposed legislation to amend Virginia Code Section 15.2-2122 to allow contractors to conduct inspections and collect civil penalties on behalf of the locality; model ordinance for I/I; and a model I/I enforcement response plan.

Following discussion by the Committee, it was anticipated that PDC staff would present the model ordinance to the Planning District Commission in December or January, explaining the need for an I/I program and emphasizing that each locality would customize the ordinance to meet the locality's needs. Staff reported on preparations for the Commission presentation at the December 1, 2010 Committee meeting, during which the Committee agreed that the Capacity Team should explore an alternative approach to address private property I/I abatement through a regional program managed by HRSD.

The Capacity Team will brief the Committee on the Team's alternatives analysis for development of a private property I/I abatement program. The team explored two options as follows: (a) development of locality-specific ordinances, as presented at the October 13, 2010 Committee meeting; and (b) development of a regional program coordinated between localities and HRSD. Prior to the Committee briefing, the findings were presented to the HRSD Commission for information and comment on January 25, 2011; DEQ was also consulted that week.

Attachments:

2A Hampton Roads Model Infiltration and Inflow Ordinance

2B Hampton Roads Model Infiltration and Inflow Enforcement Response Plan

2C Hampton Roads Model Infiltration and Inflow Sewer Inspection Form Instructions, Certificate of Compliance or Non-Compliance

2D Hampton Roads Regional Private Property Infiltration/Inflow (I/I) Abatement Program Outline

ACTION: The Committee will evaluate the two options and provide a recommendation, which will be presented to the Commission in a briefing tentatively scheduled for March 2011.

3. Committee Decision-Making Procedures

HRPDC staff will lead a discussion on the Committee's procedures for decision making and actions that impact budget planning and expenditures. Issues to be considered include: whether Committee approval should require unanimous support and whether budget decisions can be made if a majority of Committee members are not present.

ACTION: Provide staff direction on recommended procedures for committee decisions. HRPDC staff will draft a specific proposal for the Committee to consider at the next meeting.

4. Water Reuse

DEQ has released the Notice of Intended Regulatory Action (NOIRA) for Water Reclamation and Reuse Regulations. HRPDC staff did not receive any comments on the NOIRA from committee members. There was some interest in nominating a representative for the Regulatory Advisory Panel. HRSD has discussed the RAP with DEQ and believes that DEQ will accept HRSD's nomination (Jim Pletl). The Committee will consider whether or not to nominate an additional candidate from the region.

Attachments:

4A NOIRA Agency Background Document for Amendment to the Water Reclamation and Reuse Regulation to promote enhance program implementation

ACTION: The Committee will pick a candidate to nominate for the Water Reuse RAP, if needed.

5. UASI Grant - Request for Proposals (RFP)

A draft RFP for the "Water Infrastructure Assessment and Emergency Response Training" project has been distributed separately for review. Committee members are encouraged to discuss their concerns with the project or proposed changes to the scope of work. Committee will also discuss the selection panel and identify potential committee members that will serve on the panel and review RFPs. Final comments on the draft RFP are due February 11, 2011. Staff will incorporate comments and distribute a final draft to be approved at the Directors of Utilities Committee meeting on March 2nd.

6. Staff Reports

- Capacity Team Update: As directed by the Committee at the December 1, 2010 meeting, the Capacity Team completed an alternatives analysis for development of a private property I/I abatement program (see agenda item 2). In February 2011, the Capacity Team will return to developing business rules to address system rehabilitation and peak flow reduction.

- Regional Water Supply Plan: Section 2, "Existing Use" and Section 3, "Existing Resources" were distributed to the Committee for review and comment in January 2011. Subsequent sections will be distributed as they become available. The Committee will discuss the fulfillment of requirements for plan development and submission, particularly local program adoption and public hearings.

  Attachments:
  6A 9 VAC 25-780. Local and Regional Water Supply Planning
  6B 15.2-1427 of the Code of Virginia

- Retreat topics; Committee meeting minutes are now included in Commission packet prior to Committee's review and approval.

7. Other Business

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES O. McREYNOLDS, TREASURER
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YORK

February 23, 2011

Memorandum #2011-35

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – March 2, 2011
RSVP – March 1, 2011

This is to call the March meeting of the Directors of Utilities Committee for **March 2, 2011, at 1:30 p.m.** The meeting will be held in the **James Room, Fountain Plaza II, City Center, Newport News.**

The Agenda and related materials are attached.

Please RSVP by March 1, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by March 1, 2011

TS/fh

Attachments

Utilities Committee

Lynn Allsbrook, HA
Daniel G. Clayton III, WM
Lawrence A. Dame, New Kent
John B. Edwards, Jr., SY
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Eileen Leininger, NN
Kristen M. Lentz, NO
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Sonja Pruitt, SM
Brian Ramaley, NN
Martin Schlesinger, GL
Everett Skipper, NN
Michael Stallings, WN
Bob Speechly, PQ
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Brian K. Woodward, YK
Edwin P. Wrightson, IW

Copy:
Joseph Durant, NN
Frank Haltom, IW
Richard Hartman, PO
Stephen Land, NN
Nettleton Richard, VB
Ellen Roberts, PQ
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Stephen Watson, FR
Albert Williams, PO
Craig Ziesemer SU

Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
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Kristen M. Lentz, NO
William J. Meyer, Jr., CH
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Nick Nagurney, VB
Richard H. Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Eric Rosser, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
March 2, 2011
Newport News
1:30 PM

1. Summary of February 2, 2011 Meeting of the Directors of Utilities Committee

The Summary of the February 2, 2011 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:
1A February 2, 2011 meeting minutes
1B February 2, 2011 meeting sign-in sheet
1C HRSD presentation: "Private Property Inflow/Infiltration (I/I) Abatement Program"
1D Water Reclamation and Reuse RAP nomination letter, dated February 8, 2011

ACTION: Approve the Meeting Summary.

2. UASI Grant - Request for Proposals (RFP)

The revised draft RFP for the "Water Infrastructure Assessment and Emergency Response Training" project was distributed separately for review. The Committee will discuss next steps and identify Committee members to serve on the selection panel and review proposals. The selection panel will recommend a consultant for Committee approval prior to development of a contract by HRPDC staff.

Attachments:
2A Preliminary schedule for RFP release and vendor selection.

ACTION:
1. Approve the revised draft RPF for finalization and release.
2. Select Committee members to serve on RFP selection panel.

3. Committee Decision-Making Procedures

The Committee will discuss the draft guidelines proposed for Committee actions on budget planning and expenditures.

Attachments:
3A Draft Guidelines for Committee Actions

ACTION: Per Committee discussion.

4. Uranium Mining

Mr. Tom Leahy will brief the Committee on the "Preliminary Assessment of Potential Impacts of Uranium Mining in Virginia on Drinking Water Sources" initiated by the City of Virginia Beach.

ACTION: No action.

5. Interbasin Transfers

Delegate Wright (District 61 - Mecklenburg, Lunenburg, Brunswick Counties) introduced H.B. 2402 in this legislative session. He has withdrawn the bill but intends to resubmit it next year. The bill proposes a detailed evaluation process, analysis of alternatives, and extensive public hearings for new or expanded interbasin transfers. This proposal is anticipated to be a topic of discussion at the next Water Supply Advisory Committee meeting. John Carlock is our representative on the Advisory Committee. The Directors of Utilities Committee will discuss this issue and provide input for John to share with the State Advisory Committee.

Attachments:
5A Interbasin Transfer – draft bill H.R. 2402.

ACTION: Per discussion.

6. Staff Reports

- Capacity Team Update: The Capacity Team is continuing to develop Rehabilitation Plan Business Rules to establish expectations for the Locality and HRSD Rehabilitation Plans due in November 2012. The Business Rules will provide a regionally agreed upon approach to facilitate appropriate Rehabilitation Plan development to allow the Wet Weather Management Plan to be completed in November 2013.

- Regional Water Supply Plan: Section 4, "Projected Water Demands" and Section 5, "Water Demand Management" were distributed to the Committee for review and comment in February 2011. Section 6/7, "Statement of Need/Alternatives" will be distributed in March 2011. Committee comments on these sections will be incorporated into a pre-final document (Sections 1 through 7) to be distributed in April for use in briefing city managers prior to commencing the local program adoption process.

- Private Property Inflow/Infiltration (I/I) Abatement Program: HRPDC staff will provide a draft brief for the March 17th meeting of the Commission. The Committee will discuss next steps and the negotiation of HRSD-locality MOAs.

- HRPDC Retreat Summary: HRPDC staff will provide a summary of the Commission retreat on February 17, 2011.

Attachments:
6A Regional Groundwater Policy Brief – HRPDC Retreat on February 17, 2011.

7. Other Business

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
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WILLIAMSBURG

YORK

March 30, 2011

Memorandum #2011-55

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – April 6, 2011
RSVP – April 5, 2011

This is to call the April meeting of the Directors of Utilities Committee for **April 6, 2011 at 11:00 a.m.** The meeting will be held in the **HRPDC Conference Room D, Chesapeake.**

The Agenda and related materials are attached.

A deli lunch will be provided. Please RSVP by April 5, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by April 5, 2011

TS/fh

Attachments

Utilities Committee

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Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
April 6, 2011
Chesapeake
11:00 AM

1. Summary of March 2, 2011 Meeting of the Directors of Utilities Committee

The Summary of the March 2, 2011 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:
1A February 2, 2011 Meeting Summary
1B February 2, 2011 Meeting Sign-in Sheet
1C City of Virginia Beach Presentation: "City of Virginia Beach Uranium Mining Impact Study, Lake Gaston Water Safety Council, February 23, 2011"
1D City of Norfolk Handout: "Public Water Supply System Concerns Related to Interbasin Transfers as Part of State Water Supply Planning (Draft 2/10/2011)"
1E HRPDC Draft Presentation: "Sanitary Sewer Overflow Consent Order, Private Property Inflow and Infiltration Abatement"

ACTION: Approve the Meeting Summary.

2. Private Property Infiltration and Inflow (I/I) Abatement Program

HRPDC staff presented the private property I/I abatement program development options and the Committee's recommendation at the March 17, 2011 Commission meeting. The Commission referred the issue for discussion at the April 21, 2011 Chief Administrative Officers meeting, with the intent of informing the May 19, 2011 Commission meeting. The Committee will discuss the next steps in facilitating program development and coordination with the rehabilitation business rules being developed by the Capacity Team (see item 3).

ACTION: Per discussion.

3. Rehabilitation Guidelines, Standards and Tools (RGST) Business Rules.

The Capacity Team has developed draft RGST Business Rules to provide a regionally agreed upon approach to assure that the Rehabilitation Plans submitted in November 2012 are appropriately developed to allow the Wet Weather Management Plan to be completed in November 2013.

Mr. Richard Stahr, Brown and Caldwell, will brief the Committee on the business rules, the Capacity Team's April 4, 2011 discussion of the draft with DEQ, and next steps. A copy of the draft rules was distributed separately prior to the meeting.

ACTION: Per discussion.

4. **State Water Supply Plan Advisory Committee**

The State Water Supply Plan Advisory Committee met on March 29, 2011. Whitney Katchmark attended for John Carlock. The Committee did not have a discussion of interbasin transfers. Ms. Katchmark will provide a summary of the meeting.

ACTION: Per discussion.

5. **Irrigation Submeter Readings and Wastewater Credits**

The Committee will discuss the practice of providing wastewater billing credits based on irrigation submeter readings. A summary of locality program practices is provided as Attachment 5A.

Attachment:
5A Summary of Locality Practices for Submeter Readings and Wastewater Credits

ACTION: Per discussion.

6. **UASI Grant RFP Release and Pre-Proposal Conference:** The RFP for the "Water Infrastructure Assessment and Emergency Response Training" project was released on March 17, 2011, with notice of availability published on the HRPDC website and in the Daily Press, the Virginian-Pilot, and the New Journal and Guide. The RFP announcement was also sent to those on the HRPDC vendor list. The Pre-Proposal Conference was held on March 25, 2011, and the formal addendum documenting written questions, responses, and the pre-proposal conference was released on March 29, 2011. Proposals are due on April 14, 2011, and interviews (if needed) will be held on April 28, 2011. The selection panel's recommendation for a contractor will be presented at the May 4, 2011 Committee Meeting. Staff will provide a summary of the pre-proposal conference.

Attachment:
6A Addendum to RFP No. WR-RFP-2011-01

ACTION: No Action.

7. Advisory Committee Reports

- Water Reclamation and Reuse Regulations: The Advisory Committee will hold its first meeting on April 21, 2011. The Directors of Utilities Committee will confirm attendance by a representative.

ACTION: No Action.

8. Staff Reports

- H2O Program Status Update: Staff will provide a summary of recent program activities. Staff requests the Committee's review and comment on the H20 program contact list (Attachment 8A) and the list of total metered accounts by locality (Attachment 8B). Comments may be emailed to Lisa Hardy (LHardy@hrpdcva.gov).

- FOG Program Status Update: Staff will report on training for food service establishments (FSEs) and grease haulers. A summary of the status of locality FOG ordinances is provided as Attachment 8C.

- Committee Decision-Making Procedures: The guidelines for committee decision-making procedures were revised per comments received at the March 2, 2011 Committee meeting. The document was distributed separately prior to the meeting. Comments for incorporation into the final document may be emailed to Tiffany Smith (tsmith@hrpdcva.gov) by April 5, 2011.

- Regional Water Supply Plan: Section 6/7, "Statement of Need/Alternatives" will be distributed for review in April 2011. Committee comments on these sections will be incorporated into a pre-final document (Sections 1 through 7) to be distributed in May for use in briefing city managers prior to commencing the local program adoption process June/July 2011.

Attachments:
8A H2O Contact List
8B List of Total Metered Accounts
8C Summary of Locality FOG Ordinances

ACTION: No Action.

9. Other Business

- Suggested May/June Agenda Topic: Newport News Department of Public Works and the City's Division of Emergency Management would like feedback from other localities as to their interest in exploring options to safeguard equipment/assets by moving these resources out of the area of potential impact due to an impending catastrophe (e.g., tsunami or Category 3 or greater storm surge).

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
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FRANKLIN

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PORTSMOUTH

SOUTHAMPTON

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VIRGINIA BEACH

WILLIAMSBURG

YORK

April 27, 2011

Memorandum #2011-68

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – May 4, 2011
RSVP – May 3, 2011

This is to call the May meeting of the Directors of Utilities Committee for **May 4, 2011 at 1:30 p.m.** The meeting will be held at the Newport News Waterworks **Lee Hall Maintenance and Operations Center Conference Room, 425 Industrial Park Drive, Newport News.** The beginning of the meeting will be convened as the H2O – Help to Others – Program Board of Director's meeting.

The Agenda and related materials are attached.

Please RSVP by May 3, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by May 3, 2011

TS/fh

Attachments

Utilities Committee

Lynn Allsbrook, HA
Daniel G. Clayton III, WM
Lawrence A. Dame, New Kent
John B. Edwards, Jr., SY
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
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Eric Rosser, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
H2O – Help to Others – Program Board of Directors
AGENDA
May 4, 2011
Lee Hall Maintenance and Operations Center
425 Industrial Park Drive
Newport News
1:30 PM

1. **Discussion of Re-Launch of H2O - Help to Others - Program**

   HRPDC staff will brief the Board of Director's on the steps necessary to re-launch the H2O Program. Discussion will include improving the allocation of funding process, and evaluating the assistance amount of $250.

   ACTION: Per discussion.

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
May 4, 2011
Lee Hall Maintenance and Operations Center
425 Industrial Park Drive
Newport News
1:30 PM

1. **Summary of April 6, 2011 Meeting of the Directors of Utilities Committee**

   The Summary of the April 6, 2011 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

   Attachments:
   1A March 2, 2011 Meeting Summary
   1B March 2, 2011 Meeting Sign-in Sheet
   1C HRPDC Handout: "HRPDC Summary, Water Supply Plan Advisory Committee, Tuesday, March 29, 2011"

   ACTION: Approve the Meeting Summary.

2. **Private Property Infiltration and Inflow (I/I) Abatement Program**

The options for development of a private property I/I abatement program were discussed at the April 21, 2011 Chief Administrative Officers (CAO) meeting. HRPDC staff will provide a summary of the meeting. The Committee will discuss the next steps toward program development.

ACTION: Per discussion.

3. **UASI Grant Proposals and Selection Panel Review**

The deadline for proposals in response to RFP No. WR-RFP-2011-01 was April 14, 2011. Six proposals were received from the following project teams:

- **Tetra Tech EM Inc.** (with Janet L. Clements Consulting and Dutko Global Risk Management)
- **Virginia Modeling, Analysis and Simulation Center** (with Old Dominion University Dept. of Civil Engineering, WBB Consulting, and Dynamis)
- Security Management International, LLC
- **Watermark Risk Management International, LLC** (with CH2M Hill and CNA)
- Abrams Learning and Information Systems, Inc. (with Dawson & Associates and Intelligent Decision Systems, Inc.)
- **URS Corporation** (will Alliance Solutions Group, Inc.)

The selection panel completed reviews of each proposal and conducted interviews with 4 project teams (bold text above) on April 28, 2011. HRPDC staff and selection panel members will brief the Committee on the review process and provide a recommendation for consultant selection.

ACTION: Select a contractor and make recommendation to Commission at May meeting to execute a contract.

4. **Committee Reports**

- **Water Reclamation and Reuse Regulations:** The Advisory Committee held its first meeting on April 21, 2011. A summary of the meeting will be provided by Mr. Eric Tucker.

  ACTION: Per discussion.

- **Consensus on Regional Hydraulic Model Inputs and Calibration:** Minor Revision Number 1 to the Regional Technical Standards states that "HRSD and the Localities shall reach consensus on the flow parameters and other Locality provided Regional Hydraulic Model (RHM) inputs and RHM calibration not later than May 1, 2011." The Capacity Team developed a document to memorialize

consensus on the referenced input data and application of the model. The agreement was to be executed by the Utility Directors no later than May 1, 2011 as a matter of compliance with the Special Order of Consent. The Committee will review the agreement and confirm execution by the Utility Directors.

ACTION: Per discussion.

- **Rehabilitation Guidelines, Standards and Tools (RGST) Business Rules:** Per discussion at the April 6, 2011 Committee meeting, Mr. Richard Stahr, Brown and Caldwell, contacted the Department of Environmental Quality (DEQ) regarding the possibility of memorializing the RGST Business Rules via a Minor Revision to the Regional Technical Standards. At the April 11, 2011 Capacity Team meeting, Mr. Stahr reported that DEQ is not amenable to a Minor Revision. However, DEQ indicated that locality and HRSD rehabilitation plans prepared in accordance with the Business Rules are unlikely to be rejected. The Capacity Team will revise the Business Rules document into a technical memorandum to be signed by the Utility Directors and HRSD.

  The Capacity Team will also prepare several rehabilitation plans for early submission to DEQ in June. This exercise is intended to reinforce understanding of the Business Rules and facilitate future DEQ review of rehabilitation plans.

  ACTION: Per discussion.

5. **Staff Reports**

- **Committee Decision-Making Procedures:** The guidelines for committee decision-making procedures were finalized per comments received at the April 6, 2011 Committee meeting and distributed to the Committee on April 26, 2011.

- **Regional Water Supply Plan:** Section 6/7, "Statement of Need/Alternatives" will be distributed for review in May 2011. Committee comments on these sections will be incorporated into a pre-final document (Sections 1 through 7) to be distributed to the Committee and presented to the Hampton Roads Planning District Commission on June 16, 2011, prior to commencing the local program adoption process. The Committee will discuss the timeframe for completing pre-final review.

- **Hampton Roads Water Quality Response Plan:** HRPDC staff is conducting the annual update of the Hampton Roads Water Quality Response Plan Contact List. The June 28, 2010 version of the list was distributed to the Committee for review/update of water utility contact information (see Attachment 8A). Submit revisions and updates by May 31, 2011 to Tiffany Smith (tsmith@hrpdcva.gov).

- **Sanitary Sewer Overflow Reporting System (SSORS):** HRPDC staff will brief the Committee on budget issues. The Committee will discuss the next steps toward implementing a maintenance agreement.

Attachment:
8A Hampton Roads Water Quality Response Plan Contact List

ACTION: Per discussion.

6. Other Business

- Topics for discussion at the June 1, 2011 Joint Meeting of the Utility Directors and Health Directors

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

MEMBER JURISDICTIONS
CHESAPEAKE
FRANKLIN
GLOUCESTER
HAMPTON
ISLE OF WIGHT
JAMES CITY
NEWPORT NEWS
NORFOLK
POQUOSON
PORTSMOUTH
SOUTHAMPTON
SUFFOLK
SURRY
VIRGINIA BEACH
WILLIAMSBURG
YORK

May 25, 2011

Memorandum #2011-88

TO: Directors of Utilities Committee
Directors of Health

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – June 1, 2011
RSVP – May 31, 2011

This is to call the June meeting of the joint Directors of Utilities and Health Directors Committee for June 1, 2011. **Lunch begins at 12:30 p.m. The meeting will start at 1:00 p.m.** The meeting will be held at the HRPDC Regional Board Room, Chesapeake. The Agenda and related materials are attached.

The Health Directors will have a special meeting from 11:30-12:30 in conference room C.

A deli lunch will be provided. Please RSVP by May 31, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by May 31, 2011

TS/fh

Attachments

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Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Health Directors

S. William Berg, MPH, VDH
Ana Colon, VDH
Jay Duell, VDH
Agnes Flemming, VDH
David Fridley, VDH
Jeffery Goodchild, VDH
Daniel B. Horne, P.E., VDH
William Nelson, VDH
Wes Kleene, VDH
Demetria Lindsay, VDH
Julia Murphy, VDH
Venita Newby-Owens, MPH, VDH
John Schellenberg, VDH
Carol Smith, VDH
Erin Sutton, VDH
David Trump, MPH, VDH
Nancy Welch, VDH

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Joseph Durant, NN
Frank Haltom, IW
Richard Hartman, PO
Dave Jordan, VDH
Stephen Land, NN
Nettleton Richard, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Craig Ziesemer SU

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
AGENDA
June 1, 2011
Chesapeake
12:30 PM

DELI BUFFET LUNCH

1. **Summary of May 4, 2011 Meeting of the Directors of Utilities Committee**

   The Summary of the May 4, 2011 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

   Attachments:
   1A May 4, 2011 Meeting Summary
   1B May 4, 2011 Meeting Sign-in Sheet
   1C HRPDC Handout: "Regional Water Supply Plan, Schedule for Final Plan Review"

   ACTION: Approve the Meeting Summary.

2. **Summary of December 1, 2010 Joint Meeting of the Directors of Utilities Committee and Directors of Health**

   The Summary of the June 2, 2010 meeting of the joint Directors of Utilities and Directors of Health Committee is attached as item 2A for the Committee's review and approval.

   Attachments:
   2A – December 1, 2010 Meeting Summary
   2B – December 1, 2010 Meeting Sign-in Sheet
   2C – December 1, 2010 handout from Mr. Dan Horne, VDH
   2D – December 1, 2010 handout from Mr. Dan Dietrich, VDH
   2E – December 1, 2010 HRSD presentation by Mr. Jay Bernas and Mr. Bruce Husselbee

   ACTION: Approve the Meeting Summary.

3. **Regulatory Update**

   Mr. Dan Horne, VDH, will provide an update on regulatory issues.

   ACTION: No action.

4. Regulations for Alternative Onsite Sewage Systems

Emergency Regulations for alternative onsite sewage systems, effective April 7, 2010, will expire October 7, 2011. VDH convened a series of technical advisory committee meetings to seek input for the proposed final regulations.

Mr. Dwayne Roadcap, Program Manager, VDH Division of Onsite Sewage, Water Services, Environmental Engineering, and Marina Programs will provide a briefing on the proposed regulations, what types of systems are allowed, and how proposed systems will be evaluated and approved.

ACTION: Per discussion.

5. Water Reclamation and Reuse Regulations

The Regulatory Advisory Panel (RAP) on revisions to the Water Reclamation and Reuse Regulation (9VAC25-740, effective October 1, 2008) held its first two meetings on April 21 and May 2, 2011. There was discussion of potential public health consequences related to some proposed amendments, for example, those proposed for 9VAC25-740-110, Design criteria, Subsection B, regarding the conversion of existing potable water distribution systems or existing sewer and wastewater collection systems for distribution of reclaimed water.

The remaining Advisory Committee meetings are scheduled for June 2, 2011 and July 7, 2011. The Committee will discuss concerns with proposed amendments to the regulation.

ACTION: Per discussion.

6. UASI Water Supply Assessment and Emergency Response Training Project

The Department of Homeland Security, Urban Area Security Initiative (UASI) program provides financial assistance to address the unique multi-disciplinary planning, operations, equipment, training, and exercise needs of high-threat, high-density urban areas, and to assist these areas in building and sustaining capabilities to prevent, protect against, respond to, and recover from threats or acts of terrorism.

On March 4, 2011, the Virginia Department of Emergency Management Grants Office awarded FY 2010 Homeland Security Grant Program (HSGP) UASI funding for the "Water Supply Assessment and Emergency Response Training" project. The project will establish a regional approach to assess significant water system hazards and vulnerabilities and to identify coordination issues in responding to a major disruption of the water supply system.

Watermark Risk Management International, Inc., has recently been selected to execute this project. Mr. Matt Branigan, Watermark, will kickoff the project by introducing the project team and outlining the project process, deliverables and timelines.

ACTION: No action.

7. **Roundtable Discussion**

The Directors of Utilities and Health Directors will have an opportunity to discuss matters of mutual interest.

BREAK (10 minutes)

At this time the Joint Directors meeting will conclude. When the meeting reconvenes, topics pertaining to the Utility Directors will be discussed. Health Directors are invited to stay if they wish.

8. **Regional Water Supply Plan**

The pre-final draft of the Regional Water Supply Plan was distributed on May 18, 2011 to the Directors of Utilities Committee for review and comment. The Committee will discuss proposed revisions for incorporation into the final plan and associated impacts to the local program adoption schedule.

ACTION: Per discussion.

9. **Staff Reports**

- **Rehabilitation Guidelines, Standards and Tools (RGST) Business Rules:** The Capacity Team met with the Department of Environmental Quality (DEQ) on May 23, 2011 to review the RGST Business Rules and application of the rules to rehabilitation plan development. Capacity Team members and HRPDC staff will brief the Committee on the discussion.

  ACTION: Per discussion.

- **Private Property Infiltration and Inflow (I/I) Abatement Program:** On May 19, 2011, the HRPDC Executive Committee approved the development of a Regional Private Property I/I Abatement Program. The Capacity Team will begin developing program details.

  ACTION: Per discussion.

- **Sanitary Sewer Overflow Reporting System (SSORS):** HRPDC staff is coordinating with the consultant on the scope of work for system maintenance and will provide additional details to the Committee.

  ACTION: Per discussion.

10. Other Business

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES D. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

June 29, 2011

Memorandum #2011-106

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – July 6, 2011
RSVP – July 5, 2011

This is to call the July meeting of the Directors of Utilities Committee for **July 6, 2011 at 1:30 p.m.** The meeting will be held in the **James Room, Fountain Plaza II, City Center, Newport News.**

The Agenda and related materials are attached.

Please RSVP by July 5, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by July 5, 2011

TS/fh

Attachments

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MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
July 6, 2011
Newport News
1:30 PM

CLOSED SESSION

1. UASI Water Supply Assessment and Emergency Response Training Project

The project team has prepared two draft documents for Committee review and comment (distributed separately prior to the meeting):

- Project Methodology; and
- Risk Scenarios and Resultant Impacts for Hampton Roads Regional Water Sector

Mr. Kurt Klingenberger, Watermark Risk Management International, LLC and Dr. Joel Silverman, CNA will brief the Committee and address questions and comments.

ACTION: Provide comments for finalizing the draft project methodology and risk scenarios.

PUBLIC MEETING

2. Summary of June 1, 2011 Joint Meeting of the Directors of Utilities Committee and Directors of Health

The Summary of the June 1, 2011 joint meeting of the Directors of Utilities Committee and Directors of Health is attached as item 2A for the Committee's review and approval.

Attachments:
2A June 1, 2011 Meeting Summary
2B June 1, 2011 Meeting Sign-in Sheet
2C Handout: VDH Office of Drinking Water Regulatory Update
2D Presentation: UASI Water Supply Assessment and Emergency Response Project
2E Handout: Hampton Roads Regional Water Supply Plan Review/Comment Status

ACTION: Approve the Meeting Summary.

3. Committee Reports

- **Water Reclamation and Reuse Regulatory Advisory Panel (RAP):** The Water Reuse RAP last met on June 2, 2011 and is scheduled to hold its final meeting July 7, 2011. A summary of the June 2, 2011 meeting will be provided to the Committee. Members of the Water Reuse RAP were asked to participate in an advisory group to examine incentivizing water reclamation and reuse. Water Reuse RAP member Mr. Eric Tucker, City of Norfolk Assistant Director of Utilities, is willing to represent the Committee on the advisory group.

  ACTION: Per discussion.

- **Stormwater Reuse:** Wetland Studies and Solutions, Inc. raised concerns about the revisions to 2009 Uniform Statewide Building Code (USBC) and Virginia Department of Health (VDH) guidelines with their Field Notes newsletter (attachment). The building code seems to limit cistern storage to 24 or 72 hours depending on use, which will limit the practical value of cisterns. Also, new Virginia Department of Health (VDH) guidelines recommend prohibiting the use of any harvested rainwater (regardless of level of treatment) for potable uses and discouraging indoor non-potable use. At the July 7, 2011 Joint Environmental Committee meeting, VDH and the Virginia Department of Housing and Community Development will provide a briefing and answer questions on these documents.
  - March 2011 "Rainwater Harvesting and Use Guidelines" (www.vdh.virginia.gov/EnvironmentalHealth/ONSITE/technicalresources/documents/2011/pdfs/VDH%20Rainwater%20Use%20Guidelines%20V2011_03.pdf)
  - Virginia 2009 Residential Code, Appendix O and Section R328, Gray Water and Rain Water Recycling Systems (www.dhcd.virginia.gov/StateBuildingCodesandRegulations/Virginia_Uniform_Statewide_Building_Code.htm)

  Attachment:
  3A Field Notes Vol. 19 No. 4

  Action: Per discussion.

- **Capacity Team:** The Capacity Team is working on the following: a) agreement with Department of Environmental Quality (DEQ) on the RGST Business Rules and review of sample rehabilitation plans; b) consensus population and employment projections for capacity assessment; c) private property infiltration/inflow locality data request; and d) potential Regional Technical Standards technical interpretation on the calculation of the gallon-per-day (gpd) per existing residential unit (ERU) using platted lots instead of occupied lots.

  ACTION: Per discussion.

4. Staff Reports

- **Final Regional Water Supply Plan:** Hard copies of the Hampton Roads Regional Water Supply Plan will be distributed to the Directors of Utilities Committee at the meeting. HRPDC staff will review the local program adoption checklist.

  Attachment:
  4A Local Program Adoption Checklist, Regional Water Supply Plan

  ACTION: Commence local program adoption process.

- **FOG Ordinance Status Update:** The Committee will review current locality ordinance status and provide any updates to HRPDC staff. A summary of ordinance status as of March 2011 is provided as Attachment 4B.

  Attachment:
  4B Status of Locality FOG Ordinances

  ACTION: Provide ordinance status updates by locality.

- **Help 2 Others (H2O) Program Update:** HRPDC staff will brief the Committee on the following:
  - The amount of funding currently available,
  - HRSD's ability to support the H2O Program,
  - Each locality's bill structure,
  - Salvation Army locations and localities served,
  - Website development, and
  - Envelope design.

  ACTION: Per discussion.

- **HR WET and HR GREEN Update:** HRPDC staff will brief the Committee on program activities and progress with the HR GREEN campaign.

  ACTION: No action.

- **Hampton Roads Water Quality Response Plan:** The 2011 update of the contact list is pending revised information from military installations. Completion is anticipated in early July 2011.

  ACTION: No action.

- **Data Call – Water Rates and Water Use:** HRPDC staff anticipates commencing the annual data call for water rates and water use in late July 2011. The 2011 data call will request information on water rates, taxes, and water use by category.

  ACTION: No action.

- **Chesapeake Bay TMDL:** HRPDC staff will discuss issues that may impact utilities.

  ACTION: Per discussion.

- **Drought Conditions:** The Hampton Roads area has been included in areas experiencing "D1 Drought – Moderate" conditions according to the U.S. Drought Monitor (http://drought.unl.edu/dm/monitor.html). The Committee will have a roundtable discussion of impacts to water supplies.

  ACTION: No action.

5. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES D. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

July 27, 2011

Memorandum #2011-128

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – August 3, 2011
RSVP – August 2, 2011

This is to call the August meeting of the Directors of Utilities Committee for **August 3, 2011 at 1:30 p.m.** The meeting will be held in the Regional Board Room, Chesapeake. The agenda and related materials are attached.

Please RSVP by August 2, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by August 2, 2011

TS/fh

Attachments

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Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
August 3, 2011
Chesapeake
1:30 PM

CLOSED SESSION

1. **UASI Water Supply Assessment and Emergency Response Training Project**
   HRPDC staff will provide a progress update, including data collection protocols.

   ACTION: No action.

PUBLIC MEETING

2. **Summary of July 6, 2011 Joint Meeting of the Directors of Utilities Committee and Directors of Health**

   The summary of the July 6, 2011 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

   Attachments:
   2A June 1, 2011 Meeting Summary
   2B June 1, 2011 Meeting Sign-in Sheet

   ACTION: Approve the Meeting Summary.

3. **SSO Consent Decree schedule**

   A lot of work has to be accomplished in the next year to ensure that the region can complete all the tasks required to be in compliance with the consent decree. Mr. Richard Stahr will review the deadlines for the required deliverables and discuss the recommended interim deadlines to stay on schedule.

   Major sub-committee activities are summarized as follows:
   - The Capacity Team has agreed to language to document consensus on population and employment projections for capacity assessment; only a few localities are still finalizing projections.
   - A response from DEQ regarding the RGST Business Rules was anticipated to be received by July 22, 2011 and discussed at the Capacity Team meeting on August 1st.

- HRSD is developing details for the regional private property infiltration/inflow abatement program and has identified several pilot projects.

ACTION: Per discussion.

4. Infrastructure Optimization Software

The City of Newport News, with consultant Woolpert, has evaluated a software product that can be used to support advanced asset management and rehabilitation planning related to the Special Order of Consent. The software is an ArcGIS extension that integrates existing GIS data with new data collected through CCTV and hydraulic modeling to simplify rehabilitation and replacement project planning. Mr. Don Cole, Woolpert, will brief the Committee on the Infrastructure Optimization (IO) toolset, its key functions, and software enhancements that can be made to accommodate the Rehabilitation Guidelines, Standards and Tools (RGST) Business Rules and basin percentage tracking for Hampton Roads localities.

ACTION: No action.

5. Virginia Department of Health Requirements for Boil Water Notices

Per the May 4, 2011 meeting, the Committee invited Mr. Dan Horne, Virginia Department of Health (VDH), Office of Drinking Water for a roundtable discussion of VDH requirements for boil water notices and revisions to the total coliform rule.

ACTION: Per discussion.

6. Committee Reports

- **Water Reclamation and Reuse Regulatory Advisory Panel (RAP):** The Water Reuse RAP held its final meeting on July 7, 2011. HRPDC staff will brief the Committee on the meeting and the advisory group formed from the RAP to examine incentivizing water reclamation and reuse.

  ACTION: Per discussion.

7. Staff Reports

- **Final Regional Water Supply Plan:** On July 21, 2011, the Hampton Roads Planning District Commission acted to: 1) Accept the plan as meeting the requirement of the HRPDC work program; and 2) Distribute the Hampton Roads Regional Water Supply Plan to local governments for adoption.

- **Hampton Roads Water Quality Response Plan:** The 2011 update of the contact list was distributed on July 21, 2011.

- **Data Call – Water Rates and Water Use:** HRPDC staff anticipates commencing the annual data call for water rates and water use in August 2011. The 2011 data call will request information on water rates, taxes, and water use by category.

- **Help 2 Others (H2O) Program Update:** HRPDC staff will provide an update to the Committee.

ACTION: No action on Staff Reports.

8. Other Business

Effective August 1, 2011, Mr. John Edwards will be the Town Manager of West Point, Virginia. In recognition of his service, the Committee would like to thank him for his contributions to the water and wastewater programs in the region.

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

August 31, 2011

Memorandum #2011-147

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – September 7, 2011
RSVP – September 6, 2011

This is to call the September meeting of the Directors of Utilities Committee and the H2O – Help to Others – Program Board of Director's meeting for **September 7, 2011.** The meeting will be held in the **James Room, Fountain Plaza II, City Center, Newport News.** The agenda and related materials are attached. The meeting schedule is as follows:

12:15 p.m.	Deli lunch served
12:30 p.m.	H2O – Help to Others – Program Board of Director's Meeting
1:30 p.m.	Directors of Utilities Committee Meeting

A Deli lunch will be provided. Please RSVP by September 6, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by September 6, 2011

TS/fh

Attachments

Utilities Committee:

Lynn Allsbrook, HA
Daniel G. Clayton III, WM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
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Copy:

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Ellen Roberts, PQ
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Stephen Watson, FR
Craig Ziesemer SU

Capacity Team:

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Ralph Patterson, WM
Danny Poe, JC
Eric Rosser, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
H2O – Help to Others – Program Board of Directors
AGENDA
September 7, 2011
Newport News
12:30 PM

1. Salvation Army Partnership Update

HRPDC staff has met with representatives from the regional Salvation Army offices in Norfolk (serves Norfolk, Virginia Beach, Chesapeake), Portsmouth (serves Portsmouth and part of Chesapeake), Suffolk (serves Suffolk, Surry and Isle of Wight County), Franklin (serves Franklin, South Hampton and part of Isle of Wight) and Williamsburg (serves Williamsburg, James City County and upper York County). A meeting has yet to be finalized with the Hampton office (serves Hampton, lower York County, Gloucester County, Newport News, and Poquoson).

Representatives from the five offices were very interested in partnering with the H2O Program as they continue to see great need for utility assistance in Hampton Roads. The next step is for the H2O Board of Directors to take formal action on entering into a partnership with the Salvation Army. Once that has been voted on, a Memorandum of Agreement (MOA) will be drafted by HRPDC between the H2O Board of Directors, HRSD, HRPDC, and the participating Salvation Army offices. The MOA will be routed through the proper chain of command at the Salvation Army offices with final approval from the Washington DC office.

The following next steps are contingent on the Board agreeing to partner with the Salvation Army:

- HRPDC will draft MOA.
- Envelope printing proposals are due August 29th. HRPDC will select the best proposal. First shipment of 250,000 envelopes will be sent to HRSD for November bills.
- HRPDC will solicit quotes for H2O website development.
- HRPDC will collect direct contact numbers from each utility billing office to provide to Salvation Army.
- HRPDC will work with Salvation Army to compile screening questions.
- HRPDC compile Program Administration Package and set-up training days for Salvation Army in December.
- HRPDC set-up H2O Program kick-off meeting with Salvation Army and Utility Billing Department representatives in January.

ACTION: 1. Vote on entering into a formal partnership with the Salvation Army.

2. Direct HRPDC staff as to pursuit of next steps (listed above).

2. Program Eligibility Criteria Document

The H2O program eligibility criteria (see Attachment 2) have been reviewed by HRSD, HRPDC and the Salvation Army. The following questions have been raised for discussion by the Board of Directors:

Criteria # 3

- Is the $250 amount adequate to cover the water and wastewater fees, trash fee, and stormwater fee?
- Will assistance cover late fees, set-up fee or connection fee, outstanding balance from previous residence?
- How will customers who have diverted water or tampered with the water meter be handled?

Criteria #4

- Is it necessary to include water conservation education? Should this be an optional requirement necessary only if water mismanagement is apparent?

Criteria #5

- Can language be added that if a utility bill is over $250, Salvation Army must require client to show they have paid down the difference to $250?

Attachment:

2 Help to Others Program Criteria Document (mark-up showing proposed revisions)

ACTION: Per discussion.

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
September 7, 2011
Newport News
1:30 PM

CLOSED SESSION

1. UASI Water Supply Assessment and Emergency Response Training Project

HRPDC staff will brief the Committee on upcoming project activities:
- Scheduling of data collection interviews with utility departments; and
- Scheduling of data collection workshops with emergency managers.

ACTION: No action.

PUBLIC MEETING

2. Summary of August 3, 2011 Meeting of the Directors of Utilities Committee

The summary of the August 3, 2011 meeting of the Directors of Utilities Committee is attached as item 2A for the Committee's review and approval.

Attachments:
2A August 3, 2011 Meeting Summary
2B August 3, 2011 Meeting Sign-in Sheet
2C HRSD presentation on SSO Consent Decree Schedule

ACTION: Approve the Meeting Summary.

3. Special Order of Consent: Proposed Amendment to the Regional Technical Standards and Development of a Memorandum of Agreement (MOA) for Private Property Infiltration/Inflow (I/I) Abatement

At the August 3, 2011 Committee meeting, Mr. Richard Stahr reviewed the deadlines for the required deliverables and tasks required for compliance with the Special Order of Consent (SOC) and discuss the recommended interim deadlines to stay on schedule. The Capacity Team has been working with the Department of Environmental Quality (DEQ) to memorialize practices for Rehabilitation Planning and for the regional private property I/I abatement program. Consensus among locality representatives and with DEQ was anticipated on August 31, 2011. Mr. Stahr will brief the Committee on the discussions with DEQ and next steps.

ACTION: Per discussion.

4. Staff Reports

- **Final Regional Water Supply Plan:** HRPDC staff will provide an update on local program adoption activities (see Attachment 4A). Staff is collecting the following by September 30, 2011 for submittal to the Department of Environmental Quality:
  - Copy of approved minutes from local public hearing;
  - Copies of any written comments received and locality responses;
  - Copy of the locality resolution adopting the plan.

- **Water and Sewer Rates and Water Use Data Call:** HRPDC staff will provide the Committee with a preview of the format for the 2011 data call, which requests information on water and sewer rates, taxes, and water use by category. Discussion will include feedback on format and the need to document assumptions for disaggregated water use data.

Attachments:
4A Regional Water Supply Plan Local Program Adoption Status

ACTION: No action on Staff Reports.

5. Other Business

- **Approval of Agenda Topics:** The Committee will discuss how new business should be approved for inclusion on future Committee agendas. A list of potential agenda topics is provided below based on past meetings and project activities.

  October 5, 2011 Meeting:
  - (Closed Session) Mike Milicich, Department of Homeland Security (DHS): Briefing on Enhanced Critical Infrastructure Protection (ECIP) Initiative and Infrastructure Survey Tool (IST) and guidance on utility information sharing for UASI project.
  - (Closed Session) Watermark Team: Presentation on UASI project "to-be" state for Hampton Roads.
  - (Open Session): Scott Kudlas, DEQ: Briefing on International Paper's groundwater withdrawal permit.

  Future Meetings:
  - Newport News Waterworks: Briefing on the evaluation of irrigation meter implementation.
  - Roundtable discussion on Virginia Department of Health (VDH) requirements for boil water notices

ACTION: Per discussion.

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
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DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

September 28, 2011

Memorandum #2011-161

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – October 5, 2011
RSVP – October 4, 2011

The October meeting of the Directors of Utilities Committee will be held **on October 5, 2011 at 1:30 p.m.** in the Regional Board Room, Chesapeake. The agenda and related materials are attached.

Please RSVP by October 4, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by October 4, 2011

TS/fh

Attachments

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MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
October 5, 2011
Chesapeake
1:30 PM

1:30 PM - CLOSED SESSION

1. **Special Order of Consent (SOC)**

   The Directors of Utilities that are party to the Joint Defense Agreement will discuss the status of SOC activities and next steps. The Directors will discuss locality concerns regarding funding and implementation of rehabilitation plans and the Regional Wet Weather Management Plan. To inform the discussion, Mr. Richard Stahr will provide a briefing on issues of concern.

   ACTION: Reach consensus on next steps or continue discussion at a future meeting.

2. **UASI Water Supply Assessment and Emergency Response Training Project**

   The project team will brief the Committee on recent project activities and facilitate a discussion of expectations for the final deliverable.

   ACTION: Per discussion.

2:45 PM - PUBLIC MEETING

3. **Summary of the September 7, 2011 Meetings of the H2O – Help to Others – Program Board of Directors and the Directors of Utilities Committee**

   The summary of the September 7, 2011 meetings of the H2O – Help to Others – Program Board of Directors and the Directors of Utilities Committee is attached as item 2A for the Committee's review and approval.

   Attachments:
   3A September7, 2011 Meeting Summary
   3B September 7, 2011 Meeting Sign-in Sheet
   3C Draft Amended Sections 1, 2, 7 and 8 of the Regional Technical Standards
   3D Draft Hampton Roads Regional Infiltration/Inflow (I/I) Abatement Memorandum of Agreement Principles

   ACTION: Approve the Meeting Summary.

4. **State Water Control Board Stakeholder Group in Advance of Regulatory Action Regarding Groundwater Recharge with Reclaimed Water**

Per the notice published on September 16, 2011, the Department of Environmental Quality (DEQ) is seeking persons interested to serve on a stakeholder group that will provide input on issues related to groundwater recharge with reclaimed water and to assist DEQ in determining the scope of one or more regulatory actions that may be needed to address these issues.

The Committee will discuss the participation in the stakeholder group. The deadline for submittal of stakeholder requests and qualifications related to groundwater recharge is October 7, 2011. DEQ is specifically seeking additional input from stakeholders related to protection of groundwater quality. The notice is available at http://TownHall.virginia.gov//l/ViewNotice.cfm?GNID=360.

Attachment:
4A Notice of Opportunity to Serve on a Stakeholder Group in Advance of Regulatory Action Regarding Groundwater Recharge with Reclaimed Water

ACTION: Per discussion.

5. Staff Reports

- **Final Regional Water Supply Plan:** HRPDC staff will provide an update on local program adoption activities (see Attachment 5A). Staff is collecting the following for submittal to the Department of Environmental Quality:
  - Copy of approved minutes from local public hearing;
  - Copies of any written comments received and locality responses;
  - Copy of the locality resolution adopting the plan.

- **Data Call – Water Rates and Water Use:** The 2011 data call for water rates, taxes, and water use information was distributed to the Committee for review prior to the meeting. Utilities should review their respective rate information and populate water use information for 2010. Submit completed data sheets to Tiffany Smith (tsmith@hrpdcva.gov) by October 28, 2011.

- **Help 2 Others (H2O) Program Update:** HRPDC staff will provide an update to the Committee.

Attachment:
5A Regional Water Supply Plan, Local Program Adoption Status

ACTION: No action on Staff Reports.

6. Other Business

- Suggestions for Agenda Topics - Joint Meeting of the Directors of Utilities Committee and Health Directors, December 7, 2011.

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

October 27, 2011

Memorandum #2011-186

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – November 2, 2011
RSVP – November 1, 2011

The November meeting of the Directors of Utilities Committee will be held **on November 2, 2011, at 1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by November 1, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by November 1, 2011

TS/fh

Attachments

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Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
November 2, 2011
Newport News
1:30 PM

1. Summary of the October 5, 2011 Meeting of the Directors of Utilities Committee

The summary of the October 5, 2011 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:
1A October 5, 2011 Meeting Summary
1B October 5, 2011 Meeting Sign-in Sheet

ACTION: Approve the Meeting Summary.

2. Back-up Water Sources for Hospitals

Mr. Lonnie Byrd, Eastern Division Hospital Preparedness Coordinator for the Hampton Roads Metropolitan Medical Response System (MMRS), will brief the Committee on a project to provide back-up water sources for Hampton Roads area hospitals.

ACTION: No action.

3. Chesapeake Bay TMDL and Sanitary Sewer Overflows

Many localities have advocated for including reductions in SSOs as a nutrient management strategy for the Bay TMDL. The Bay Program has agreed to evaluate this strategy and develop a method of including illicit discharges in the Bay model. HRPDC staff asked HRSD to develop an order of magnitude estimate of the pounds of nitrogen and phosphorus in past overflows to help localities understand the potential nutrient reductions associated with overflows relative to the total required urban nutrient reductions. Mr. Henifin will discuss the data and assumptions used to estimate the nutrient reductions. This information will also be presented at the TMDL Regional Steering Committee meeting.

ACTION: Per discussion.

4. Water and Wastewater Work Program and Budget

The Committee will discuss the work program and budget for the next fiscal year. HRPDC staff will briefly review on-going water and wastewater projects and programs. The summary of HRPDC programs from last year's retreat, the Committee's discussion at the retreat, and the budget for the current year are attached for reference. A draft budget will likely be on the December or January agenda for approval.

Attachments:
4A Water and Wastewater program descriptions from the January 2011 retreat
4B January 5, 2011 Meeting Summary – retreat discussion
4C Water and Wastewater Budgets for FY11-12

ACTION: Form subcommittee to develop draft programs and budgets, if needed.

5. Staff Reports

- **Final Regional Water Supply Plan:** The Hampton Roads Regional Water Supply Plan (WSP) and the accompanying WSP Local Program Adoption Documents were submitted to the Department of Environmental Quality prior to the November 2, 2011 deadline. Copies of the WSP Local Program Adoption Documents will be distributed to each locality at the meeting.

- **Data Call – Water Rates and Water Use:** The 2011 data call for water rates, taxes, and water use information was distributed to the Committee for review on October 4, 2011. Completed data sheets should be submitted to Tiffany Smith (tsmith@hrpdcva.gov).

ACTION: No action on Staff Reports.

6. Other Business

- December 7, 2011 Joint Meeting of the Directors of Utilities Committee and Health Directors:
  - Department of Environmental Quality (DEQ) briefing on the State Water Supply Plan Process
  - Regulations and guidance for rainwater harvesting
  - Virginia Pollutant Discharge Elimination System (VPDES) Pesticide Discharges General Permit (VAG87) required as of October 31, 2011 for the direct application of pesticides to surface waters
  - Special Order of Consent (SOC) status and timeline update

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

November 30, 2011

Memorandum #2011-202

TO: Directors of Utilities Committee
Directors of Health

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – December 7, 2011
RSVP – December 6, 2011

This is to call the December meeting of the joint Directors of Utilities Committee and Health Directors for December 7, 2011 at the HRPDC Regional Board Room, Chesapeake. **Lunch begins at 12:30 p.m. The meeting will start at 1:00 p.m.** The Agenda and related materials are attached.

The Health Directors will have a special meeting from 11:30-12:30 in conference room D.

A deli lunch will be provided. Please RSVP by December 6, 2011 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by December 6, 2011

TS/fh

Attachments

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Stephen Williams, NN
Frank Wilson, PO
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Health Directors

S. William Berg, MPH, VDH
David Chang, VDH
Ana Colon, VDH
Jay Duell, VDH
Agnes Flemming, VDH
David Fridley, VDH
Jeffery Goodchild, VDH
Daniel B. Horne, P.E., VDH
Wes Kleene, VDH
Demetria Lindsay, VDH
Julia Murphy, VDH
Venita Newby-Owens, MPH, VDH
John Schellenberg, VDH
Carol Smith, VDH
Erin Sutton, VDH
David Trump, MPH, VDH
Nancy Welch, VDH

Copy

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Craig Ziesemer SU

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
AGENDA
December 7, 2011
Chesapeake
1:00 PM

DELI BUFFET LUNCH (12:30)

1. **Summary of November 2, 2011 Meeting of the Directors of Utilities Committee**

   The Summary of the November 2, 2011 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

   Attachments:
   1A November 2, 2011 Meeting Summary
   1B November 2, 2011 Meeting Sign-in Sheet
   1C Handout from Mr. Lonnie Byrd: "Eastern Region of Virginia Hospital Emergency Preparedness Coordinating Group"
   1D Handout from HRSD/Brown and Caldwell: "Current Affordability Snapshot"

   ACTION: Approve the Meeting Summary.

2. **Summary of June 1, 2011 Joint Meeting of the Directors of Utilities Committee and Directors of Health**

   The Summary of the June 1, 2011 joint meeting of the Directors of Utilities Committee and the Health Directors is attached as item 2A for the Committee's review and approval.

   Attachments:
   2A June 1, 2011 Meeting Summary
   2B June 1, 2011 Meeting Sign-in Sheet
   2C Summary from Mr. Dan Horne: "VDH Office of Drinking Water, Update Items for HRPDC Meeting, 1 June 2011"
   2D Presentation by Watermark Risk Management International, "Water Supply Assessment and Emergency Response Training"
   2E Handout from HRPDC: "Regional Water Supply Plan Status Summary"

   ACTION: Approve the Meeting Summary.

3. **UASI Water Supply Assessment and Emergency Response Training Project**

An update will be provided on HRPDC's "Water Supply Assessment and Emergency Response Training" project. The project kick-off was held in conjunction with the June 1, 2011 joint meeting of the Committee and Health Directors. Mr. Joel Silverman, CNA, will report on progress to date and outline next steps, including the objectives, development process, and roles for the upcoming table top training exercise.

ACTION: No action.

4. **International Paper Groundwater Withdrawal Permit and State Water Supply Plan Update**

Mr. Scott Kudlas, Director of the Office of Surface and Ground Water Supply Planning, Department of Environmental Quality, will brief the Committee on the status of International Paper's groundwater withdrawal permit. Mr. Kudlas will also provide an update on the progress of the State Water Supply Plan Advisory Committee.

ACTION: Per discussion.

5. **Regulatory Update**

Mr. Daniel Horne, VDH, will provide an update on regulatory issues.

ACTION: No action.

6. **EPA Consent Decree and Special Order by Consent Activities/Timeline Update**

HRSD will provide an overview of the process and timeline for activities.

ACTION: No action.

7. **Disaggregated Water Use Data**

The 2011 data call for water rates, taxes, and water use information was distributed to the Committee for review on October 4, 2011. Responses have been received from most localities. The Committee will discuss the quality and utility of disaggregated water use data.

ACTION: Per discussion.

8. **Staff Report**

   - **Help 2 Others (H2O) Program Update:** HRPDC staff will provide an update to the Committee.

9. **Roundtable Discussion**

   The Directors of Utilities and Health Directors will have an opportunity to discuss matters of mutual interest.

10. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
STAN D. CLARK, CHAIRMAN • THOMAS G. SHEPPERD, JR., VICE CHAIR • JAMES O. McREYNOLDS, TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

December 28, 2011

Memorandum #2011-216

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – January 4, 2012
RSVP – January 3, 2012

The Directors of Utilities Committee meeting will be held **on January 4, 2012, at 1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by January 3, 2012 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by January 3, 2012

TS/kg

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Richard H. Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Eric Rosser, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING AND ANNUAL RETREAT OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
January 4, 2012
Newport News
1:30 PM

1:30 PM - CLOSED SESSION: Only Committee members and their designees will attend.

1. **Special Order of Consent (SOC)**

   The Directors of Utilities that are party to the Joint Defense Agreement will discuss the status of SOC activities.

   ACTION: No action.

2:30 PM - PUBLIC MEETING

2. **Summary of the December 7, 2011 Joint Meeting of the Directors of Utilities Committee and Health Directors**

   The summary of the December 7, 2011 joint meeting of the Directors of Utilities Committee and Health Directors is attached as item 2A for the Committee's review and approval.

   Attachments:
   2A December 7, 2011 Meeting Summary
   2B December 7, 2011 Meeting Sign-in Sheet
   2C Regulatory Update, Mr. Dan Horne, Virginia Department of Health

   ACTION: Approve the Meeting Summary.

3. **Rehabilitation Planning Approach**

   The Capacity Team is continuing with the development of rehabilitation plans, in consultation with the Department of Environmental Quality. To support Committee discussion of next steps, Mr. Richard Stahr, Brown and Caldwell, will provide a briefing on the status of rehabilitation planning activities and related issues.

   ACTION: Per discussion.

4. Annual Committee Retreat

FY 2012-2013 Budget

The Committee will discuss the proposed water and wastewater program budgets, as revised per the November 2, 2011 meeting. The budget will be distributed separately prior to the meeting.

Review of Program Progress - FY 2011 – 2012

The Committee will consider progress on regional water and wastewater programs over the past year. Successes, as well as areas for improvement, should be identified. The water and wastewater program budgets will be reviewed.

Committee Direction for FY 2012 – 2013

Committee members should be prepared to discuss water supply and wastewater issues of importance that could/should be addressed through the committee process. The results of this discussion will determine committee direction and provide input to the Regional Water and Wastewater Program components of the HRPDC Unified Planning Work Program for FY 2012 – 2013.

The water supply assessment funded by the UASI grant will be completed by the end of 2012. Potential new projects include: alternatives assessments for measuring subsidence and developing of trend data for residential per capita and per connection water demand.

Based on discussions at the meeting, the staff will revise the FY 2011 – 2012 Program and Budget and will email the final budgets to the Committee after the meeting.

Attachments:
4A – Summary of Water and Wastewater Budgets

ACTION:
1. Determine FY 2012 – 2013 program elements and priorities per discussion.
2. Determine FY 2012 – 2013 Water and Wastewater Program Budgets in accordance with Action No. 1.

5. Other Business

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

January 26, 2012

Memorandum #2012-15

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – February 1, 2012
RSVP – January 31, 2012

The Directors of Utilities Committee meeting and the H2O – Help to Others – Program Board of Director's meeting will be held **on February 1, 2012 at 1:30 p.m.** in the **Regional Board Room, Chesapeake**. The agenda and related materials are attached.

Please RSVP by January 31, 2012 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by January 31, 2012

TS/fh

Attachments

Utilities Committee

Daniel G. Clayton III, WM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Eileen Leininger, NN
Kristen M. Lentz, NO
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Sonja Pruitt, SM
Anthony Reyes, HA
Brian Ramaley, NN
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Moses Thompson, PO
Erin Trimyer, PO
James K. Walski, CH
Brian K. Woodward, YK
Edwin P. Wrightson, IW

Copy

Lynn Allsbrook, HA
Joseph Durant, NN
Frank Haltom, IW
Richard Hartman, PO
Stephen Land, NN
Dave Morris, NNWW
Nettleton Richard, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Craig Ziesemer SU

Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
William J. Meyer, Jr., CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard H. Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Eric Rosser, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
H2O – Help to Others – Program Board of Directors
AGENDA
February 1, 2012
Chesapeake
1:30 PM

1. **Salvation Army Memorandum of Understanding**

   Per the September 7, 2011 H2O Board of Directors meeting, HRPDC staff has developed a Memorandum of Understanding (MOU) to formalize the partnership between H2O Program, the Salvation Army, HRSD, and HRPDC. The MOU will be presented to the Board of Directors for review and approval.

   ACTION: Authorize Board Chairperson to execute MOU.

2. **Summary of H2O Program Kick-off Meeting**

   Per the September 7, 2011 H2O Board of Directors meeting, HRPDC hosted the H2O Program kick-off meeting with utility billing department representatives, HRSD, and the Salvation Army on January 12, 2012. HRPDC staff will provide a summary of the meeting discussion, including fundraising and program administration.

   ACTION: Per discussion.

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
February 1, 2012
Chesapeake
1:30 PM

1. Summary of the January 4, 2012 Meeting of the Directors of Utilities Committee

The summary of the January 4, 2012 meeting of the Directors of Utilities Committee will be distributed separately prior to the meeting for the Committee's review and approval.

ACTION: Approve the Meeting Summary.

2. White Paper: Coastal Plain Aquifer Groundwater Levels

During the Committee's discussion of the International Paper (IP) Groundwater Withdrawal Permit at the December 7, 2011 meeting, the Committee agreed to develop a white paper on the groundwater impacts observed since pumping has ceased at the IP plant. HRPDC staff will lead a discussion on the following issues:

- Who is the intended audience for the white paper? DEQ, Virginia Department of Business Assistance/Governor's Opportunity Fund, International Paper?
- Given that the reissuance of IP's permit will impact jobs and revenue for Hampton Roads localities, should the white paper suggest alternatives other than renewal or denial at the same withdrawal amount?
- If alternatives are addressed, what types should be considered? More reuse and conservation, purchase of surface water, others?
- Who should pay for alternatives? Funding ideas?
- What are the consequences to local governments of renewing the permit? Are they significant?

The Committee will discuss and provide input and direction to staff as to points to include in the draft white paper.

ACTION: Per discussion.

3. EPA Draft Framework for Integrated Municipal Stormwater and Wastewater Planning

The EPA has acknowledged that compliance with Clean Water Act (CWA) requirements for stormwater and wastewater is typically accomplished through independent planning and that this approach may not allow local governments to cost-effectively address and prioritize the most serious water quality issues (see EPA web page titled Integrated

Municipal Stormwater and Wastewater Plans: http://cfpub.epa.gov/npdes/integratedplans.cfm). EPA has indicated that applying an integrated planning process will allow local governments to determine the critical path to achieving water quality objectives by identifying efficiencies in implementing wastewater and stormwater requirements. EPA developed a Draft Integrated Planning Approach Framework (http://www.epa.gov/npdes/pubs/integrated planning framework%20 draft.pdf) and is soliciting comments on the draft through five workshops scheduled in various locations across the country.

Jim Pletl, HRSD, is attending the first workshop held on January 31, 2012 and will provide an informal summary of the workshop. HRPDC staff will be attending the fifth workshop on February 17, 2012 in Chicago at the request of HRPDC's Stormwater Committee. The Utility Directors are encouraged to provide input to HRPDC staff on their level of interest and concerns about EPA's Integrated Planning concept.

Attachment:
3A EPA Draft Integrated Planning Approach Framework (1-13-12)

ACTION: Per discussion.

4. **Staff Reports**

- **FY 2012-2013 Water and Wastewater Program Budgets:** The Committee will review the revised program budgets, which will be distributed separately prior to the meeting.

- **HRPDC Socio-Economic Analysis:** HRPDC will be commencing work on the regional socio-economic analysis, which includes population projections. HRPDC staff will provide the committee with an overview of the project in anticipation of a March 2012 presentation by HRPDC Chief Economist Greg Grootendorst.

ACTION: Per discussion.

5. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

March 28, 2012

Memorandum #2012-46

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – April 4, 2012
RSVP – April 3, 2012

The Directors of Utilities Committee meeting will be held **on April 4, 2012 at 1:30 p.m.** in the **Regional Board Room, Chesapeake**. The agenda and related materials are attached.

Please RSVP by April 3, 2012 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by April 3, 2012

TS/fh

Attachments

HEADQUARTERS • THE REGIONAL BUILDING • 723 WOODLAKE DRIVE • CHESAPEAKE, VIRGINIA 23320 • (757) 420-8300

Utilities Committee

Daniel G. Clayton III, WM
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Eileen Leininger, NN
Kristen M. Lentz, NO
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Brian Ramaley, NN
Anthony Reyes, HA
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
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Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Craig Ziesemer SU

Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
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William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard H. Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Eric Rosser, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
April 4, 2012
Chesapeake
1:30 PM

1:30 PM - CLOSED SESSION

1. UASI Water Supply Assessment and Emergency Response Training Project

The project team will brief the Committee preliminary findings and preparations for the table top exercises scheduled for Southside and Western Tidewater utilities on May 23, 2012 and Peninsula utilities on May 24, 2012.

ACTION: Per discussion.

2:00 PM - PUBLIC MEETING

2. Summary of the March 7, 2012 Meetings of the Directors of Utilities Committee

The summary of the March 7, 2012 meetings of the Directors of Utilities Committee are attached as item 1A for the Committee's review and approval.

Attachments:
2A March 7, 2012 Meeting Summary
2B March 7, 2012 Meeting Sign-in Sheet
2C Regional Wet Weather Management Program, EPA Update Meeting, Richard Stahr, Brown and Caldwell
2D Presentation to HRPDC CAOs, March 15, 2012, Ted Henifin, HRSD

ACTION: Approve the meeting summary.

3. Special Order by Consent

The Committee will discuss the status of SOC activities and regionalization. Mr. Richard Stahr, Brown and Caldwell, will provide a summary of the issues of concern.

ACTION: Per discussion.

4. Staff Reports

- **H2O – Help to Others Program:** HRPDC staff will provide an update on administration of the H2O Program including donations and the partnership with The Salvation Army.

- **HR Green:** HRPDC staff will brief the committee on recent and planned program activities as well as upcoming Drinking Water Week promotions.

- **Water Supply Plan Advisory Committee:** HRPDC staff will provide a summary of the February 29, 2012 meeting of the Water Supply Plan Advisory Committee.

ACTION: Per discussion.

5. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

March 28, 2012

Memorandum #2012-62

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – May 2, 2012
RSVP – May 1, 2012

The Directors of Utilities Committee meeting will be held **on May 2, 2012 at 1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by May 1, 2012 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by May 1, 2012

TS/fh

Attachments

Utilities Committee

Daniel G. Clayton III, WM
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
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Everett Skipper, NN
Bob Speechly, PQ
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Peter M. Stephenson, SM
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Edwin P. Wrightson, IW

Copy

Lynn Allsbrook, HA
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Frank Haltom, IW
Richard Hartman, PO
Stephen Land, NN
Dave Morris, NNWW
Nettleton Richard, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Craig Ziesemer SU

Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard H. Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Eric Rosser, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
May 2, 2012
Newport News
1:30 PM

1. Summary of the April 4, 2012 Meetings of the Directors of Utilities Committee

The summary of the April 4, 2012 meetings of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:
1A April 4, 2012 Meeting Summary
1B April 4, 2012 Meeting Sign-in Sheet
1C askHRgreen.org and H2O Program Updates, Katie Cullipher, HRPDC

ACTION: Approve the meeting summary.

2. Virginia Water and Wastewater Agency Response Network

The Virginia Water and Wastewater Agency Response Network (VA WARN) has experienced considerable growth in member utilities during the two and a half years that the program has been operational. Mr. Clarence Warnstaff, former chairman of the VA WARN Committee, will provide a briefing on program progress and the advantages of the VA WARN mutual aid agreement and will answer questions on the benefits of program membership.

ACTION: Per discussion.

3. Sanitary Sewer System Asset Consolidation Study

At the April 19, 2012 HRPDC Quarterly Commission Meeting, Mr. Ted Henifin, HRSD briefed the Commission on the suggested comprehensive study of the costs and benefits of regionalization of sanitary sewer assets with respect to the Special Order of Consent. The Commission authorized the Executive Director to issue a Request for Proposals, pursue consultant selection, and execute contracts with HRSD and the selected consultant for the Sanitary Sewer System Asset Consolidation Study. HRSD and HRPDC staff will update the Committee on the formation of the steering committee and next steps.

ACTION: No action.

4. Subcommittee Report

- **Capacity Team:** The Capacity Team continues to discuss the regional affordability analysis, MOM costs, and Minor Revision No. 2.

5. Staff Reports

- **Groundwater Reuse Technical Advisory Committee (TAC):** HRPDC staff will provide a summary of the TAC's progress, with input from local government TAC members.

- **UASI Water Supply Assessment and Emergency Response Training Project:** HRPDC staff will review preparations for the table top exercises scheduled for Southside and Western Tidewater utilities on May 23, 2012 and Peninsula utilities on May 24, 2012.

- **Special Meeting on June 14th:** HRPDC staff will provide options on format and topics for the discussion of the future work plans and budget. Committee members are encouraged to provide guidance on their interests and concerns.

- **H2O - Help to Others Program:** The new fundraising period begins May 1, 2012. Donations will be solicited with envelopes inserted in water or wastewater utility bills and during the June 2012 Drinking Water Week campaign.

6. Other Business

- **Virginia Pollutant Discharge Elimination System (VPDES) General Permit for Discharges Resulting from the Application of Pesticides to Surface Waters:** The State Water Control Board issued the notice of intent to amend and reissue a VPDES general permit for discharges from pesticides applied directly to surface waters to control pests, and/or applied to control pests that are present in or over, including near, surface waters. A Technical Advisory Committee is forming (http://www.townhall.virginia.gov/L/ViewChapter.cfm?chapterid =2418).

- **Topics for June 6, 2012 Joint Committee Meeting with Health Directors:** Committee will discuss any suggestions for inclusion on the meeting agenda.

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

May 24, 2012

Memorandum #2012-74

TO: Directors of Utilities Committee
Director of Health

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – June 6, 2012
RSVP – June 5, 2012

The joint meeting of the Directors of Utilities Committee and Health Directors will be held on **June 6, 2012** at the HRPDC Regional Board Room, Chesapeake. **Lunch begins at 12:30 p.m. The meeting will start at 1:00 p.m.** The Agenda and related materials are attached.

The Health Directors will have a special meeting from 11:30-12:30 in conference room E.

A deli lunch will be provided. Please RSVP by June 5, 2012 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by June 5, 2012

TS/fh

Attachments

Directors of Utilities Committee

Daniel G. Clayton III, WM
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
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Michael Stallings, WN
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Erin Trimyer, PO
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Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
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William J. Meyer, CH
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Nick Nagurney, VB
Richard H. Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Eric Rosser, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Health Directors

S. William Berg, MPH, VDH
David Chang, VDH
Ana Colon, VDH
Jay Duell, VDH
Agnes Flemming, VDH
David Fridley, VDH
Jeffery Goodchild, VDH
Nzinga Teule-Hekima, VDH
Clifton D. Horne, VDH
Daniel B. Horne, VDH
Dave Jordan, VDH
Demetria Lindsay, VDH
Julia Murphy, VDH
Venita Newby-Owens, MPH, VDH
Steve Pelli, VDH
John Schellenberg, VDH
Carol Smith, VDH
Nancy Welch, VDH

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Lynn Allsbrook, HA
Joseph Durant, NN
Frank Haltom, IW
Richard Hartman, PO
Stephen Land, NN
Dave Morris, NNWW
Nettleton Richard, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Craig Ziesemer SU
David Trump. MPH, VDH

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
AGENDA
June 6, 2012
Chesapeake
1:00 PM

DELI LUNCH (12:30)

1. **Summary of the May 2, 2012 Meetings of the Directors of Utilities Committee**

   The summary of the May 2, 2012 meetings of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

   Attachments:
   1A May 2, 2012 Meeting Summary
   1B May 2, 2012 Meeting Sign-in Sheet
   1C "Utilities Helping Utilities Before, During, and After Disaster, WARN," presentation by Mr. Clarence Warnstaff, Virginia WARN Committee
   1D "Update on Groundwater Recharge TAC," presentation by Ms. Whitney Katchmark, HRPDC

   ACTION: Approve the meeting summary.

2 **Summary of December 7, 2011 Joint Meeting of the Directors of Utilities Committee and Directors of Health**

   The Summary of the December 7, 2011 joint meeting of the Directors of Utilities Committee and the Health Directors is attached as item 2A for the Committee's review and approval.

   Attachments:
   2A December 7, 2011 Meeting Summary
   2B December 7, 2011 Meeting Sign-in Sheet
   2C Regulatory Update, Mr. Dan Horne, Virginia Department of Health

   ACTION: Approve the Meeting Summary.

3. **Uranium Mining Study Results**

Mr. Tom Leahy, City of Virginia Beach Public Utilities Director, will brief the Committee on the findings of the City's February 2012 report, *Potential Impacts of Uranium Mining in Virginia on Drinking Water Sources, Phase II Assessment* (see http://www.vbgov.com/government/departments/public-utilities/Documents/20120210-PUT-Uranium-Mining-Project PhaseII FinalReport.pdf). Mr. Leahy's presentation may also reference the National Academy of Sciences' report, *Uranium Mining in Virginia: Scientific, Technical, Environmental, Human Health and Safety, and Regulatory Aspects of Uranium Mining and Processing in Virginia* (2012) (http://www.nap.edu/catalog.php?record id=13266).

ACTION: Per discussion.

4. **Regulatory Update**

Mr. Daniel Horne, VDH, will provide an update on regulatory issues, including final revisions to the Unregulated Contaminant Monitoring Rule (UCMR 3) for public water systems.

ACTION: Per discussion.

5. **Sanitary Sewer System Asset Consolidation Study**

The initial steering committee meeting for the Sanitary Sewer System Asset Consolidation Study was held on May 7, 2012. Also, HRSD met with EPA on May 14, 2012 regarding the federal Consent Decree. A summary of these meetings will be provided to the Committee.

ACTION: Per discussion

6. **Staff Reports**

- **Fats, Oils, and Grease (FOG) Ordinances:** HRPDC staff polled Committee members on the status of FOG ordinance adoption. The results are summarized in Attachment 6A.

- **June 14, 2012 Directors of Utilities Committee Special Meeting:** Materials regarding work program and budget will be distributed via email to support the meeting discussion.

- **Hampton Roads Water Quality Response Plan:** HRPDC is compiling the 2012 update of the emergency contact list and will distribute to the Committee upon completion.

- **UASI Water Supply Assessment and Emergency Response Training Project:** HRPDC staff will summarize the table top exercises held on May 23, 2012 and May 24, 2012 and update the committee on next steps in the project.

Attachment:
6A Status of Locality FOG Ordinances

ACTION: No action.

7. **Roundtable Discussion**

The Directors of Utilities and Health Directors will have an opportunity to discuss matters of mutual interest.

ACTION: Per discussion.

8. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

June 29, 2012

Memorandum #2012-92

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – July 11, 2012
RSVP – July 10, 2012

The Directors of Utilities Committee meeting will be held on **July 11, 2012 at 12:30 p.m. (please note summer meeting start time)** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by July 10, 2012 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by July 10, 2012

TS/jc

Attachments

Directors of Utilities Committee

Daniel G. Clayton III, WM
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
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Craig Ziesemer SU

Capacity Team

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Phil Hubbard, HRSD
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Stephen T. Motley, VB
Nick Nagurney, VB
Richard H. Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Melissa Lindgren, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
July 11, 2012
Newport News
12:30 PM

1. Summary of the June 6, 2012 Meetings of the Directors of Utilities Committee

The summary of the June 6, 2012 meetings of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:

- 1A June 6, 2012 Meeting Summary
- 1B June 6, 2012 Meeting Sign-in Sheet
- 1C "City of Virginia Beach Uranium Mining Impact Study," presentation by Mr. Tom Leahy, Director, Virginia Beach Department of Public Utilities
- 1D "Unregulated Contaminants Monitoring Rule 3," presentation by Mr. Dan Horne, Field Director, Southeast Virginia Field Office, VDH Office of Drinking Water

ACTION: Approve the meeting summary.

2 Summary of June 14, 2011 Meeting of the Directors of Utilities Committee

The Summary of the June 14, 2011 Directors of Utilities Committee work program planning meeting is attached as item 2A for the Committee's review and approval.

Attachments:

- 2A June 14, 2011 Meeting Summary
- 2B June 14, 2011 Meeting Sign-in Sheet
- 2C "FY2013 HRPDC-USGS Cooperative Investigation of Coastal Plain Groundwater," presented by Mr. Mark Bennett, Director, USGS Virginia Water Science Center

ACTION: Approve the Meeting Summary.

3. HRPDC FY2013 Unified Planning Work Program – Water Resources

The Committee will discuss and select PDC projects for the FY13 Water Program. The Water Program budget includes $291,655 to support HRPDC staff time. The staff time and associated budget for the administration and operation of HR WET is $64,771. The remaining $226,884 funds staff time for technical projects and program administration.

In the past few years, the HRPDC staff has focused on developing the Regional Water Supply Plan and the UASI infrastructure resiliency study. The UASI study will conclude

in the fall of 2012. The PDC staff has many small projects and tasks related to program administration. The focus of this discussion is to identify major projects that are not reoccurring program elements. The PDC staff recommends the following projects for FY13:

- **Update Water Quality Response Plan:** Staff will summarize existing plan for Utility and Health Directors that were not involved in its development. Staff will identify potential alternates for the plan function and content. If the Directors agree the plan needs to be updated or modified, the PDC staff will make revisions.

- **Improve Water Usage tracking:** Consistent reporting protocols for tracking water usage would allow utilities to compare water usage by sector (residential, commercial, industrial) and compare water losses due to production processes or losses in the distribution. Reliable, long-term data would allow better evaluation of conservation programs and shifts in customer demands. PDC staff would meet with locality representatives to discuss capabilities of billing systems to export data and develop business rules/protocols to categorize water usage consistently. Staff will develop an annual report to summarize the data regionally.

- **Regional Groundwater Policy:** Existing groundwater regulations do not set clear priorities for allocating groundwater resources. If the region develops a policy that identifies priorities and management goals, it could influence the state's policies and permitting program. The PDC staff would prepare briefs to describe the existing DEQ program, the current availability of groundwater and projected resource depletion, and challenges of changing the groundwater management policy or supporting the status quo. The PDC would establish a workgroup with representatives from local utilities, planning, and economic development departments to evaluate the issues and draft policy recommendations.

Committee members are encouraged to suggest other projects and identify regional needs that HRPDC could address.

ACTION: Identify projects for staff to include in FY13 workplan.

4. Sanitary Sewer System Asset Consolidation Study

The deadline for proposals for the Sanitary Sewer System Asset Consolidation Study was June 18, 2012; seven proposals were received and the Steering Committee developed a short list for consideration. July 23, 2012 was identified as the potential contract award date. The Committee will discuss the EPA's response to the regionalization study proposal and next steps.

ACTION: Per discussion

5. **Staff Reports**

- **Hampton Roads Water Quality Response Plan:** HRPDC distributed the annual update of the emergency contact list to Committee members on June 27, 2012. The Committee will revisit the Plan to discuss potential revisions at the December 5, 2012 joint meeting with the Health Directors.

- **Data Call – Water/Wastewater Rates and Water Use:** HRPDC staff distributed the annual data call for water and wastewater rates and water use on July 5, 2012. The data call requests information on active accounts, water and wastewater rates, taxes, and disaggregated water use. Responses should be sent to tsmith@hrpdcva.gov by July 30, 2012.

ACTION: No action.

6. **Other Business**

Attachment 1A
MEETING SUMMARY
JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
June 6, 2012
Chesapeake

1. Summary of the May 2, 2012 Meetings of the Directors of Utilities Committee

The following correction was made under item 5, Staff Reports (deletion indicated by strikethrough text; addition indicated by bracketed text):

- **Groundwater ~~Reuse~~ [Recharge] Technical Advisory Committee (TAC):** HRPDC staff provided a presentation summarizing the key issues being considered by the groundwater reuse technical advisory committee (TAC). The TAC is a precursor to the initiation of any regulatory process and regulatory advisory committee.

ACTION: The summary of the May 2, 2012 meeting of the Directors of Utilities Committee meeting was approved as corrected.

2. Summary of December 7, 2011 Joint Meeting of the Directors of Utilities Committee and Directors of Health

There were no comments on, or revisions to the summary of the December 7, 2012 meeting.

ACTION: The summary of the December 7, 2012 joint meeting of the Directors of Utilities Committee and Directors of Health was approved.

3. Uranium Mining Study Results

Mr. Tom Leahy, City of Virginia Beach Public Utilities Director, briefed the Committee on the findings of the City's February 2012 report, *Potential Impacts of Uranium Mining in Virginia on Drinking Water Sources, Phase II Assessment* (see http://www.vbgov.com/government/departments/public-utilities/Documents/20120210-PUT-Uranium-Mining-Project_PhaseII_FinalReport.pdf). A copy of the presentation is attached. A similar briefing was also presented by Mr. Leahy to the Virginia Beach City Council on June 5, 2012.

Mr. Leahy summarized the proposed mining activity and location; the hydrologic setting and climate issues; the findings of two economic studies, the National Academy of Sciences (NAS) study, and the Virginia Beach modeling study; and the City's position opposing uranium mining. Mr. Leahy noted the differences between the original and the

current mining proposal and emphasized the point made to the Virginia Beach City Council: Virginia Uranium is not bound by any plan, and mining economics, the price of uranium, and regulations at the time will dictate the alternative pursued by the company. Mr. Leahy reviewed the model assumptions in the City's study, then played video clips showing different model simulations of the movement of pollutant plumes in the water column in Kerr Lake and Lake Gaston after tailings were discharged to the Bannister River. Simulations were run over multi-year wet and dry periods following the release. The Committee discussion is summarized as follows:

- The federal Nuclear Regulatory Commission (NRC) is the agency that administers regulatory requirements for containment cells and disposal sites; the NAS study notes that the NRC has no experience implementing the regulations in areas like Virginia that are subject to wet climates and high precipitation events.

- Although Virginia Uranium is proposing below-grade tailings disposal, past studies indicate that below-grade disposal is infeasible due to shallow groundwater and groundwater flow.

- In an event that contaminated water is introduced into the Hampton Roads water supply via the Lake Gaston pipeline to Norfolk's reservoir, water utilities would be required to advise customers, however, VDH regulations do not prohibit use as long as the water is treated to safe drinking standards. The VDH Office of Drinking Water, VDH Epidemiology, DEQ, other agencies, and the Governor's office would need to develop a state response effort for such an event. Some discussions with VDH, DEQ, and the Attorney General's Office have already occurred, and a subsequent report was sent to the Governor's office.

- Clean Water Act issues would be at the forefront in the event of a release. Given the anticipated political and public reaction, any technical information provided by utilities assuring the safety of the regional water supply would likely be overwhelmed by negative public perception. A study currently being completed indicates that any contaminants introduced into Norfolk's reservoir system would likely be diluted to within water quality standards, and the water treatment plant process would further remove contamination.

- If a tailing release occurs, it is anticipated that the City of Virginia Beach would have to shut down the City's intake, as pumping would cause the pollutant plume to move up into the tributary creek where the intake is located. Also, even if pumping were to continue, the City does not have NPDES permits to discharge materials like uranium, thorium, and radium to the reservoir.

- The Governor's Task Force is working on a state regulatory framework for uranium mining, and it is expected that the issue will come up again for General Assembly vote in 2013.

There was no formal action on this item by the Committee. A recommendation was made to the Virginia Beach City Council on June 5, 2012 to update and reaffirm its opposition to uranium mining in Virginia, and Council is expected to adopt a formal resolution stating as such on June 12, 2012. The City is likely to ask other Hampton Roads localities to do the same.

ACTION: No action.

4. Regulatory Update

Mr. Dan Horne, Virginia Department of Health (VDH), Office of Drinking Water (ODW), advised the Committee of recent VDH staffing changes. Regarding regulations, he noted that VDH has full primacy for the Safe Drinking Water Act as of April 26, 2012. Regarding the Long Term 2 Enhanced Surface Water Treatment Rule for control of microbial pathogens, Mr. Horne summarized issues discussed at 2011 and 2012 EPA-hosted stakeholder meetings, which included monitoring requirements for Cryptosporidium and enforcement actions for uncovered finished water reservoirs. He noted that utilities should anticipate the announcement of a third stakeholder meeting regarding revisions to the bin classifications.

Mr. Horne also presented a summary of the final Unregulated Contaminant Monitoring Rule 3 (UCMR 3), including EPA's implementation of the rule and issues regarding the detection and analysis of hexavalent chromium and the expansion of monitoring requirements to include consecutive systems. A copy of his presentation is attached. Mr. Horne reviewed the development of UCMR 1, 2, and 3, and noted that UCMR 3 is an EPA "direct-implement" rule and that VDH's role will be very limited. The Final Rule was published on May 2, 2012 and EPA has begun contacting waterworks regarding implementation. As UCMR 3 includes hexavalent chromium, Mr. Horne provided a summary of the issues related to monitoring, including the lack of understanding of the chromium 3 – chromium 6 relationship and species removal, concerns regarding the analytical methods, and inconsistencies in lab performance and technology.

During Committee discussion, it was noted that some utilities have been receiving customer inquiries regarding chloramines and chloramine by-products. Although the opinion in circulation is that chloramines cause health problems, there is no supporting evidence. At this point, the EPA and Virginia are not changing regulations. It appears that the chloramine inquiries and complaints come from the same segment of the population that has expressed concerns over fluoride. There was no formal action on this item.

ACTION: No action.

5. Sanitary Sewer System Asset Consolidation Study

The initial steering committee meeting for the Sanitary Sewer System Asset Consolidation Study was held on May 7, 2012. HRSD met with EPA on May 14, 2012 regarding the federal Consent Decree. Mr. Ted Henifin, HRSD, summarized the meetings, noting that EPA was generally receptive to the idea of the consolidation study. HRSD sent EPA follow-up correspondence detailing the proposed study and schedule. With respect to the RFP, the May 30, 2012 pre-proposal conference was well attended, and the steering committee is developing proposal evaluation criteria and will participate in the selection process. There was no formal action on this item.

ACTION: No action.

6. Staff Reports

Staff Reports are summarized below:

- **Fats, Oils, and Grease (FOG) Ordinances:** The May 2012 updates provided by utilities regarding the status of FOG ordinance adoption are summarized and provided to the Committee as agenda Attachment 6A.

- **June 14, 2012 Directors of Utilities Committee Special Meeting:** HRPDC staff is preparing materials to support the work program discussion and will distribute materials prior to the meeting.

- **Hampton Roads Water Quality Response Plan:** HRPDC is compiling the 2012 update of the emergency contact list. Responses from utilities were requested by June 15, 2012. The updated list will be distributed to the Committee upon completion.

- **UASI Water Supply Assessment and Emergency Response Training Project:** HRPDC Staff thanked the Committee for participating in the May 23-24, 2012 table top training exercises for the Urban Areas Security Initiative (UASI) Water Supply Assessment and Emergency Response Training project and summarized the next steps in the water sector assessment project, including a planned briefing from the Virginia Fusion Center at the September 5, 2012 Committee meeting.

ACTION: No action.

7. Roundtable Discussion

The roundtable portion of the meeting is summarized below:

- It was agreed that the effectiveness and objectives of the Hampton Roads Water Quality Response Plan will be discussed at the December 5, 2012 joint meeting of the Directors of Utilities Committee and Health Directors.

- In response to a question regarding obtaining a list of restaurant facilities, HRPDC staff was directed by VDH representatives to contact the VDH Office of Environmental Health Services to request relevant information from the VENIS permitted facilities database.

ACTION: No action.

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

July 25, 2012

Memorandum #2012-101

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – August 1, 2012
RSVP – July 31, 2012

The Directors of Utilities Committee meeting will be held on **August 1, 2012 at 12:30 p.m. (please note summer meeting start time)** in the **HRPDC Regional Board Room, Chesapeake**. The agenda and related materials are attached.

Please RSVP by July 31, 2012 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by July 31, 2012

TS/fh

Attachments

Directors of Utilities Committee

Daniel G. Clayton III, WM
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Brian Ramaley, NN
Anthony Reyes, HA
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK
Edwin P. Wrightson, IW

Copy

Lynn Allsbrook, HA
Joseph Durant, NN
Frank Haltom, IW
Stephen Land, NN
Dave Morris, NNWW
Nettleton Richard, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Craig Ziesemer SU

Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard H. Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Melissa Lindgren, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
August 1, 2012
Chesapeake
12:30 PM

1. **Summary of the July 11, 2012 Meetings of the Directors of Utilities Committee**

   The summary of the July 11, 2012 meetings of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

   Attachments:
   1A July 11, 2012 Meeting Summary
   1B July 11, 2012 Meeting Sign-in Sheet

   ACTION: Approve the meeting summary.

2. **FY2013 Work Program Follow-Up**

   Per the June 14, 2012 and July 11, 2012 FY2013 work program discussions, the Committee will consider action on the following:

   - **HRWET Campaign Messaging:** HRPDC staff will present the recommendations from the June HRWET committee planning meeting for discussion and endorsement.
   - **The State of Hampton Roads Drinking Water Infrastructure:** HRPDC staff will present a communication plan targeting HRPDC, elected officials, and chief administrative officers to convey a consistent regional statement explaining the impact of infrastructure renewal needs and decreasing revenues on rate structures and the need to transition to more appropriate business models.

   ACTION: Endorse projects for inclusion in the FY13 work program.

3. **Hampton Roads Regional Water Supply Planning Process Memorandum of Agreement**

   The 2007 Memorandum of Agreement (MOA) providing the administrative framework for the Regional Water Supply Planning process expired on December 31, 2011. The Committee will consider the status of the Department of Environmental Quality (DEQ) Water Supply Planning Program and discuss the renewal of the regional MOA.

   Attachment:
   3A 2007 Hampton Roads Regional Water Supply Planning Process MOA (signature pages omitted)

   ACTION: Per discussion

4. **HRPDC Legislative Agenda**

HRPDC staff is beginning development of the legislative agenda for the 2013 General Assembly session. Committee members are encouraged to suggest ideas and identify issues that warrant regional attention. The agenda will be presented to the Commission for approval in December 2012. The FY2012 Legislative Agenda (attached) included statements on water quality funding, uranium mining, nutrient credit expansion, septic tanks, sea level rise and coastal flooding, environmental education, and unfunded mandates.

Attachment:
4A HRPDC FY2012 Legislative Agenda

ACTION: Identify issues for inclusion in the draft HRPDC FY2013 Legislative Agenda.

5. **Sanitary Sewer System Asset Consolidation Study**

EPA and Virginia DEQ acknowledged via email on July 10, 2012 the agencies' agreement in principle to the HRPDC regionalization study. A formal written approval is pending. The Committee will discuss recent developments and next steps.

ACTION: Per discussion

6. **Staff Reports**

- **UASI Water Supply Assessment and Emergency Response Training Project:** The project team is completing the After Action Report (AAR) for the May 23 and 24, 2012 table top exercises. The draft Improvement Plan is anticipated in August. Staff will poll the Committee as to whether any utilities took advantage of EPA's offer to sponsor utility memberships to WaterISAC Pro.
- **Water/Wastewater Rates and Water Use:** HRPDC staff distributed the annual data call for water and wastewater rates and water use on July 5, 2012 (email responses to tsmith@hrpdcva.gov by August 31, 2012). Staff will poll the Committee regarding the posting of summary rate information on the HRPDC website.
- **SSORS User Group Meeting:** HRPDC is holding a SSORS User Group Meeting on August 17, 2012 at 9 a.m. in the Regional Board Room to solicit input from regular users on system functionality and recommendations for desired system upgrades (meeting registration is via email to tsmith@hrpdcva.gov).

ACTION: No action.

7. Other Business

Future Meeting Agendas: The following agenda topics were identified at previous meetings and are provided for reference:

- September 5, 2012 Meeting:
  - Virginia Fusion Center Briefing
  - UASI Draft Improvement Plan Briefing
- October 3, 2012 Meeting:
  - FY2014 Committee Retreat and budget discussion

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
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DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

August 29, 2012

Memorandum #2012-116

TO: Directors of Utilities Committee

BY: John M. Carlock, Deputy Executive Director

RE: Committee Meeting – September 5, 2012
RSVP – September 4, 2012

The Directors of Utilities Committee meeting will be held on **September 5, 2012 at 1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by September 4, 2012 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to call me or Whitney Katchmark.

Please RSVP by September 4, 2012

TS/fh

Attachments

Directors of Utilities Committee

Daniel G. Clayton III, WM
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Brian Ramaley, NN
Anthony Reyes, HA
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK
Edwin P. Wrightson, IW

Copy

Lynn Allsbrook, HA
Joseph Durant, NN
Frank Haltom, IW
Stephen Land, NN
Dave Morris, NNWW
Nettleton Richard, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Marsha Thomas-Canady, NN
Stephen Watson, FR
Craig Ziesemer SU

Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
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Ralph Patterson, WM
Danny Poe, JC
Melissa Lindgren, IW
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
September 5, 2012
Newport News
1:30 PM

1:30 PM - CLOSED SESSION

1. Update: UASI Water Supply Assessment and Emergency Response Training Project

Mr. Kurt Klingenberger will brief the Committee on the After Action Report from the May 23 and 24, 2012 regional water and wastewater utility table top training exercise.

ACTION: Per discussion.

2. Virginia Fusion Center

As a follow-up to discussions at the May 23-24, 2012 UASI Water Utilities Table Top Training Exercise, Special Agent Austin White, Virginia State Police, Criminal Intelligence Division, Virginia Fusion Center will brief the Committee on two of the Center's programs: Fusion Liaison Officer (FLO) training, and Suspicious Activity Reporting (SAR). The briefing is intended to provide perspective on the training components offered to law enforcement and first responders, including examples of suspicious activities and inquiries and how to train staff to recognize and report incidents.

The Virginia Fusion Center was created as a partnership between the Virginia State Police and the Department of Emergency Management and is the primary conduit for critical information exchange among local, state and national homeland security, law enforcement and intelligence agencies (see http://www.vsp.state.va.us/FusionCenter/index.shtm).

ACTION: Per discussion.

2:20 PM - PUBLIC MEETING

3. Summary of the August 1, 2012 Meeting of the Directors of Utilities Committee

The summary of the August 1, 2012 meeting of the Directors of Utilities Committee is attached as item 3A for the Committee's review and approval.

Attachments:
- 3A August 1, 2012 Meeting Summary
- 3B August 1, 2012 Meeting Sign-in Sheet

ACTION: Approve the meeting summary.

4. **Sanitary Sewer System Asset Consolidation Study**

On August 13, 2012, HRPDC awarded the contract and provided notice to proceed for the Regional Consolidation of Sewer System Assets Study to the project team of HDR, Inc., McGuire Woods, and Davenport. The first project workshop is scheduled for September 7, 2012. The Committee will discuss recent developments and next steps.

ACTION: Per discussion

5. **Environment Virginia 2013 Conference Planning**

The 24th Annual Environment Virginia Symposium will be held in Lexington at VMI on April 9 -11, 2013. The Call for Papers for the conference has been issued with a deadline of October 16, 2012. HRPDC Deputy Executive Director John Carlock has been asked to serve on the Program Advisory Group. Advisory Group members have been requested to provide suggestions on topics for panels, workshops and feature speakers. Topics that have been suggested, to date, include uranium mining, water supply, stormwater management and the Bay TMDL, solid waste management and wetlands. There has also been some discussion of including industrial programs and innovation.

The HRPDC staff wants to provide recommendations on topics that would be particularly interesting to localities or where localities have particular stories that they want to share.

ACTION: Provide recommendations for topics and speakers for the Environment Virginia 2013 Conference Program.

6. **Staff Reports**

- **SSORS User Group Meeting:** HRPDC staff will provide a summary of key issues discussed at the August 17, 2012 SSORS User Group Meeting.

ACTION: No action.

7. **Other Business**

Future Meeting Agendas: The following agenda topics were identified at previous meetings and are provided for reference:

- October 3, 2012 Committee Meeting:
  - FY2014 Committee Retreat and Budget Discussion
- November 5, 2012 Committee Meeting:
  - Annual Board of Directors Meeting, H2O – Help to Others Program
  - UASI Final Improvement Plan Briefing

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
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DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

January 30, 2013

Memorandum #2013-18

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – February 6, 2013
RSVP – February 5, 2013

The Directors of Utilities Committee meeting will be held on **February 6, 2013 at 1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by February 5, 2013 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me or Whitney Katchmark.

Please RSVP by February 5, 2013.

TS/jc

Attachments

Directors of Utilities Committee

Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
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Peter M. Stephenson, SM
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Brian K. Woodward, YK
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Copy

Lynn Allsbrook, HA
Joseph Durant, NN
Frank Haltom, IW
Stephen Land, NN
David Morris, NN
Richard Nettleton, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
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Melissa Lindgren, IW
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Stephen T. Motley, VB
Nick Nagurney, VB
Richard Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
February 6, 2013
Newport News
1:30 PM

1. **Summary of the December 5, 2012 Joint Meeting of the Directors of Utilities Committee and Health Directors**

   The summary of the December 5, 2012 joint meeting of the Directors of Utilities Committee and Health Directors is attached as item 1A for the Committee's review and approval.

   Attachments:
   - 1A December 5, 2012 Meeting Summary
   - 1B December 5, 2012 Meeting Sign-in Sheet
   - 1C Regulatory Update, Mr. Daniel Horne, VDH Office of Drinking Water
   - 1D Presentation Slides - Hampton Roads Water Quality Response Plan, Whitney Katchmark, HRPDC
   - 1E Presentation Slides - Chesapeake Bay TMDL: Credit for Sewer Improvements, Whitney Katchmark, HRPDC

   ACTION: Approve the meeting summary.

2. **Uranium Mining**

   Mr. Tom Leahy, City of Virginia Beach Public Utilities Director, will provide an update on the General Assembly's actions related to the moratorium on uranium mining.

   ACTION: Per discussion.

3. **Consumer Confidence Report Rule Electronic Delivery Option**

   The Committee will discuss the January 3, 2013 EPA memorandum clarifying the requirements of the Consumer Confidence Report (CCR) Rule associated with delivery of the CCR. The CCR Delivery Options memorandum and attachment describing the EPA's framework for electronic delivery methods that meet existing CCR Rule requirements is provided for reference. The slides from EPA's January 17, 2013 webinar explaining the CCR electronic delivery framework are available at http://tinyurl.com/CCRslidedeck.

   Attachments:
   - 3A January 3, 2013 EPA Memorandum, Safe Drinking Water Act – Consumer Confidence Report Rule Delivery Options

   ACTION: Per discussion

4. **Regional Sewer Consolidation Study**

   Ted Henifin and Glen Elmers attended the HRPDC CAO meeting on January 17, 2013 to answer questions about the Regional Sewer Consolidation study. The HRPDC staff will provide a summary of the issues discussed.

   ACTION: Per discussion.

5. **Water Quality Advertising**

   The HRPDC staff will review a proposal to use the Water Quality Advertising funds that are included in the FY13 budget.

   ACTION: Approve proposal.

6. **Staff Updates**

   - **Hazard Mitigation Grant:** Discuss questions or requests for grant assistance.
   - **Groundwater Monitoring:** Follow up on HRPDC email soliciting feedback for DEQ Groundwater Steering Committee.
   - **Groundwater Regulations:** Update on comments submitted to the State.

7. **Other Business**

   Mr. John Carlock, HRPDC Deputy Director, will be retiring on January 31, 2013. In recognition of his service, the Committee would like to thank him for his contributions to the water and wastewater programs in the region.

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES O. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

February 27, 2013

Memorandum #2013-31

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – March 6, 2013
RSVP – March 5, 2013

The Directors of Utilities Committee meeting will be held on **March 6, 2013 at 1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by March 5, 2013 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee

Daniel G. Clayton III, WM
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David Morris, NN
Richard Nettleton, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

Capacity Team

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
Melissa Lindgren, IW
William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
March 6, 2013
Newport News
1:30 PM

1. Summary of the February 6, 2013 Meeting of the Directors of Utilities Committee

The summary of the February 6, 2013 meeting of the Directors of Utilities Committee is attached as item 1A for the Committee's review and approval.

Attachments:
- 1A February 6, 2013 Meeting Summary
- 1B February 6, 2013 Meeting Sign-in Sheet

ACTION: Approve the meeting summary.

2. Hampton Roads Inmate Evacuation Planning Committee

The Hampton Roads Inmate Evacuation Planning Committee recognizes that correctional facilities are dependent on water and wastewater services. The Committee, which includes representatives from local and regional jails, the Virginia Department of Corrections, the Virginia Department of Emergency Management, emergency managers, and the HRPDC, is interested in reducing the risk of water service interruption and ensuring the provision of adequate water for consumption and cooling through an extended event.

Ms. Natalie Easterday, HRPDC Regional Emergency Management Planner, will brief the Directors of Utilities Committee on the Inmate Evacuation Planning Committee's preliminary discussions. The December 2012 *Hampton Roads Water and Wastewater Systems Emergency Preparedness and Response Regional Improvement Plan* (UASI grant project) recommended enhancement of crisis planning with the Hampton Roads Inmate Evacuation Planning Committee. HRPDC staff will solicit feedback on potential follow-up actions.

ACTION: Per discussion.

3. Groundwater Regulations

The Department of Environmental Quality is developing a written response to the Committee's comments on the draft Groundwater Regulations (9VAC25-610). Mr. Scott Kudlas, DEQ Office of Surface and Ground Water Supply Planning Director, will discuss the comments and the anticipated schedule for seeking approval of revised regulations from the State Water Control Board.

ACTION: Per discussion.

4. **Regional Sanitary Sewer System Asset Consolidation Study**

   The third project workshop for the Regional Sewer System Asset Consolidation Study was held on February 22, 2013. Also, the United States Department of Justice intends to issue public notice of the Second Amendment to the Consent Decree, which revises the schedule to accommodate the regional consolidation study. The Committee will discuss recent developments and next steps.

   ACTION: Per discussion.

5. **Staff Updates**

   - **SSORS Reports Viewing Privileges:** As follow-up to the discussion at the February 6, 2013 Committee meeting, staff will describe recommendations for sharing Sanitary Sewer Overflow Reporting System (SSORS) reports between localities. The Committee will determine the preferred course of action.

     ACTION: Provide direction to staff regarding SSORS information sharing.

   - **FY14 Water and Wastewater Rate Structures Project:** Staff will summarize the research completed to date, and highlight key resources, issues, and themes prevalent in recent literature.

     ACTION: Per discussion.

6. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

March 27, 2013

Memorandum #2013-45

TO: **Directors of Utilities Committee**

BY: **Whitney Katchmark, Principal Water Resources Engineer**

RE: **Committee Meeting – April 3, 2013**
RSVP – April 2, 2013

The Directors of Utilities Committee meeting will be held on **April 3, 2013 at 1:30 p.m.** in the **HRPDC Regional Board Rooms, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached.

Please RSVP by April 2, 2013 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee

Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Brian Ramaley, NN
Anthony Reyes, HA
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK
Edwin P. Wrightson, IW

Copy

Lynn Allsbrook, HA
Joseph Durant, NN
Frank Haltom, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
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Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

MEETING
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
April 3, 2013
HRPDC Chesapeake
1:30 PM

1. **Summary of the March 6, 2013 Meeting of the Directors of Utilities Committee**

   The summary of the March 6, 2013 meeting of the Directors of Utilities Committee is attached for the Committee's review and approval.

   Attachments:
   - 1A March 6, 2013 Meeting Summary
   - 1B March 6, 2013 Meeting Sign-in Sheet
   - 1C Hampton Roads Inmate Evacuation Planning Committee Presentation
   - 1D Draft Groundwater Regulations
   - 1E Regional Sewer Consolidation Study
   - 1F Staff Reports

   ACTION: Approve the meeting summary.

2. **askHRgreen.org Update**

   HRPDC staff will provide an overview of the second wave of askHRgreen.org research. The most recent survey is nearly identical to the benchmark survey, with the exceptions of a small number of new questions and removal of a section devoted to exploring media and communications use. The report compares responses from both surveys to measure changes in population behavior and the evolving effectiveness of the askHRgreen campaign.

   ACTION: No action.

3. **Water and Wastewater Rate Structures Project**

   The HRPDC staff will summarize draft work products. The Committee will be asked to review and provide comments to staff through April 24, 2013. Revisions will be presented at the May 1, 2013 Committee meeting.

   ACTION: Per discussion.

4. **Regional Sanitary Sewer System Asset Consolidation Study**

   The fourth project workshop for the Regional Sewer System Asset Consolidation Study is scheduled for Friday, April 19, 2013 at HRSD's North Shore Operations Center. The Committee will discuss recent developments and next steps. Committee members are welcome to share thoughts on City Council presentations.

ACTION: Per discussion.

5. **Staff Updates**

- **SSORS User Training for 2013 Upgrades:** A user training session will be held to review 2013 upgrades to the Sanitary Sewer Overflow Reporting System (SSORS) on April 11, 2013 from 1:00 p.m. to 3:00 p.m. in the HRPDC Regional Board Room. Users may register via email (tsmith@hrpdcva.gov).

  ACTION: No action.

- **June 5, 2013 Joint Meeting with Health Directors and Emergency Managers:** To support preparations for hurricane season, the agenda for the June Committee meeting is being developed to provide coordination and information sharing between utilities, public health, and emergency management. Agenda items will include the Water Quality Response Plan, the Hampton Roads Incident Management Team, and the Ready Hampton Roads regional training/exercise calendar and file library. In preparation for this meeting, HRPDC staff briefed the Regional Emergency Management Technical Advisory Committee on the Directors of Utilities Committee activities on March 26, 2012

  ACTION: No action.

6. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES O. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

May 29, 2013

Memorandum #2013-71

TO: **Directors of Utilities Committee**
Health Directors
Emergency Mangers

BY: **Whitney Katchmark, Principal Water Resources Engineer**

RE: **Committee Meeting – June 5, 2013**
RSVP – June 4, 2013

To enhance coordination and information sharing and to support preparations for hurricane season, a joint meeting of the HRPDC Directors of Utilities Committee, Health Directors, and Emergency Managers will be held on **June 5, 2013** in the **HRPDC Regional Board Room, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached. The meeting schedule is as follows:

12:30 p.m.	Lunch (provided)
1:00 p.m.	Meeting

Please RSVP by June 4, 2013 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee:

Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Brian Ramaley, NN
Anthony Reyes, HA
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK
Edwin P. Wrightson, IW

Health Directors:

John Aulbach, VDH
Harry Bennett, VDH
S. William Berg, MPH, VDH
David Chang, VDH
Ana Colon, VDH
Jay Duell, VDH
David Fridley, VDH
Jeffery Goodchild, VDH
Alton Hart, VDH
Clifton D. Horne, VDH
Daniel B. Horne, VDH
Heidi Kulberg, VDH
Demetria Lindsay, VDH
Amy Pemberton, VDH
John Schellenberg, VDH
Carol Smith, VDH
Nzinga Teule-Hekima, VDH
Nancy Welch, VDH

Regional Emergency Management Technical Advisory Committee (REMTAC):

Tamara B. Arthur, SY
T. Stewart Baker, VDEM
Mark Carr, FR
Rusty Chase, IW
Steven Cover, VB
Pat Dent, WM
Edmund Elliot, CH
Tyrone W. Franklin, SY
Andrea Gayer, HRPDC
Kate Hale, JC
Robert Holloway, PQ
Ken Jones, NN
James Judkins, SU
Stephen Kopczynski, YK
Creig, Moore, GL
Jim Redick, NO
J.B. Stutts, SH
Wallace Twigg, VDEM
Hui-Shan Walker, HA

Capacity Team:

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
Melissa Lindgren, IW
William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

REMTAC Alternate:

Cliff Bowen, PQ
Robb Braidwood, CH
Mike Bryant, PQ
Spence Campbell, PO
Anthony Castillo, NO
Patricia Chappell, VDEM
Andrea Clontz, IW
George Glazner, CH
Vince Holt, FR
James Humphrey, WM
Michael W. Johnson, SH
Ervin Jones, SY
Beth Lewis, SH
Paul Long, YK
Tal Luton, JC
Scott Mahone, NO
Mark Marchbank, VB
Doreen McAndrews, NN
Richard Parker, GL
Gwen Pointer, HA
Steven Pyle, NN
Sara Ruch, HA
Brian Spicer, SU
Erin Sutton, VB

Directors of Utilities Copy:

Lynn Allsbrook, HA
Joseph Durant, NN
Frank Haltom, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

REMTAC Copy:

Stephen R. Best, RCPT
Donna Brehm, CRA
Martha Burns, CH
Michael Cline, VDEM
Mark Cox, CRA
Robert Engle, VDH
William Ginnow, MMRS
Tracy Hanger, HA
Bill Hoddinott, PO
Mark Junghans
John Kuplinski, VPRJ
Ruth Reich, Navy
Robert Ryalls, JC
Judith Shuck, MMRS
Roger D. Tomlinson, Coast Guard
Patrick Twiss, DHS
Latoya Vaughn, NO
Pamela Wakefield, Red Cross
Tim Winstanley, MMRS

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
REGIONAL EMERGENCY MANAGEMENT TECHNICAL ADVISORY COMMITTEE
AGENDA
June 5, 2013
HRPDC
1:00 P.M.

LUNCH (12:30)

1. **Summary of the May 1, 2013 Meeting of the Directors of Utilities Committee**

   The summary of the May 1, 2013 meeting of the Directors of Utilities Committee is attached for the Committee's review and approval.

   Attachments:
   - 1A May 1, 2013 Meeting Summary
   - 1B May 1, 2013 Meeting Sign-in Sheet
   - 1C Comment Summary, Water and Wastewater Rate Structures Project
   - 1D Staff Update, Groundwater Levels
   - 1E Resolution of Appreciation to Brian Ramaley

   ACTION: Approve the meeting summary.

2. **Summary of December 5, 2012 Joint Meeting of the Directors of Utilities Committee and Directors of Health**

   The summary of the December 5, 2012 joint meeting of the Directors of Utilities Committee and the Health Directors is attached for the Committee's review and approval.

   Attachments:
   - 2A December 5, 2012 Meeting Summary
   - 2B December 5, 2012 Meeting Sign-in Sheet
   - 2C Regulatory Update, Mr. Daniel Horne, VDH Office of Drinking Water
   - 2D Presentation Slides - Hampton Roads Water Quality Response Plan, Whitney Katchmark, HRPDC
   - 2E Presentation Slides - Chesapeake Bay TMDL: Credit for Sewer Improvements, Whitney Katchmark, HRPDC

   ACTION: Approve the meeting summary.

3. Ready Hampton Roads

In 2012, the HRPDC staff, the Regional Emergency Management Technical Advisory Committee, and the Citizen Corps Committee completed the ReadyHamptonRoads.org website. In addition to public resources, ReadyHamptonRoads.org supports login access for emergency management practitioners, a secure file library for regional documents and plans, and a regional calendar for coordinating training, exercise, and meeting activities.

The *Hampton Roads Water and Wastewater Systems Emergency Preparedness and Response Regional Improvement Plan* (December 2012) includes initiatives to leverage existing HRPDC committee structures and communication tools to improve utility relationships with Emergency Managers, and other entities. Utilities have also expressed interest in participating in functional exercises.

HRPDC staff will provide a briefing on the program, and the group will discuss opportunities for utilization of the file library and regional calendar. The group will also consider scheduling an annual meeting of the Utility Directors, Health Directors, and Emergency Managers.

Attachment:

3 Executive Summary, *Hampton Roads Water and Wastewater Systems Emergency Preparedness and Response Regional Improvement Plan*

ACTION: Per discussion.

4. Hampton Roads Incident Management Team

Using Urban Area Security Initiative (UASI) Grant funds, the region developed an All-Hazards Incident Management Team (IMT) to support major incidents and events. The goal is for HRIMT to have public works, water, and wastewater expertise to complement police, fire, and emergency management capabilities.

The Hampton Roads IMT will provide an overview of the program. The group will discuss membership needs and participation.

ACTION: Per discussion.

5. Hampton Roads Water Quality Response Plan

At the December 5, 2012 joint meeting of the Directors of Utilities Committee and Health Directors, the group agreed to update the Hampton Roads Water Quality Response Plan. HRPDC staff revised the document as directed; no further comments or suggestions for revisions were received. HRPDC staff will provide an overview of the 2013 plan update and present the document for approval by the Directors of Utilities Committee and Health Directors.

The group will discuss incorporating an exercise of the Water Quality Response Plan into the Regional Catastrophic Planning Team's two year exercise schedule.

ACTION: (a) Approve the 2013 Update of the Hampton Roads Water Quality Response Plan.
(b) Decide whether to pursue an exercise of the Plan through the Regional Catastrophic Planning Team.

6. Regulatory Update

VDH Office of Drinking Water will provide an update on regulatory issues.

ACTION: Per discussion.

7. Roundtable Discussion

The Utility Directors, Health Directors, and Emergency Managers will have an opportunity to discuss matters of mutual interest.

ACTION: Per discussion.

BREAK (5 minutes)

At this time the joint meeting of Utility Directors, Health Directors, and Emergency Managers will conclude. When the meeting reconvenes, topics pertaining to the Utility Directors will be discussed. Health Directors and Emergency Managers are invited to stay if they wish.

8. askHRgreen.org Trailer Hosting

HRPDC staff will review the responsibilities associated with hosting the askHRgreen.org trailer and confirm the utility volunteer host for FY 14.

ACTION: Determine host utility for FY 14.

9. Regional Sanitary Sewer System Asset Consolidation Study

The Committee will receive a briefing on the results of the comparative analysis, which contrasts the regional and non-regional requirements for capacity enhancements. This economic analysis is being incorporated into the Regional Sanitary Sewer System Asset Consolidation Study.

ACTION: Per discussion.

10. Other Business

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

July 31, 2013

Memorandum #2013-109

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – August 7, 2013
RSVP – August 6, 2013

The meeting of the HRPDC Directors of Utilities Committee will be held on **August 7, 2013** at **12:30 p.m.** in the **HRPDC Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached.

Please RSVP by August 6, 2013 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee:

Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Anthony Reyes, HA
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
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Erin Trimyer, PO
Brian K. Woodward, YK
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Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Directors of Utilities Copy:

Lynn Allsbrook, HA
Joseph Durant, NN
Frank Haltom, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
August 7, 2013
HRPDC, Chesapeake
1:30 P.M.

1. **Summary of the June 5, 2013 Joint Meeting of the Directors of Utilities Committee, Health Directors, and Emergency Managers**

   The summary of the June 5, 2013 meeting of the Directors of Utilities Committee is attached for the Committee's review and approval.

   The Directors of Utilities Committee meeting was cancelled for the month of July.

   Attachments:
   - 1A June 5, 2013 Meeting Summary
   - 1B June 5, 2013 Meeting Sign-in Sheet
   - 1C Presentation Slides - Hampton Roads All Hazards Incident Management Team, Bill Burkett, Virginia Port Authority Maritime Incident Response Team
   - 1D Presentation Slides - Hampton Roads Water Quality Response Plan, Whitney Katchmark, HRPDC
   - 1E Handout – askHRgreen.org Mobile Trailer, Housing and Transportation
   - 1F Presentation Slides – Comparative Analysis, Richard Stahr, Brown and Caldwell

   ACTION: Approve the meeting summary.

2. **Hampton Roads Regional Water Supply Plan**

   The Department of Environmental Quality is completing the agency's tentative compliance review of the Hampton Roads Regional Water Supply Plan. The HRPDC staff met with DEQ staff on July 24, 2013 to review the agency's preliminary findings and recommendations. The HRPDC staff will provide a summary of the discussion and requirements for a final determination of compliance with the regulation.

   ACTION: No action.

3. **Water and Wastewater Rate Structures Project**

   The HRPDC staff presented the draft project presentation to the region's Chief Administrative Officers on July 18, 2013 and solicited general feedback in preparation for the September 19, 2013 presentation to the HRPDC Executive Committee. The HRPDC staff will summarize the discussion for the Committee.

   The pre-final water and wastewater rate structures report will be provided to the Committee by August 12, 2013. The Committee will be asked to review and provide comments to staff through August 16, 2013. The final report will be provided to the

HRPDC Executive Committee as part of the agenda packet for the September 19, 2013 Commission meeting.

Attachment:

3 Presentation Slides – Water & Wastewater Utilities: Designing the Modern Rater Structure, Whitney Katchmark, HRPDC

ACTION: Per discussion.

4. **Groundwater Program Proposed by Mission H2O Virginia**

Mission H20 Virginia is a group organized by Andrea Wortzel at Hunton & Williams that tracks water supply issues and comments on regulatory proposals on behalf of the membership. The group was launched in 2007 and membership is a combination of industrial, commercial and municipal users and utilities. Mission H2O Virginia has reached out to several Hampton Roads localities and HRPDC staff and invited us to participate in a new groundwater initiative. The proposed work plan for the groundwater program is attached. The HRPDC staff will review the work plan and encourages the Committee to decide whether or not to participate as a group.

Attachments:

4 Mission H2O – goals and work plan

ACTION: Vote on membership in Mission H2O or partial membership (groundwater initiative only).

5. **Regional Sanitary Sewer System Asset Consolidation Study**

Mr. Glen Elmers, HDR, provided an update on the Regional Sewer Consolidation Study at the July 18, 2013 HRPDC Quarterly Commission Meeting. Mr. Ted Henifin, HRSD, reviewed the next steps with the Commissioners. The Committee will have the opportunity for a roundtable discussion of the project status and next steps.

ACTION: Per discussion.

6. **Staff Reports**

- **Legislative Agenda:** The HRPDC is developing a legislative agenda and seeks input from localities on issues of regional interest.

- **FY14 Work Program and FY15 Budget** to be discussed at next meeting. Potential ideas –update Source Water Assessment Program, groundwater mitigation claims/MOA, outreach related to Rate Structure whitepaper, integrated planning, water supply plan updates or data collection, follow up to UASI study.

- **New Building Code Provisions for Rainwater Harvesting**: The update to the Virginia Uniform Statewide Building Code, which was released for public

comment on July 29, 2013, includes new provisions for non-potable water systems, including rainwater harvesting systems. The HRPDC Joint Environmental Committee (JEC) is developing comments on the new rainwater harvesting provisions. Endorsement of comments is anticipated at the September 5, 2013 JEC meeting.

- **Business Continuity Plans for Water Utilities**: On June 17, 2013, the Water Research Foundation, AWWA, and U.S. EPA published a guidance document, template, and online training video modules for business continuity planning/continuity of operations planning for water utilities (access project information at http://www.waterrf.org/Pages/Projects.aspx?PID=4319). This guidance and template tool is consistent with Initative 1D of the *Hampton Roads Water and Wastewater Systems Emergency Preparedness and Response Regional Improvement Plan* (December 2012), which recommended development of regional guidance for continuity of operations planning.

- **AWWA survey on Water Demand Impact of the Recession**: AWWA is requesting utility member participation in a web-based survey about water demand impacts of the recent "Great Recession." The survey is part of a Water Research Foundation project entitled, "Water Demand Forecasting in Uncertain Times: Isolating the Effects of the Great Recession" (#4458). The survey closes on August 15, 2013 (link: https://www.surveymonkey.com/s/WaterRF4458).

ACTION: Per discussion.

7. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

September 25, 2013

Memorandum #2013-141

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – October 2, 2013
RSVP – October 1, 2013

The meeting of the HRPDC Directors of Utilities Committee will be held on **October 2, 2013** at **1:30 p.m.** in the **HRPDC Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached.

Please RSVP by October 1, 2013 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee:

Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Edward G. Henifin, HRSD
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Julien Johnson, SH
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Martin Schlesinger, GL
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Richard Stahr, Brown and Caldwell
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Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
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Directors of Utilities Copy:

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Joseph Durant, NN
Frank Haltom, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
October 2, 2013
HRPDC, Chesapeake
1:30 P.M.

1. **Summary of the September 4, 2013 Meeting of the Directors of Utilities Committee**

   The summary of the September 4, 2013 meeting of the Directors of Utilities Committee is attached for the Committee's review and approval.

   Attachments:
   - 1A September 4, 2013 Meeting Summary
   - 1B September 4, 2013 Meeting Sign-in Sheet
   - 1C Description and Recommendations of Hampton Roads Source Water Assessment Plan (handout)
   - 1D Proposed Building Code Provisions for Non-potable Rainwater Harvesting Systems (presentation slides)

   ACTION: Approve the meeting summary.

2. **Regional Sanitary Sewer System Asset Consolidation Study**

   The Hampton Roads Sanitation District Commission considered the final report on the sanitary sewer system asset consolidation study at the September 24, 2013 Commission meeting. The Committee will discuss the Commission action.

   ACTION: Per discussion.

3. **HRWET & HRFOG Program Updates**

   The HRPDC staff will update the Committee on FY14 program activities for HRWET and HRFOG. The askHRgreen Annual Report for FY13 is available for review at: http://askhrgreen.org/wp-content/uploads/2011/06/askHRgreen-Annual-Report_final_web.pdf

   ACTION: No action.

4. **HRPDC FY2014 Unified Planning Work Program – Water Resources**

   At the September 4, 2013 meeting, the Committee prioritized the following ideas for major FY14 HRPDC projects that are not recurring program elements:

   - **Rate Structure Outreach:** Increase HRPDC newsletter articles, outreach to media, promote issue via community groups (civic leagues, Rotary Clubs, and others).

- **Create Groundwater Subcommittee:** Subcommittee would vet policy recommendations to support Mission H2O and recommend research or modeling efforts to HRPDC staff.
- **Affordability research:** A) Use U.S. Counsel of Mayors worksheets to evaluate affordability metrics for all localities, and B) Identify subsidy program models and present pros/cons of different models.
- **Update Groundwater Mitigation Program:** Revisit the MOA and technical guidelines for evaluating mitigation claims.
- **Source Water Protection Update:** Update map of likely sources of contamination and revisit recommendations in the regional plan. Examine land uses surrounding reservoirs and potential impacts water quality.

The HRPDC staff will present a proposed work program for Committee consideration.

ACTION: Approve the FY14 work program.

5. **FY15 Wastewater and Water Program Budgets**

The Committee will discuss the FY15 budgets for Wastewater and Water Programs. HRPDC staff will review the Committee Guidelines for budget planning. The Committee members present will be asked to endorse the FY15 budgets, and consensus on budgets will be polled via a follow-up email.

Attachments:
5A Wastewater Program FY15 Budget
5B Water Program FY15 Budget

ACTION: Endorse the FY15 Wastewater and Water Program budgets.

6. **Staff Reports**

- **State Water Commission:** Staff will summarize the meeting on September 11, 2013 which covered the State Water Supply Plan and groundwater management.
- **DEQ Ambient Groundwater Quality Monitoring Strategy:** Staff will brief the Committee on the September 2013 revised final draft of the monitoring strategy and the implementation plan for FY2014.
- **FY14 Water and Wastewater Rate Data:** The compiled results of the annual water and wastewater rate data call was distributed to the Committee on September 18, 2013.
- **Water and Wastewater Rate Structures Report:** The HRPDC Executive Committee approved the report for distribution on September 19, 2013. The full report and two-page summary are available on HRPDC's website: http://www.hrpdc.org/news/index/view/id/1576.

ACTION: No action.

7. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

October 30, 2013

Memorandum #2013-163

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – November 6, 2013
RSVP – November 5, 2013

The Directors of Utilities Committee meeting and the H2O – Help to Others –Program Annual Board of Directors' meeting will be held on **November 6, 2013** beginning at **1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached. All members of the Directors of Utilities Committee are members of the H2O Program Board of Directors.

Please RSVP by November 5, 2013 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/fw

Attachments

Directors of Utilities Committee:

Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Anthony Reyes, HA
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK

Capacity Team:

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
Melissa Lindgren, IW
William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Directors of Utilities Copy:

Lynn Allsbrook, HA
Joseph Durant, NN
Donald Jennings, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Ellen Roberts, PQ
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

MEETING
H2O – Help to Others – Program Board of Directors
AGENDA
November 6, 2013
Newport News
1:30 PM

1. **Program Status**

   HRPDC staff will review fundraising and distribution results and the proposed budget and funding allocations for FY 2015.

   ACTION: Per discussion.

2. **Officers**

   The Board will decide to continue the term of current officers or elect new officers. The officers do not have specified terms. The bylaws state that the officers serve at the pleasure of the Board.

   HRPDC staff will follow-up with officers for signed authorization of the SCC forms.

   ACTION: Continue the term of current officers or elect new officers.

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
November 6, 2013
Newport News
2:00 P.M.

1. Summary of the October 2, 2013 Meeting of the Directors of Utilities Committee

The summary of the October 2, 2013 meeting of the Directors of Utilities Committee is attached for the Committee's review and approval.

Attachments:

- 1A October 2, 2013 Meeting Summary
- 1B October 2, 2013 Meeting Sign-in Sheet
- 1C FY14 askHRgreen.org Environmental Education Update (presentation slides)
- 1D Informing the Public About Water/Wastewater Rates, Proposed Outreach Plan and Schedule (presentation slide)
- 1E Staff Report, DEQ Ambient Groundwater Quality Monitoring Strategy (presentation slide and handout)

ACTION: Approve the meeting summary.

2. askHRgreen.org Trailer Hosting Schedule

At the June 5, 2013 Directors of Utilities Committee Meeting, Virginia Beach volunteered to continue hosting the askHRgreen trailer through June 2014. The Committee agreed that a trailer hosting rotation queue would be determined for future years. The Committee should discuss which localities have the capability to host and transport the trailer and determine a rotation queue beginning July 1, 2014.

Attachment:

- 2 askHRgreen.org Mobile Trailer - Housing and Transportation

ACTION: Agree to a schedule for a trailer hosting rotation queue, beginning in July 2014.

3. Regional Sanitary Sewer System Asset Consolidation Study

The Committee will have the opportunity to discuss any recent developments regarding sewer consolidation recommendations and alternatives.

ACTION: Per discussion.

4. Groundwater Subcommittee Report

At the September 4, 2013 meeting, the Committee agreed to form a Groundwater Subcommittee to vet policy recommendations to support Mission H2O Virginia and recommend research or modeling efforts to HRPDC staff. The first Subcommittee meeting was held on October 31, 2013. HRPDC staff will summarize the meeting and the Committee will discuss and evaluate subcommittee recommendations.

ACTION: Per discussion.

5. **Affordability Research**

As part of the HRPDC Water Resources FY14 work program, HRPDC staff will complete worksheets provided in the 2013 report "Affordability Assessment Tool for Federal Water Mandates" to evaluate affordability metrics for all localities. Some utility-specific information will be collected by HRPDC staff through a data call. HRPDC staff will provide an overview of the data requirements and will solicit feedback from the Committee on any data elements that may require clarification or guidelines for consistent utility responses to the data call.

ACTION: Per discussion.

6. **Staff Reports**

- **Hampton Roads Regional Water Supply Plan:** The public comment period for DEQ's determination of tentative compliance for the Hampton Roads Regional Water Supply Plan concluded on October 1, 2013. DEQ did not receive any comments. The agency plans to issue final compliance determination letters by December 31, 2013.

ACTION: No action.

7. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
KENNETH I. WRIGHT, CHAIRMAN • CLYDE HAULMAN, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

November 26, 2013

Memorandum #2013-182

TO: Directors of Utilities Committee
Health Directors

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – December 4, 2013
RSVP – December 3, 2013

The joint meeting of the Directors of Utilities Committee and Health Directors will be held on **December 4, 2013** in the **HRPDC Regional Board Room, Chesapeake**. The agenda and related materials are attached. The meeting schedule is as follows:

12:30 p.m.	Lunch (provided)
1:00 p.m.	Meeting

Please RSVP by December 3, 2013 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/fw

Attachments

Directors of Utilities Committee:

Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
Larry Foster, JCSA
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Ralph Patterson, WM
Anthony Reyes, HA
Ellen Roberts, PQ
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK

Health Directors:

John Aulbach, VDH
Harry Bennett, VDH
David Chang, VDH
Ana Colon, VDH
Jay Duell, VDH
David Fridley, VDH
Jeffery Goodchild, VDH
Gary Hagy, VDH
Alton Hart, VDH
Tim Jones, VDH
Clifton D. Horne, VDH
Daniel B. Horne, VDH
Heidi Kulberg, VDH
Demetria Lindsay, VDH
Amy Pemberton, VDH
John Schellenberg, VDH
Carol Smith, VDH
Nzinga Teule-Hekima, VDH
W. Ted Tweel, VDH
Nancy Welch, VDH

Capacity Team:

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
Melissa Lindgren, IW
William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Directors of Utilities Copy:

Lynn Allsbrook, HA
Joseph Durant, NN
Donald Jennings, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
REGIONAL EMERGENCY MANAGEMENT TECHNICAL ADVISORY COMMITTEE
AGENDA
December 4, 2013
Chesapeake

1:00 P.M.

LUNCH (12:30)

1. **Summary of the November 6, 2013 Meetings of the H2O – Help to Others – Program Board of Directors and the Directors of Utilities Committee**

   The summary of the November 6, 2013 meetings of the H2O – Help to Others – Program Board of Directors and the Directors of Utilities Committee is attached for review and approval.

   Attachments:
   - 1A November 6, 2013 Meeting Summary
   - 1B November 6, 2013 Meeting Sign-in Sheet
   - 1C H2O – Help to Others – Program Update (presentation slides)
   - 1D Outline for Groundwater Management Criteria Whitepaper
   - 1E Affordability Research Data Call (presentation slides)
   - 1F Homeland Security Grant Funding Award (presentation slide)

   ACTION: Approve the meeting summary.

2. **Summary of June 5, 2013 Joint Meeting of the Directors of Utilities Committee, Directors of Health, and Emergency Managers**

   The summary of the June 5, 2013 joint meeting of the Directors of Utilities Committee, Health Directors, and Emergency Managers is attached for review and approval.

   Attachments:
   - 2A June 5, 2013 Meeting Summary
   - 2B June 5, 2013 Meeting Sign-in Sheet
   - 2C Hampton Roads All Hazards Incident Management Team (presentation slides)
   - 2D Hampton Roads Water Quality Response Plan (presentation slides)
   - 2E askHRgreen.org Mobile Trailer, Housing and Transportation (handout)
   - 2F Comparative Analysis, Regional Sanitary Sewer System Asset Consolidation Study (presentation slides)

   ACTION: Approve the meeting summary.

3. **Regulatory Update**

Mr. Dan Botdorf, Deputy Field Director for Virginia Department of Health Office of Drinking Water's Southeast Virginia Field Office, will provide an update on regulatory issues.

ACTION: No action.

3. **Drinking Water Fluoridation**

Staff from the City of Virginia Beach Department of Public Utilities will present an overview of current literature and discussions regarding the addition of fluoride to drinking water.

ACTION: No action.

4. **Back-up Water Supplies for Jail Facilities**

The City of Virginia Beach Public Utilities recently completed a five-month feasibility study of providing back-up water supplies for jails. Director Tom Leahy, Virginia Beach Department of Public Utilities, will brief the Committee on the study results.

ACTION: No action.

5. **Roundtable Discussion**

The Utility Directors and Health Directors will have an opportunity to discuss matters of mutual interest.

ACTION: Per discussion.

BREAK (5 minutes)

At this time the joint meeting of Utility Directors and Health Directors will conclude. When the meeting reconvenes, topics pertaining to the Utility Directors will be discussed. Health Directors are invited to stay if they wish.

6. **Regional Sanitary Sewer System Asset Consolidation**

The Committee will have the opportunity to discuss the alternative for HRSD implementation of the regional wet weather capacity improvements.

ACTION: Per discussion.

7. **Staff Reports**

- **2013 Groundwater Permit Summary Map:** HRPDC staff has prepared an updated groundwater permit map for the Eastern Virginia Groundwater Management Area. The map will be made available on HRPDC's website.

- **2014 Committee Meeting Schedule:** The 2014 meeting schedule for the Directors of Utilities Committee is attached.

  Attachment:

  7A 2014 Directors of Utilities Committee meeting schedule

ACTION: Per discussion.

8. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
KENNETH I. WRIGHT, CHAIRMAN • CLYDE HAULMAN, VICE-CHAIR • JAMES O. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

January 2, 2014

Memorandum #2014-02

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – January 8, 2014
RSVP – January 7, 2014

The meeting of the HRPDC Directors of Utilities Committee will be held on **January 8, 2014** at **1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by January 7, 2014 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/kg

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
David Jurgens, CH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
Stephanie Luton, JCSA
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Ralph Patterson, WM
Anthony Reyes, HA
Ellen Roberts, PQ
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK

Capacity Team:

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
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Kristen M. Lentz, NO
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Ralph Patterson, WM
Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Directors of Utilities Copy:

Lynn Allsbrook, HA
Joseph Durant, NN
Donald Jennings, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

HRPDC Staff:

Katie Cullipher
Rebekah Eastep
Julia Hillegass
Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
January 8, 2014
Newport News
1:30 P.M.

1. **Summary of the December 4, 2013 Meeting of the Directors of Utilities Committee and Health Directors**

   The summary of the December 4, 2013 meeting of the Directors of Utilities Committee and Health Directors is attached for review and approval.

   Attachments:
   - 1A December 4, 2013 Meeting Summary
   - 1B December 4, 2013 Meeting Sign-in Sheet
   - 1C VDH Office of Drinking Water Regulatory Update
   - 1D Water Fluoridation (presentation slides)
   - 1E Review of Water Fluoridation (white paper)

   ACTION: Approve the meeting summary.

2. **Subsidence Report Summary**

   HRPDC staff will provide a summary of the USGS report "Land Subsidence and Relative Sea-Level Rise in the Southern Chesapeake Bay Region." HRPDC worked with USGS to develop this report which reviews the available measurements of land subsidence in the region and evaluates the potential causes of land subsidence.

   ACTION: No action.

3. **Mission H2O Update**

   HRPDC staff will brief the Committee on the groundwater management criteria white papers prepared in support of the Mission H2O groundwater initiative and based on the recommendations of the October 31, 2013 HRPDC Directors of Utilities Committee, Groundwater Subcommittee meeting.

4. **Fats, Oils, and Grease**

The Committee will discuss the status of the Hampton Roads Fats, Oils, and Grease (HR FOG) Program, including the 2008 "Memorandum of Agreement Pertaining to Mutual Cooperation in the Retrofit Enforcement of Grease Control Devices" and local FOG ordinances.

Attachments:

3A FOG Ordinance summary – May 2012
3B HRPDC recommendation to CAOs – November 2008

ACTION: Per discussion.

5. **Regional Sanitary Sewer System Asset Consolidation**

The Committee will have the opportunity to discuss the regional Memorandum of Agreement and the future of the Department of Environmental Quality Special Order by Consent.

ACTION: Per discussion.

6. **Staff Reports**

- **SB 48 Eastern Virginia Groundwater Management Area; prohibition on oil and gas drilling:** HRPDC staff will brief the Committee on the proposed legislation SB 48. The Committee will have the opportunity to discuss the Committee's position and any recommended actions.

- **Update on Implementation of the Reduction of Lead in Drinking Water Act of 2011:** Following unanimous votes by the U.S. House of Representatives and the Senate, the Community Fire Safety Act (HR3588) was signed by President Obama on December 20, 2013. The new Public Law No. 113-64 exempts fire hydrants from compliance with the Reduction of Lead in Drinking Water Act. The U.S. Environmental Protection Agency has revised the agency's "Summary of the Reduction of Lead in Drinking Water Act and Frequently Asked Questions" to state that the Community Fire Safety Act of 2013 exempts fire hydrants from the lead free requirements in section 1417(a) of the Reduction of Lead in Drinking Water Act.

ACTION: Per discussion.

7. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
KENNETH I. WRIGHT, CHAIRMAN • CLYDE HAULMAN, VICE-CHAIR • JAMES O. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

January 31, 2014

Memorandum #2014-11

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – February 5, 2014
RSVP – February 4, 2014

The meeting of the HRPDC Directors of Utilities Committee will be held on **February 5, 2014** at **1:30 p.m.** in the **HRPDC Regional Board Room, Chesapeake**. The agenda and related materials are attached.

Please RSVP by February 4, 2014 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

WSK/fw

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
David Jurgens, CH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
Stephanie Luton, JCSA
William J. Meyer, CH
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Capacity Team:

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Richard Nettleton, VB
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Craig Ziesemer, SU

Directors of Utilities Copy:

Lynn Allsbrook, HA
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Donald Jennings, IW
Stephen Land, NN
Bob Montague, VB
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Richard Nettleton, VB
Kenneth Sims, WN
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Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

HRPDC Staff:

Katie Cullipher
Rebekah Eastep
Julia Hillegass
Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
February 5, 2014
Chesapeake
1:30 P.M.

1. Summary of the January 8, 2014 Meeting of the Directors of Utilities Committee

The summary of the January 8, 2014 meeting of the Directors of Utilities Committee is attached for review and approval.

Attachments:

- 1A January 8, 2014 Meeting Summary
- 1B January 8, 2014 Meeting Sign-in Sheet
- 2A Land Subsidence in Hampton Roads (presentation slides)
- 3A MissionH20 update (presentation slides)

ACTION: Approve the meeting summary.

2. Groundwater Regulatory Update

Scott Kudlas, DEQ, will provide an update on research and policies related to the state's groundwater withdrawal permitting program.

ACTION: No action.

3. Regional Sanitary Sewer System Asset Consolidation

The Committee will have the opportunity to discuss the regional Memorandum of Agreement and the Department of Environmental Quality Special Order by Consent.

ACTION: Per discussion.

4. Monthly Meter Reading

HRPDC staff will consolidate the responses to Virginia Beach's previous request for information on monthly meter reading and billing. The Committee will have the opportunity to share research and experience with implementing monthly instead of bi-monthly billing.

ACTION: Per discussion.

5. Staff Reports

- **Mission H20 Update:** HRPDC staff will brief the Committee on revisions to the whitepapers and next steps.

- **Legislative Update:** HRPDC staff will provide an update on legislation related to drilling in the Eastern Virginia GWMA and other utility-related legislation.

6. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
KENNETH I. WRIGHT, CHAIRMAN • CLYDE HAULMAN, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

February 26, 2014

Memorandum #2014-29

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – March 5, 2014
RSVP – March 4, 2014

The meeting of the HRPDC Directors of Utilities Committee will be held on **March 5, 2014** at **1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by March 4, 2014 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

WSK/jc

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
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Directors of Utilities Copy:

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Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

HRPDC Staff:

Katie Cullipher
Rebekah Eastep
Julia Hillegass
Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
March 5, 2014
Newport News
1:30 P.M.

1. **Summary of the February 5, 2014 Meeting of the Directors of Utilities Committee**

   The summary of the February 5, 2014 meeting of the Directors of Utilities Committee is attached for review and approval.

   Attachments:
   - 1A February 5, 2014 Meeting Summary
   - 1B February 5, 2014 Meeting Sign-in Sheet
   - 1C DEQ Groundwater Listening Session (presentation slides)
   - 1D HRPDC Update on Sewer MOA (presentation slides)
   - 1E HRPDC Fracking Legislation (presentation slides)

   ACTION: Approve the meeting summary.

2. **Groundwater Regulatory Update**

   The HRPDC staff will provide an update on the recommendations that Mission H2O presented to the Department of Environmental Quality (DEQ) on February 21, 2014. HRPDC staff will also present data comparing actual use and total permitted use for each permittee.

   Attachments:
   - 2A MissionH2O Recommendations

   ACTION: Per discussion.

3. **Regional Sanitary Sewer System MOA**

   The Committee will discuss the regional Memorandum of Agreement and next steps to comply with the DEQ Special Order by Consent.

   ACTION: Per discussion.

4. **Fats, Oils, and Grease**

   The Committee will discuss Fats, Oils, and Grease programs and enforcement. Newport News has been encouraged to make its program more lenient and would like to revisit the discussion of future local programs in the region.

   ACTION: Per discussion.

5. **Staff Reports**

- **Affordability:** The HRPDC staff will summarize the data collected for the Affordability analysis for wastewater utilities and discuss how to structure the data call to complete the analysis, if time allows.

6. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
KENNETH I. WRIGHT, CHAIRMAN • CLYDE HAULMAN, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

March 26, 2014

Memorandum #2014-45

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – April 2, 2014
RSVP – April 1, 2014

The meeting of the HRPDC Directors of Utilities Committee will be held on **April 2, 2014** at **1:30 p.m.** in the **HRPDC Regional Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached.

Please RSVP by April 1, 2014 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

WSK/jc

Enclosures

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
David Jurgens, CH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
Stephanie Luton, JCSA
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Ralph Patterson, WM
Doug Powell, JCSA
Anthony Reyes, HA
Ellen Roberts, PQ
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK

Capacity Team:

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
Melissa Lindgren, IW
William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
Richard Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Directors of Utilities Copy:

Lynn Allsbrook, HA
Joseph Durant, NN
Donald Jennings, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

HRPDC Staff:

Katie Cullipher
Rebekah Eastep
Julia Hillegass
Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
April 2, 2014
Chesapeake
1:30 P.M.

1. **Summary of the March 5, 2014 Meeting of the Directors of Utilities Committee**

   The summary of the March 5, 2014 meeting of the Directors of Utilities Committee will be provided for review and approval with the June meeting agenda.

   ACTION: No action.

2. **H2O – Help to Others –Program Planning**

   The HRPDC staff will provide an updated program status, including non-profit status and the spring campaign.

   ACTION: Per discussion.

3. **Mission H2O Virginia Update**

   The HRPDC staff will brief the Committee on the wastewater reclamation and reuse white paper prepared by Mission H2O Virginia. Staff has also mapped groundwater permits and wastewater discharges to evaluate potential reuse partnerships. A second set of maps shows groundwater permits within public water service areas to evaluate the potential to reduce withdrawals by transitioning groundwater users to surface water/conjunctive use systems.

   Enclosures (available at http://www.hrpdcva.gov/events/index/view/id/285):

   3A HRSD Treatment Plant Discharge Rates & Active Groundwater Withdrawal Permits on the Hampton Roads Peninsula
   3B HRSD Treatment Plant Discharge Rates & Active Groundwater Withdrawal Permits in Southside Hampton Roads
   3C HRSD Treatment Plant Discharge Rates & Active Groundwater Withdrawal Permits in Western Hampton Roads
   3D Active Groundwater Withdrawal Permits That Could Be Serviced by Public Water Systems on the Hampton Roads Peninsula
   3E Active Groundwater Withdrawal Permits That Could Be Serviced by Public Water Systems in South Hampton Roads
   3F Active Groundwater Withdrawal Permits That Could Be Serviced by Public Water Systems in Western Hampton Roads

   ACTION: Per discussion.

4. **Regional Sanitary Sewer System MOA**

The Committee will discuss the next steps to comply with the DEQ Special Order by Consent. The executed Regional Sanitary Sewer System Memorandum of Agreement (MOA) includes the signature pages for all localities.

Enclosure: (available at http://www.hrpdcva.gov/events/index/view/id/285):

4A Regional Sanitary Sewer System MOA

ACTION: Per discussion.

5. **Fats, Oils, and Grease (FOG) Related Wastewater Overflows**

The HRPDC staff will present a summary of Sanitary Sewer Overflow Reporting System (SSORS) data on FOG-related wastewater overflows by locality and discuss whether locality Fats, Oils, and Grease (FOG) cleaning and enforcement programs have impacted the frequency of FOG-related wastewater overflows.

ACTION: Per discussion.

6. **Staff Reports**

- **Affordability Analysis:** The HRPDC staff will lead a discussion to clarify assumptions to be applied in the affordability analysis for wastewater utilities.

- **Joint Meeting of the Directors of Utilities Committee, Health Directors, and Emergency Managers:** Input is requested for the agenda for the June 5, 2013 joint meeting.

ACTION: Per discussion.

7. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
THOMAS G. SHEPPERD, JR., CHAIRMAN • KENNETH I. WRIGHT, VICE-CHAIR • JAMES D. McREYNOLDS – TREASURER
DWIGHT L. FARMER, EXECUTIVE DIRECTOR/SECRETARY

May 28, 2014

Memorandum #2014-77

TO: **Directors of Utilities Committee**
Health Directors
Regional Emergency Management Technical Advisory (REMTAC)

BY: **Whitney Katchmark, Principal Water Resources Engineer**

RE: **Committee Meeting – June 4, 2014**
RSVP – June 3, 2014

To enhance coordination and information sharing, a joint meeting of the HRPDC Directors of Utilities Committee, Health Directors, and Emergency Managers will be held on **June 4, 2014** in the **HRPDC Regional Board Room, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached. The meeting schedule is as follows:

12:30 p.m.	Lunch (provided)
1:00 p.m.	Meeting

Please RSVP by June 3, 2014 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
Bill Hopkins, SM
John Hudgins, YK
Julien Johnson, SH
David Jurgens, CH
Thomas M. Leahy III, VB
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Stephanie Luton, JCSA
William J. Meyer, CH
Jason Mitchell, HA
Albert Moor II, SU
Russell Pace, FR
Ralph Patterson, WM
Doug Powell, JCSA
Anthony Reyes, HA
Ellen Roberts, PQ
Martin Schlesinger, GL
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK

Health Directors:

John Aulbach, VDH
Harry Bennett, VDH
David Chang, VDH
Ana Colon, VDH
Jay Duell, VDH
David Fridley, VDH
Jeffery Goodchild, VDH
Gary Hagy, VDH
Alton Hart, VDH
Clifton D. Horne, VDH
Daniel B. Horne, VDH
Tim Jones, VDH
Heidi Kulberg, VDH
Demetria Lindsay, VDH
Amy Pemberton, VDH
John Schellenberg, VDH
Carol Smith, VDH
Nzinga Teule-Hekima, VDH
W. Ted Tweel, VDH
Nancy Welch, VDH

Regional Emergency Management Technical Advisory Committee (REMTAC):

Tamara B. Arthur, SY
T. Stewart Baker, VDEM
Mark Carr, FR
Rusty Chase, IW
Steven Cover, VB
Pat Dent, WM
Edmund Elliot, CH
Tyrone W. Franklin, SY
Andrea Gayer, HRPDC
George Glazner, NN
Kate Hale, JC
Robert Holloway, PQ
James Judkins, SU
Stephen Kopczynski, YK
Creig, Moore, GL
Jim Redick, NO
J.B. Stutts, SH
Wallace Twigg, VDEM
Hui-Shan Walker, HA

Directors of Utilities Copy:

Lynn Allsbrook, HA
Joseph Durant, NN
Donald Jennings, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

REMTAC Alternate:

Cliff Bowen, PQ
Robb Braidwood, CH
Mike Bryant, PQ
Spence Campbell, PO
Anthony Castillo, NO
Patricia Chappell, VDEM
Andrea Clontz, IW
Joe Davis, JC
Vince Holt, FR
James Humphrey, WM
Michael W. Johnson, SH
Ervin Jones, SY
Beth Lewis, SH
Paul Long, YK
Tal Luton, JC
Scott Mahone, NO
Mark Marchbank, VB
Doreen McAndrews, NN
Gwen Pointer, HA
Steven Pyle, NN
Sara Ruch, HA
Brian Spicer, SU
Erin Sutton, VB

REMTAC Copy:

Stephen R. Best, RCPT
Donna Brehm, CRA
Brett Burdick, VDEM
Judy Cooling, VDH
Robert Engle, VDH
Jennifer Foster, MMRS
William Ginnow, MMRS
Tracy Hanger, HA
Bill Hoddinott, PO
Mark Junghans
John Kuplinski, VPRJ
Ruth Reich, Navy
Robert Ryalls, JC
Judith Shuck, MMRS
Adam Theil, Governor's Office
Roger D. Tomlinson, Coast Guard
Tonya Vincent, Governor's Office
Patrick Twiss, DHS
Latoya Vaughn, NO
Pamela Wakefield, Red Cross
Tim Winstanley, MMRS

Capacity Team:

Edward G. Henifin, HRSD
Phil Hubbard, HRSD
Stephen K. Land, NN
Kristen M. Lentz, NO
Melissa Lindgren, IW
William J. Meyer, CH
Stephen T. Motley, VB
Nick Nagurney, VB
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Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

HRPDC Staff:

Curtis Brown
Dawn Brantley
Katie Cullipher
Rebekah Eastep
Julia Hillegass
Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
DIRECTORS OF HEALTH
REGIONAL EMERGENCY MANAGEMENT TECHNICAL ADVISORY COMMITTEE
AGENDA
June 4, 2014
HRPDC
1:00 P.M.

LUNCH (12:30)

1. **Summary of the March 5, 2014 Meeting of the Directors of Utilities Committee**

   The summary of the March 5, 2014 meeting of the Directors of Utilities Committee is attached for the Committee's review and approval.

   Attachments:
   - 1A March 5, 2014 Meeting Summary
   - 1B March 5, 2014 Meeting Sign-in Sheet
   - 1C Mission H2O: Groundwater Permits (presentation slides)
   - 1D Regional Wet Weather Management Plan Under Hybrid Regionalization (presentation slides)

   ACTION: Approve the meeting summary.

2. **Summary of the April 2, 2014 Meeting of the Directors of Utilities Committee**

   The summary of the April 2, 2014 meeting of the Directors of Utilities Committee is attached for the Committee's review and approval.

   Attachments:
   - 2A April 2, 2014 Meeting Summary
   - 2B April 2, 2014 Meeting Sign-in Sheet
   - 2C Mission H2O: Groundwater Permits (presentation slides)
   - 2D Help 2 Others Program Update (presentation slides)
   - 2E Summary of Reported Grease-Related SSOs (presentation slides)

   ACTION: Approve the meeting summary.

3. **Summary of December 4, 2013 Joint Meeting of the Directors of Utilities Committee and Directors of Health**

The summary of the December 4, 2013 joint meeting of the Directors of Utilities Committee and the Health Directors is attached for review and approval.

Attachments:

3A December 4, 2013 Meeting Summary
3B December 4, 2013 Meeting Sign-in Sheet
3C VDH Office of Drinking Water Regulatory Update
3D Water Fluoridation (presentation slides)
3E Review of Water Fluoridation (white paper)

ACTION: Approve the meeting summary.

4. **Public Comment**

5. **City of Chesapeake Public Utilities and Emergency Management Coordination**

Mr. Robb Braidwood, Emergency Manager, will brief the group on the coordination of the emergency management sector and public utilities sector in the City of Chesapeake.

ACTION: Per discussion.

6. **Priorities for Utility Preparedness and Response**

The HRPDC staff will review priority initiatives from the *Hampton Roads Water and Wastewater Systems Emergency Preparedness and Response Regional Improvement Plan* (December 2012). The HRPDC staff will present implementation proposals for fiscal year 2015. The group will provide feedback and discuss next steps.

Attachment:

6A Priority Initiatives (one-page summaries)

ACTION: Per discussion.

7. **Regional Hazard Mitigation Planning**

Mr. George Glazner, Newport News Emergency Management Division, and Ms. Erin Sutton, Virginia Beach Health Department, will brief the group on the development of a Regional Hazard Mitigation Plan.

ACTION: Per discussion.

8. **Beach Monitoring: 2013 qPCR Demonstration Project in Virginia Beach and 2013 Microbial Source Tracking in Newport News**

The Virginia Department of Health (VDH) routinely monitors beaches for indicators of fecal contamination to reduce public health risks. The VDH Office of Epidemiology, the City of Virginia Beach, and the Hampton Roads Sanitation District conducted a 2013 study to evaluate a new method for the analysis of enterococci bacteria in saltwater. Mr. Matthew Skiljo, VDH Waterborne Pathogens Control Program Coordinator, will brief the group on the project.

Swimming advisories and beach closures are issued when high levels of bacteria are found in recreational waters. The City of Newport News Public Works Department partnered with HRSD, VDH, and Virginia Tech to examine high bacteria levels at Hilton Beach through additional sampling and analysis. Mr. Reed Fowler, Newport News Public Works Director, will brief the group on the bacteria source tracking effort and follow-up actions for Hilton Beach.

ACTION: Per discussion.

9. **Source Water Protection Program**

The Virginia Department of Health (VDH), through grant funding from the EPA, is offering assistance to eastern Virginia communities to develop Source Water Protection Programs (SWPPs). Golder Associates Inc. has been contracted by VHD to provide technical expertise, facilitate utility and stakeholder input, and to develop plans. Mr. Brent Waters, Golder Associates Inc., will brief the group on VDH's proposed approach, available funding, and opportunities for Hampton Roads communities.

ACTION: Per discussion.

10. **Regulatory Update**

Mr. Daniel Horne, VDH Office of Drinking Water, will provide an update on regulatory issues.

ACTION: Per discussion.

11. **Roundtable Discussion**

The Utility Directors, Health Directors, and Emergency Managers will have an opportunity to discuss matters of mutual interest.

ACTION: Per discussion.

BREAK (5 minutes)

At this time the joint meeting of Utility Directors, Health Directors, and Emergency Managers will conclude. Upon reconvening, topics pertaining to the Utility Directors will be discussed. Health Directors and Emergency Managers are invited to stay if they wish.

12. H2O - Help to Others - Program

Mr. Randy Keaton, HRPDC Deputy Director, will provide a review of IRS Form 990 and report on the reinstatement of the program's tax-exempt status.

ACTION: Authorize submittal of forms.

13. Regional Sanitary Sewer System Asset Consolidation

The Committee will have the opportunity to discuss the regional approach to address wet weather capacity requirements.

ACTION: Per discussion.

14. Staff Reports

- **Hampton Roads Water Quality Response Plan:** The annual update of the Emergency Contact list for the Hampton Roads Water Quality Response Plan is underway. The 2014 update will be distributed upon completion.

15. Other Business

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION

KENNETH I. WRIGHT, CHAIRMAN . CLYDE E. HAULMAN, VICE CHAIR . JAMES O. McREYNOLDS, TREASURER
RANDY KEATON, INTERIM EXECUTIVE DIRECTOR

September 24, 2014

Memorandum #2014-128

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Directors of Utilities Committee Meeting – October 1, 2014
RSVP – September 30, 2014

The HRPDC Directors of Utilities Committee will meet on **Wednesday, October 1, 2014** at **1:30 p.m**. in the **HRPDC Regional Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached.

Please RSVP by September 30, 2014 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

WSK/fw

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
H. Reed Fowler II, NN
J. Arnie Francis, GL
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
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John Hudgins, YK
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Russell Pace, FR
Ralph Patterson, WM
Doug Powell, JCSA
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Capacity Team:

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Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Directors of Utilities Copy:

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David Fauber, Cape Charles
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Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

HRPDC Staff:

Katie Cullipher
Rebekah Eastep
Julia Hillegass
Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
October 1, 2014
Chesapeake
1:30 P.M.

1. **Summary of the September 3, 2014 Meeting of the Directors of Utilities Committee**

   The summary of the September 3, 2014 meeting of the Directors of Utilities Committee will be provided for review and approval with the November meeting agenda.

   ACTION: No action.

2. **Public Comment**

3. **FY2016 Wastewater and Water Program Budgets**

   The Committee will discuss FY16 budgets for Wastewater and Water Programs. HRPDC staff will review the Committee Guidelines for budget planning. The Committee members present will be asked to endorse the FY16 budgets, and consensus on budgets will be polled via a follow-up email to the Committee.

   Attachments:
   3A Wastewater Program FY16 Budget
   3B Water Program FY16 Budget

   ACTION: Endorse the FY2016 Water and Wastewater Program budgets.

4. **State Water Control Board Order by Consent**

   The HRPDC staff will provide an update on the status of the Consent Order. The Committee will have the opportunity to discuss next steps and required approvals. The Consent Order must be approved by locality boards or councils and provided to DEQ by October 27, 2014.

   ACTION: Per discussion.

5. **Groundwater Regulatory Update**

   The HRPDC staff will update the Committee on groundwater regulatory topics, including:

- DEQ's study, "An Investigation of the Economic Impacts of Coastal Plain Aquifer Depletion and Actions That May Be Needed to Maintain Long-Term Availability and Productivity;"
- Mission H2O Virginia meeting; and
- October 16, 2014 HRPDC briefing on groundwater permits and DEQ's ongoing permit negotiations.

The Committee will discuss next steps and follow-up actions.

ACTION: Per discussion.

6. Legislative Agenda

The HRPDC staff will provide a summary of legislative proposals of interest to the Committee that are being put forth by other planning districts and localities.

The Committee will discuss ideas for legislative proposals for inclusion in the HRPDC legislative agenda. Topics may include:

- Managing the use of private wells and groundwater withdrawals less than 300,000 gallons per month;
- Funding for connecting homes on septic tanks to sanitary sewer systems;
- VDH tracking of completed and pending septic tank pumpouts; and
- Groundwater permits

Legislative recommendations from HRPDC advisory committees will be considered by the HRPDC Legislative Committee for inclusion in the regional legislative agenda.

ACTION: Vote to recommend items for consideration by the HRPDC Legislative Committee.

7. Staff Reports

- **FY15 Water and Wastewater Rate Data:** The deadline for responses to the annual water and wastewater rate data call was September 15, 2014. The compiled responses to the FY15 data call were distributed to the Committee on September 24, 2014.
- **Chlorides Whitepaper:** Revisions to the chloride whitepaper are complete. The final document, "Chloride Concentrations in Hampton Roads Drinking Water Sources," is available on the HRPDC website.

ACTION: No action.

8. Other Business

November 5, 2014

Memorandum #2014-150

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – November 12, 2014
RSVP – November 11, 2014

The Directors of Utilities Committee meeting and the H2O – Help to Others – Program Annual Board of Directors' meeting will be held on **November 12, 2014** beginning at **1:30 p.m.** in the **HRPDC Regional Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached. All members of the Directors of Utilities Committee are members of the H2O Program Board of Directors.

Please RSVP by November 11, 2014 so we may make appropriate logistical arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
Scott Dewhirst, NN
Sonja Eubank, SM
Bryan Foster, PO
H. Reed Fowler II, NN
Arnie Francis, GL
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
Bill Hopkins, SM
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Kristen M. Lentz, NO
Stephanie Luton, JCSA
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Stephen K. Land, NN
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Richard Nettleton, VB
Ralph Patterson, WM
Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

Directors of Utilities Copy:

Lynn Allsbrook, HA
Joseph Durant, NN
David Fauber, Cape Charles
Donald Jennings, IW
Stephen Land, NN
Bob Montague, VB
David Morris, NN
Richard Nettleton, VB
Kenneth Sims, WN
Stephen Watson, FR
Shannon M. White, NO
Sherry D. Wright, NN
Craig Ziesemer, SU

HRPDC Staff:

Katie Cullipher
Rebekah Eastep
Julia Hillegass
Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo

MEETING
H2O – Help to Others – Program Board of Directors
AGENDA
November 12, 2014
Chesapeake
1:30 PM

1. **Program Status**

   The HRPDC staff will review non-profit status, fundraising and distribution results, and the proposed budget and funding allocations for FY 2016.

   ACTION: Per discussion.

2. **Officers**

   The Board will decide to continue the term of current officers and elect new officers. The officers do not have specified terms. The bylaws state that the officers serve at the pleasure of the Board.

   ACTION: Continue the term of current officers and elect new officers.

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
November 12, 2013
Chesapeake
2:00 P.M.

1. **Summaries of the September 3, 2014 and October 1, 2014 Meetings of the Directors of Utilities Committee**

   The summaries of the September 3, 2014 and October 2, 2014 meetings of the Directors of Utilities Committee is attached for the Committee's review and approval.

   Attachments:
   - 1A September 3, 2014 Meeting Summary
   - 1B September 3, 2014 Groundwater Regulatory Update (presentation slides)
   - 1C October 1, 2014 Meeting Summary
   - 1D October 1, 2014 Meeting Sign-in Sheet
   - 1E October 1, 2014 Groundwater Regulatory Update (presentation slides)

   ACTION: Approve the meeting summary.

2. **Public Comment**

3. **Coordination of Enforcement for Fats, Oils, and Grease Programs**

   The HR FOG committee is working with HRSD on coordinating enforcement efforts for Fats, Oils, and Grease (FOG) Programs. Utilities were asked to respond to a survey to help HRSD establish how to interact with various locality FOG programs. Responses are still pending from a few localities. HRPDC Staff will review the survey and the Committee will have the opportunity to discuss and clarify any issues.

   Attachment:
   - 3A FOG Enforcement Survey and Responses

   ACTION: Provide input on FOG enforcement to the HRFOG committee.

4. **State Water Control Board Order by Consent**

   The HRPDC staff will provide an update on the status of the Consent Order. The 30-day public notice will be published in the Virginia Register and local newspapers on November 17, 2014. The Order will become effective upon signature by DEQ following completion of the public notice period. HRPDC staff is continuing to collect the original signature pages from localities, which must be received by DEQ prior to the agency's execution of the order.

   ACTION: No action.

5. **Regional Source Water Assessment Land Use Maps and Inventory of Risk Activities**

At the July 2, 2014 meeting, the Committee directed staff to develop a project proposal for developing regional source water assessment land use maps and land use activity risk maps to assist utilities in protecting surface and groundwater supplies. Follow-up discussions with the Virginia Department of Health have yielded additional information for consideration by the Committee. The HRPDC staff will provide a status briefing and the Committee will discuss next steps.

ACTION: Per discussion.

6. **Integrated Planning**

Given the, the EPA's initiative for Integrated Municipal Stormwater and Wastewater Plans and the HRPDC's participation in DEQ's 2015 pilot project for long range environmental planning in Hampton Roads (see HRPDC June 19, 2014 agenda item 3), the Committee will discuss interest in forming a Subcommittee to develop objectives for water management. Subcommittee membership could be extended to include locality stormwater representatives and members of the HRPDC Special Committee on Recurrent Flooding and Sea Level Rise.

ACTION: Decide whether to form a Water Management Subcommittee.

7. **Groundwater Permits Discussion**

The HRPDC staff will update the Committee on groundwater topics, including:

- November 5, 2014 Mission H2O-DEQ meeting on groundwater permits;
- Final report, "An Investigation of the Economic Impacts of Coastal Plain Aquifer Depletion and Actions That May Be Needed to Maintain Long-Term Availability and Productivity - A Report Submitted to the Virginia Department of Environmental Quality, August 2014, by Stephenson, Kurt, and Abt Associates, Inc."

The Committee will discuss next steps and follow-up actions.

ACTION: Per discussion.

8. **Staff Reports**

- **2014 Groundwater Permits Summary and Map:** The HRPDC staff will brief the Committee on the 2014 Groundwater Permits Summary.

ACTION: No action.

9. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION

KENNETH I. WRIGHT, CHAIRMAN • CLYDE E. HAULMAN, VICE CHAIR • SELENA CUFFEE-GLENN, TREASURER
RANDY KEATON, INTERIM EXECUTIVE DIRECTOR

December 29, 2014

Memorandum #2014-176

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – January 7, 2015
RSVP – January 6, 2015

The meeting of the HRPDC Directors of Utilities Committee will be held on **January 7, 2015** at **1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by January 6, 2015 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
J. Chris Dawson, GL
Bryan Foster, PO
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Frank Haltom, IW
Edward G. Henifin, HRSD
Julien Johnson, SH
David Jurgens, CH
Thomas M. Leahy III, VB
Kristen M. Lentz, NO
Albert Moor II, SU
Russell Pace, FR
Doug Powell, JCSA
Anthony Reyes, HA
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Brian K. Woodward, YK

Directors of Utilities Copy:

Lynn Allsbrook, HA
Scott Dewhirst, NN
Joseph Durant, NN
Sonja Eubank, SM
David Fauber, Cape Charles
J. Arnie Francis, GL
Bill Hopkins, SM
Donald Jennings, IW
Stephen Land, NN
Stephanie Luton, JCSA
Jason Mitchell, HA
Bob Montague, VB
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Sherry D. Wright, NN
Craig Ziesemer, SU

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Danny Poe, JC
Richard Stahr, Brown and Caldwell
Eric Tucker, NO
Kenneth Turner, NO
Rick Underhill, Greeley-Hansen
Stephen Williams, NN
Frank Wilson, PO
Craig Ziesemer, SU

HRPDC Staff:

Katie Cullipher
Rebekah Eastep
Julia Hillegass
Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo
Joe Turner

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
January 7, 2015
Newport News
1:30 P.M.

1. **Summary of the December 3, 2014 Joint Meeting of the Directors of Utilities Committee and Health Directors**

   The summary of the December 3, 2014 meeting of the Directors of Utilities Committee is attached for review and approval.

   Attachments:
   - 1A December 3, 2014 Meeting Summary
   - 1B December 3, 2014 Meeting Sign-in Sheet
   - 1C VDH Regulatory Update

   ACTION: Approve the meeting summary.

2. **Public Comment**

3. **Land Subsidence**

   The HRPDC staff will provide a briefing on the December 19, 2014 meeting of the HRPDC Special Committee on Recurrent Flooding and Sea Level Rise and the Committee's recommendation for assessing land subsidence in the region.

   ACTION: Recommend approach to study or collect land subsidence measurements.

4. **Investigating Aquifer Recharge**

   Mr. Ted Henifin, HRSD, will brief the Committee on HRSD's aquifer recharge study.

   Action: No action.

5. **Groundwater Management**

   The Committee will discuss recent developments, including:
   - December 3, 2014 presentation by Secretary of Natural Resources Molly Ward to the Rappahannock River Basin Commission on the Governor's Water Resource Priorities.
   - December 4, 2014 Mission H20 correspondence to DEQ advocating for regional solutions.

- December 15, 2014 Mission H20 presentation to the State Water Commission Meeting and draft legislation to establish a groundwater management advisory committee.
- DEQ coordination with VDH Office of Drinking Water to collect information on private wells and small water systems permitted by Local Health Departments to quantify withdrawals not subject to DEQ's groundwater withdrawal permitting program.

ACTION: Per discussion.

6. **Regional Source Water Protection Planning**

The HRPDC staff will provide a status update, including the project schedule and data collection efforts.

ACTION: No action.

7. **Staff Reports**

- **State Water Control Board Order by Consent:** The 30-day public comment period concluded on December 18, 2014. No comments were received by DEQ. The final Order became effective on December 19, 2014.

- **HRPDC Continuing Services Contracts:** The HRPDC staff will brief the Committee on the forthcoming RFP for FY2016 continuing services contracts.

ACTION: No action.

8. **Other Business**

- **FY16 Retreat:** Committee members are encouraged to share their preferences on whether or not to have a retreat to set goals or identify tasks for FY16 Water and Wastewater Programs. If the Committee chooses to have a retreat, members are asked to provide input on the location, format, and schedule.

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
KENNETH I. WRIGHT, CHAIRMAN • CLYDE E. HAULMAN, VICE CHAIR • SELENA CUFFEE-GLENN, TREASURER
RANDY KEATON, INTERIM EXECUTIVE DIRECTOR

January 28, 2015

Memorandum #2015-15

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – February 4, 2015
RSVP – February 3, 2015

The meeting of the HRPDC Directors of Utilities Committee will be held on **February 4, 2015** at **1:00 p.m.** in the **HRPDC Regional Board Room, The Regional Building, Chesapeake.** The agenda and related materials are attached. The meeting schedule is as follows:

12:30 p.m.	Lunch (provided)
1:00 p.m.	**Meeting**

Please RSVP by February 3, 2015 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
J. Chris Dawson, GL
Bryan Foster, PO
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Tiffany Smith
Jenny Tribo
Joe Turner

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
February 4, 2015
Chesapeake
1:00 P.M.

(LUNCH 12:30)

1. Retreat - HRPDC FY2016 Water and Wastewater Programs

The Committee will discuss its priorities for HRPDC projects in FY16. The focus of this discussion is to identify major projects that are not recurring program elements.

Potential FY16 priority projects are listed below for consideration:

- **Groundwater Policy:** Develop a regional groundwater policy or policy recommendations; participate in the regulatory process, including DEQ's development of short- and long-term policy options; continue collaborating with Mission H2O where appropriate on groundwater management and regulatory issues.
- **Residential Rates Affordability Indicators and Assessment Tool:** Compile a "package" of indicator data tables and charts for each utility, including an Excel-based tool populated with local data to assess the relative affordability of rates on residential customers using multiple metrics.

Committee members are encouraged to suggest other projects and identify regional needs that the HRPDC could address.

ACTION: Identify priority projects for the FY16 HRPDC Water and Wastewater programs.

2. Summary of the January 7, 2015 Meeting of the Directors of Utilities Committee

The summary of the January 7, 2015 meeting of the Directors of Utilities Committee is attached for review and approval.

Attachments:

1A January 7, 2015 Meeting Summary
1B January 7, 2015 Meeting Sign-in Sheet
1C Source Water Protection Plan Update
1D Staff Report – HRPDC RFP for FY2016 Professional Services

ACTION: Approve the meeting summary.

3. **Public Comment**

4. **Groundwater Management**

The Committee will discuss recent developments and proposed legislation, including HB 1924/SB 1341 and HJ 623/SJ 272.

ACTION: Per discussion.

5. **Capacity Team Update**

The Capacity Team met on January 26, 2015 and reviewed HRSD's regional GIS effort and recent HRSD Commission Adopted Policies for Regional Sewage Flow Projection Data and Hydraulic Grade Line System Operating Pressure (HRSD Commission Meeting Minutes, Items 11 and 12). The transmittal of updated population and employment forecasts was also noted; localities were asked to acknowledge receipt of the updated forecasts for use in preparing the Regional Wet Weather Management Plan. The Committee will have the opportunity to discuss these items and any Consent Order business.

6. **Staff Reports**

- **Regional Source Water Protection Planning:** The HRPDC staff will provide a status update on data collection, plan organization, and project schedule.
- **HRPDC RFP for FY16 Professional Services:** The Committee will be updated on draft RFP revisions.
- **Notice of Location Change - June 3, 2015 Joint Meeting of the Directors of Utilities Committee and Health Directors**: The meeting will be held at the Chesapeake Bay Foundation's Brock Environmental Center. Details will be provided with the meeting agenda.

ACTION: No action.

7. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION
KENNETH I. WRIGHT, CHAIRMAN • CLYDE A. HAULMAN, VICE CHAIR • LOUIS R. JONES, TREASURER
RANDY KEATON, INTERIM EXECUTIVE DIRECTOR

April 29, 2015

Memorandum #2015-53

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – May 6, 2015
RSVP – May 5, 2015

The meeting of the HRPDC Directors of Utilities Committee will be held on **May 6, 2015** at **1:30 p.m.** in the **James Room, Fountain Plaza II, City Center, Newport News**. The agenda and related materials are attached.

Please RSVP by May 5, 2015 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

Directors of Utilities Committee:

Kofi M. Boateng, NN
Daniel G. Clayton III, WM
J. Chris Dawson, GL
Bryan Foster, PO
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Whitney Katchmark
Randy Keaton
Tiffany Smith
Jenny Tribo
Joe Turner

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
May 6, 2015
Newport News
1:30 P.M.

1. Summary of the February 4, 2015 Meeting of the Directors of Utilities Committee

The summary of the February 4, 2015 meeting of the Directors of Utilities Committee is attached for review and approval.

Attachments:

- 1A February 4, 2015 Meeting Summary
- 1B February 4, 2015 Meeting Sign-in Sheet
- 1C FY16 Retreat - Groundwater Management (presentation slides)
- 1D FY16 Retreat – Affordability Data Package (presentation slides)
- 1E Staff Reports (presentation slides)

ACTION: Approve the meeting summary.

2. Public Comment

3. State Water Resources Plan

The draft State Water Resources Plan is available for public comment through May 8, 2015. Ms. Tammy Stephenson, DEQ, will provide a briefing to the Committee. The document is available at DEQ's website: http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity/WaterSupplyPlanning/StateWaterPlan.aspx

The Committee will have the opportunity to discuss issues of concern and the development of Committee comments for submittal to DEQ.

ACTION: Per discussion.

4. Proposed Amendments to the Virginia Water Protection Permit Regulations

The Committee will have the opportunity to discuss the proposed amendments to the Virginia Water Protection Permit Program Regulation (9 VAC 25-210), including the definition of "safe yield" as agreed upon by the DEQ and the VDH. The Virginia Regulatory Town Hall Agency Background Document notes the following:

> "An advantage of locating the term within DEQ's regulation is that it more accurately reflects the responsibilities of DEQ as the agency authorized to determine the availability for a given water withdrawal. One disadvantage is the perception by the regulated community that the proposal results in a change in

how safe yield is determined and causes uncertainty in what is authorized by their VDH waterworks permits. The Department believes the proposal is prospective in nature, applying only to new withdrawals or excluded withdrawals that need a new 401 certificate to increase the withdrawal beyond what it was before July 1, 1989."

ACTION: Per discussion.

5. Guidelines for Committee Actions

The Committee will consider amending the 2011 Guidelines for Committee Actions to provide for a decision-making procedure for the expenditure of reserve funds. The HRPDC staff will present proposed language for discussion.

Attachment:
5A Proposed 2015 Revision, Guidelines of Committee Actions

Action: Amend the 2011 Guidelines for Committee Actions based on Committee discussion.

6. Hampton Roads All Hazards Advisory Committee

The Committee will appoint a public utilities sector representative to serve as a non-voting member on the newly formed Hampton Roads All Hazards Advisory Committee (AHAC). The Hampton Roads AHAC is a consolidated emergency management and homeland security committee that meets on the fourth Tuesday of every other month; AHAC reports directly to the Hampton Roads Planning District Commission. Non-voting member appointments will be approved at the May 26, 2015 AHAC meeting.

Attachment:
6A Hampton Roads AHAC Summary

ACTION: Appoint a representative to serve as non-voting member of AHAC.

7. Regional Source Water Protection Plan

The HRPDC staff will brief the Committee on project status, including coordination with VDH and source data verification. A proposed schedule for next steps and subcommittee activities will be presented for discussion.

ACTION: Per discussion.

8. **Future Participation in Mission H2O Groundwater Subgroup**

The Mission H2O Annual Meeting, to be held on May 7, 2015, will include the development of a draft budget for next year. The Committee will discuss interest in future participation and funding of Mission H2O and the Groundwater Subgroup.

ACTION: Decide on future participation in Mission H2O activities.

9. **Staff Reports**

- **Affordability:** The HRPDC will review the components of the "data package" prepared for each locality, including the regional cost scenarios, socio-economic indicator data tables, and residential rates affordability assessment tool. Data packages will be provided to each utility by May 8, 2015.

- **HRPDC RFP for FY16 Professional Services:** A status update will be provided.

- **June 3, 2015 Joint Meeting of the Directors of Utilities Committee and Health Directors**: The meeting will be held at the Chesapeake Bay Foundation's Brock Environmental Center (12:30 p.m. lunch; 1:00 meeting). Details will be provided with the meeting agenda.

ACTION: No action.

10. **Other Business**

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION

CLYDE A. HAULMAN, CHAIRMAN • ELLA P. WARD, VICE CHAIR • MARCUS D. JONES, TREASURER
ROBERT A. CRUM, JR., EXECUTIVE DIRECTOR/SECRETARY

October 29, 2015

Memorandum #2015-139

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Committee Meeting – November 4, 2015
RSVP – November 3, 2015

The Directors of Utilities Committee meeting will be held on **November 4, 2015** at **1:30 p.m.** in the **James Room, City Center, Fountain Plaza II, 700 Town Center Drive, Newport News**. The agenda and related materials are attached.

Please RSVP by November 3, 2015 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/jc

Attachments

HEADQUARTERS • THE REGIONAL BUILDING • 723 WOODLAKE DRIVE • CHESAPEAKE, VIRGINIA 23320 • (757) 420-8300

Directors of Utilities Committee:

Lynn Allsbrook, HA
Kofi M. Boateng, NN
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Tyrone W. Franklin, SY
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HRPDC Staff:

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Rebekah Eastep
Julia Hillegass
Whitney Katchmark
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Tiffany Smith
Jenny Tribo
Joe Turner

MEETING OF
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
November 4, 2015
Newport News
1:30 P.M.

1. Summary of the October 7, 2015 Meeting of the Directors of Utilities Committee

The summary of the October 7, 2015 meeting of the Directors of Utilities Committee is attached for review and approval.

Attachments:

- 1A October 7, 2015 Meeting Summary
- 1B October 7, 2015 Meeting Sign-in Sheet
- 1C H2O Board of Directors Meeting (presentation slides)
- 1D Groundwater Withdrawal Reduction Incentive Program, Concept Update (presentation slides)

ACTION: Approve the meeting summary.

2. Public Comment

3. HRSD I/I Reduction Program and RWWMP Schedule

HRSD will discuss 1) how the proposed aquifer replenishment project may impact the Regional Wet Weather Management Plan and 2) lessons HRSD is learning from local rehab pilot projects.

ACTION: Per discussion.

4. James City Service Authority Water Supply Study

The James City Service Authority (JCSA) commissioned a water supply study that was completed earlier this year. Mr. Doug Powell, JCSA General Manager, will brief the Committee on the study and its findings.

ACTION: No action.

5. Groundwater Management

The next meeting of the Eastern Virginia Groundwater Management Advisory Committee (EVGMAC) will be held on November 19, 2015 (see also DEQ's EVGMAC

website). The Committee will have the opportunity to discuss recent and upcoming EVGMAC Workgroup meetings:

Workgroup #1, Alternative Sources of Supply:

- October 15, 2015 meeting
- October 27, 2015 meeting

Workgroup #2A - Alternative Management Structures

- October 23, 2015 meeting
- November 5, 2015 meeting

Workgroup #2B – Trading

- October 15, 2015 meeting
- November 5, 2015 meeting

ACTION: Per discussion.

6. **Legislative Agenda**

The HRPDC staff will review the draft HRPDC Legislative Agenda. The final legislative agenda will be presented at the November 19, 2015 HRPDC meeting. The Committee will have the opportunity to discuss emerging issues, including:

- Potential legislation reallocating locality nutrient allocations currently assigned to existing municipal wastewater facilities; and
- Potential legislation for groundwater conservation incentive program.
- Require sewer lateral inspection at time of home sale

ACTION: Per discussion

7. **Staff Reports**

- **FY 2016 Water and Sewer Rates Data Call**: The compiled results of the FY16 water and wastewater rates data call will be distributed to the Committee on October 30, 2015.

- **Regional Source Water Protection Plan**: The HRPDC staff will provide a status update.

- **Final State Water Resources Plan:** The final State Water Resources Plan is complete and available to the public. Appendix E documents the DEQ's responses to comments received on the draft Plan. Although no changes were made to the Plan, Appendix E is provided to ensure consideration of comments in future Plan updates.

ACTION: No action.

ELLA P. WARD CHAIR, MICHAEL HIPPLE, VICE CHAIR, R. RANDY MARTIN, TREASURER
ROBERT A. CRUM, JR., EXECUTIVE DIRECTOR/SECRETARY

February 23, 2017

Memorandum #2017-23

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Meeting Announcements – March 1, 2017
RSVP – February 28, 2017

The meeting of the Directors of Utilities Committee will be held on Wednesday, **March 1, 2017** at **1:30 p.m.** at the **Suffolk Department of Public Utilities Operations Center, 272 Benton Road, Suffolk**. Please note the special meeting location.

Directions:

- From Hampton: https://goo.gl/maps/o7sFvFTSswC2
- From Chesapeake: https://goo.gl/maps/JswA1LBsbWQ2

The agenda and related materials are attached. **Please RSVP by February 28, 2017** so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/sl

Attachments

Directors of Utilities Committee:

Lynn Allsbrook, HA
Daniel G. Clayton III, WM
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S. Mark Swilley
Eric Tucker, NO
Stephen Watson, FR
Shannon M. White, NO
Steve Williams, NN
Sherry D. Wright, NN
Craig Ziesemer, SU

HRPDC Staff:

Keith Cannady
Robert Crum
Katie Cullipher
Rebekah Eastep
Katherine Filippino
Whitney Katchmark
Tiffany Smith
Joe Turner

MEETING OF THE
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
March 1, 2017
Suffolk
1:30 P.M.

1. **Summary of the February 1, 2017 Meeting of the Directors of Utilities Committee**

   The summary of the February 1, 2017 meeting of the Directors of Utilities Committee is attached for review and approval.

   Attachments:
   1A February 1, 2017 Meeting Summary
   1B February 1, 2017 Meeting Sign-in Sheet

   ACTION: Approve the meeting summary.

2. **Public Comment**

3. **Regional Wet Weather Management Plan Update**

   Mr. Richard Stahr, Brown and Caldwell Senior Vice President, will provide an update on the optimization of the solution set for HRSD's Regional Wet Weather Management Plan.

   ACTION: No action.

4. **Affordability**

   Ms. Whitney Katchmark, HRPDC Principal Water Resources Engineer, will update the Committee on plans for the CAO's discussion of the affordability of city services. Ms. Katchmark will review draft talking points for the Committee's consideration and comment.

   ACTION: Per discussion.

5. **HRPDC FY 2018 Water and Wastewater Programs**

   The Committee will discuss its priorities for HRPDC projects in FY 2018. The HRPDC staff will review annual recurring program activities and technical assistance provided during the past year. The focus of the discussion is to identify major projects that are not recurring program elements.

   Committee members are encouraged to comment on what past projects and work products were especially valuable and to suggest new projects and regional needs that the HRPDC could address.

   ACTION: Identify priority projects for the FY2018 HRPDC Water and Wastewater programs.

6. Eastern Virginia Groundwater Management Advisory Committee Follow up

The facilitator for the Eastern Virginia Groundwater Management Advisory Committee (EVGMAC) has requested input on three issues that the EVGMAC should resolve. Ms. Katchmark will lead a discussion of potential priorities including:

- Lengthening the permit term;
- Incentivizing users to transition from groundwater to surface water sources; and
- Determining how groundwater will be allocated after SWIFT is implemented.

The HRPDC staff will submit the Committee's comments to the facilitator by the March 1, 2017 deadline (close of business).

ACTION: Identify three issues that the EVGMAC should resolve.

7. Staff Reports

- **Drinking Water State Revolving Funds**: Application deadline is April 1, 2017; a funding workshop will be held in the Suffolk area on March 13, 2017. The VDH is offering a new Lead Service Line (LSL) Replacement Program that provides up to $5000 in grant funds per each service line replaced on the homeowner's side of the meter.
- **Utility Pay Scales**: Staff will update the Committee on the data call on salaries for basic utility staff positions.
- **Support for Roanoke River Basin Association (RRBA):** Staff will update the Committee on the status of the proposed funding for the RRBA.

ACTION: No action.

8. Other Business

ELLA P. WARD CHAIR, MICHAEL HIPPLE, VICE CHAIR, R. RANDY MARTIN, TREASURER
ROBERT A. CRUM, JR., EXECUTIVE DIRECTOR/SECRETARY

May 31, 2017

Memorandum #2017-66

TO: Directors of Utilities Committee
Health Directors

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Meeting Announcement – June 7, 2017
RSVP – June 6, 2017

The joint meeting of the Directors of Utilities Committee and Health Directors will be held on Wednesday, **June 7, 2017** in the **HRPDC Regional Board Room, The Regional Building, 723 Woodlake Drive, Chesapeake**. The agenda and related materials are attached. The meeting schedule is as follows:

12:30 p.m. Lunch (provided)

1:00 p.m. Meeting

Please RSVP by June 6, 2016 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/sl

Attachments

Directors of Utilities Committee:

Lynn Allsbrook, HA
Daniel G. Clayton III, WM
J. Chris Dawson, GL
H. Reed Fowler II, NN
Tyrone W. Franklin, SY
Edward G. Henifin, HRSD
Donald Jennings, IW
Julien Johnson, SH
David Jurgens, CH
Kristen M. Lentz, NO
Louis Martinez, NN
Bob Montague, VB
Albert Moor II, SU
Russell Pace, FR
Doug Powell, JCSA
Everett Skipper, NN
Bob Speechly, PQ
Michael Stallings, WN
Peter M. Stephenson, SM
Erin Trimyer, PO
Brian K. Woodward, YK

Health Directors:

S. William Berg, VDH
David Chang, VDH
Ana Colon, VDH
Jay Duell, VDH
Thomas Franck, VDH
David Fridley, VDH
Norman Grefe, VDH
Gary Hagy, VDH
Alton Hart, VDH
Daniel B. Horne, VDH
George Khan, VDH
Tim Jones, VDH
Heidi Kulberg, VDH
Demetria Lindsay, VDH
James (Jim) Moore, VDH
Amy Pemberton, VDH
Michael Rexroad, VDH
Nancy Welch, VDH
Bree Williams, VDH
Christopher Wilson, VDH

Directors of Utilities Copy:

Mark Bellamy, YK
Alan Benthall, NN
Kate Bernatitus, NN
Scott Dewhirst, NN
Joseph Durant, NN
Sonja Eubank, SM
David Fauber, Cape Charles
J. Arnie Francis, GL
Ted Garty, CH
Sue Houser, NN
Ron Harris, NN
Phil Hubbard
Josiah Jendrey, SM
Thomas M. Leahy III, VB
Melissa Lindgren, IW
Stephanie Luton, JCSA
Jason Mitchell, HA
Stephan Motley, VB
Richard Nettleton, VB
Brenton E. Payne, GL
Danny Poe, JCSA
Jack Reed, SM
Ellen Roberts, PQ
Kenneth Sims, WN
Richard Stahr, Brown and Caldwell
Stephen Watson, FR
Shannon M. White, NO
Steve Williams, NN
Sherry D. Wright, NN
Craig Ziesemer, SU

HRPDC Staff:

Keith Cannady
Robert Crum
Katie Cullipher
Rebekah Eastep
Katherine Filippino
Whitney Katchmark
Tiffany Smith
Joe Turner

JOINT MEETING OF
DIRECTORS OF UTILITIES COMMITTEE AND HEALTH DIRECTORS
AGENDA
June 7, 2017
Chesapeake
1:00 P.M.

(LUNCH 12:30)

1. **Summary of the May 3, 2017 Meeting of the Directors of Utilities Committee**

   The summary of the May 3, 2017 meeting of the Directors of Utilities Committee is attached for review and approval.

   Attachments:
   - 1A May 3, 2017 Meeting Summary
   - 1B May 3, 2017 Meeting Sign-in Sheet
   - 1C DEQ Tidewater Regional Office Update (presentation slides)
   - 1D askHRgreen.org Public Education and Outreach (presentation slides)
   - 1E Groundwater Advisory Committee (presentation slides)
   - 1F Roundtable Discussion – Utility Staff Compensation (presentation slides)
   - 1G Staff Report – Water Supply Plan Compliance (presentation slide)

   ACTION: Approve the meeting summary.

2. **Summary of the November 2, 2016 Joint Meeting of the Directors of Utilities Committee and Health Directors**

   The summary of the November 2, 2016 joint meeting of the Directors of Utilities Committee and Health Directors is attached for review and approval.

   Attachments:
   - 2A November 2, 2016 Meeting Summary
   - 2B November 2, 2016 Meeting Sign-in Sheet
   - 2C Microbial Source Tracking in Hampton Roads (presentation slides)
   - 2D VDH Office of Drinking Water Regulatory Update (presentation slides)
   - 2E Rainfall Statistics and Maps (presentation slides)
   - 2F Regional Source Water Protection Plan Update (presentation slides)
   - 2G askHRgreen.org FY16 Review and FY17 Highlights (presentation slides)

   ACTION: Approve the meeting summary.

3. **Public Comment**

4. **Beach Monitoring Update**

   The VDH Office of Epidemiology staff has indicated that the VDH has decided not to pursue the development of a predictive model for beach advisories with the Virginia Institute of Marine Science. HRPDC staff will summarize the update provided by the Office of Epidemiology.

   ACTION: No action.

5. Onsite Wastewater/Septic Sector Update

Ms. Angela Redwine, VDH Office of Environmental Health Services, will provide an update on the onsite sewage program, the nutrient reductions achieved by the sector thus far, and the Chesapeake Bay TMDL Phase III Watershed Implementation Plan (WIP) strategies for the onsite sewage/septic sector.

ACTION: Per discussion.

6. VDH Office of Drinking Water Regulatory Update

Mr. Dan Horne, VDH Office of Drinking Water Southeast Virginia Field Office Director, will provide an update on regulatory issues.

ACTION: No action.

7. Water Quality Response Plan Emergency Contact List

The first biannual update of the Water Quality Response Plan Emergency Contact List is anticipated to be distributed to the Committee and Health Directors on June 6, 2017. For the second biannual update (November 2017), the list will be enhanced with contacts for railways, oil and gas pipelines, electric transmission lines, and major roadways located in designated Source Water Protection Areas (see the Hampton Roads Regional Source Water Protection Plan). The HRPDC staff will brief the group on this effort.

ACTION: No action.

8. Affordability of City Services

At the May 3, 2017 meeting, the Committee agreed to share statistics on water shut offs due to nonpayment (a summary will be provided prior to the meeting). The group will discuss the results and determine if the data is useful in illustrating the concern that an increasing number of households are experiencing financial hardship such that budget constraints are forcing trade-offs between competing essential needs such as housing, utility services, food, and medical care.

ACTION: Per discussion.

9. Utility Directors and Health Directors Roundtable Discussion

The Utility Directors and Health Directors will have the opportunity to discuss matters of mutual interest, including:

- The Code of Virginia §15.2-2119, part D allows water service to be turned off for accounts that are 60 days past due "unless the health officers certify that shutting off the water will endanger the health of occupants of the premises or the health of others." Directors are encouraged to share how health districts would carry out the certification process and how best to coordinate with utilities in such cases.

ACTION: Per discussion.

BREAK (5 minutes)

The joint meeting of the Directors of Utilities Committee and Health Directors concludes at the break. Upon reconvening, topics pertaining to the Utility Directors will be discussed. Health Directors are invited to stay if they wish.

10. Groundwater Update

The HRPDC staff will summarize recently issued groundwater permit allocations and conditions. The Committee will also have the opportunity discuss the May 15, 2017 meeting of the Eastern Virginia Groundwater Management Advisory Committee. The draft meeting agenda and attachments are available on DEQ's website.

ACTION: Per discussion.

11. Mission H2O Virginia Groundwater Subgroup FY18 Participation

The Committee will decide whether to participate in Mission H2O Virginia's Groundwater Subgroup during FY18. If the Committee decides to participate, the Committee's portion of the Groundwater Subgroup budget will be $10,000 (same as in FY17 and FY16).

ACTION: If the Committee decides to participate in the Mission H2O Groundwater Subgroup during FY18, vote on the reserve fund expenditure of $10,000 to subscribe to the Subgroup.

12. Regional Wet Weather Management Plan Update

Mr. Richard Stahr, Brown and Caldwell Senior Vice President, will brief the Committee on the preliminary list of high priority projects for HRSD's Regional Wet Weather Management Plan.

ACTION: Per discussion.

13. Staff Reports

- **Potential EPA Energy-Water Resilience Workshop**: As a follow-up to the May 3, 2017 Committee discussion, staff from Virginia Beach Public Utilities and HRPDC responded to the Association of Metropolitan Water Agencies' request for host organizations and offered HRPDC meeting space and coordination support. AMWA staff is continuing to send contact information for potential hosts to the EPA; however, AMWA noted that the EPA is already considering workshop locations in Texas and Arizona.
- **Roanoke River Basin Association (RRBA) draft MOA:** The HRPDC has developed a draft MOA for the administration of proposed funding for the RRBA (see Attachment 13A).
- **Hampton Roads Regional Construction Standards (HRRCS):** The recently launched new HRRCS website (www.HRRCS.com) allows users to view and access the Standards on any mobile device. It also includes a new custom search tool and interactive calendar.

- **Water Supply Plan Compliance**: Staff participated in the May 18, 2017 training for DEQ's VA Hydro pilot project, and is commencing with activities to validate and update data.

Attachment:

13A Draft MOA, Roanoke River Basin Association

ACTION: No action.

14. Other Business

ELLA P. WARD CHAIR, MICHAEL HIPPLE, VICE CHAIR, R. RANDY MARTIN, TREASURER
ROBERT A. CRUM, JR., EXECUTIVE DIRECTOR/SECRETARY

August 30, 2017

Memorandum #2017-101

TO: Directors of Utilities Committee

BY: Whitney Katchmark, Principal Water Resources Engineer

RE: Meeting Announcement – September 6, 2017
RSVP – September 5, 2017

The Directors of Utilities Committee meeting and the H2O – Help to Others – Program Annual Board of Directors' meeting will be held on Wednesday, **September 6, 2017** beginning at **1:30 p.m.** in the **James Room, City Center, Fountain Plaza II, 700 Town Center Drive, Newport News**.

All members of the Directors of Utilities Committee are members of the H2O Program Board of Directors. The agenda and related materials are attached.

Please RSVP by September 5, 2017 so we may make appropriate arrangements. If you have any questions or need further information, please do not hesitate to contact me.

TS/sl

Attachments

Directors of Utilities Committee:

Lynn Allsbrook, HA
Daniel G. Clayton III, WM
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Rebekah Eastep
Katherine Filippino
Whitney Katchmark
Tiffany Smith
Joe Turner

MEETING OF THE
H2O – Help to Others – Program Board of Directors
AGENDA
September 6, 2017
Newport News
1:30 PM

1. Officers

The Board will decide to continue the terms of current officers and/or elect new officers. The officers do not have specified terms. The bylaws state that the officers serve at the pleasure of the Board. Current officers are listed below:

President:	Doug Powell, JCSA
Vice President:	David Jurgens, Chesapeake Public Utilities
Secretary/Treasurer:	Ted Henifin, HRSD
Director:	Scott Dewhirst, Newport News Waterworks
Director:	Al Moor, Suffolk Public Utilities

ACTION: Continue the term of current officers and/or elect new officers.

2. Program Status

The HRPDC staff will review fundraising and distribution results for FY 2017, the current program budget, and fundraising objectives for FY 2018 and beyond.

ACTION: Per discussion.

MEETING OF THE
DIRECTORS OF UTILITIES COMMITTEE
AGENDA
September 6, 2017
Newport News
2:00 P.M.

1. **Summary of the August 9, 2017 Meeting of the Directors of Utilities Committee**

   The summary of the August 9, 2017 Committee meeting is attached for review and approval.

   Attachments:
   - 1A August 9, 2017 Meeting Summary
   - 1B August 9, 2017 Meeting Sign-in Sheet
   - 1C HRSD Apprenticeship Program (presentation slides)
   - 1D High School Career and Technical Education Programs (presentation slides)
   - 1E Grease Control Device Sizing Standards (presentation slides)
   - 1F Water Supply Plan Compliance (presentation slides)

   ACTION: Approve the meeting summary.

2. **Public Comment**

3. **Hampton Roads Regional Technical Standards for the Sizing of Grease Control Devices (GCDs)**

   Following the August 9, 2017 presentation to the Committee on proposed revisions, the HR FOG Technical Subcommittee finalized the regional standards for sizing grease control devices on August 15, 2017. HRPDC Principal Environmental Education Planner Katie Cullipher will present the final document for the Committee's approval.

   Attachment:
   - 3A Hampton Roads Regional Technical Standards for the Sizing of Grease Control Devices

   ACTION: Approve the final document.

4. **Imagine a Day Without Water**

   October 12, 2017 is the third annual Image a Day Without Water national awareness day. Ms. Katie Cullipher, HRPDC, will brief the Committee on the week-long media campaign and outreach efforts planned by the Water Awareness subcommittee, including an op-ed piece for local print publications on the importance of water infrastructure (draft to be distributed prior to the meeting).

   ACTION: Endorse the op-ed for publication by local news media.

5. **Final FY19 Regional Water and Wastewater Program Budgets**

   The Committee will consider endorsement of the FY 2019 budgets for the Regional Wastewater Program and the Regional Water Program. The guidelines for Committee actions related to budget planning are listed below:

Recommendations related to budget planning require unanimous agreement by the Committee. Committee members will have opportunities to review and comment on proposed budgets at monthly meetings or via email. Committee members may express their support of proposed budgets either in-person at Committee meetings or via written communication to HRPDC staff.

Any Committee decision regarding budget planning is an endorsement by the Committee and amounts to a commitment by the locality to include recommending the agreed-upon budget in the locality departmental budget as input to the locality's budget. If a locality representative did not attend the Committee meeting to vote on budget planning, HRPDC staff will contact the locality to confirm that the locality is aware of and supports the proposed budget.

Attachments:

5A Final FY2019 Regional Water Program Budget
5B Draft FY2019 Regional Wastewater Program Budget

ACTION: Endorse the FY 2019 Regional Water Program and Regional Wastewater Program budgets.

6. October Committee Meeting

The Committee will discuss canceling the October 4, 2017 meeting.

ACTION: Per discussion.

7. Customer Assistance Programs

The HRPDC staff will provide a summary of recently published resources on funding and implementing customer assistance programs, including examples of programs that are receiving national attention.

ACTION: Per discussion.

8. Integrated Plan/Regional Wet Weather Management Plan (Closed Session, as Necessary)

The Committee will have the opportunity for consultation with legal counsel and a briefing by staff members or consultants pertaining to actual litigation, where such consultation or briefing in open meeting would adversely affect the negotiating or litigating posture of the public body (motion needed to approve Closed Session request).

Brown and Caldwell Senior Vice President Richard Stahr will brief the Committee on the status of HRSD's Integrated Plan/Regional Wet Weather Management Plan that is due to EPA not later than October 1, 2017.

ACTIONS: 1) Motion to enter Closed Session for discussion with legal counsel, consultants, and staff regarding actual litigation [Specific Exemption: Va. Code §2.2-3711.A7].

2) Motion to reconvene meeting.

9. Other Business

Appendix B: I/I Reduction Program

HRSD Regional I/I Reduction Program Summary

HRSD Regional I/I Reduction Program Maps by Locality

MACP Codes for Data Driven Plan Development

PACP Codes for Data Driven Plan Development

Locality Specific Condition Data Conversion Logic

Appendix B: Table B-1. HRSD Regional I/I Reduction Program Summary

Table B-1 HRSD Regional I/I Reduction Program Summary											
Locality	I/I Reduction Plan Area ID	RWWMP Future TP	I/I Reduction Plan Type	Description	Appendix B Figure Reference	Map ID	Total Peak I/I, 10yr GPD	I/I Removal Target, %	I/I Removal Target, 10yr GPD	% NSF	NSF Rehab Included (Y/N)
CHES	CHES-009	AT	Comprehensive	Catchment(s): CHES-009	Figure 1	1	4,474,913	57%	2,540,534	45%	Yes
CHES	CHES-013	AT	General	Catchment(s): CHES-013	Figure 1	2	557,396	45%	249,509	80%	Yes
CHES	CHES-016	NA	Comprehensive	Catchment(s): CHES-016	Figure 1	3	5,712,116	56%	3,209,840	37%	Yes
CHES	CHES-018	NA	Comprehensive	Catchment(s): CHES-018	Figure 1	4	2,998,475	59%	1,761,311	25%	Yes
CHES	CHES-026	NA	Comprehensive	Catchment(s): CHES-026	Figure 1	5	1,557,428	60%	929,345	28%	Yes
CHES	CHES-032	AT	General	Catchment(s): CHES-032	Figure 1	6	900,523	28%	249,280	4%	No
CHES	CHES-039	VIP	General	Catchment(s): CHES-039	Figure 1	7	1,134,008	15%	169,673	44%	No
CHES	CHES-043	VIP	General	Catchment(s): CHES-043	Figure 1	8	630,061	31%	197,570	31%	No
CHES	CHES-047	AT	Data-Driven	Catchment(s): CHES-047	Figure 1	9	775,818	45%	350,366	17%	No
CHES	CHES-060	VIP	General	Catchment(s): CHES-060	Figure 1	10	308,978	23%	70,828	43%	No
CHES	CHES-063	AT	Data-Driven	Catchment(s): CHES-063	Figure 1	11	857,552	34%	294,093	0%	No
CHES	CHES-067	AT	Comprehensive	Catchment(s): CHES-067	Figure 1	12	6,012,788	62%	3,726,488	9%	Yes
CHES	CHES-072	AT	Data-Driven	Catchment(s): CHES-072	Figure 1	13	199,900	29%	57,924	73%	Yes
CHES	CHES-074	AT	General	Catchment(s): CHES-074	Figure 1	14	579,833	35%	205,799	7%	No
CHES	CHES-089	NA	Comprehensive	Catchment(s): CHES-089	Figure 1	15	1,624,360	55%	890,931	71%	Yes
CHES	CHES-096	AT	Data-Driven	Catchment(s): CHES-096	Figure 1	16	272,083	29%	79,410	12%	No
CHES	CHES-100	VIP	Data-Driven	Catchment(s): CHES-100	Figure 1	17	413,090	50%	207,118	0%	No
CHES	CHES-101	VIP	General	Catchment(s): CHES-101	Figure 1	18	1,870,363	53%	1,000,111	0%	No
CHES	CHES-111	AT	General	Catchment(s): CHES-111	Figure 1	19	963,442	39%	372,539	1%	Yes
CHES	CHES-116	AT	Data-Driven	Catchment(s): CHES-116	Figure 1	20	501,054	30%	151,969	71%	Yes
CHES	CHES-124	VIP	Data-Driven	Catchment(s): CHES-124	Figure 1	21	656,489	48%	317,036	16%	No
CHES	CHES-134	AT	Comprehensive	Catchment(s): CHES-134	Figure 1	22	981,748	52%	514,820	78%	Yes
CHES	CHES-164	AT	Comprehensive	Catchment(s): CHES-164	Figure 1	23	770,586	56%	434,706	62%	Yes
CHES	CHES-165	AT	Data-Driven	Catchment(s): CHES-165	Figure 1	24	139,077	37%	51,432	66%	Yes
CHES	CHES-197	AT	Data-Driven	Catchment(s): CHES-197	Figure 1	25	695,817	21%	146,733	10%	No
CHES	CHES-214	AT	Data-Driven	Catchment(s): CHES-214	Figure 1	26	745,161	29%	214,022	19%	No
CHES	CHES-220	AT	Comprehensive	Catchment(s): CHES-220	Figure 1	27	728,940	54%	390,560	40%	Yes
CHES	CHES-221	AT	General	Catchment(s): CHES-221	Figure 1	28	3,168,221	31%	969,362	22%	No
CHES	CHES-227	NA	Data-Driven	Catchment(s): CHES-227	Figure 1	29	673,584	36%	244,784	11%	No
CHES	CHES-919-G1	VIP	Data-Driven	Catchment(s): CHES-H-119-G001	Figure 1	30	5,499,740	39%	2,159,535	21%	No
CHES	CHES-931-G1	AT	General	Catchment(s): CHES-H-131-G001	Figure 1	31	1,669,430	36%	593,779	45%	No
CHES	CHES-931-G2	AT	General	Catchment(s): CHES-H-131-G002	Figure 1	32	598,124	40%	242,144	14%	No
GLOU	GLOU-16	YR	Comprehensive	Catchment(s): GLOU-016	Figure 2	1	476,151	59%	279,633	22%	Yes
HAMP	HAMP-017	BH	Data-Driven	Catchment(s): HAMP-017	Figure 3	1	2,023,966	55%	1,108,623	18%	No
HAMP	HAMP-024	YR	Comprehensive	Catchment(s): HAMP-024	Figure 3	2	312,085	61%	191,321	13%	Yes
HAMP	HAMP-045	YR	Comprehensive	Catchment(s): HAMP-045	Figure 3	3	412,507	62%	257,779	0%	No
HAMP	HAMP-048	YR	Comprehensive	Catchment(s): HAMP-048	Figure 3	4	2,418,909	54%	1,295,940	14%	No
HAMP	HAMP-117	YR	Comprehensive	Catchment(s): HAMP-117	Figure 3	5	609,066	54%	326,240	78%	Yes
HAMP	HAMP-217H-121	YR	Comprehensive	Catchment(s): HAMP-H-217-G0171-1	Figure 3	6	394,973	64%	253,406	0%	No
HAMP	HAMP-225H-107	BH	General	Catchment(s): HAMP-H-225-G107	Figure 3	7	2,352,069	34%	798,867	26%	No
HAMP	HAMP-225H-117	BH	Comprehensive	Catchment(s): HAMP-H-225-G117	Figure 3	8	1,400,977	59%	827,401	8%	No
HAMP	HAMP-225H-124	BH	General	Catchment(s): HAMP-H-225-G124	Figure 3	9	709,661	32%	229,377	14%	No
JCSA	JCSA-LSA10-4	WB	Comprehensive	Catchment(s): JCSA-010-4	Figure 4	1	1,037,169	53%	549,821	42%	Yes
JCSA	JCSA-LSA1-2	WB	Data-Driven	Catchment(s): JCSA-001-2	Figure 4	2	6,668,817	30%	2,000,528	16%	No
JCSA	JCSA-LSA1-5	WB	Data-Driven	Catchment(s): JCSA-001-5	Figure 4	3	3,323,899	25%	824,820	17%	No
JCSA	JCSA-LSA1-6	WB	Data-Driven	Catchment(s): JCSA-001-6	Figure 4	4	277,345	33%	92,435	48%	No
JCSA	JCSA-LSA1-8	WB	Data-Driven	Catchment(s): JCSA-001-8	Figure 4	5	414,562	30%	124,911	7%	No
JCSA	JCSA-LSA1-9	WB	Comprehensive	Catchment(s): JCSA-001-9	Figure 4	6	1,604,271	56%	901,278	7%	No
JCSA	JCSA-LSA3-1	WB	Comprehensive	Catchment(s): JCSA-003-1	Figure 4	7	6,595,030	60%	3,942,353	22%	Yes
JCSA	JCSA-LSA3-3	WB	Data-Driven	Catchment(s): JCSA-003-3	Figure 4	8	688,958	15%	105,679	0%	No
JCSA	JCSA-LSA3-6	WB	Data-Driven	Catchment(s): JCSA-003-6	Figure 4	9	1,790,578	21%	372,610	2%	No
JCSA	JCSA-LSA3-8	WB	General	Catchment(s): JCSA-003-8	Figure 4	10	2,906,254	41%	1,200,031	8%	No
JCSA	JCSA-LSA3-9	WB	Data-Driven	Catchment(s): JCSA-003-9	Figure 4	11	1,082,987	32%	349,940	26%	No
JCSA	JCSA-LSA4-1	WB	Comprehensive	Catchment(s): JCSA-004-1	Figure 4	12	290,779	57%	167,122	12%	No
JCSA	JCSA-LSA4-2	WB	Comprehensive	Catchment(s): JCSA-004-2	Figure 4	13	595,941	55%	327,716	27%	Yes
JCSA	JCSA-LSA4-5	WB	Data-Driven	Catchment(s): JCSA-004-5	Figure 4	14	289,269	38%	109,000	15%	No
JCSA	JCSA-LSA5-1	WB	Comprehensive	Catchment(s): JCSA-005-1	Figure 4	15	210,291	62%	130,267	0%	No

Table B-1 HRSD Regional I/I Reduction Program Summary											
Locality	I/I Reduction Plan Area ID	RWWMP Future TP	I/I Reduction Plan Type	Description	Appendix B Figure Reference	Map ID	Total Peak I/I, 10yr GPD	I/I Removal Target, %	I/I Removal Target, 10yr GPD	% NSF	NSF Rehab Included (Y/N)
JCSA	JCSA-LSA6-2-A	WB	Data-Driven	Catchment(s): JCSA-006-2-A	Figure 4	16	1,014,702	42%	426,527	11%	No
JCSA	JCSA-LSA6-9	WB	Data-Driven	Catchment(s): JCSA-006-9	Figure 4	17	1,169,650	58%	680,864	56%	Yes
NEWP	NEWP-WCPSA001180	JR	Data-Driven	Catchment(s): NEWP-049	Figure 5	1	2,216,495	41%	911,378	46%	Yes
NEWP	NEWP-WCPSA001430	JR	General	Catchment(s): NEWP-H-220-G001; NEWP-H-220-G002; NEWP-H-220-G003; NEWP-H-220-G004; NEWP-H-220-G005; NEWP-H-220-G006	Figure 5	2	1,058,380	31%	325,123	0%	No
NEWP	NEWP-WCPSA001565	JR	Comprehensive	Catchment(s): NEWP-023	Figure 5	3	211,788	55%	115,536	74%	Yes
NEWP	NEWP-WCPSA001575	JR	General	Catchment(s): NEWP-013	Figure 5	4	2,334,949	48%	1,128,398	12%	No
NEWP	NEWP-WCPSA001600	JR	Comprehensive	Catchment(s): NEWP-015	Figure 5	5	2,527,232	53%	1,347,677	30%	Yes
NEWP	NEWP-WCPSA001635	BH	General	Catchment(s): NEWP-011	Figure 5	6	266,787	41%	110,282	54%	Yes
NEWP	NEWP-WCPSA001660	BH	General	Catchment(s): NEWP-089	Figure 5	7	1,509,779	52%	783,509	6%	No
NEWP	NEWP-WCPSA001705	BH	Data-Driven	Catchment(s): NEWP-004	Figure 5	8	1,304,157	34%	446,026	39%	No
NEWP	NEWP-WCPSA003002	JR	Comprehensive	Catchment(s): NEWP-H-212-G001	Figure 5	9	928,800	62%	572,644	10%	Yes
NEWP	NEWP-WCPSA003003	JR	General	Catchment(s): NEWP-H-207-G003	Figure 5	10	349,568	43%	149,558	10%	No
NEWP	NEWP-WCPSA003004	JR	Comprehensive	Catchment(s): NEWP-H-207-G004	Figure 5	11	931,663	56%	518,397	13%	No
NEWP	NEWP-WCPSA003005	JR	Comprehensive	Catchment(s): NEWP-H-207-G005	Figure 5	12	577,495	56%	324,493	18%	Yes
NEWP	NEWP-WCPSA003007	JR	General	Catchment(s): NEWP-H-207-G007	Figure 5	13	910,305	40%	367,722	15%	No
NEWP	NEWP-WCPSA003008	JR	General	Catchment(s): NEWP-H-207-G008	Figure 5	14	575,462	53%	307,120	0%	No
NEWP	NEWP-WCPSA003010	JR	Data-Driven	Catchment(s): NEWP-H-207-G010	Figure 5	15	438,065	51%	225,106	56%	Yes
NEWP	NEWP-WCPSA003200	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G031	Figure 5	16	957,242	35%	335,301	93%	Yes
NEWP	NEWP-WCPSA003202	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G033	Figure 5	17	299,008	64%	191,731	0%	No
NEWP	NEWP-WCPSA003300	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G061	Figure 5	18	533,153	31%	165,325	68%	Yes
NEWP	NEWP-WCPSA003302	BH	General	Catchment(s): NEWP-H-BH1-G063	Figure 5	19	184,278	35%	64,769	9%	No
NEWP	NEWP-WCPSA003303	BH	General	Catchment(s): NEWP-H-BH1-G064	Figure 5	20	452,516	27%	124,246	4%	No
NEWP	NEWP-WCPSA003401	BH	General	Catchment(s): NEWP-H-BH1-G053	Figure 5	21	310,936	37%	114,954	75%	Yes
NEWP	NEWP-WCPSA003402	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G054	Figure 5	22	519,725	36%	187,639	80%	Yes
NEWP	NEWP-WCPSA003500	JR	Data-Driven	Catchment(s): NEWP-H-207-G500	Figure 5	23	291,134	45%	131,842	2%	No
NEWP	NEWP-WCPSA003502	JR	General	Catchment(s): NEWP-H-207-G502	Figure 5	24	183,998	36%	65,685	7%	No
NEWP	NEWP-WCPSA003503	JR	General	Catchment(s): NEWP-H-207-G503	Figure 5	25	231,116	42%	96,447	6%	No
NEWP	NEWP-WCPSA003504	JR	Data-Driven	Catchment(s): NEWP-H-207-G504	Figure 5	26	185,800	41%	75,695	50%	No
NEWP	NEWP-WCPSA003601	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G081	Figure 5	27	685,635	54%	371,139	55%	Yes
NEWP	NEWP-WCPSA003700	BH	General	Catchment(s): NEWP-H-BH1-G021	Figure 5	28	485,528	49%	236,878	52%	Yes
NEWP	NEWP-WCPSA003701	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G022	Figure 5	29	2,727,482	57%	1,549,466	14%	No
NEWP	NEWP-WCPSA003801	BH	General	Catchment(s): NEWP-H-BH4-G011	Figure 5	30	337,078	42%	142,105	14%	No
NEWP	NEWP-WCPSA003802	BH	General	Catchment(s): NEWP-H-BH4-G012	Figure 5	31	308,484	28%	86,418	28%	No
NEWP	NEWP-WCPSA003803	BH	Data-Driven	Catchment(s): NEWP-H-BH4-G013	Figure 5	32	333,694	57%	188,969	12%	No
NEWP	NEWP-WCPSA003804	BH	Data-Driven	Catchment(s): NEWP-H-BH4-G014	Figure 5	33	155,669	56%	86,903	3%	No
NEWP	NEWP-WCPSA003906	BH	General	Catchment(s): NEWP-H-BH3-G096	Figure 5	34	422,362	23%	98,797	44%	No
NEWP	NEWP-WCPSA004100	BH	General	Catchment(s): NEWP-H-201-G100	Figure 5	35	186,193	41%	77,051	62%	Yes
NEWP	NEWP-WCPSA004101	BH	General	Catchment(s): NEWP-H-201-G101	Figure 5	36	428,196	30%	128,829	43%	No
NEWP	NEWP-WCPSA004103	BH	Comprehensive	Catchment(s): NEWP-H-201-G103	Figure 5	37	446,697	54%	241,722	32%	Yes
NEWP	NEWP-WCPSA004300	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G071	Figure 5	38	804,651	52%	419,278	42%	Yes
NEWP	NEWP-WCPSA004301	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G072	Figure 5	39	1,020,806	57%	582,029	13%	No
NEWP	NEWP-WCPSA004302	BH	Comprehensive	Catchment(s): NEWP-H-BH1-G073	Figure 5	40	417,225	55%	227,881	15%	No
NORF	NORF-003-G001	VIP	Comprehensive	Catchment(s): NORF-003-G001	Figure 6	1	804,150	57%	456,939	14%	No
NORF	NORF-009-G001	VIP	Comprehensive	Catchment(s): NORF-009-G001	Figure 6	2	3,336,513	46%	1,544,575	32%	No
NORF	NORF-009-G002	VIP	Comprehensive	Catchment(s): NORF-009-G002	Figure 6	3	3,959,460	59%	2,352,398	8%	No
NORF	NORF-H-103	VIP	Comprehensive	Catchment(s): NORF-H-103-G001; NORF-H-103-G002; NORF-H-103-G003; NORF-H-103-G004	Figure 6	4	2,675,121	62%	1,647,710	22%	Yes
NORF	NORF-H-106	VIP	General	Catchment(s): NORF-H-106-G002	Figure 6	5	626,368	25%	156,621	40%	No
NORF	NORF-H106-G1	VIP	General	Catchment(s): NORF-H-106-G001	Figure 6	6	1,068,680	37%	393,510	5%	No
NORF	NORF-H-107	VIP	Comprehensive	Catchment(s): NORF-H-107-G001	Figure 6	7	7,896,246	51%	4,024,072	24%	No
NORF	NORF-H-113	VIP	General	Catchment(s): NORF-H-113-G001	Figure 6	8	969,031	47%	452,675	4%	No
NORF	NORF-H113-G1	VIP	Comprehensive	Catchment(s): NORF-H-113-G004; NORF-H-113-G005; NORF-H-113-G006	Figure 6	9	779,504	62%	485,025	3%	No

Table B-1 HRSD Regional I/I Reduction Program Summary											
Locality	I/I Reduction Plan Area ID	RWWMP Future TP	I/I Reduction Plan Type	Description	Appendix B Figure Reference	Map ID	Total Peak I/I, 10yr GPD	I/I Removal Target, %	I/I Removal Target, 10yr GPD	% NSF	NSF Rehab Included (Y/N)
NORF	NORF-H113-G2	VIP	General	Catchment(s): NORF-H-113-G002; NORF-H-113-G003	Figure 6	10	660,790	65%	429,290	0%	No
NORF	NORF-H-115	AT	Comprehensive	Catchment(s): NORF-H-115-G001; NORF-H-115-G002; NORF-H-115-G003	Figure 6	11	6,206,606	58%	3,607,810	31%	Yes
NORF	NORF-H122-G1	VIP	General	Catchment(s): NORF-H-122-G001	Figure 6	12	796,107	39%	306,815	0%	No
NORF	NORF-H122-G2	VIP	General	Catchment(s): NORF-H-122-G002	Figure 6	13	430,601	28%	122,016	0%	No
NORF	NORF-H-127-10	VIP	Comprehensive	Catchment(s): NORF-H-127-G010	Figure 6	14	576,336	60%	343,135	40%	Yes
NORF	NORF-H127-3	VIP	Comprehensive	Catchment(s): NORF-H-127-G003	Figure 6	15	532,737	60%	319,263	18%	Yes
NORF	NORF-H127-4	VIP	Comprehensive	Catchment(s): NORF-H-127-G004	Figure 6	16	182,435	59%	106,728	10%	No
NORF	NORF-H127-5	VIP	Comprehensive	Catchment(s): NORF-H-127-G005	Figure 6	17	1,416,891	63%	890,117	6%	Yes
NORF	NORF-H127-G2	VIP	General	Catchment(s): NORF-H-127-G002	Figure 6	18	560,808	30%	165,588	10%	No
NORF	NORF-H128-G2	VIP	General	Catchment(s): NORF-H-128-G004	Figure 6	19	1,039,567	38%	393,418	61%	Yes
NORF	NORF-H-130	VIP	Data-Driven	Catchment(s): NORF-H-130-G001	Figure 6	20	3,155,120	50%	1,573,333	58%	Yes
NORF	NORF-PS-004	VIP	General	Catchment(s): NORF-004	Figure 6	21	4,625,927	36%	1,659,068	29%	No
NORF	NORF-PS-005	VIP	General	Catchment(s): NORF-005	Figure 6	22	3,116,935	39%	1,222,232	32%	No
NORF	NORF-PS-008	VIP	General	Catchment(s): NORF-008-G001; NORF-153	Figure 6	23	4,781,382	35%	1,695,657	9%	No
NORF	NORF-PS-010	VIP	General	Catchment(s): NORF-010-G001; NORF-010-G002	Figure 6	24	4,457,234	32%	1,428,808	18%	No
NORF	NORF-PS-012	VIP	General	Catchment(s): NORF-012	Figure 6	25	526,703	38%	199,039	2%	No
NORF	NORF-PS-020	VIP	Data-Driven	Catchment(s): NORF-020	Figure 6	26	1,126,044	61%	684,065	2%	No
NORF	NORF-PS-037	VIP	Comprehensive	Catchment(s): NORF-037	Figure 6	27	458,726	55%	251,760	16%	No
NORF	NORF-PS-060	VIP	General	Catchment(s): NORF-060	Figure 6	28	665,516	25%	167,986	23%	No
NORF	NORF-PS-081	AT	General	Catchment(s): NORF-081	Figure 6	29	2,072,136	32%	663,330	18%	No
NORF	NORF-PS-097	VIP	Comprehensive	Catchment(s): NORF-097	Figure 6	30	2,810,146	59%	1,654,391	31%	Yes
PORT	PORT-01	VIP	Comprehensive	Catchment(s): PORT-001	Figure 7	1	300,363	51%	154,262	24%	No
PORT	PORT-02	VIP	General	Catchment(s): PORT-002-V001; PORT-002-V002; PORT-002-V003; PORT-002-V004; PORT-002-V005	Figure 7	2	4,422,179	30%	1,332,612	24%	No
PORT	PORT-03	VIP	General	Catchment(s): PORT-003-V001; PORT-003-V002; PORT-003-V004; PORT-003-V005; PORT-003-V006	Figure 7	3	7,967,373	32%	2,524,741	21%	No
PORT	PORT-03-LOP35-1	VIP	General	Catchment(s): PORT-003-V003-G001	Figure 7	4	2,223,250	51%	1,133,962	14%	Yes
PORT	PORT-03-LOP35-2	VIP	General	Catchment(s): PORT-003-V003-G002	Figure 7	5	1,149,307	55%	628,932	25%	Yes
PORT	PORT-04	VIP	General	Catchment(s): PORT-H-146-G001	Figure 7	6	343,971	37%	128,776	4%	No
PORT	PORT-04-LOP65-1	VIP	Data-Driven	Catchment(s): PORT-H-146-G008	Figure 7	7	2,198,146	27%	587,634	20%	No
PORT	PORT-04-LOP65-2	VIP	Data-Driven	Catchment(s): PORT-H-146-G009	Figure 7	8	2,211,589	46%	1,022,630	5%	No
PORT	PORT-04-LOP65-3	VIP	Data-Driven	Catchment(s): PORT-H-146-G010	Figure 7	9	142,949	53%	75,706	18%	No
PORT	PORT-04-LOP66-1	VIP	Data-Driven	Catchment(s): PORT-H-146-G006	Figure 7	10	997,780	47%	470,538	19%	No
PORT	PORT-04-LOP72-1	VIP	Data-Driven	Catchment(s): PORT-H-146-G002	Figure 7	11	1,577,665	42%	660,822	9%	No
PORT	PORT-04-LOP72-2	VIP	Data-Driven	Catchment(s): PORT-H-146-G003	Figure 7	12	1,078,676	44%	477,448	57%	Yes
PORT	PORT-04-LOP72-4	VIP	Data-Driven	Catchment(s): PORT-H-146-G005	Figure 7	13	768,068	50%	387,786	11%	No
PORT	PORT-10	VIP	Data-Driven	Catchment(s): PORT-010	Figure 7	14	6,936,684	37%	2,591,593	10%	Yes
PORT	PORT-12	VIP	Data-Driven	Catchment(s): PORT-012	Figure 7	15	416,839	38%	158,858	63%	Yes
SUFF	SUFF-003	NA	General	Catchment(s): SUFF-003	Figure 8	1	718,037	38%	272,024	0%	No
SUFF	SUFF-004	NA	Data-Driven	Catchment(s): SUFF-004	Figure 8	2	2,952,575	38%	1,111,031	13%	Yes
SUFF	SUFF-017	NA	Comprehensive	Catchment(s): SUFF-017	Figure 8	3	910,228	62%	566,746	11%	Yes
SUFF	SUFF-022	NA	Comprehensive	Catchment(s): SUFF-022	Figure 8	4	383,888	61%	235,947	5%	No
SUFF	SUFF-023	NA	Data-Driven	Catchment(s): SUFF-023	Figure 8	5	563,767	36%	204,151	18%	No
SUFF	SUFF-027	NA	Comprehensive	Catchment(s): SUFF-027	Figure 8	6	394,888	58%	229,820	18%	Yes
SUFF	SUFF-032	NA	Comprehensive	Catchment(s): SUFF-032	Figure 8	7	180,600	65%	117,809	0%	No
SUFF	SUFF-042	NA	Comprehensive	Catchment(s): SUFF-042	Figure 8	8	436,068	52%	226,489	23%	No
SUFF	SUFF-048	NA	Comprehensive	Catchment(s): SUFF-048	Figure 8	9	7,775,884	53%	4,139,813	29%	Yes
SUFF	SUFF-063	NA	Comprehensive	Catchment(s): SUFF-063	Figure 8	10	548,429	46%	252,389	70%	Yes
SUFF	SUFF-064	NA	Comprehensive	Catchment(s): SUFF-064	Figure 8	11	915,060	63%	577,235	0%	No
SUFF	SUFF-076	NA	Comprehensive	Catchment(s): SUFF-076	Figure 8	12	276,123	61%	169,476	30%	Yes
SUFF	SUFF-146	NA	Comprehensive	Catchment(s): SUFF-146	Figure 8	13	1,377,800	60%	832,652	18%	Yes
SUFF	SUFF-517	NA	General	Catchment(s): SUFF-517	Figure 8	14	477,619	28%	132,140	15%	No

Table B-1 HRSD Regional I/I Reduction Program Summary											
Locality	I/I Reduction Plan Area ID	RWWMP Future TP	I/I Reduction Plan Type	Description	Appendix B Figure Reference	Map ID	Total Peak I/I, 10yr GPD	I/I Removal Target, %	I/I Removal Target, 10yr GPD	% NSF	NSF Rehab Included (Y/N)
SUFF	SUFF-ShingleCreek-Group	NA	Data-Driven	Catchment(s): SUFF-594; SUFF-595; SUFF-601; SUFF-602; SUFF-604; SUFF-610; SUFF-611; SUFF-614; SUFF-615; SUFF-616; SUFF-621; SUFF-624; SUFF-625	Figure 8	15	4,475,713	51%	2,272,905	19%	Yes
VAB	VAB-007a	AT	Comprehensive	Catchment(s): VAB-H-115-G007-A	Figure 9	1	3,089,270	56%	1,733,095	33%	Yes
VAB	VAB-218	AT	Data-Driven	Catchment(s): VAB-218	Figure 9	2	818,879	34%	279,678	21%	No
VAB	VAB-248	AT	Comprehensive	Catchment(s): VAB-248	Figure 9	3	505,950	57%	287,071	44%	Yes
VAB	VAB-256	AT	Comprehensive	Catchment(s): VAB-256	Figure 9	4	441,186	50%	219,972	96%	Yes
VAB	VAB-260	AT	Data-Driven	Catchment(s): VAB-260	Figure 9	5	1,750,897	50%	868,525	16%	No
VAB	VAB-318	AT	General	Catchment(s): VAB-318	Figure 9	6	2,300,921	32%	743,579	15%	No
VAB	VAB-338	AT	Comprehensive	Catchment(s): VAB-338	Figure 9	7	989,367	51%	508,524	66%	Yes
VAB	VAB-340 NSF_Rehab_Only	AT	General	Catchment(s): VAB-340	Figure 9	8	1,231,556	14%	166,998	30%	Yes
VAB	VAB-343a	AT	Comprehensive	Catchment(s): VAB-343-A	Figure 9	9	641,928	47%	304,173	27%	No
VAB	VAB-343b	AT	Comprehensive	Catchment(s): VAB-343-B	Figure 9	10	738,085	61%	449,314	11%	Yes
VAB	VAB-349	AT	Data-Driven	Catchment(s): VAB-349	Figure 9	11	703,590	62%	435,184	9%	No
VAB	VAB-350	AT	Data-Driven	Catchment(s): VAB-350	Figure 9	12	184,989	29%	54,193	33%	No
VAB	VAB-357	AT	Comprehensive	Catchment(s): VAB-357	Figure 9	13	2,318,484	44%	1,019,911	60%	Yes
VAB	VAB-359	AT	Comprehensive	Catchment(s): VAB-359	Figure 9	14	544,265	53%	288,502	44%	Yes
VAB	VAB-360	AT	Data-Driven	Catchment(s): VAB-360	Figure 9	15	1,403,132	53%	746,055	54%	Yes
VAB	VAB-364	AT	Data-Driven	Catchment(s): VAB-364	Figure 9	16	1,114,777	44%	493,830	19%	No
VAB	VAB-401	AT	Data-Driven	Catchment(s): VAB-401	Figure 9	17	342,397	43%	146,502	7%	No
VAB	VAB-465	AT	Comprehensive	Catchment(s): VAB-465	Figure 9	18	1,015,728	55%	555,513	60%	Yes
VAB	VAB-466	AT	Comprehensive	Catchment(s): VAB-466	Figure 9	19	1,285,424	60%	767,986	19%	Yes
VAB	VAB-502	AT	Data-Driven	Catchment(s): VAB-502	Figure 9	20	321,916	45%	144,735	9%	No
VAB	VAB-509	AT	General	Catchment(s): VAB-509	Figure 9	21	378,384	45%	168,898	0%	No
VAB	VAB-558	AT	Data-Driven	Catchment(s): VAB-558	Figure 9	22	955,299	38%	361,902	5%	No
VAB	VAB-602	AT	Data-Driven	Catchment(s): VAB-602	Figure 9	23	1,093,245	34%	376,318	19%	No
WILL	WILL-005	WB	Comprehensive	Catchment(s): WILL-005	Figure 10	1	1,797,703	55%	996,693	46%	Yes
WILL	WILL-12A-8	WB	Comprehensive	Catchment(s): WILL-012-A8	Figure 10	2	527,803	51%	269,968	21%	No
WILL	WILL-12A-9	WB	Data-Driven	Catchment(s): WILL-012-A9	Figure 10	3	812,172	9%	71,918	5%	No
WILL	WILL-14	WB	Data-Driven	Catchment(s): WILL-014	Figure 10	4	469,647	14%	65,347	43%	No
WILL	WILL-226A-5	WB	Data-Driven	Catchment(s): WILL-H-226-G001	Figure 10	5	1,360,504	35%	482,536	33%	No
YORK	YORK-001	WB	Comprehensive	Catchment(s): YORK-001	Figure 11	1	616,813	46%	284,492	29%	No
YORK	YORK-003	WB	Data-Driven	Catchment(s): YORK-003	Figure 11	2	1,443,078	47%	671,362	11%	No
YORK	YORK-006	WB	Comprehensive	Catchment(s): YORK-006	Figure 11	3	3,208,424	64%	2,049,579	0%	No
YORK	YORK-229-2	WB	Comprehensive	Catchment(s): YORK-229-2	Figure 11	4	2,000,927	60%	1,191,317	34%	Yes

Appendix B: HRSD Regional I/I Reduction Program Maps by Locality

Appendix B – Figure 1

Appendix B – Figure 2

Appendix B – Figure 3

Appendix B – Figure 4

Appendix B – Figure 5

Appendix B – Figure 6

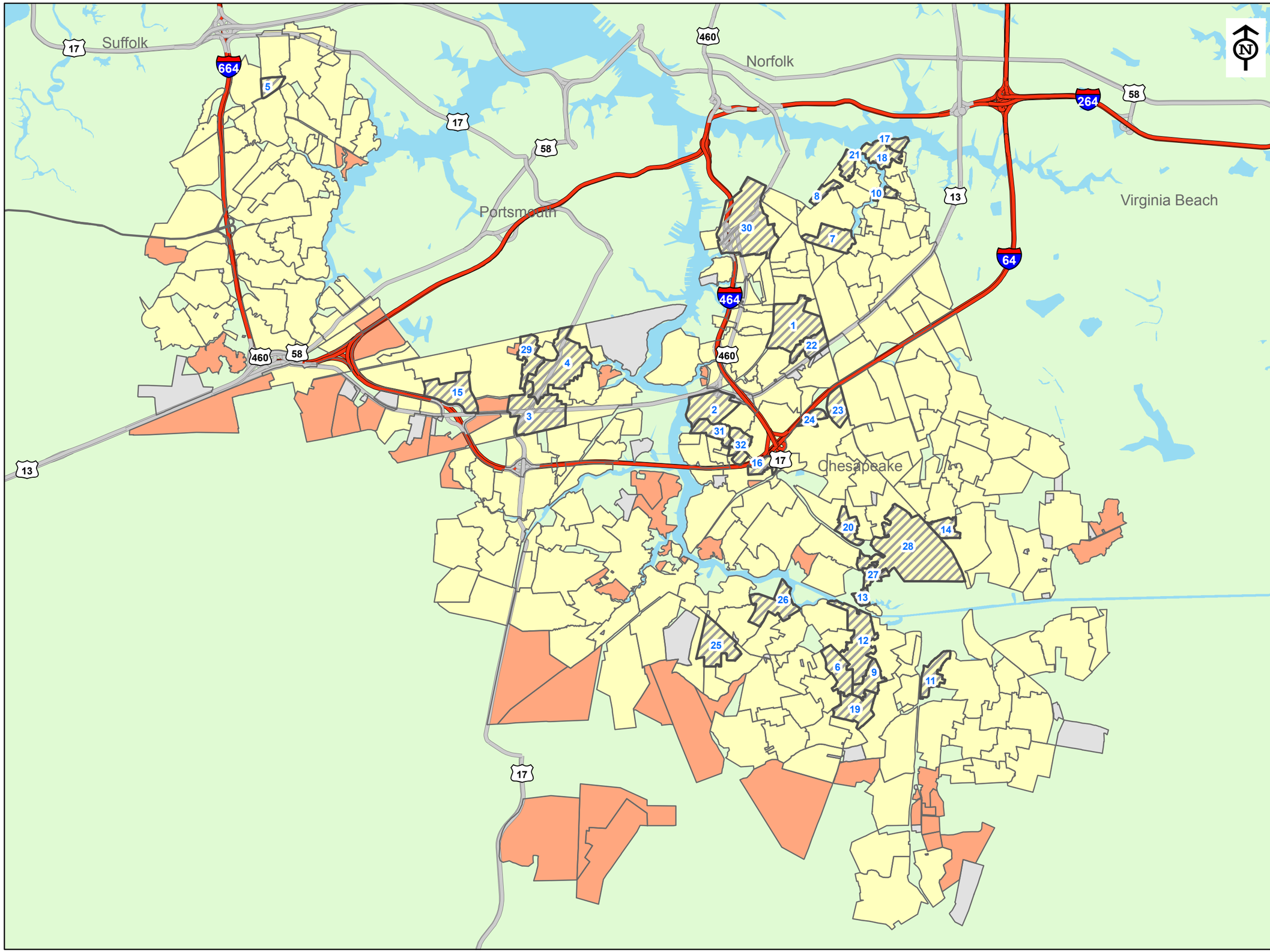
Appendix B – Figure 7

Appendix B – Figure 8

Appendix B – Figure 9

Appendix B – Figure 10

Appendix B – Figure 11



Appendix B - Figure 1

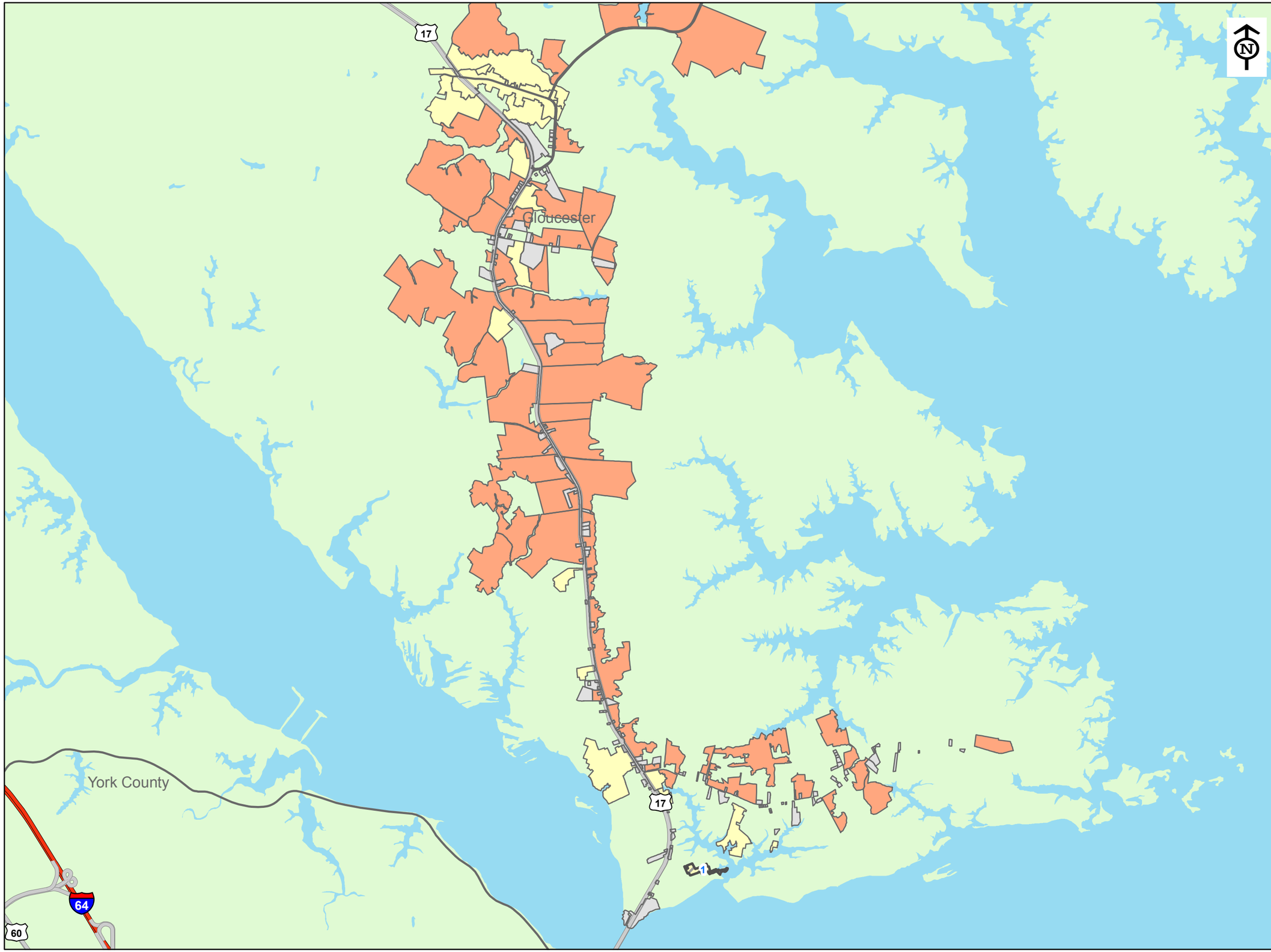
HRSD I/I Reduction Program
Locality: Chesapeake

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

6,200 3,100 0 6,200
Feet



Appendix B - Figure 2

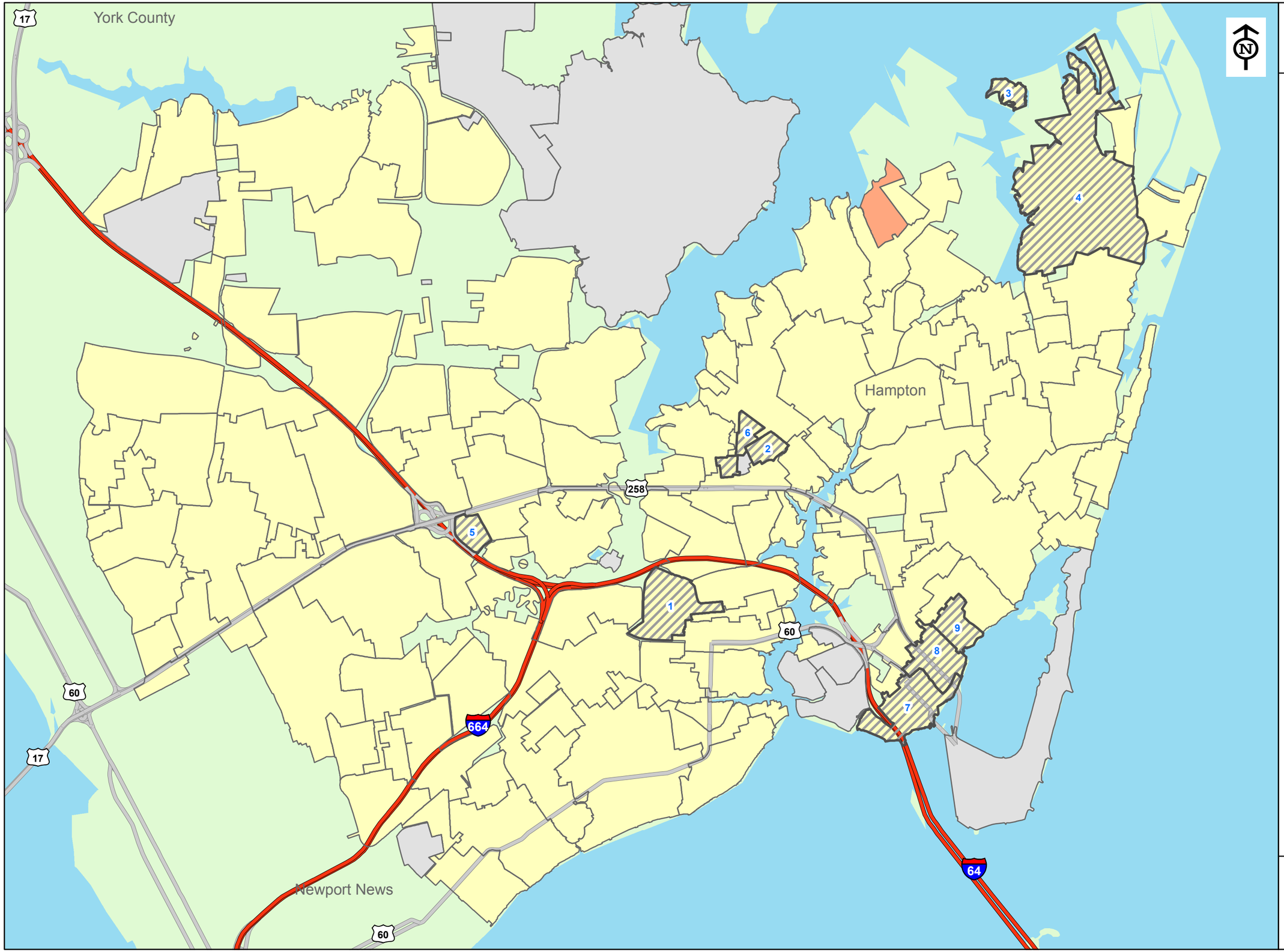
HRSD I/I Reduction Program
Locality: Gloucester

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

5,100 2,550 0 5,100
Feet



Appendix B - Figure 3

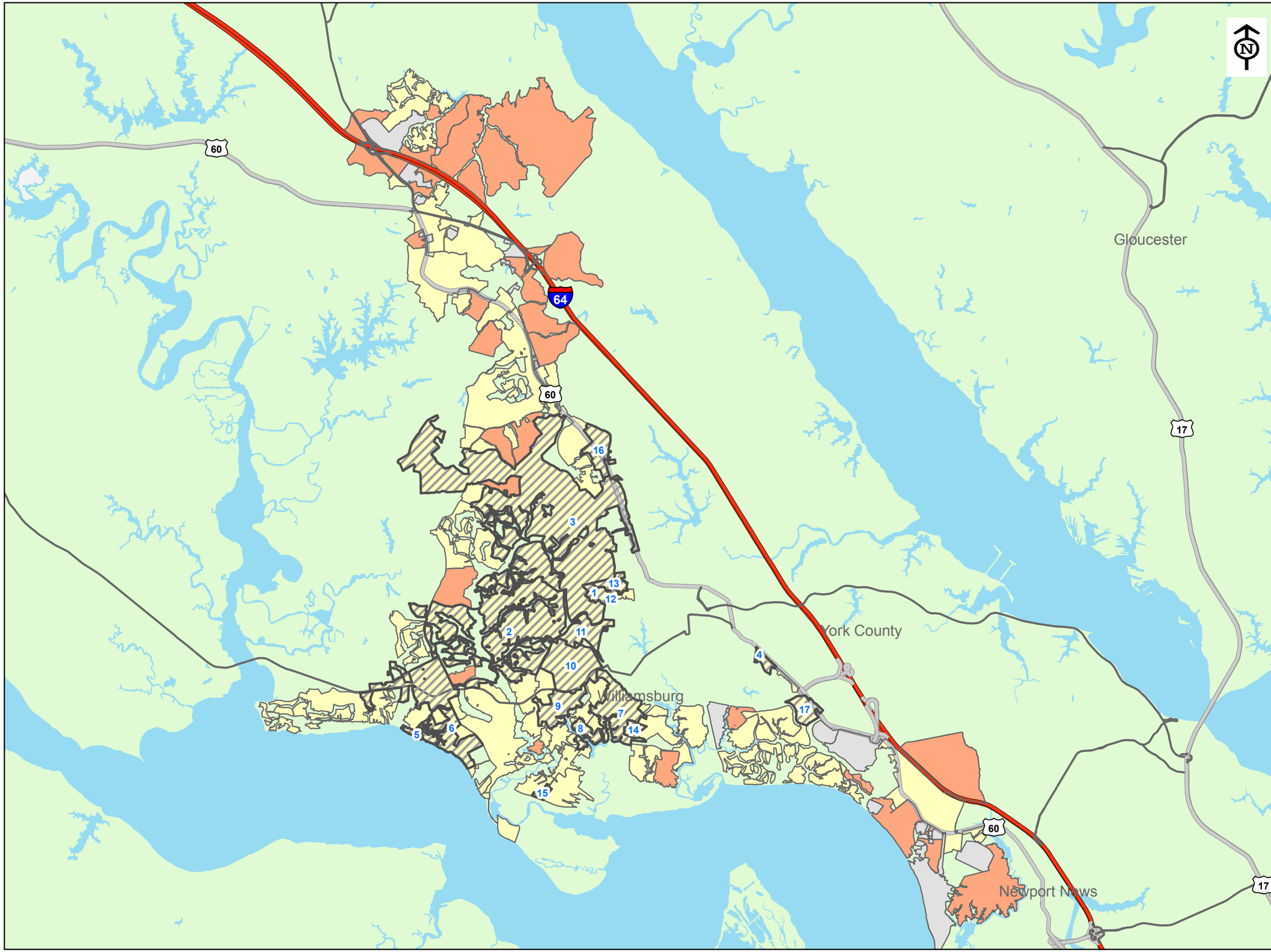
HRSD I/I Reduction Program
Locality: Hampton

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

3,200 1,600 0 3,200
Feet



Appendix B - Figure 4

HRSD I/I Reduction Program
Locality: JCSA

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

7,900 3,950 0 7,900
Feet

Appendix B - Figure 5

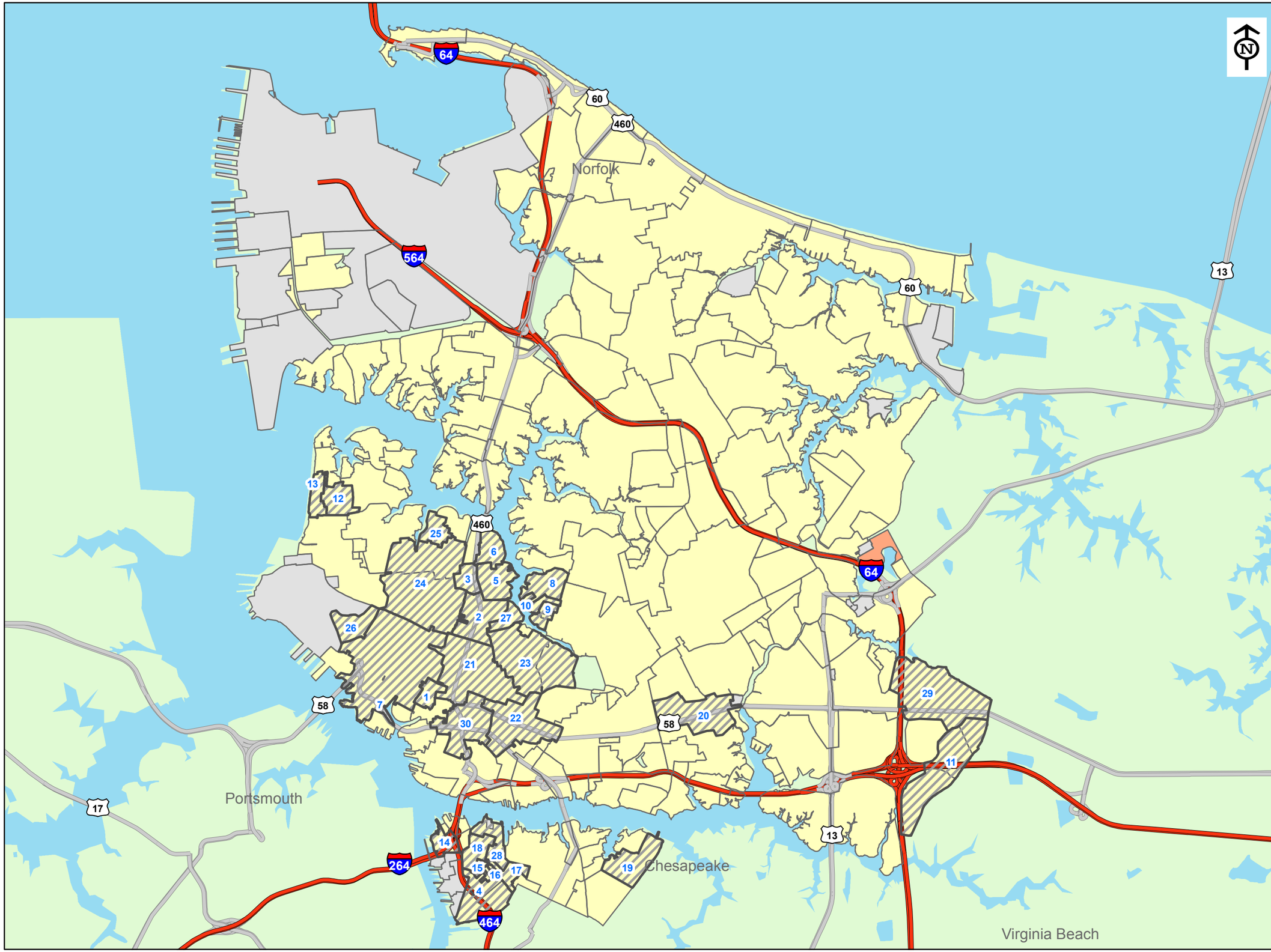
HRSD I/I Reduction Program
Locality: Newport News

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

7,300 3,650 0 7,300
Feet



Appendix B - Figure 6

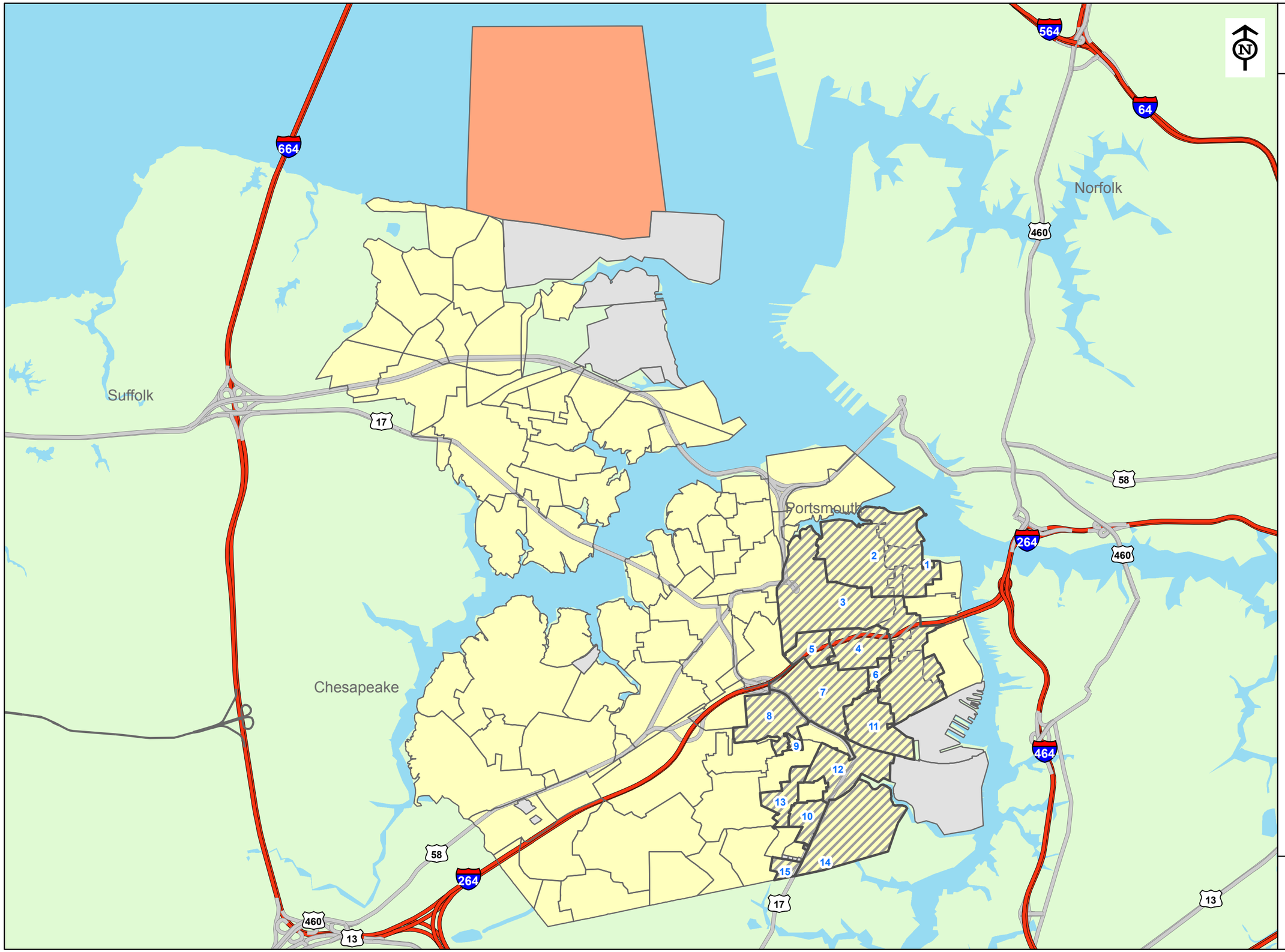
HRSD I/I Reduction Program
Locality: Norfolk

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

4,200 2,100 0 4,200
Feet



Appendix B - Figure 7

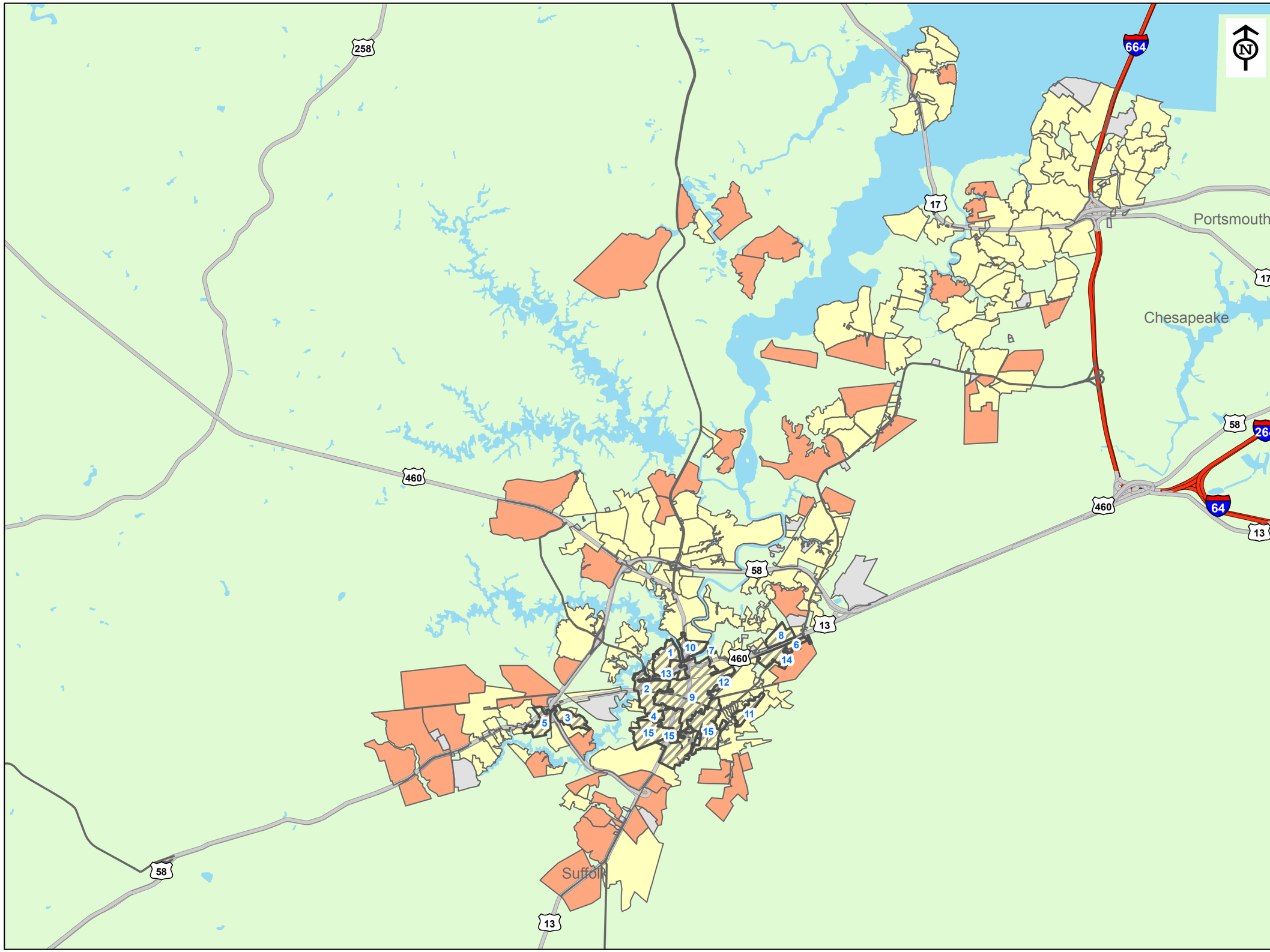
HRSD I/I Reduction Program
Locality: Portsmouth

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

3,900 1,950 0 3,900
Feet



Appendix B - Figure 8

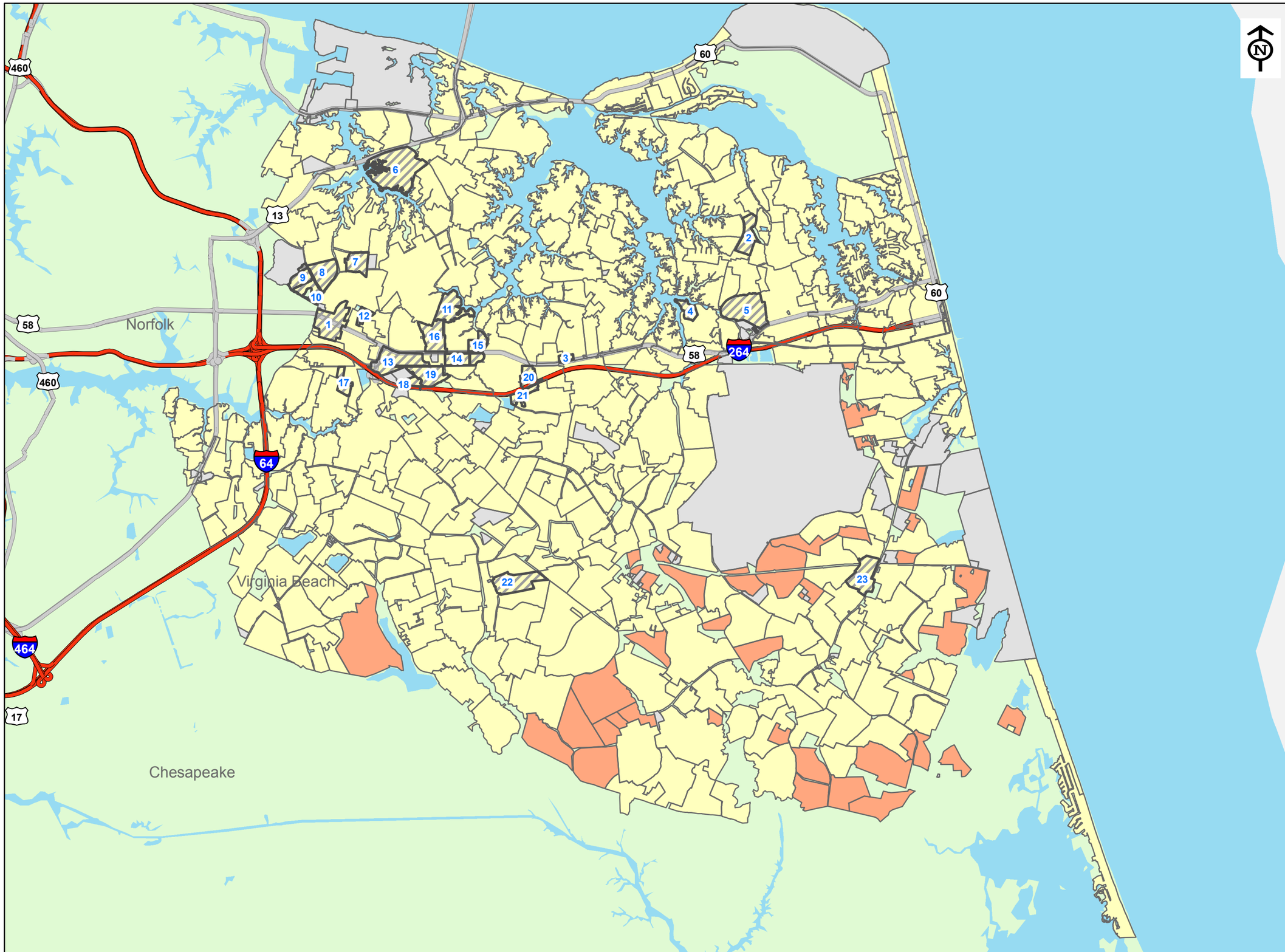
HRSD I/I Reduction Program
Locality: Suffolk

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

7,400 3,700 0 7,400
Feet



Appendix B - Figure 9

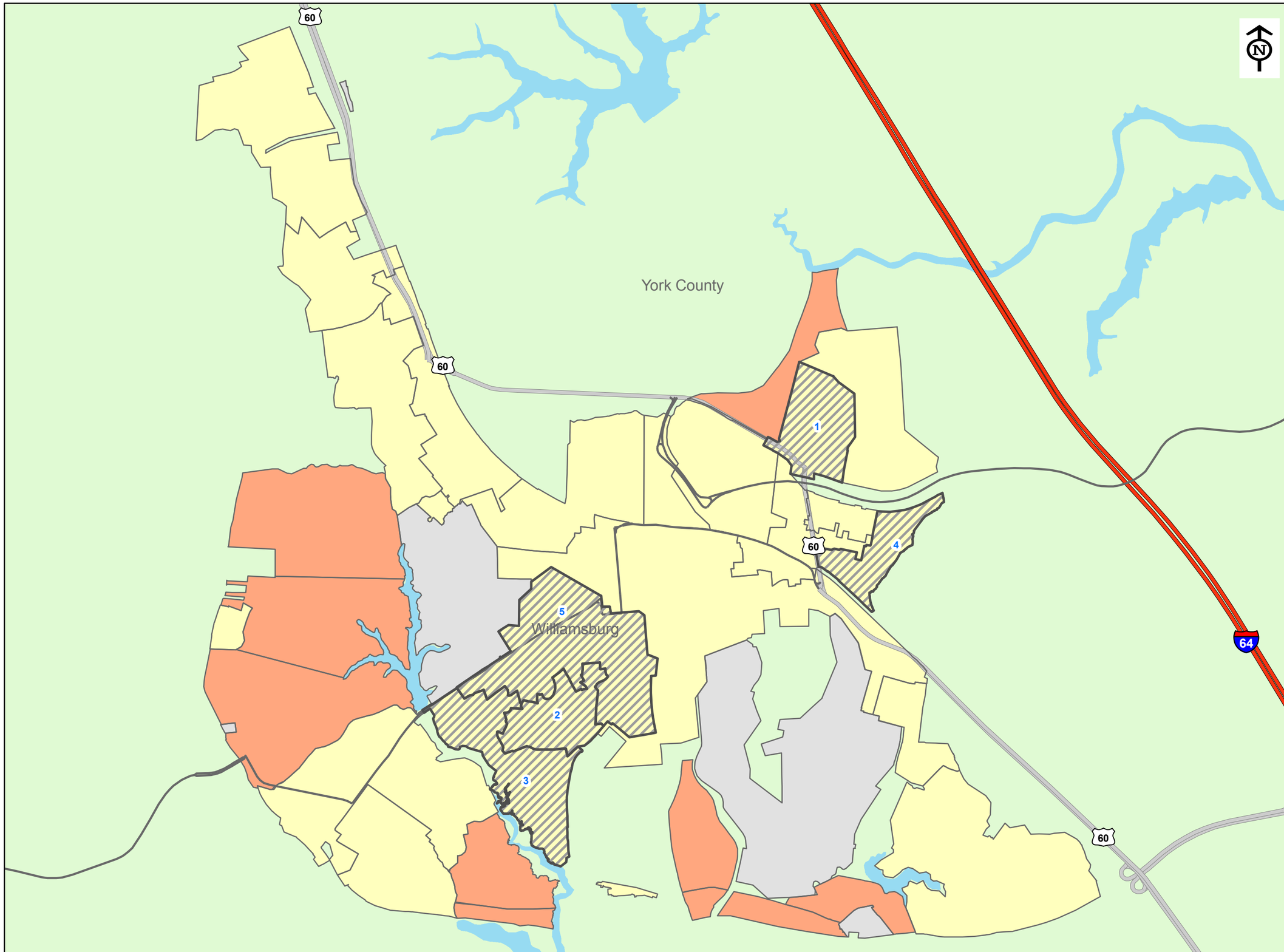
HRSD I/I Reduction Program
Locality: Virginia Beach

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

6,700 3,350 0 6,700
Feet



Appendix B - Figure 10

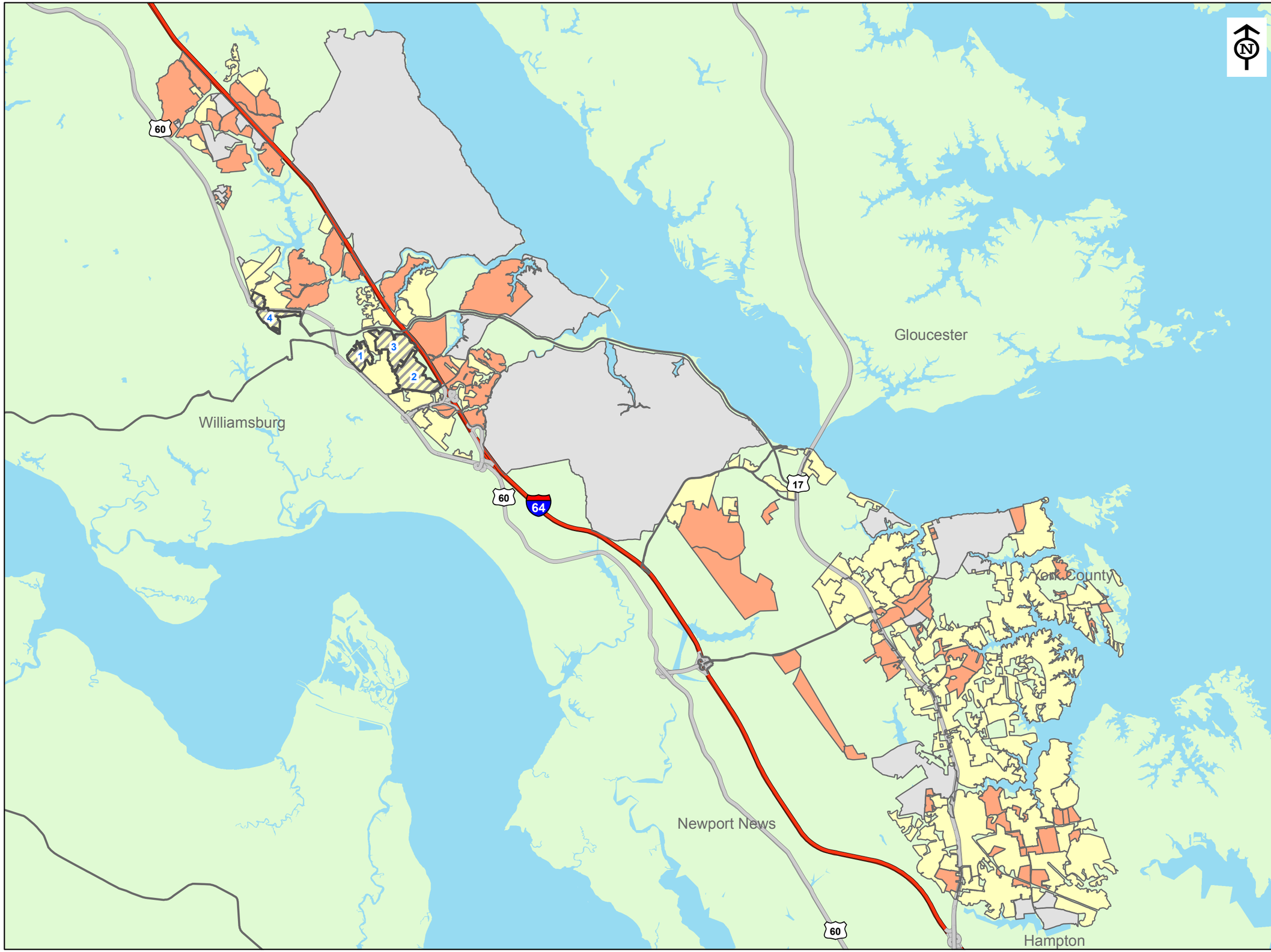
HRSD I/I Reduction Program
Locality: Williamsburg

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

1,700 850 0 1,700
Feet



Appendix B - Figure 11

HRSD I/I Reduction Program
Locality: York County

Legend

- I/I Reduction Program Area
- Public Service Area
- Private/Federal Service Area
- Future Service Area
- Surface Water
- Other Area

HRSD
Cleaning wastewater every day for a better Bay.

7,750 3,875 0 7,750
Feet

Appendix B: Table B-2. MACP Codes for Data Driven Plan Development

Table B-2 MACP Codes For Regional Data Driven Plan Development			
Code	Description	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
B	Broken	Y	Y
BSV	Broken Soil Visible	Y	Y
BVV	Broken Void Visible	Y	Y
CC	Crack Circumferential	N	N
CH2	Crack Longitudinal Hinge, 2	Y	N
CH3	Crack Longitudinal Hinge, 3	Y	N
CH4	Crack Longitudinal Hinge, 4	Y	N
CL	Crack Longitudinal	Y	N
CM	Crack Multiple	Y	Y
CS	Crack Spiral	Y	N
D	Deformed	Y	N
DAE	Deposits Attached Encrustation	Y	N
DAGS	Deposits Attached Grease	N	N
DAR	Deposits Attached Ragging	N	N
DAZ	Deposits Attached Other	N	N
DB	Displaced Brick	N	N
DH	Deformed Horizontal	Y	N
DI	Dropped Invert	N	N
DNF	Deposits Ingressed Fine	N	N
DNGV	Deposits Ingressed Gravel	N	N
DNZ	Deposits Ingressed Other	N	N
DSC	Deposits Settled Compacted	N	N
DSF	Deposits Settled Fine	N	N
DSGV	Deposits Settled Gravel	N	N
DSZ	Deposits Settled Other	N	N
DV	Deformed Vertical	Y	N
FC	Fracture Circumferential	Y	N
FH2	Fracture Longitudinal Hinge, 2	Y	Y
FH3	Fracture Longitudinal Hinge, 3	Y	Y
FH4	Fracture Longitudinal Hinge, 4	Y	Y
FL	Fracture Longitudinal	Y	Y
FM	Fracture Multiple	Y	Y
FS	Fracture Spiral	Y	Y
GRT	Grout done at Location	N	N
GTFJ	Grout Air Test Fail Joint	Y	Y
GTFL	Grout Air Test Fail Lateral	Y	Y
GTPJ	Grout Air Test Pass Joint	N	N
GTPL	Grout Air Test Pass Lateral	N	N
GTUJ	Grout Air Test Unable Joint	N	N
GTUL	Grout Air Test Unable Lateral	N	N
H	Hole	Y	Y
HSV	Hole Soil Visible	Y	Y
HVV	Hole Void Visible	Y	Y
ID	Infil Dripper	Y	Y
IG	Infil Gusher	Y	Y

Table B-2 MACP Codes For Regional Data Driven Plan Development			
Code	Description	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
IR	Infil Runner	Y	Y
IS	Infil Stain	Y	N
ISGT	Intruding Sealing Grout	Y	N
ISSR	Intruding Sealing Ring	Y	N
ISSRB	Intruding Sealing Ring Broken	Y	N
ISSRH	Intruding Sealing Ring Hanging	Y	N
ISSRL	Intruding Sealing Ring Loose/Poorly Fitting	Y	N
ISZ	Intruding Sealing Other	Y	N
IW	Infil Weeper	Y	Y
JAL	Joint Angular Large	Y	N
JAM	Joint Angular Medium	Y	N
JOL	Joint Offset Large	Y	N
JOM	Joint Offset Medium	Y	N
JSL	Joint Separated Large	Y	N
JSM	Joint Separated Medium	Y	N
KD	Buckling Dimpling	Y	N
KI	Inverse Curvature	N	N
KW	Buckling Wall	Y	N
LFAC	Lining Failure Abandoned Connection	N	N
LFAS	Lining Failure Annular Space	N	N
LFB	Lining Failure Blistered	N	N
LFBK	Lining Failure Buckled	N	N
LFBU	Lining Failure Bulges	N	N
LFCS	Lining Failure Connection Cut Shifted	N	N
LFD	Lining Failure Detached	N	N
LFDC	Lining Failure Discoloration	N	N
LFDE	Lining Failure Defective End	N	N
LFDL	Lining Failure Delaminating	N	N
LFOC	Lining Failure Overcut Connection	N	N
LFPH	Lining Failure Pinhole	N	N
LFRS	Lining Failure Resin slug	N	N
LFUC	Lining Failure Undercut Connection	N	N
LFW	Lining Failure Wrinkled	N	N
LFZ	Lining Failure Other	N	N
MB	Missing Brick	Y	N
MGO	General Observation	N	N
MGP	General Photo	N	N
MJL	Joint Length Change	N	N
MLC	Lining Change	N	N
MMC	Material Change	N	N
MML	Mortar Missing Large	N	N
MMM	Mortar Missing Medium	N	N
MMS	Mortar Missing Small	N	N
MSA	Abandoned Survey	N	N
MSC	Shape or Size Change	N	N

Table B-2 MACP Codes For Regional Data Driven Plan Development			
Code	Description	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
MWL	Water Level	N	N
MWLS	Water Level Sag	N	N
MWM	Water Mark	N	N
MYN	Dye Test Not Visible	N	N
MYV	Dye Test Visible	Y	N
OBB	Obstacle Brick	N	N
OBC	Obstacle Thru Connection	Y	N
OBI	Obstacle Intruding Thru Wall	Y	N
OBJ	Obstacle In Joint	Y	N
OBM	Obstacle Pipe Material	Y	N
OBN	Obstacle Construction Debris	N	N
OBP	Obstacle External Pipe or Cable	Y	N
OBR	Obstacle Rocks	N	N
OBS	Obstacle Built Into Structure	Y	N
OBZ	Obstacle Other	N	N
RBB	Roots Ball Barrel	Y	N
RBC	Roots Ball Connection	Y	N
RBJ	Roots Ball Joint	Y	N
RBL	Roots Ball Lateral	Y	N
RFB	Roots Fine Barrel	Y	N
RFC	Roots Fine Connection	Y	N
RFJ	Roots Fine Joint	Y	N
RFL	Roots Fine Lateral	Y	N
RMB	Roots Medium Barrel	Y	N
RMC	Roots Medium Connection	Y	N
RMJ	Roots Medium Joint	Y	N
RML	Roots Medium Lateral	Y	N
RPL	Repair Localized Liner	N	N
RPLD	Repair Localized Liner Defective	Y	Y
RPP	Repair Patch	N	N
RPPD	Repair Patch Defective	Y	Y
RPR	Repair Point Pipe Replaced	N	N
RPRD	Repair Point Defective	Y	Y
RPZ	Repair Other	N	N
RPZD	Repair Other Defective	Y	Y
RTB	Roots Tap Barrel	Y	N
RTC	Roots Tap Connection	Y	N
RTJ	Roots Tap Joint	Y	N
RTL	Roots Tap Lateral	Y	N
SAM	Surface Aggregate Missing	N	N
SAMC	Surface Aggregate Missing Chemical	N	N
SAMM	Surface Aggregate Missing Mechanical	N	N
SAMZ	Surface Aggregate Missing Unknown	N	N
SAP	Surface Aggregate Projecting	N	N
SAPC	Surface Aggregate Projecting Chemical	N	N

Table B-2 MACP Codes For Regional Data Driven Plan Development			
Code	Description	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
SAPM	Surface Aggregate Projecting Mechanical	N	N
SAPZ	Surface Aggregate Projecting Unknown	N	N
SAV	Surface Aggregate Visible	N	N
SAVC	Surface Aggregate Visible Chemical	N	N
SAVM	Surface Aggregate Visible Mechanical	N	N
SAVZ	Surface Aggregate Visible Unknown	N	N
SCP	Surface Corrosion Metal Pipe	N	N
SMW	Surface Missing Wall	Y	N
SMWC	Surface Missing Wall Chemical	Y	N
SMWM	Surface Missing Wall Mechanical	Y	N
SMWZ	Surface Missing Wall Unknown	Y	N
SRC	Surface Reinforcement Corroded	Y	N
SRCC	Surface Reinforcement Corroded Chemical	Y	N
SRCM	Surface Reinforcement Corroded Mechanical	Y	N
SRCZ	Surface Reinforcement Corroded Unknown	Y	N
SRI	Surface Roughness Increased	N	N
SRIC	Surface Roughness Increased Chemical	N	N
SRIM	Surface Roughness Increased Mechanical	N	N
SRIZ	Surface Roughness Increased Unknown	N	N
SRP	Surface Reinforcement Projecting	Y	N
SRPC	Surface Reinforcement Projecting Chemical	Y	N
SRPM	Surface Reinforcement Projecting Mechanical	Y	N
SRPZ	Surface Reinforcement Projecting Unknown	Y	N
SRV	Surface Reinforcement Visible	Y	N
SRVC	Surface Reinforcement Visible Chemical	Y	N
SRVM	Surface Reinforcement Visible Mechanical	Y	N
SRVZ	Surface Reinforcement Visible Unknown	Y	N
SSS	Surface Spalling	N	N
SSSC	Surface Spalling Chemical	N	N
SSSM	Surface Spalling Mechanical	N	N
SSSZ	Surface Spalling Other	N	N
SZ	Surface Other	N	N
SZC	Surface Other Chemical	N	N
SZM	Surface Other Mechanical	N	N
SZZ	Surface Other Unknown	N	N
VC	Vermin Cockroach	N	N
VR	Vermin Rat	N	N
VZ	Vermin Other	N	N
WFC	Weld Failure Circumferential	Y	N
WFL	Weld Failure Longitudinal	Y	N
WFM	Weld Failure Multiple	Y	Y
WFS	Weld Failure Spiral	Y	N
WFZ	Weld Failure Other	Y	N
XB	Collapse Brick Sewer	Y	Y
XP	Collapse Pipe Sewer	Y	Y

Appendix B: Table B-3. PACP Codes for Data Driven Plan Development

Table B-3 PACP Codes For Regional Data Driven Plan Development									
Family	Group	Description	Modifier	Code	Percentage	Grade	Grade Type	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
Structural	Pipe Failures	Broken	Silent	B		5	Structural	Y	Y
Structural	Pipe Failures	Broken	Soil Visible	BSV		5	Structural	Y	Y
Structural	Pipe Failures	Broken	Void Visible	BVV		5	Structural	Y	Y
Structural	Crack	Circumferential		CC		1	Structural	N	N
Structural	Crack	Longitudinal		CL		2	Structural	Y	N
Structural	Crack	Multiple		CM		3	Structural	Y	Y
Structural	Crack	Spiral		CS		2	Structural	Y	N
Structural	Deformed	Pipe		D	<=10%	4	Structural	N	N
Structural	Deformed	Pipe		D	>10%	5	Structural	Y	N
Structural	Brickwork	Displaced		DB		3	Structural	N	N
Structural	Deformed	Brick	Horizontally	DH		5	Structural	N	N
Structural	Brickwork	Dropped Invert		DI		5	Structural	N	N
Structural	Deformed	Brick	Vertically	DV		5	Structural	N	N
Structural	Fracture	Circumferential		FC		2	Structural	Y	N
Structural	Fracture	Longitudinal		FL		3	Structural	Y	Y
Structural	Fracture	Multiple		FM		4	Structural	Y	Y
Structural	Fracture	Spiral		FS		3	Structural	Y	Y
Structural	Pipe Failures	Hole	Silent	H		5	Structural	Y	Y
Structural	Pipe Failures	Hole	Soil Visible	HSV		5	Structural	Y	Y
Structural	Pipe Failures	Hole	Void Visible	HVV		5	Structural	Y	Y
Structural	Joint	Angular	Large	JAL		2	Structural	Y	N
Structural	Joint	Angular	Medium	JAM		1	Structural	Y	N
Structural	Joint	Offset (displacement)		JO				N	N
Structural	Joint	Offset (displacement)	Large	JOL		2	Structural	Y	N
Structural	Joint	Offset (displacement)	Medium	JOM		1	Structural	Y	N
Structural	Joint	Seperated (open)	Large	JSL		2	Structural	Y	N
Structural	Joint	Seperated (open)	Medium	JSM		1	Structural	Y	N
Structural	Lining Failure	Abandoned Connection		LFAC		0	Structural	N	N
Structural	Lining Failure	Blistered		LFB		3	Structural	Y	N
Structural	Lining Failure	Buckled		LFBK		3	Structural	Y	N
Structural	Lining Failure	Service Cut Shifted		LFCS		3	Structural	Y	N
Structural	Lining Failure	Detached		LFD		3	Structural	Y	N
Structural	Lining Failure	Defective End		LFDE		3	Structural	Y	N
Structural	Lining Failure	Overcut Service		LFOC		3	Structural	Y	N
Structural	Lining Failure	Undercut Service		LFUC		3	Structural	Y	N
Structural	Lining Failure	Wrinkled		LFW		3	Structural	Y	N
Structural	Lining Failure	Other		LFZ		0	Structural	Y	N
Structural	Brickwork	Missing		MB		4	Structural	N	N
Structural	Brickwork	Missing Mortar	Large	MML		3	Structural	N	N
Structural	Brickwork	Missing Mortar	Medium	MMM		3	Structural	N	N
Structural	Brickwork	Missing Mortar	Slight	MMS		2	Structural	N	N
Structural	Point Repair	Localized Lining		RPL		0	Structural	N	N

Table B-3 PACP Codes For Regional Data Driven Plan Development									
Family	Group	Description	Modifier	Code	Percentage	Grade	Grade Type	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
Structural	Point Repair	Localized Lining	Defective	RPLD		4	Structural	Y	Y
Structural	Point Repair	Patch Repair		RPP		0	Structural	N	N
Structural	Point Repair	Patch Repair	Defective	RPPD		4	Structural	Y	Y
Structural	Point Repair	Pipe Replaced		RPR		0	Structural	N	N
Structural	Point Repair	Pipe Replaced	Defective	RPRD		4	Structural	Y	Y
Structural	Point Repair	Other		RPRZ		0	Structural	N	N
Structural	Point Repair	Other	Defective	RPRZD		4	Structural	Y	Y
Structural	Surface Damage Chemical	Aggregate Missing	Chemical	SAMC		4	Structural	N	N
Structural	Surface Damage Mechanical	Aggregate Missing	Mechanical	SAMM		4	Structural	N	N
Structural	Surface Damage Not Evident	Aggregate Missing	Not Evident/Unknown	SAMZ		4	Structural	N	N
Structural	Surface Damage Chemical	Aggregate Projecting	Chemical	SAPC		3	Structural	N	N
Structural	Surface Damage Mechanical	Aggregate Projecting	Mechanical	SAPM		3	Structural	N	N
Structural	Surface Damage Not Evident	Aggregate Projecting	Not Evident/Unknown	SAPZ		3	Structural	N	N
Structural	Surface Damage Chemical	Aggregate Visible	Chemical	SAVC		3	Structural	N	N
Structural	Surface Damage Mechanical	Aggregate Visible	Mechanical	SAVM		3	Structural	N	N
Structural	Surface Damage Not Evident	Aggregate Visible	Not Evident/Unknown	SAVZ		3	Structural	N	N
Structural	Surface Damage (Metal Pipes)	Corrosion		SCP		3	Structural	N	N
Structural	Surface Damage Chemical	Missing Wall	Chemical	SMWC		5	Structural	Y	N
Structural	Surface Damage Mechanical	Missing Wall	Mechanical	SMWM		5	Structural	Y	N
Structural	Surface Damage Not Evident	Missing Wall	Not Evident/Unknown	SMWZ		5	Structural	Y	N
Structural	Surface Damage Chemical	Reinforcement Corroded	Chemical	SRCC		5	Structural	Y	N
Structural	Surface Damage Mechanical	Reinforcement Corroded	Mechanical	SRCM		5	Structural	Y	N
Structural	Surface Damage Not Evident	Reinforcement Corroded	Not Evident/Unknown	SRCZ		5	Structural	Y	N
Structural	Surface Damage Chemical	Roughness Increased	Chemical	SRIC		1	Structural	N	N
Structural	Surface Damage Mechanical	Roughness Increased	Mechanical	SRIM		1	Structural	N	N
Structural	Surface Damage Not Evident	Roughness Increased	Not Evident/Unknown	SRIZ		1	Structural	N	N
Structural	Surface Damage Chemical	Reinforcement Visible	Chemical	SRVC		5	Structural	Y	N
Structural	Surface Damage Mechanical	Reinforcement Visible	Mechanical	SRVM		5	Structural	Y	N
Structural	Surface Damage Not Evident	Reinforcement Visible	Not Evident/Unknown	SRVZ		5	Structural	Y	N
Structural	Surface Damage Chemical	Surface Spalling	Chemical	SSSC		2	Structural	N	N
Structural	Surface Damage Mechanical	Surface Spalling	Mechanical	SSSM		2	Structural	N	N
Structural	Surface Damage Not Evident	Surface Spalling	Not Evident/Unknown	SSSZ		2	Structural	N	N

Table B-3 PACP Codes For Regional Data Driven Plan Development									
Family	Group	Description	Modifier	Code	Percentage	Grade	Grade Type	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
Structural	Surface Damage Chemical	Other	Chemical	SZC		0	Structural	N	N
Structural	Surface Damage Mechanical	Other	Mechanical	SZM		0	Structural	N	N
Structural	Surface Damage Not Evident	Other	Not Evident/Unknown	SZZ		0	Structural	N	N
Structural	Weld Failure	Circumferential		WFC		2	Structural	Y	N
Structural	Weld Failure	Longitudinal		WFL		2	Structural	Y	N
Structural	Weld Failure	Multiple		WFM		3	Structural	Y	Y
Structural	Weld Failure	Spiral		WFS		2	Structural	Y	N
Structural	Collapse	Brick		XB		5	Structural	Y	Y
Structural	Collapse	Pipe		XP		5	Structural	Y	Y
Other	Miscellaneous	Camera Underwater		MCU		4	O&M	N	N
Other	Miscellaneous	General Observation		MGO			O&M	N	N
Other	Miscellaneous	General Photograph		MGP			O&M	N	N
Other	Miscellaneous	Joint Length Change		MJL			O&M	N	N
Other	Miscellaneous	Lining Change		MLC			O&M	N	N
Other	Miscellaneous	Material Change		MMC			O&M	N	N
Other	Miscellaneous	Survey Abandoned		MSA			O&M	N	N
Other	Miscellaneous	Dimension/Diam/ Shape Change		MSC			O&M	N	N
Other	Miscellaneous	Water Level		MWL			O&M	N	N
Other	Miscellaneous	Water Level		MWLS	<=30%	2	O&M	N	N
Other	Miscellaneous	Water Level		MWLS	<=50%	3	O&M	Y	N
Other	Miscellaneous	Water Level		MWLS	>50%	4	O&M	Y	N
Other	Miscellaneous	Water Mark		MWM	>=50%	4	O&M	Y	N
Other	Miscellaneous	Water Mark		MWM	>=75%	5	O&M	Y	N
Other	Miscellaneous	Dye Test		MY			O&M	N	N
Other	Miscellaneous	Dye Test	Not Visible	MYN		3	O&M	N	N
Other	Miscellaneous	Dye Test	Visible	MYV		5	O&M	Y	N
O&M	Deposits Attached	Encrustation		DAE	<=10%	2	O&M	N	N
O&M	Deposits Attached	Encrustation		DAE	<=20%	3	O&M	Y	N
O&M	Deposits Attached	Encrustation		DAE	<=30%	4	O&M	Y	N
O&M	Deposits Attached	Encrustation		DAE	>30%	5	O&M	Y	N
O&M	Deposits Attached	Grease		DAGS	<=10%	2	O&M	N	N
O&M	Deposits Attached	Grease		DAGS	<=20%	3	O&M	N	N
O&M	Deposits Attached	Grease		DAGS	<=30%	4	O&M	N	N
O&M	Deposits Attached	Grease		DAGS	>30%	5	O&M	Y	N
O&M	Deposits Attached	Ragging		DAR	<=10%	2	O&M	N	N
O&M	Deposits Attached	Ragging		DAR	<=20%	3	O&M	N	N
O&M	Deposits Attached	Ragging		DAR	<=30%	4	O&M	N	N
O&M	Deposits Attached	Ragging		DAR	>30%	5	O&M	Y	N
O&M	Deposits Attached	Other		DAZ	<=10%	2	O&M	N	N
O&M	Deposits Attached	Other		DAZ	<=20%	3	O&M	N	N
O&M	Deposits Attached	Other		DAZ	<=30%	4	O&M	N	N
O&M	Deposits Attached	Other		DAZ	>30%	5	O&M	N	N
O&M	Deposits Ingress	Fine Silt/Sand		DNF	<=10%	2	O&M	N	N
O&M	Deposits Ingress	Fine Silt/Sand		DNF	<=20%	3	O&M	N	N
O&M	Deposits Ingress	Fine Silt/Sand		DNF	<=30%	4	O&M	N	N

Table B-3 PACP Codes For Regional Data Driven Plan Development									
Family	Group	Description	Modifier	Code	Percentage	Grade	Grade Type	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
O&M	Deposits Ingress	Fine Silt/Sand		DNF	>30%	5	O&M	Y	N
O&M	Deposits Ingress	Gravel		DNGV	<=10%	2	O&M	N	N
O&M	Deposits Ingress	Gravel		DNGV	<=20%	3	O&M	N	N
O&M	Deposits Ingress	Gravel		DNGV	<=30%	4	O&M	N	N
O&M	Deposits Ingress	Gravel		DNGV	>30%	5	O&M	Y	N
O&M	Deposits Ingress	Other		DNZ	<=10%	2	O&M	N	N
O&M	Deposits Ingress	Other		DNZ	<=20%	3	O&M	N	N
O&M	Deposits Ingress	Other		DNZ	<=30%	4	O&M	N	N
O&M	Deposits Ingress	Other		DNZ	>30%	5	O&M	N	N
O&M	Deposits Settled	Hard/Compacted		DSC	<=10%	2	O&M	N	N
O&M	Deposits Settled	Hard/Compacted		DSC	<=20%	3	O&M	N	N
O&M	Deposits Settled	Hard/Compacted		DSC	<=30%	4	O&M	N	N
O&M	Deposits Settled	Hard/Compacted		DSC	>30%	5	O&M	N	N
O&M	Deposits Settled	Fine		DSF	<=10%	2	O&M	N	N
O&M	Deposits Settled	Fine		DSF	<=20%	3	O&M	N	N
O&M	Deposits Settled	Fine		DSF	<=30%	4	O&M	N	N
O&M	Deposits Settled	Fine		DSF	>30%	5	O&M	Y	N
O&M	Deposits Settled	Gravel		DSGV	<=10%	2	O&M	N	N
O&M	Deposits Settled	Gravel		DSGV	<=20%	3	O&M	N	N
O&M	Deposits Settled	Gravel		DSGV	<=30%	4	O&M	N	N
O&M	Deposits Settled	Gravel		DSGV	>30%	5	O&M	Y	N
O&M	Deposits Settled	Other		DSZ	<=10%	2	O&M	N	N
O&M	Deposits Settled	Other		DSZ	<=20%	3	O&M	N	N
O&M	Deposits Settled	Other		DSZ	<=30%	4	O&M	N	N
O&M	Deposits Settled	Other		DSZ	>30%	5	O&M	N	N
O&M	Infiltration	Dripper		ID		3	O&M	Y	Y
O&M	Infiltration	Gusher		IG		5	O&M	Y	Y
O&M	Infiltration	Runner		IR		4	O&M	Y	Y
O&M	Infiltration	Weeper		IW		2	O&M	Y	N
O&M	Obstacles/Obstructions	Brick or Masonry		OBB	<=10%	2	O&M	N	N
O&M	Obstacles/Obstructions	Brick or Masonry		OBB	<=20%	3	O&M	N	N
O&M	Obstacles/Obstructions	Brick or Masonry		OBB	<=30%	4	O&M	N	N
O&M	Obstacles/Obstructions	Brick or Masonry		OBB	>30%	5	O&M	N	N
O&M	Obstacles/Obstructions	Object Thru Connection		OBC	<=10%	2	O&M	Y	N
O&M	Obstacles/Obstructions	Object Thru Connection		OBC	<=20%	3	O&M	Y	N
O&M	Obstacles/Obstructions	Object Thru Connection		OBC	<=30%	4	O&M	Y	N
O&M	Obstacles/Obstructions	Object Thru Connection		OBC	>30%	5	O&M	Y	N
O&M	Obstacles/Obstructions	Object Protruding Thru Wall		OBI	<=10%	2	O&M	Y	N
O&M	Obstacles/Obstructions	Object Protruding Thru Wall		OBI	<=20%	3	O&M	Y	N
O&M	Obstacles/Obstructions	Object Protruding Thru Wall		OBI	<=30%	4	O&M	Y	N
O&M	Obstacles/Obstructions	Object Protruding Thru Wall		OBI	>30%	5	O&M	Y	N
O&M	Obstacles/Obstructions	Object Wedged In Joint		OBJ	<=10%	2	O&M	Y	N
O&M	Obstacles/Obstructions	Object Wedged In Joint		OBJ	<=20%	3	O&M	Y	N

Table B-3 PACP Codes For Regional Data Driven Plan Development									
Family	Group	Description	Modifier	Code	Percentage	Grade	Grade Type	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
O&M	Obstacles/Obstructions	Object Wedged In Joint		OBJ	<=30%	4	O&M	Y	N
O&M	Obstacles/Obstructions	Object Wedged In Joint		OBJ	>30%	5	O&M	Y	N
O&M	Obstacles/Obstructions	Pipe Material in Invert		OBM	<=10%	2	O&M	N	N
O&M	Obstacles/Obstructions	Pipe Material in Invert		OBM	<=20%	3	O&M	N	N
O&M	Obstacles/Obstructions	Pipe Material in Invert		OBM	<=30%	4	O&M	N	N
O&M	Obstacles/Obstructions	Pipe Material in Invert		OBM	>30%	5	O&M	Y	N
O&M	Obstacles/Obstructions	Construction Debris		OBN	<=10%	2	O&M	N	N
O&M	Obstacles/Obstructions	Construction Debris		OBN	<=20%	3	O&M	N	N
O&M	Obstacles/Obstructions	Construction Debris		OBN	<=30%	4	O&M	N	N
O&M	Obstacles/Obstructions	Construction Debris		OBN	>30%	5	O&M	N	N
O&M	Obstacles/Obstructions	External Pipe or Cable in Sewer		OBP	<=10%	2	O&M	N	N
O&M	Obstacles/Obstructions	External Pipe or Cable in Sewer		OBP	<=20%	3	O&M	N	N
O&M	Obstacles/Obstructions	External Pipe or Cable in Sewer		OBP	<=30%	4	O&M	N	N
O&M	Obstacles/Obstructions	External Pipe or Cable in Sewer		OBP	>30%	5	O&M	N	N
O&M	Obstacles/Obstructions	Rocks		OBR	<=10%	2	O&M	N	N
O&M	Obstacles/Obstructions	Rocks		OBR	<=20%	3	O&M	N	N
O&M	Obstacles/Obstructions	Rocks		OBR	<=30%	4	O&M	N	N
O&M	Obstacles/Obstructions	Rocks		OBR	>30%	5	O&M	N	N
O&M	Obstacles/Obstructions	Built Into Structure		OBS	<=10%	2	O&M	N	N
O&M	Obstacles/Obstructions	Built Into Structure		OBS	<=20%	3	O&M	N	N
O&M	Obstacles/Obstructions	Built Into Structure		OBS	<=30%	4	O&M	N	N
O&M	Obstacles/Obstructions	Built Into Structure		OBS	>30%	5	O&M	N	N
O&M	Obstacles/Obstructions	Other		OBZ	<=10%	2	O&M	N	N
O&M	Obstacles/Obstructions	Other		OBZ	<=20%	3	O&M	N	N
O&M	Obstacles/Obstructions	Other		OBZ	<=30%	4	O&M	N	N
O&M	Obstacles/Obstructions	Other		OBZ	>30%	5	O&M	N	N
O&M	Roots	Ball		RB				N	N
O&M	Roots	Ball	Barrel	RBB		5	O&M	Y	N
O&M	Roots	Ball	Connection	RBC		4	O&M	Y	N
O&M	Roots	Ball	Joint	RBJ		4	O&M	Y	N
O&M	Roots	Ball	Lateral	RBL		4	O&M	Y	N
O&M	Roots	Fine		RF				N	N
O&M	Roots	Fine	Barrel	RFB		2	O&M	Y	N
O&M	Roots	Fine	Connection	RFC		1	O&M	Y	N
O&M	Roots	Fine	Joint	RFJ		1	O&M	Y	N
O&M	Roots	Fine	Lateral	RFL		1	O&M	Y	N
O&M	Roots	Medium		RM				N	N
O&M	Roots	Medium	Barrel	RMB		4	O&M	Y	N
O&M	Roots	Medium	Connection	RMC		3	O&M	Y	N
O&M	Roots	Medium	Joint	RMJ		3	O&M	Y	N
O&M	Roots	Medium	Lateral	RML		3	O&M	Y	N
O&M	Roots	Tap		RT				N	N
O&M	Roots	Tap	Barrel	RTB		3	O&M	Y	N
O&M	Roots	Tap	Connection	RTC		2	O&M	Y	N
O&M	Roots	Tap	Joint	RTJ		2	O&M	Y	N

Table B-3 PACP Codes For Regional Data Driven Plan Development									
Family	Group	Description	Modifier	Code	Percentage	Grade	Grade Type	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
O&M	Roots	Tap	Lateral	RTL		2	O&M	Y	N
O&M	Vermin	Cockroach		VC		1	O&M	N	N
O&M	Vermin	Rat		VR		2	O&M	N	N
O&M	Vermin	Other		VZ		1	O&M	N	N
Construction	Intruding Seal Material			IS			O&M	N	N
Construction	Intruding Seal Material	Grout		ISGT	<=10%	2	O&M	N	N
Construction	Intruding Seal Material	Grout		ISGT	<=20%	3	O&M	N	N
Construction	Intruding Seal Material	Grout		ISGT	<=30%	4	O&M	N	N
Construction	Intruding Seal Material	Grout		ISGT	>30%	5	O&M	N	N
Construction	Intruding Seal Material	Seal Ring		ISSR	<=10%	2	O&M	N	N
Construction	Intruding Seal Material	Seal Ring		ISSR	<=20%	3	O&M	N	N
Construction	Intruding Seal Material	Seal Ring		ISSR	<=30%	4	O&M	N	N
Construction	Intruding Seal Material	Seal Ring		ISSR	>30%	5	O&M	N	N
Construction	Intruding Seal Material		Broken	ISSRB	<=10%	2	O&M	N	N
Construction	Intruding Seal Material		Broken	ISSRB	<=20%	3	O&M	N	N
Construction	Intruding Seal Material		Broken	ISSRB	<=30%	4	O&M	N	N
Construction	Intruding Seal Material		Broken	ISSRB	>30%	5	O&M	N	N
Construction	Intruding Seal Material		Hanging	ISSRH	<=10%	2	O&M	N	N
Construction	Intruding Seal Material		Hanging	ISSRH	<=20%	3	O&M	N	N
Construction	Intruding Seal Material		Hanging	ISSRH	<=30%	4	O&M	N	N
Construction	Intruding Seal Material		Hanging	ISSRH	>30%	5	O&M	N	N
Construction	Intruding Seal Material	Other		ISZ	<=10%	2	O&M	N	N
Construction	Intruding Seal Material	Other		ISZ	<=20%	3	O&M	N	N
Construction	Intruding Seal Material	Other		ISZ	<=30%	4	O&M	N	N
Construction	Intruding Seal Material	Other		ISZ	>30%	5	O&M	N	N
Construction	Line	Down		LD	<=10 Deg	2	O&M	N	N
Construction	Line	Down		LD	<=20 Deg	3	O&M	N	N
Construction	Line	Down		LD	<=30 Deg	4	O&M	N	N
Construction	Line	Down		LD	>30 Deg	5	O&M	N	N
Construction	Line	Left		LL	<=10 Deg	2	O&M	N	N
Construction	Line	Left		LL	<=20 Deg	3	O&M	N	N
Construction	Line	Left		LL	<=30 Deg	4	O&M	N	N
Construction	Line	Left		LL	>30 Deg	5	O&M	N	N
Construction	Line	Left/Down		LLD	<=10 Deg	2	O&M	N	N
Construction	Line	Left/Down		LLD	<=20 Deg	3	O&M	N	N
Construction	Line	Left/Down		LLD	<=30 Deg	4	O&M	N	N
Construction	Line	Left/Down		LLD	>30 Deg	5	O&M	N	N
Construction	Line	Left/Up		LLU	<=10 Deg	2	O&M	N	N
Construction	Line	Left/Up		LLU	<=20 Deg	3	O&M	N	N
Construction	Line	Left/Up		LLU	<=30 Deg	4	O&M	N	N
Construction	Line	Left/Up		LLU	>30 Deg	5	O&M	N	N
Construction	Line	Right		LR	<=10 Deg	2	O&M	N	N
Construction	Line	Right		LR	<=20 Deg	3	O&M	N	N
Construction	Line	Right		LR	<=30 Deg	4	O&M	N	N
Construction	Line	Right		LR	>30 Deg	5	O&M	N	N
Construction	Line	Right/Down		LRD	<=10 Deg	2	O&M	N	N
Construction	Line	Right/Down		LRD	<=20 Deg	3	O&M	N	N
Construction	Line	Right/Down		LRD	<=30 Deg	4	O&M	N	N

Table B-3 PACP Codes For Regional Data Driven Plan Development									
Family	Group	Description	Modifier	Code	Percentage	Grade	Grade Type	Defect Included in R/R Scope (Y/N)	Defects Represent Significant Infow Source (Y/N)
Construction	Line	Right/Down		LRD	>30 Deg	5	O&M	N	N
Construction	Line	Right/Up		LRU	<=10 Deg	2	O&M	N	N
Construction	Line	Right/Up		LRU	<=20 Deg	3	O&M	N	N
Construction	Line	Right/Up		LRU	<=30 Deg	4	O&M	N	N
Construction	Line	Right/Up		LRU	>30 Deg	5	O&M	N	N
Construction	Line	Up		LU	<=10 Deg	2	O&M	N	N
Construction	Line	Up		LU	<=20 Deg	3	O&M	N	N
Construction	Line	Up		LU	<=30 Deg	4	O&M	N	N
Construction	Line	Up		LU	>30 Deg	5	O&M	N	N
Construction	Tap	Break-In/Hammer		TB			O&M	Y	N
Construction	Tap	Break-In/Hammer	Active	TBA			O&M	Y	N
Construction	Tap	Break-In/Hammer	Capped	TBC		2	O&M	Y	N
Construction	Tap	Break-In/Hammer	Defective	TBD		3	O&M	Y	N
Construction	Tap	Break-In/Hammer	Intruding	TBI	<=10%	2	O&M	Y	N
Construction	Tap	Break-In/Hammer	Intruding	TBI	<=20%	3	O&M	Y	N
Construction	Tap	Break-In/Hammer	Intruding	TBI	<=30%	4	O&M	Y	N
Construction	Tap	Break-In/Hammer	Intruding	TBI	>30%	5	O&M	Y	N
Construction	Tap	Factory Made		TF			O&M	N	N
Construction	Tap	Factory Made	Active	TFA			O&M	N	N
Construction	Tap	Factory Made	Capped	TFC			O&M	N	N
Construction	Tap	Factory Made	Defective	TFD		2	O&M	Y	N
Construction	Tap	Factory Made	Intruding	TFI	<=10%	2	O&M	N	N
Construction	Tap	Factory Made	Intruding	TFI	<=20%	3	O&M	N	N
Construction	Tap	Factory Made	Intruding	TFI	<=30%	4	O&M	N	N
Construction	Tap	Factory Made	Intruding	TFI	>30%	5	O&M	N	N
Construction	Tap	Saddle		TS			O&M	N	N
Construction	Tap	Saddle	Active	TSA			O&M	N	N
Construction	Tap	Saddle	Capped	TSC			O&M	N	N
Construction	Tap	Saddle	Defective	TSD		2	O&M	N	N
Construction	Tap	Saddle	Intruding	TSI	<=10%	2	O&M	N	N
Construction	Tap	Saddle	Intruding	TSI	<=20%	3	O&M	N	N
Construction	Tap	Saddle	Intruding	TSI	<=30%	4	O&M	N	N
Construction	Tap	Saddle	Intruding	TSI	>30%	5	O&M	N	N

Appendix B: Table B-4. Locality Specific Condition Data Conversion Logic

Table B-4 Locality Condition Data Conversion Logic		
Chesepeake Manhole Defects		
Locality Defect Category	Defect Description	Comparable Defect Category
CnCond	SOUND	None
	BROKEN	MajorStrDef
	SOIL/VOID VISIBLE	MajorStrDef
	CRACKED	MinorStrDef
	JOINT SEPARATED	MajorStrDef
	FRACTURE	MajorStrDef
CnLeak	NONE	None
	STAINS	MinorInfDef
	I/I VISIBLE	MajorInfDef
	WEEPER	MinorInfDef
WCond	SOUND	None
	CRACKED	MinorStrDef
	SOIL/VOID VISIBLE	MajorStrDef
	HOLE	MajorStrDef
	BROKEN	MajorStrDef
	JOINT SEPARATED	MajorStrDef
	FRACTURE	MajorStrDef
WLeak	NONE	None
	I/I VISIBLE	MajorInfDef
	STAINS	MinorInfDef
	WEEPER	MinorInfDef
	DRIPPER	MinorInfDef
	RUNNER	MajorInfDef
	GUSHER	MajorInfDef
WRoot	TAP	MinorStrDef
	FINE	MinorStrDef
	MEDIUM	MinorStrDef
BnchCond	SOUND	None
	SOIL/VOID VISIBLE	MajorStrDef
	BROKEN	MajorStrDef
	CRACKED	MinorStrDef
BnchLeak	NONE	None
	STAINS	MinorStrDef
	WEEPER	MinorStrDef
	I/I VISIBLE	MajorStrDef
BnchRoot	TAP	MinorStrDef
	FINE	MinorStrDef
ChlCond	SOUND	None
	BROKEN	MajorStrDef
	HOLE	MajorStrDef
	FRACTURE	MajorStrDef
	CRACKED	MinorStrDef
ChlRoot	FINE	MinorStrDef
EffSeal	SOUND	None
	HOLE	MajorStrDef
	CRACKED	MinorStrDef

Table B-4 Locality Condition Data Conversion Logic		
Chesepeake Manhole Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
Effl/I	T-STAIN	MinorInfDef
	W-WEEPER	MinorInfDef
	D-DRIPPER	MinorInfDef
SealInf1	SOUND	None
	CRACKED	MinorStrDef
	HOLE	MajorStrDef
I/IInf1	W-WEEPER	MinorInfDef
	T-STAIN	MinorInfDef
	D-DRIPPER	MinorInfDef
SealInf2	SOUND	None
	CRACKED	MinorStrDef
	HOLE	MajorStrDef
I/IInf2	W-WEEPER	MinorInfDef
	T-STAIN	MinorInfDef
	R-RUNNER	MajorInfDef
	D-DRIPPER	MinorInfDef
SealInf3	SOUND	None
	HOLE	MajorStrDef
	CRACKED	MinorStrDef
I/IInf3	W-WEEPER	MinorInfDef
	R-RUNNER	MajorInfDef
	D-DRIPPER	MinorInfDef
	T-STAIN	MinorInfDef
SealInf4	SOUND	None
	CRACKED	MinorStrDef
	HOLE	MajorStrDef
I/IInf4	W-WEEPER	MinorInfDef
	D-DRIPPER	MinorInfDef
SealInf5	SOUND	None
	CRACKED	MinorStrDef
	HOLE	MajorStrDef
I/IInf5	W-WEEPER	MinorInfDef
SealInf6	SOUND	None
	CRACKED	MinorStrDef
I/IInf6	W-WEEPER	MinorInfDef
Inflow	0	None
	1	MajorInfDef
Infiltration	0	None
	1	MinorInfDef
Structural	0	None
	1	MajorStrDef
Chesepeake CCTV Pipe Defects		
Locality Defect Category	Defect Description	Comparable Defect Category
Quick Scores	O&M Quick Score = 1	None
	O&M Quick Score = 2	MinorInfDef
	O&M Quick Score = 3	MinorInfDef

Table B-4 Locality Condition Data Conversion Logic		
Chesepeake CCTV Pipe Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
Quick Scores	O&M Quick Score = 4	MinorInfDef
	O&M Quick Score = 5	MajorInfDef
	Structural Quick Score = 1	None
	Structural Quick Score = 2	MinorStrDef
	Structural Quick Score = 3	MinorStrDef
	Structural Quick Score = 4	MinorStrDef
	Structural Quick Score = 5	MajorStrDef
Hampton Manhole Defects		
Locality Defect Category	Defect Description	Comparable Defect Category
Infiltration_Wall	None	None
	Minimal	MinorInfDef
	Stains	MinorInfDef
	Weeper	MinorInfDef
	Dripper	MinorInfDef
	Moderate	MajorInfDef
	Gusher	MajorInfDef
	Runner	MajorInfDef
Deterioration_Wall	N/A	None
	None	None
	Minimal	MinorStrDef
	Moderate	MajorStrDef
	Severe	MajorStrDef
Bench/Inv_Condition	Good	None
	Sound	None
	N/A	None
	Needs Concrete Work	MinorStrDef
Frame/Cover_Fit	Good	None
	Sound	None
	Tight	None
	Loose	MinorStrDef
	Rocking	MajorStrDef
Frame/Cover_Condition	Good	None
	Sound	None
	Needs Grade Adjustment	MinorStrDef
	Replace Frame	MajorStrDef
	Broken	MajorStrDef
Pipe_Seal	Good	None
	Needs Concrete	MinorStrDef
JCSA Manhole Defects		
Locality Defect Category	Defect Description	Comparable Defect Category
MH Grades	Grade = A	None
	Grade = B	MinorInfDef
	Grade = C	MinorInfDef
	Grade = D	MajorInfDef
	Grade = F	MajorInfDef
Infiltration Observations	Observed Infiltration	MinorInfDef

Table B-4 Locality Condition Data Conversion Logic		
JCSA Manhole Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
Infiltration Observations	Infiltration Evidence	MinorInfDef
	Weeper	MinorInfDef
	Dripper	MinorInfDef
	Runner	MajorInfDef
	Gusher	MajorInfDef
JCSA CCTV Pipe Defect		
Locality Defect Category	Defect Description	Comparable Defect Category
Quick Scores	O&M Quick Score = 1	None
	O&M Quick Score = 2	MinorInfDef
	O&M Quick Score = 3	MinorInfDef
	O&M Quick Score = 4	MinorInfDef
	O&M Quick Score = 5	MajorInfDef
	Structural Quick Score = 1	None
	Structural Quick Score = 2	MinorStrDef
	Structural Quick Score = 3	MinorStrDef
	Structural Quick Score = 4	MinorStrDef
	Structural Quick Score = 5	MajorStrDef
Newport News Manhole Defect		
Locality Defect Category	Defect Description	Comparable Defect Category
Quick Scores	O&M Quick Score = 1	None
	O&M Quick Score = 2	MinorInfDef
	O&M Quick Score = 3	MinorInfDef
	O&M Quick Score = 4	MinorInfDef
	O&M Quick Score = 5	MajorInfDef
	Structural Quick Score = 1	None
	Structural Quick Score = 2	MinorStrDef
	Structural Quick Score = 3	MinorStrDef
	Structural Quick Score = 4	MinorStrDef
	Structural Quick Score = 5	MajorStrDef
Infiltration_Evidence	Blank	None
	Yes	MinorInfDef
Active_Groundwater	Blank	None
	Yes	MajorInfDef
Depressed_MH	Blank	None
	Yes	MinorInfDef
Inflow_Potential	Blank	None
	Sheeting/Ponding	MinorInfDef
Newport News Pipe Defect		
Locality Defect Category	Defect Description	Comparable Defect Category
Quick Scores	O&M Quick Score = 1	None
	O&M Quick Score = 2	MinorInfDef
	O&M Quick Score = 3	MinorInfDef
	O&M Quick Score = 4	MinorInfDef
	O&M Quick Score = 5	MajorInfDef
	Structural Quick Score = 1	None
	Structural Quick Score = 2	MinorStrDef

Table B-4 Locality Condition Data Conversion Logic		
Newport News Pipe Defect cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
Quick Scores	Structural Quick Score = 3	MinorStrDef
	Structural Quick Score = 4	MinorStrDef
	Structural Quick Score = 5	MajorStrDef
Norfolk Manhole Defects		
Locality Defect Category	Defect Description	Comparable Defect Category
CRACKED	Score = 0	None
	Score = 2	MinorInfDef
	Score = 3	MinorInfDef
	Score = 4	MinorInfDef
	Score = 5	MajorInfDef
BROKEN	Score = 0	None
	Score = 2	MinorInfDef
	Score = 3	MinorInfDef
	Score = 4	MinorInfDef
	Score = 5	MajorInfDef
OFFSET (inches)	Score = 0	None
	Score = 0.50	MinorInfDef
	Score = 0.70	MinorInfDef
	Score = 1.00	MinorInfDef
	Score = 1.20	MinorInfDef
	Score = 1.5	MinorInfDef
	Score = 1.7	MinorInfDef
	Score = 2.00	MajorInfDef
	Score = 2.20	MajorInfDef
	Score = 2.50	MajorInfDef
	Score = 3.00	MajorInfDef
	Score = 3.50	MajorInfDef
	Score = 4.00	MajorInfDef
	Score = 4.50	MajorInfDef
	Score = 5.00	MajorInfDef
	Score = 6.00	MajorInfDef
	Score = 11.5	MajorInfDef
ROOTS	Score = 0	None
	Score = 1	MinorInfDef
	Score = 3	MinorInfDef
	Score = 5	MajorInfDef
DETERIORATION	Score = 0	None
	Score = 1	MinorInfDef
	Score = 3	MinorInfDef
	Score = 5	MajorInfDef
DEBRIS	Score = 0	None
	Score = 1	MinorInfDef
	Score = 3	MinorInfDef
	Score = 5	MajorInfDef
DebrisCH	Score = 0	None
	Score = 1	MinorInfDef

Table B-4 Locality Condition Data Conversion Logic		
Norfolk Manhole Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
DebrisCH	Score = 3	MinorInfDef
	Score = 5	MajorInfDef
LEAKAGE GPM	Score = 0	None
	Score = 1	MinorInfDef
	Score = 2	MinorInfDef
	Score = 3	MinorInfDef
	Score = 4	MinorInfDef
LEAKAGE	Yes	MinorInfDef
	Score = 1	MinorInfDef
	Score = 2	MinorInfDef
	Score = 3	MinorInfDef
	Score = 5	MajorInfDef
	Unknown	None
	No	None
Portsmouth Manhole Defects		
Locality Defect Category	Defect Description	Comparable Defect Category
CnCond	SOUND	None
	BROKEN	MajorStrDef
	CRACKED	MinorStrDef
	CRACKS (MULTIPLE)	MinorStrDef
	HOLE	MajorStrDef
	HOLES (MULTIPLE)	MajorStrDef
	JOINT OFFSET	MajorStrDef
	JOINT SEPARATED	MajorStrDef
	FRACTURE	MajorStrDef
CnLeak	NONE	None
	STAINS	MinorInfDef
	WEEPER	MinorInfDef
	DRIPPER	MinorInfDef
	RUNNER	MajorInfDef
WCond	SOUND	None
	BROKEN	MajorStrDef
	CRACKED	MinorStrDef
	CRACKS (MULTIPLE)	MinorStrDef
	HOLE	MajorStrDef
	HOLES (MULTIPLE)	MajorStrDef
	JOINT OFFSET	MajorStrDef
	JOINT SEPARATED	MajorStrDef
	FRACTURE	MajorStrDef
WLeak	NONE	None
	STAINS	MinorInfDef
	WEEPER	MinorInfDef
	DRIPPER	MinorInfDef
	RUNNER	MajorInfDef
BnchCond	SOUND	None
	BROKEN	MajorStrDef

Table B-4 Locality Condition Data Conversion Logic		
Portsmouth Manhole Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
BnchCond	CRACKED	MinorStrDef
	CRACKS (MULTIPLE)	MinorStrDef
	HOLE	MajorStrDef
	HOLES (MULTIPLE)	MajorStrDef
	JOINT OFFSET	MajorStrDef
	JOINT SEPARATED	MajorStrDef
	FRACTURE	MajorStrDef
BnchLeak	NONE	None
	STAINS	MinorStrDef
	GUSHER	MajorInfDef
	RUNNER	MajorInfDef
ChlCond	SOUND	None
	BROKEN	MajorStrDef
	CRACKED	MinorStrDef
	CRACKS (MULTIPLE)	MinorStrDef
	HOLE	MajorStrDef
	HOLES (MULTIPLE)	MajorStrDef
	JOINT OFFSET	MajorStrDef
	JOINT SEPARATED	MajorStrDef
	FRACTURE	MajorStrDef
ChlLeak	NONE	None
	STAINS	MinorStrDef
	I/I VISIBLE	MajorInfDef
ChmCond	SOUND	None
	BROKEN	MajorStrDef
	CRACKED	MinorStrDef
	CRACKS (MULTIPLE)	MinorStrDef
	HOLE	MajorStrDef
	HOLES (MULTIPLE)	MajorStrDef
	JOINT OFFSET	MajorStrDef
	JOINT SEPARATED	MajorStrDef
	FRACTURE	MajorStrDef
ChmLeak	FALSE	None
	TRUE	MinorInfDef
Frame_Dfcts	FASLE	None
	TRUE	MinorInfDef
Chmy_Dfcts	FALSE	None
	TRUE	MinorInfDef
Wall_Dfcts	FALSE	None
	TRUE	MinorInfDef
Chl_Dfcts	FALSE	None
	TRUE	MinorInfDef
Suffolk Defects		
Locality Defect Category	Defect Description	Comparable Defect Category
SCREAMStructScore	Score = 0	None
	Score = 6	MinorStrDef

Table B-4 Locality Condition Data Conversion Logic		
Suffolk Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
SCREAMStructScore	Score = 7	MinorStrDef
	Score = 12	MinorStrDef
	Score = 15	MinorStrDef
	Score = 25	MinorStrDef
	Score = 28	MinorStrDef
	Score = 33	MinorStrDef
	Score = 37	MinorStrDef
	Score = 38	MinorStrDef
	Score = 40	MinorStrDef
	Score = 43	MinorStrDef
	Score = 45	MinorStrDef
	Score = 55	MajorStrDef
	Score = 60	MajorStrDef
	Score = 66	MajorStrDef
	Score = 67	MajorStrDef
	Score = 75	MajorStrDef
	Score = 76	MajorStrDef
	Score = 77	MajorStrDef
	Score = 80	MajorStrDef
	Score = 81	MajorStrDef
	Score = 83	MajorStrDef
	Score = 85	MajorStrDef
	Score = 86	MajorStrDef
	Score = 90	MajorStrDef
	Score = 99	MajorStrDef
SCREAMMaintScore	Score = 0	None
	Score = 11	None
	Score = 15	None
	Score = 16	None
	Score = 17	None
	Score = 18	None
	Score = 24	None
	Score = 26	None
	Score = 30	None
	Score = 31	None
	Score = 32	None
	Score = 33	None
	Score = 35	None
	Score = 41	None
	Score = 50	MinorStrDef
	Score = 51	MinorStrDef
	Score = 53	MinorStrDef
	Score = 56	MinorStrDef
	Score = 62	MinorStrDef
	Score = 75	MinorStrDef
	Score = 81	MinorStrDef

Table B-4 Locality Condition Data Conversion Logic		
Suffolk Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
SCREAMMaintScore	Score = 85	MinorStrDef
	Score = 86	MinorStrDef
	Score = 88	MinorStrDef
	Score = 90	MinorStrDef
	Score = 95	MinorStrDef
	Score = 97	MinorStrDef
	Score = 98	MinorStrDef
	Score = 100	MinorStrDef
SCREAMTotalScore	Score = 0	None
	Score = 4	MinorStrDef
	Score = 6	MinorStrDef
	Score = 7	MinorStrDef
	Score = 10	MinorStrDef
	Score = 11	MinorStrDef
	Score = 12	MinorStrDef
	Score = 15	MajorStrDef
	Score = 16	MajorStrDef
	Score = 17	MajorStrDef
	Score = 18	MajorStrDef
	Score = 20	MajorStrDef
	Score = 24	MajorStrDef
	Score = 25	MajorStrDef
	Score = 26	MajorStrDef
	Score = 28	MajorStrDef
	Score = 29	MajorStrDef
	Score = 30	MajorStrDef
	Score = 31	MajorStrDef
	Score = 32	MajorStrDef
	Score = 33	MajorStrDef
	Score = 35	MajorStrDef
	Score = 38	MajorStrDef
	Score = 40	MajorStrDef
	Score = 43	MajorStrDef
	Score = 45	MajorStrDef
	Score = 50	MajorStrDef
	Score = 51	MajorStrDef
	Score = 53	MajorStrDef
	Score = 56	MajorStrDef
	Score = 60	MajorStrDef
	Score = 61	MajorStrDef
	Score = 64	MajorStrDef
	Score = 66	MajorStrDef
	Score = 67	MajorStrDef
	Score = 75	MajorStrDef
	Score = 76	MajorStrDef
	Score = 77	MajorStrDef

Table B-4 Locality Condition Data Conversion Logic		
Suffolk Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
SCREAMTotalScore	Score = 80	MajorStrDef
	Score = 81	MajorStrDef
	Score = 83	MajorStrDef
	Score = 85	MajorStrDef
	Score = 86	MajorStrDef
	Score = 88	MajorStrDef
	Score = 90	MajorStrDef
	Score = 95	MajorStrDef
	Score = 97	MajorStrDef
	Score = 98	MajorStrDef
	Score = 99	MajorStrDef
	Score = 100	MajorStrDef
SREAMIIScore	Score = 0	None
	Score = 4	MinorInfDef
	Score = 10	MinorInfDef
	Score = 11	MinorInfDef
	Score = 20	MinorInfDef
	Score = 51	MajorInfDef
Williamsburg Manhole Defects		
Locality Defect Category	Defect Description/Grade	Comparable Defect Category
Infiltration	FALSE/Score=1	None
	FALSE/Score=2	None
	FALSE/Score=3	None
	FALSE/Score=4	None
	FALSE/Score=5	None
	TRUE/Score=1	None
	TRUE/Score=2	MinorInfDef
	TRUE/Score=3	MinorInfDef
	TRUE/Score=4	MinorInfDef
	TRUE/Score=5	MajorInfDef
Roots	FALSE/Score=1	None
	FALSE/Score=2	None
	FALSE/Score=3	None
	FALSE/Score=4	None
	FALSE/Score=5	None
	TRUE/Score=1	None
	TRUE/Score=2	MinorStrDef
	TRUE/Score=3	MinorStrDef
	TRUE/Score=4	MinorStrDef
	TRUE/Score=5	MajorStrDef
Structure	FALSE/Score=1	None
	FALSE/Score=2	None
	FALSE/Score=3	None
	FALSE/Score=4	None
	FALSE/Score=5	None
	TRUE/Score=1	None

Table B-4 Locality Condition Data Conversion Logic		
Williamsburg Manhole Defects cont.		
Locality Defect Category	Defect Description/Grade	Comparable Defect Category
Structure	TRUE/Score=2	MinorStrDef
	TRUE/Score=3	MinorStrDef
	TRUE/Score=4	MinorStrDef
	TRUE/Score=5	MajorStrDef
York Manhole Defects		
Locality Defect Category	Defect Description	Comparable Defect Category
Infiltration	0	None
	Unknown	None
	None	None
	Mild	MinorStrDef
	Moderate	MinorStrDef
	Severe	MajorStrDef
FrameSealCon	None	None
	Sound	None
	Cracked	MinorStrDef
	Missing	MinorStrDef
	Loose	MinorStrDef
	Offset	MajorStrDef
Frame	None	None
	Sound	None
	Soun	None
	Sund	None
	Suno	None
	G	None
	C	None
	Corroded	MinorStrDef
	Cracked	MinorStrDef
	BR	MajorStrDef
	Broken	MajorStrDef
P1 SEAL	None	None
	Sound	None
	S	None
	D	None
	GR	None
	P	None
	IS	None
	C	None
	RH	None
	R	None
	IW	MinorStrDef
	ID	MinorStrDef
	IG	MajorStrDef
	IR	MajorStrDef
	I/I	MajorStrDef
P2 SEAL	None	None
	Sound	None

Table B-4 Locality Condition Data Conversion Logic		
York Manhole Defects cont.		
Locality Defect Category	Defect Description	Comparable Defect Category
P2 SEAL	SS	None
	S	None
	C	None
	LB	None
	D	None
	IS	None
	P	None
	IS	None
	GR	None
	RM	MinorStrDef
	IW	MinorStrDef
	IG	MajorStrDef
	IR	MajorStrDef
P3 SEAL	None	None
	Sound	None
	S	None
	D	None
	GR	None
	IS	None
	P	None
	RW	MinorStrDef
	IW	MinorStrDef
	ID	MinorStrDef
	IR	MajorStrDef
	I/I	MajorStrDef
P4 SEAL	None	None
	S	None
	LB	None
	D	None
	IS	None
	P	None
	ID	MinorStrDef
	IW	MinorStrDef
	IG	MajorStrDef
	IR	MajorStrDef

Appendix C: RHM Conveyance System Capacity Enhancement Solutions Table and Maps

RHM Wet Weather Capacity Improvement Elements Table

RWWMP RHM Solution Set Maps

4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL by Treatment Plan Service Area

Peak HGL Documentation Sites by Treatment Plant Service Area

4-Year Wet Weather Event Simulated 1-Hour Average Peak Depths by Treatment Plant Service Area

Peak Depth Documentation Sites by Treatment Plant Service Area

Appendix C: RHM Wet Weather Capacity Improvement Elements Table

RHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix C Map Reference
AB	HRSD	FM	Terminal Blvd/ Hampton Blvd FM	Upgrade 7,300 LF of 30" FM with 36" FM along Terminal Blvd. and Hampton Blvd. from Diven Street to Sewell's Point Elementary School	Figure 1
AB	HRSD	PRS	Terminal PRS	Upgrade PRS to 55 ft. of assistance - Existing Location	Figure 1
AB	NORF	PS	NORF-PS-016	NORF Pump Station 016	Figure 1
AB	NORF	PS	NORF-PS-022	NORF Pump Station 022	Figure 1
AB	NORF	PS	NORF-PS-068	NORF Pump Station 068	Figure 1
AT	CHES	FM	CHES-PS-067 FM	Install 1,930 LF of 10" Discharge force main downstream of Chesapeake pump station 067 (114 Mann Dr.)	Figure 2
AT	CHES	FM	CHES-PS-073 Jumper	Install 30 LF of 6-Inch Jumper pipe to connect Chesapeake PS 073 to a force main downstream of Chesapeake PS 219	Figure 2
AT	CHES	PS	CHES-PS-012	CHES Pump Station 012; 935 Mains Creek Rd.	Figure 2
AT	CHES	PS	CHES-PS-056	CHES Pump Station 056; 4632 Bainbridge Blvd	Figure 2
AT	CHES	PS	CHES-PS-072	CHES Pump Station 072; 100 Tilden Ave	Figure 2
AT	HRSD	FM	Virginia Beach Blvd. FM - I	Parallel a new 30 in and new 24 in (36" Equivalent) and associated locality connections (Based on old line connections) - Install 10,000 LF new FM along Virginia Beach Blvd. from Independence PRS to Lynn Shores Dr (New Alignment)	Figure 2
AT	HRSD	FM	Virginia Beach Blvd. FM - II	Parallel a new 30 inch with existing 24 in (36" Equivalent) - Install 5,100 LF new FM along Virginia Beach Blvd. from Lynn Shores Dr to Little Neck Road	Figure 2
AT	HRSD	FM	Virginia Beach Blvd. FM - III	Parallel a new 30" with existing 24" (36" Equivalent) - Install 1,200 LF new FM along Virginia Beach Blvd. from Little Neck Road to West of Groveland Rd.	Figure 2
AT	HRSD	FM	Virginia Beach Blvd. FM - IV	Parallel a new 36" with existing 24" (42" Equivalent) - Install 4,420 LF new FM along Virginia Beach Blvd. from West of Groveland Rd. to Pine Tree PRS	Figure 2
AT	HRSD	FM	Birdneck - General Booth Blvd. FM - I	Parallel a new 42" with existing 42" (54" Equivalent) - Install 5,310 LF along General Booth Blvd. from easement connection North of Berknor Drive to Dam Neck Road.	Figure 2
AT	HRSD	FM	Birdneck - General Booth Blvd. FM - II	Parallel a new 42" with existing 42" (54" Equivalent) - Install 11,500 LF new FM along Birdneck Road from Owl Creek Golf Course to General Booth Blvd.	Figure 2
AT	HRSD	FM	Birdneck - General Booth Blvd. FM - III	Parallel a new 42" with existing 42" (54" Equivalent) - 3,000 LF along Birdneck Road from Southern Blvd to Owl Creek Golf Course	Figure 2
AT	HRSD	FM	Great Bridge Blvd FM	Downsize 7,100 LF of 24" FM to 20" FM along Great Bridge Blvd from Battlefield Blvd to Willow Pt Arch to improve self cleaning velocities	Figure 2
AT	HRSD	FM	Battlefield Blvd South FM - I	Parallel 5,850 LF of 24" new FM along Battlefield Blvd South from intersection of Johnstown Rd and Mt. Pleasant Rd. to Edna St.	Figure 2
AT	HRSD	FM	Battlefield Blvd South FM - II	Install 8,580 LF of 24" FM Along Battlefield Blvd from Edna St. to Hillwell Road	Figure 2
AT	HRSD	FM	Dominion Blvd; Chesapeake Southern Loop FM	Install 47,650 LF of 24" FM as part of the Chesapeake Southern Loop from Cedar Rd. to Battlefield Blvd.	Figure 2
AT	HRSD	FM	Lynnhaven Pkwy FM	Upgrade 8,500 of 42" GM along Buckner Blvd from Lynnhaven Pkwy to Holland Road	Figure 2
AT	HRSD	GM	Great Bridge Blvd. GM Improvement - I	Upgrade 3,530 LF of 18" GM with 24" GM	Figure 2
AT	HRSD	GM	Great Bridge Blvd. GM Improvement - II	Upgrade 760 LF of 15" GM with 18" GM	Figure 2
AT	HRSD	PRS	Dominion Blvd. PRS	Install new PRS with 75 ft of assistance - New Location	Figure 2
AT	HRSD	PRS	Pine Tree PRS	Upgrade PRS to 80 ft of assistance - Existing Location	Figure 2
AT	HRSD	PRS	Laskin Road PRS	Upgrade PRS to 80 ft of assistance - Existing Location	Figure 2
AT	HRSD	PRS	Kempsville PRS	Upgrade PRS to 65 ft of assistance - Existing Location	Figure 2
AT	HRSD	PRS	Hillwell PRS	Install new PRS with 70 ft of assistance - New Location	Figure 2
AT	HRSD	PRS	Elbow Road PRS	Install permanent PRS with 80 ft of assistance - New Location	Figure 2
AT	HRSD	PRS	Courthouse PRS	Install permanent PRS with 80 ft of assistance - New Location	Figure 2
AT	HRSD	PRS	Atlantic PRS	Upgrade PRS to 80 ft of assistance - Existing Location	Figure 2
AT	HRSD	PRS	Independence PRS	Upgrade PRS to 80 ft of assistance - Existing Location	Figure 2
AT	HRSD	PS	Dozier's Corner PS	SS-PS-109	Figure 2
AT	HRSD	Storage	Oceana Storage	Install new 4.9 MG storage tank	Figure 2
AT	HRSD	Storage	Shipps Corner Storage	Install new 3.1 MG storage tank	Figure 2

RHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix C Map Reference
AT	VAB	PS	VAB-PS-120	VAB Pump Station 120; Terrace Ave	Figure 2
AT	VAB	PS	VAB-PS-455	VAB Pump Station 455; Brigadoon Waff	Figure 2
AT	VAB	PS	VAB-PS-508	VAB Pump Station 508; Mount Trashmore	Figure 2
AT	VAB	PS	VAB-PS-544	VAB Pump Station 544; Green Run Dahlia South	Figure 2
BH	HAMP	FM	HAMP PS 002 FM Improvement	Extend 1,200 LF of 4" discharge force main along Ivy Home Road into a City gravity manhole near Congress Avenue to reroute flow to the HRSD GM interceptor along Kecoughtan Road upstream of Claremont Avenue PS.	Figure 3
BH	HAMP	FM	HAMP PS 006 FM Improvement	Extend 730 LF of 8" discharge force main along Chamberlin Avenue into a City gravity manhole near North Mallory Street to reroute flow to the end of the HRSD GM interceptor along North Hope Street upstream of Willard Avenue PS.	Figure 3
BH	HRSD	GM	35th St GM Improvement	Upgrade 1,470 LF of 18" GM with 24" GM	Figure 3
BH	HRSD	GM	Mercury Blvd and Newmarket GM Improvement - I	Install 3,090 LF of 30" GM; Gravity main u/s of Newmarket Creek PS	Figure 3
BH	HRSD	GM	Mercury Blvd and Newmarket GM Improvement - II	Install 3,780 LF of 36" GM	Figure 3
BH	HRSD	GM	Claremont Ave GM Improvement -I	Upgrade 6,490 LF to 42" GM	Figure 3
BH	HRSD	GM	Claremont Ave GM Improvement -II	Upgrade 2,180 LF of 24" GM to 36" GM	Figure 3
BH	HRSD	GM	Washington St GM Improvement - I	Install 1,040 LF of 24" GM	Figure 3
BH	HRSD	GM	Washington St GM Improvement - II	Install 2,380 LF of 30" GM	Figure 3
BH	HRSD	GM	Copeland Park GM Improvement	Upgrade 2,260 LF of 24" GM to 36" GM; U/S of Copeland Park PS along railroad tracks to Aluminium Avenue (NG-109)	Figure 3
BH	HRSD	PS	Claremont PS	NS-PS-208	Figure 3
BH	HRSD	PS	Copeland Park PS	NS-PS-209	Figure 3
BH	HRSD	PS	Newmarket Creek PS	NS-PS-219	Figure 3
BH	HRSD	Siphon	Claremont Siphon - Chesapeake Ave and Robinson Rd	Upgrade 70 LF of 42" inverted siphon along Chesapeake Avenue upstream of NS-PS-208	Figure 3
BH	HRSD	Siphon	Claremont Siphon - Indian River	Upgrade 70 LF of 42" inverted siphon along Chesapeake Avenue upstream of NS-PS-208	Figure 3
BH	HRSD	Storage	14th St Storage	Install new 4.3 MG storage tank	Figure 3
BH	HRSD	Storage	58th St Storage	Install new 2.5 MG storage tank	Figure 3
JR	HRSD	FM	Jefferson Avenue FM Improvement	Upgrade 6,520 LF of 12" , 14", 16" FM with 30 " FM	Figure 4
JR	HRSD	PRS	Lucas Creek PRS	Upgrade PRS to 65 ft. of assistance - Existing Location	Figure 4
JR	HRSD	PRS	Tabb PRS	Install new PRS with 80 ft. of assistance - New Location	Figure 4
JR	HRSD	PS	Morrison PS	NS-PS-218	Figure 4
JR	HRSD	Storage	Tabb Storage	Install new 1 MG storage tank	Figure 4
JR	NEWP	PS	NEWP-PS-019	NEWP PS 019 (WWPAS)	Figure 4
JR	NEWP	PS	NEWP-PS-068	NEWP PS-068 (WWPCP)	Figure 4
JR	POQ	PS	POQ-PS-001	POQ Pump Station 001	Figure 4
JR	YORK	PS	YORK-PS-019	YORK Pump Station 019; King's Villa	Figure 4
NA	CHES	FM	Holland Blvd FM Improvement	Upsize 90 LF of 4" to 10" FM; d/s of CHES-PS-089; Along Holland Blvd to Cavalier Blvd	Figure 5
NA	CHES	PS	CHES-PS-046	CHES Pump Station 046; 3733 Cannon Point Dr	Figure 5
NA	CHES	PS	CHES-PS-069	CHES Pump Station 069; 4224 Meadowood Dr	Figure 5
NA	CHES	PS	CHES-PS-084	CHES Pump Station 084; 2415 Drum Creek Rd	Figure 5
NA	CHES	PS	CHES-PS-089	CHES Pump Station 089; 1022 Cavalier Blvd	Figure 5
NA	CHES	PS	CHES-PS-158	CHES Pump Station 158; 4236 Airline Blvd	Figure 5
NA	CHES	PS	CHES-PS-246	CHES Pump Station 246; 3000 Bromay St	Figure 5
NA	HRSD	FM	Jumper FM CHES-PS-041	150 LF of 16" Jumper FM; d/s of CHES-PS-41; along Canal Drive to S. Military Hwy	Figure 5
NA	HRSD	FM	Jumper FM PORT-PS-047	25 LF of 8" Jumper; d/s of PORT-047; direct connect PS discharge to HRSD FM	Figure 5
NA	HRSD	FM	Shingle Creek FM Improvement - I	Install 2,730 LF of 8 " FM; SS-PS-SC2 discharge force main along US 460 to Elm St.	Figure 5
NA	HRSD	FM	Shingle Creek FM Improvement - II	Install 4,370 LF of 16 " FM; SS-PS-SC1 discharge force main to US 460 and Elm St.	Figure 5

RHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix C Map Reference
NA	HRSD	FM	Shingle Creek FM Improvement - III	Install 780 LF of 18 " FM; SS-PS-SC1 and -SC2 joint force main along US 460 past Wilroy Road	Figure 5
NA	HRSD	GM	Shingle Creek GM Improvement - I	upgrade 6,360 LF of 18" GM with 21" GM; Shingle Creek Interceptor (upstream of RP extent to the south)	Figure 5
NA	HRSD	GM	Shingle Creek GM Improvement - II	Install 250 LF of 21" GM; Shingle Creek Interceptor upstream of PS-SC1	Figure 5
NA	HRSD	GM	Shingle Creek GM Improvement - III	Install 590 LF of 18" GM; Shingle Creek Interceptor upstream of PS-SC1	Figure 5
NA	HRSD	GM	Shingle Creek GM Improvement - IV	Install 420 LF of 8" GM; Shingle Creek Interceptor upstream of PS-SC2	Figure 5
NA	HRSD	GM	Shingle Creek GM Improvement - V	Install 900 LF of 12" GM; Shingle Creek Interceptor upstream of PS-SC2	Figure 5
NA	HRSD	GM	Cedar Lane PS GM Improvement	Upgrade 910 LF from 18" to 24" GM upstream of Cedar Lane PS	Figure 5
NA	HRSD	PRS	Constance Rd PRS	Install new PRS with 80 ft of assistance - New Location	Figure 5
NA	HRSD	PRS	Nansemond River PRS	Install new PRS with 80 ft of assistance - New Location	Figure 5
NA	HRSD	PRS	Western Branch PRS	Install new PRS with 80 ft of assistance - New Location	Figure 5
NA	HRSD	PRS	Wilroy PRS	Install new PRS with 80 ft of assistance - New Location	Figure 5
NA	HRSD	PS	Cedar Lane PS	SS-PS-104	Figure 5
NA	HRSD	PS	Shingle Creek PS 1 (Suffolk PS Replacement 1)	SS-PS-SC1	Figure 5
NA	HRSD	PS	Shingle Creek PS 2 (Suffolk PS Replacement 2)	SS-PS-SC2	Figure 5
NA	HRSD	Storage	Wilroy Storage	Install new 2.9 MG storage tank	Figure 5
NA	IOW	PS	IOW-PS-013	IOW Pump Station 013; Shirley T. Holland #2	Figure 5
NA	IOW	PS	IOW-PS-026	IOW Pump Station 026; Gatling Pointe	Figure 5
NA	SUFF	FM	Respass Beach Rd FM	Upsize 930 LF of 8" to 10" FM; d/s of SUFF-PS-110; Along Respass Beach Rd. to Burbage Lake Cir.	Figure 5
NA	SUFF	FM	East Washington St FM	Extend 10" FM by 1,230 LF; u/s of SS-PS-SC1; Along East Washington Street	Figure 5
NA	SUFF	FM	Old Town Point Rd FM	Upsize 3,000 LF of 4" to 8" FM; d/s of SUFF-PS-054; Along Old Town Point Rd to College Dr HRSD connection point	Figure 5
VIP	CHES	PS	CHES-PS-007	CHES Pump Station 007; 1101 Freeman Ave	Figure 6
VIP	CHES	PS	CHES-PS-060	CHES Pump Station 060; 1000 Oleander Ave	Figure 6
VIP	HRSD	FM	Chesapeake Blvd FM	Upsize 110 ft of 12-inch force main to 16-inch immediately d/s from Chesapeake Blvd PS to Chesapeake Blvd.	Figure 6
VIP	HRSD	FM	Seay Avenue PS Line FM Improvement	Upgrade 3,750 LF 8” FM with 12” FM from Seay Ave. PS to Virginia Beach Blvd.	Figure 6
VIP	HRSD	FM	Steamboat Creek FM Improvement	Install 340 LF of 16" FM downstream of Steamboat Creek PS	Figure 6
VIP	HRSD	FM	Robin Hood Road FM Improvement	Upgrade 3,630 LF 12” FM with 16” FM along Robin Hood Rd. from PS-057 to Chesapeake Blvd. - CIP is approximately 2,800 LF	Figure 6
VIP	HRSD	GM	Ford Dr GM Improvement	Upgrade 560 LF of 8" GM with 10" GM - CIP includes rehab for pipeline and manholes outside of VIP-GM-R100 project scope	Figure 6
VIP	HRSD	GM	Ferebee Avenue GM Influent Improvement	Upgrade 1,100 LF of 18" GM with 24" GM along Bainbridge Blvd	Figure 6
VIP	HRSD	GM	Bainbridge Blvd. PS GM Improvement	Upgrade 760 LF of 8" GM with 12" GM along Bainbridge Blvd between S Main Street and Lancaster Street	Figure 6
VIP	HRSD	GM	Park Ave. GM Improvements - I	Upgrade 3,720 LF of 18" and 24" to 30" GM	Figure 6
VIP	HRSD	GM	Park Ave. GM Improvements - II	Upgrade 2,170 LF of 18" GM to 24" GM	Figure 6
VIP	HRSD	GM	Norchester St. GM Improvement	Upgrade 2,930 LF of 24" GM to 27" GM	Figure 6
VIP	HRSD	PRS	State St PRS	Install new PRS with 35ft of assistance - New Location	Figure 6
VIP	HRSD	PS	Ashland Circle PS	SS-PS-102	Figure 6
VIP	HRSD	PS	Chesapeake Blvd. PS	SS-PS-105	Figure 6
VIP	HRSD	PS	City Park PS	SS-PS-106	Figure 6
VIP	HRSD	PS	Ferebee Ave PS	SS-PS-110	Figure 6
VIP	HRSD	PS	Monroe Place PS	SS-PS-114	Figure 6
VIP	HRSD	PS	Park Ave PS	SS-PS-119	Figure 6
VIP	HRSD	PS	Richmond Crescent PS	SS-PS-124	Figure 6
VIP	HRSD	PS	Willoughby Ave PS	SS-PS-132	Figure 6
VIP	HRSD	PS	Hanover Ave PS	SS-PS-141	Figure 6
VIP	HRSD	PS	Jamestown Crescent PS	SS-PS-142	Figure 6
VIP	HRSD	PS	Camden Ave. PS	SS-PS-146	Figure 6
VIP	HRSD	PS	Ingleside Rd PS	SS-PS-148	Figure 6

RHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix C Map Reference
VIP	HRSD	Storage	State Street Storage	Install new 2.3 MG storage tank	Figure 6
VIP	HRSD	Storage	May Ave Storage	Install new 1.9 MG storage tank	Figure 6
VIP	NORF	FM	NORF-PS-020 FM Realignment	Connection to HRSD Portsmouth FM from NORF-PS-020; Install 900 LF of 6" FM	Figure 6
VIP	NORF	FM	NORF-PS-048 FM Realignment	1,575 LF of 6" FM NORF PS-048 Reroute to GM u/s of Chesapeake Blvd. PS	Figure 6
VIP	NORF	FM	Raby Rd FM Improvement	Upgrade 75 LF of 6" to 10" FM; Immediately d/s from NORF PS-091 to FM along Raby Rd	Figure 6
VIP	NORF	FM	Victoria Ave FM	Install 1,100 LF of 12" FM Immediately d/s from NORF PS-149, along Victoria Ave and Norchester Ave to I-264.	Figure 6
VIP	NORF	FM	Powhatan and Magnolia Ave Manifolded FM Improvement - I	Upgrade 1,700 LF of 4" FM with 6" FM along Powhatan Ave. from PS-112 to Walnut Hill St.	Figure 6
VIP	NORF	FM	Powhatan and Magnolia Ave Manifolded FM Improvement - II	Upgrade 670 LF of 6" FM with 8" FM along Powhatan Ave. from Magnolia Ave. to Powhatan Ave. PS	Figure 6
VIP	NORF	FM	Powhatan and Magnolia Ave Manifolded FM Improvement - III	Upgrade 1,400 LF of 6" FM with 8" FM along Powhatan Ave. from Walnut Hill St. to Magnolia Ave.	Figure 6
VIP	NORF	FM	Powhatan and Magnolia Ave Manifolded FM Improvement - IV	Upgrade 2,800 LF of 3" FM with 4" FM from PS-114 along Westwood Ter. to Powhatan Ave. & Magnolia Ave.	Figure 6
VIP	NORF	GM	NORF PS 097 GM Improvement	Upgrade 50 LF of 6" GM to 12" GM	Figure 6
VIP	NORF	PS	NORF-PS-091	NORF Pump Station 091	Figure 6
VIP	NORF	PS	NORF-PS-149	NORF Pump Station 149	Figure 6
VIP	PORT	GM	Camden Ave. GM Improvement - I	Upgrade 1,670 LF of 12" GM to 15" GM	Figure 6
VIP	PORT	GM	Camden Ave. GM Improvement - II	Upgrade 2,170 LF of 17" GM to 21" GM and 370 LF of 15" GM to 18" GM	Figure 6
VIP	PORT	PS	PORT-PS-002	PORT Pump Station 002; Glasgow Street PS	Figure 6
VIP	PORT	PS	PORT-PS-006	PORT Pump Station 006; Douglas Avenue PS	Figure 6
VIP	PORT	PS	PORT-PS-008	PORT Pump Station 008; Clifford Street PS	Figure 6
VIP	PORT	PS	PORT-PS-055	PORT Pump Station 055; Pinners Point PS	Figure 6
WB	HRSD	FM	Williamsburg Crossing FM	Install 2,090 LF of 24" FM; Routing Jamestown Rd flow to co-located Tank/PRS (Williamsburg Crossing)	Figure 7
WB	HRSD	PRS	Route 199 PRS	Upgrade PRS to 80 ft of assistance - Existing Location	Figure 7
WB	HRSD	PRS	Longhill PRS	Install new PRS with 80 ft of assistance - New Location	Figure 7
WB	HRSD	PRS	Williamsburg Crossing PRS	Install new PRS with 70 ft of assistance - New Location	Figure 7
WB	HRSD	Storage	Colonial Williamsburg Extended WW	Extended wet well storage at Colonial Williamsburg PS	Figure 7
WB	HRSD	Storage	Lodge Rd Extended WW	Extended wet well storage at Lodge Rd PS	Figure 7
WB	HRSD	Storage	Williamsburg Crossing Storage	Install 1.8 MG Storage Tank	Figure 7
WB	JCSA	FM	JCSA-PS-003-6 FM Realignment - I	Upgrade existing 2,740 LF of 8" FM to 16" FM; Inclusion of JCSA-PS-003-6 as terminal station	Figure 7
WB	JCSA	FM	JCSA-PS-003-6 FM Realignment - II	Install 920 LF of new 16" FM; Inclusion of JCSA-PS-003-6 as terminal station	Figure 7
WB	JCSA	PS	JCSA-PS-003-3	JCSA Pump Station 003-3; Lake Powell	Figure 7
WB	JCSA	PS	JCSA-PS-003-6	JCSA Pump Station 003-6; Hickory Signpost Rd, conversion to terminal station	Figure 7
WB	JCSA	PS	JCSA-PS-004-8	JCSA Pump Station 004-8; Raleigh Square	Figure 7
WB	JCSA	PS	JCSA-PS-006-2	JCSA Pump Station 006-2; Forest Heights Road	Figure 7
WB	NEWP	FM	NEWP-PS-172 FM	Upsize 1,160 LF of 6" FM downstream of pump station 172 along Crafford Road	Figure 7
WB	WB	PS	WILL-PS-012	WILL Pump Station 012	Figure 7
YR	GLOU	PS	GLOU-013	GLOU Pump Station 013; Gloucester Courthouse PS	Figure 8
YR	GLOU	PS	GLOU-016	GLOU Pump Station 016; Rt 1202 Terrapin Cove Road	Figure 8
YR	HAMP	PS	HAMP-121	HAMP Pump Station 121; Westminister PS	Figure 8
YR	HAMP	PS	HAMP-123	HAMP Pump Station 123; Riverdale Dr	Figure 8
YR	HAMP	PS	HAMP-130	HAMP Pump Station 130; Big Bethel PS	Figure 8
YR	HAMP	PS	HAMP-134	HAMP Pump Station 134; Tidemill Ln	Figure 8
YR	HRSD	FM	Bay Shore Lane FM	New Bayshore Lane PS discharge force main to route flow parallel to the influent gravity line along Seaboard Avenue to the existing HRSD forcemain near Nickerson Boulevard; Install 4,700 LF of 14" FM	Figure 8

RHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix C Map Reference
YR	HRSD	PRS	Yorktown PRS	Install new PRS with 80 ft of assistance - New Location	Figure 8
YR	HRSD	PS	Bay Shore Lane	NS-PS-203	Figure 8
YR	HRSD	PS	Bloxom's Corner	NS-PS-204	Figure 8
YR	HRSD	PS	Langley Circle	NS-PS-217	Figure 8
YR	HRSD	PS	Freeman Drive	NS-PS-238	Figure 8
YR	HRSD	Storage	Coliseum Storage	Add 2.4 MG Storage Tank to Coliseum site	Figure 8

Appendix C: RWWMP RHM Solution Set Maps

Appendix C – Figure 1

Appendix C – Figure 2

Appendix C – Figure 3

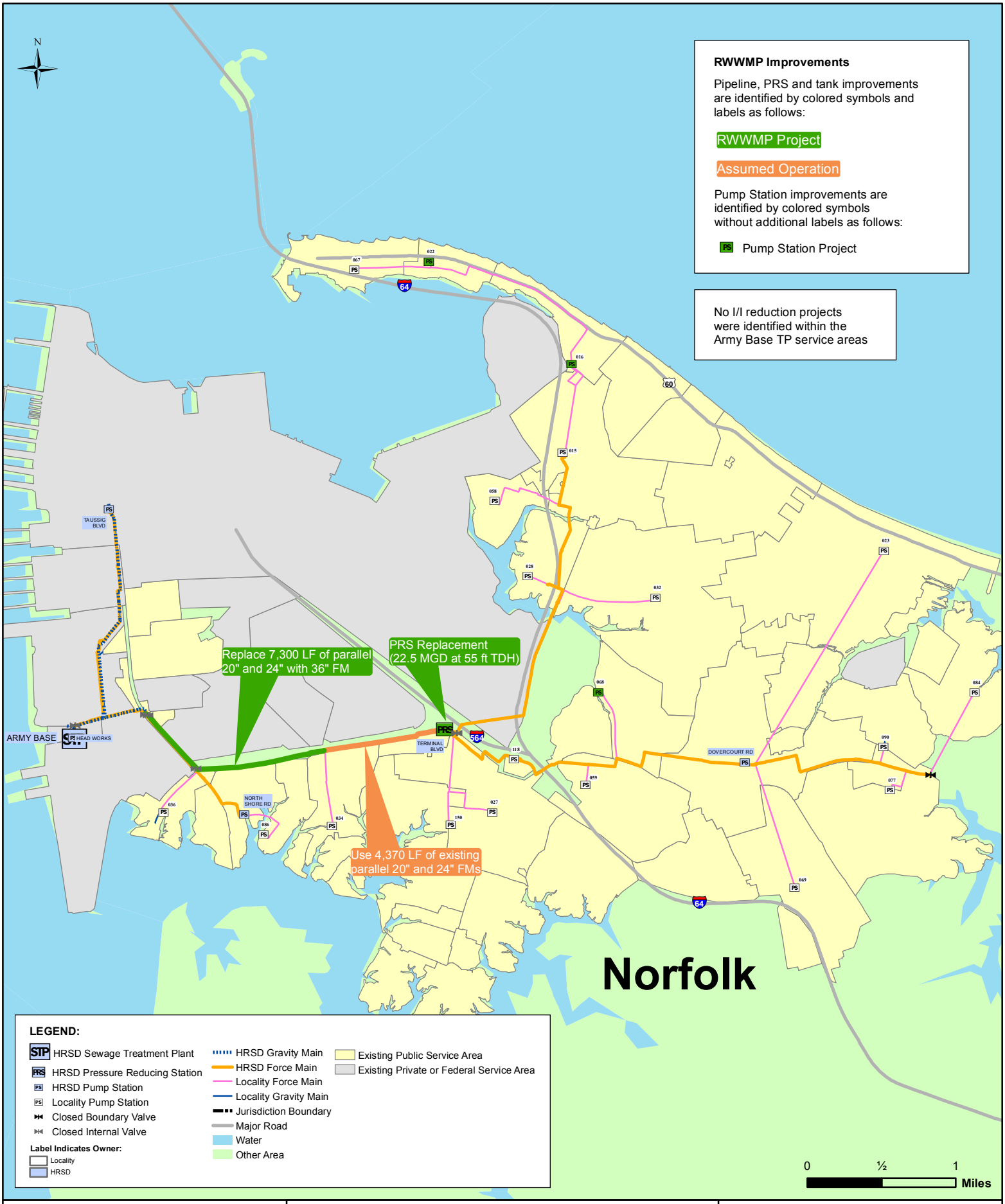
Appendix C – Figure 4

Appendix C – Figure 5

Appendix C – Figure 6

Appendix C – Figure 7

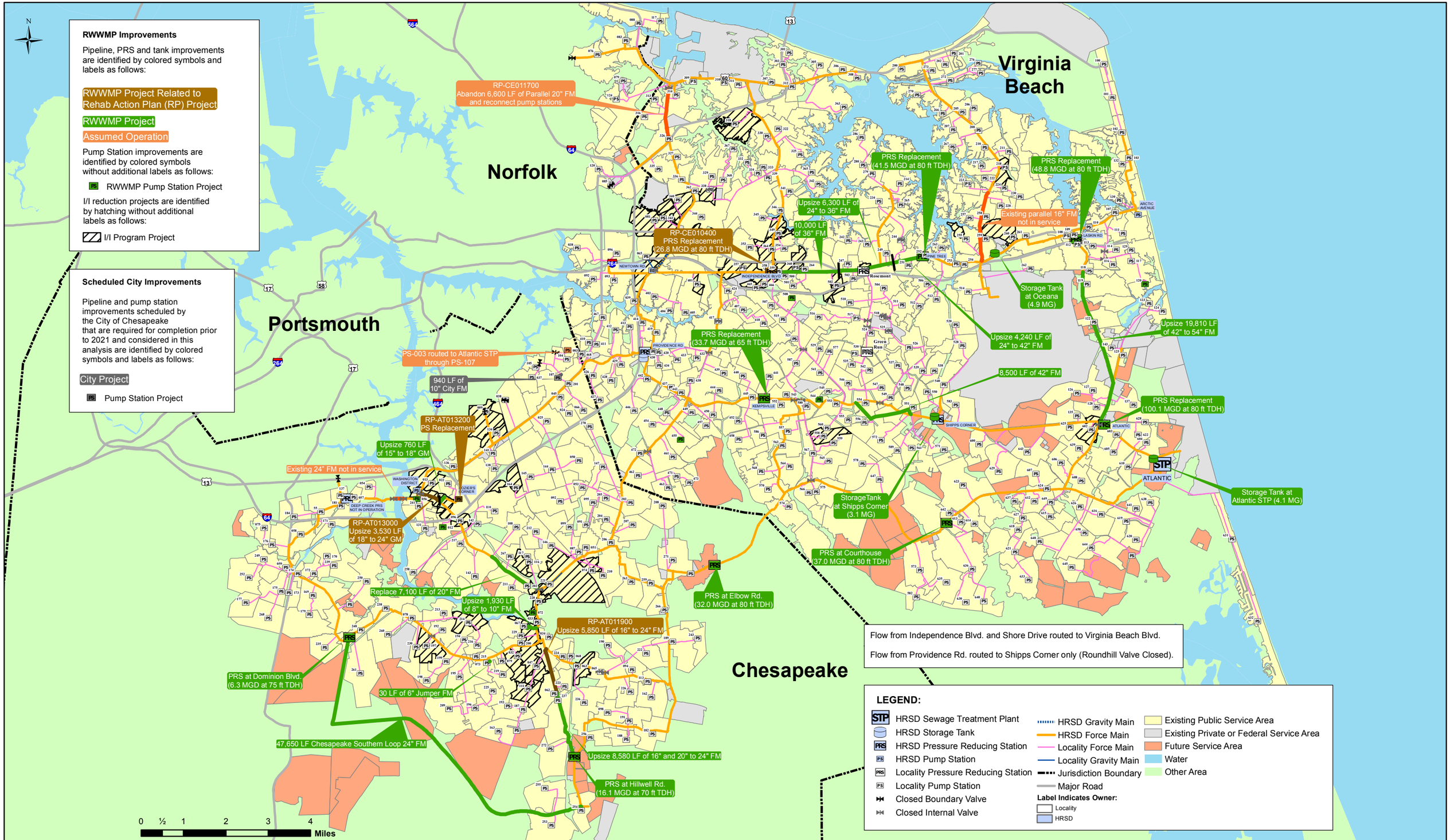
Appendix C – Figure 8



Regional Wet Weather Management Plan

Appendix C - Figure 1
Army Base TP
RWWMP RHM Solution Set
for 4-Year 2030 Flow Conditions
with RWWMP I/I Program

9/19/2017

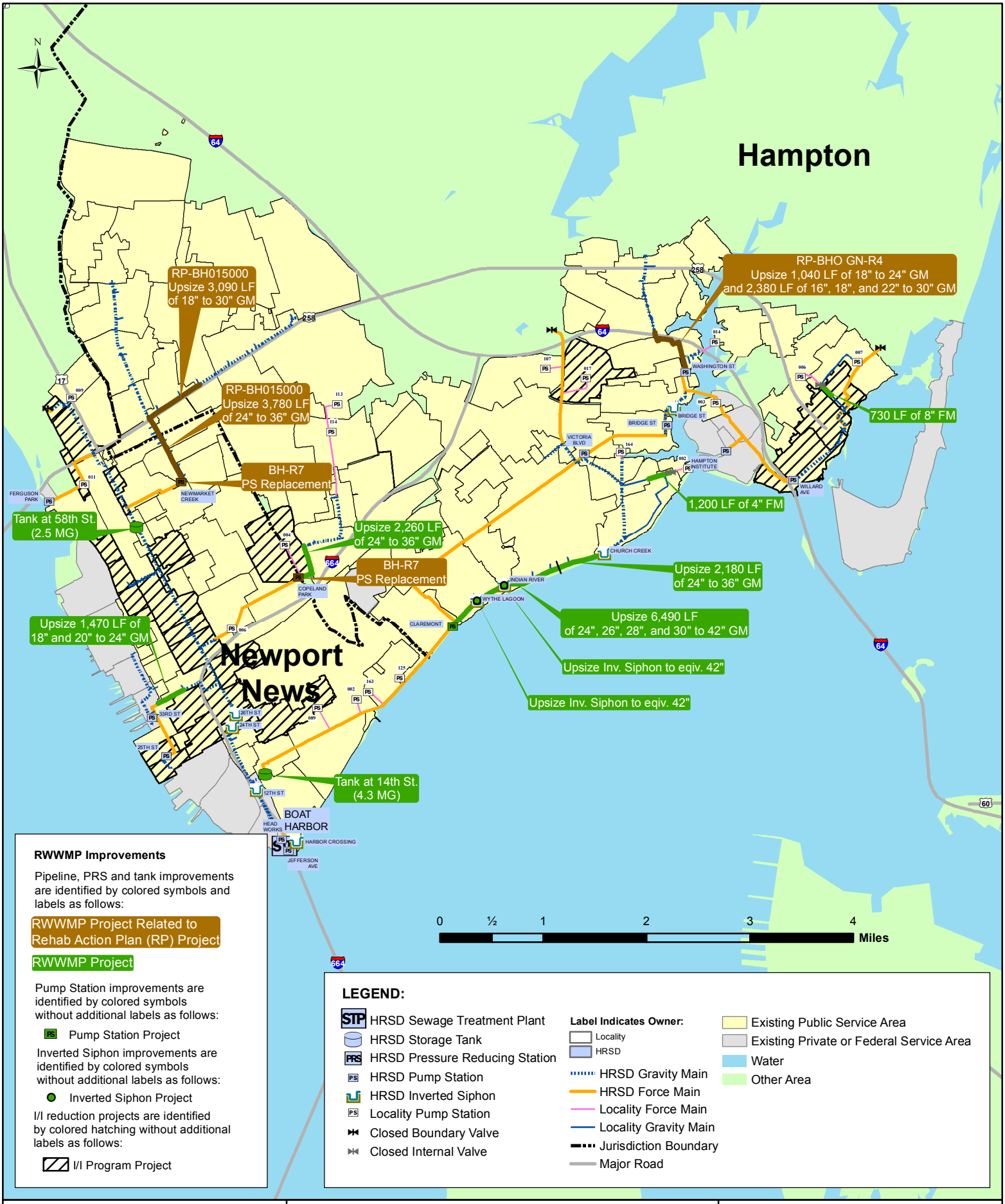


HRSD

Regional Wet Weather Management Plan

Appendix C - Figure 2
Atlantic TP
RWWMP RHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

9/19/2017



HRSD

Regional Wet Weather Management Plan

Appendix C - Figure 3
Boat Harbor TP
RWWMP RHM Solution Set
for 4-year 2030 Flow Condition
with RWWMP I/I Program

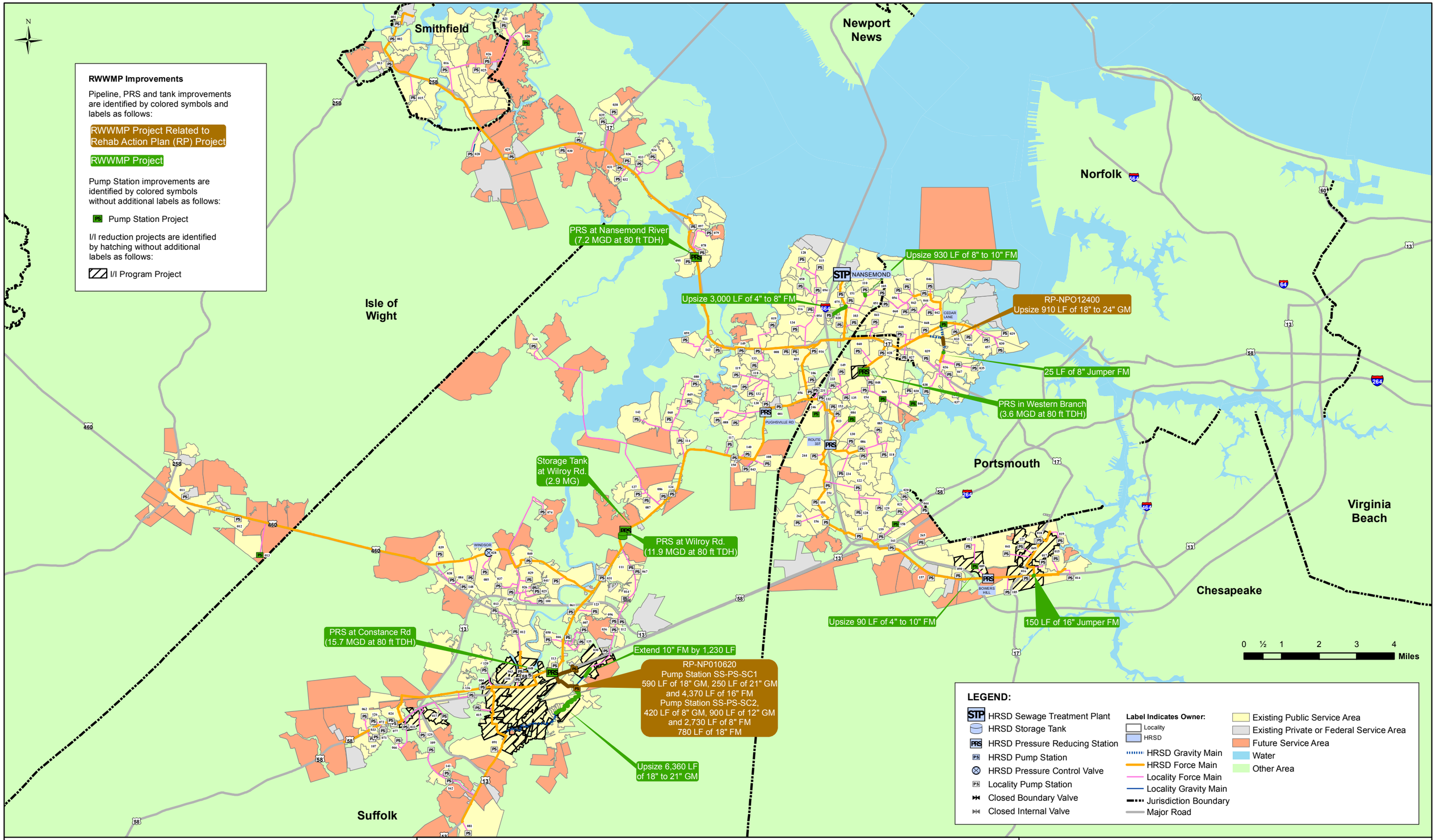
9/19/2017

HRSD

Regional Wet Weather Management Plan

Appendix C - Figure 4
James River TP
RWWMP RHM Solution Set
for 4-year 2030 Flow Condition
with RWWMP I/I Program

9/19/2017



HRSD

Regional Wet Weather Management Plan

Appendix C - Figure 5
Nansemond TP
RWWMP RHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

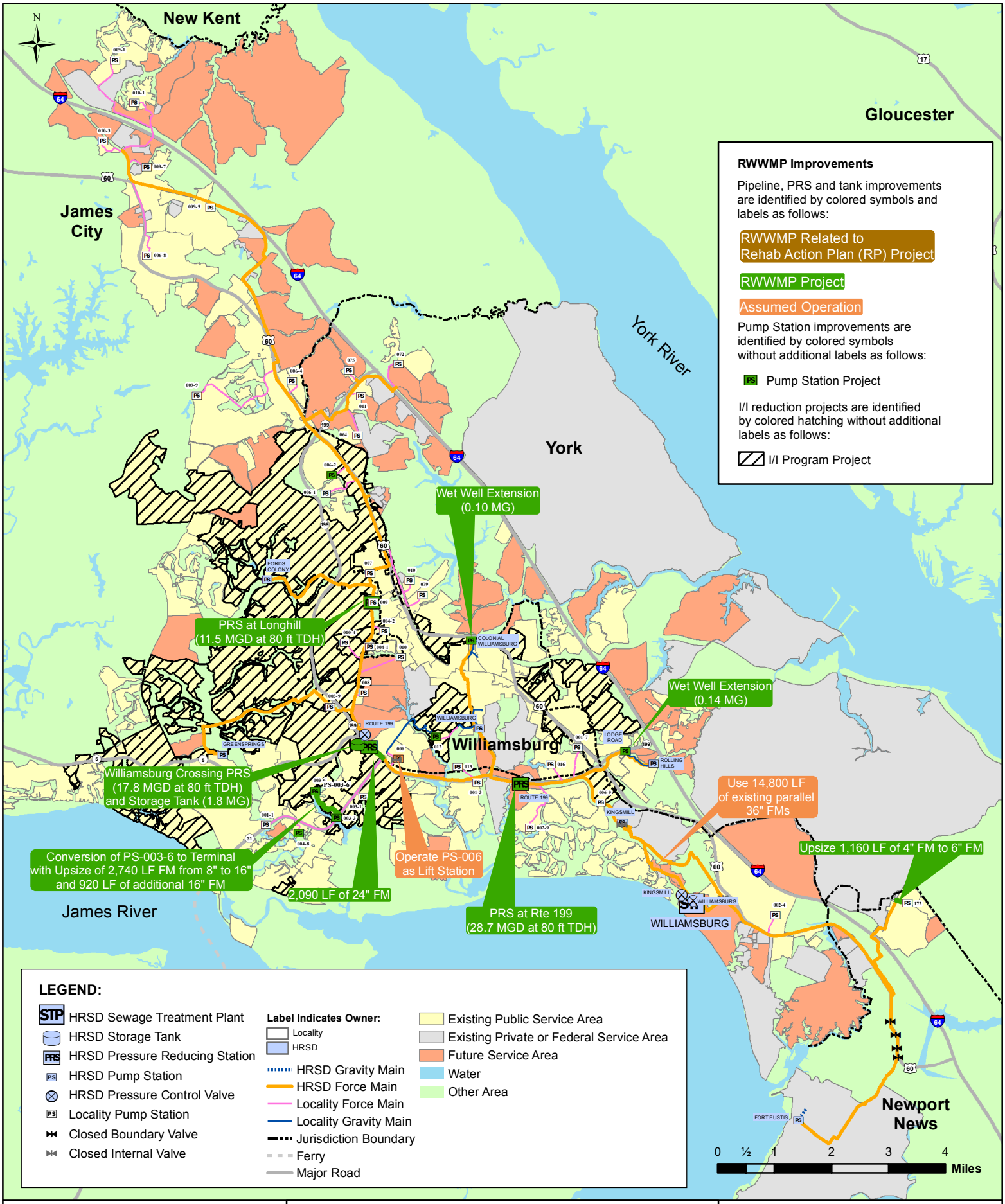
9/19/2017

HRSD

Regional Wet Weather Management Plan

Appendix C - Figure 6
Virginia Initiative TP
RWWMP RHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

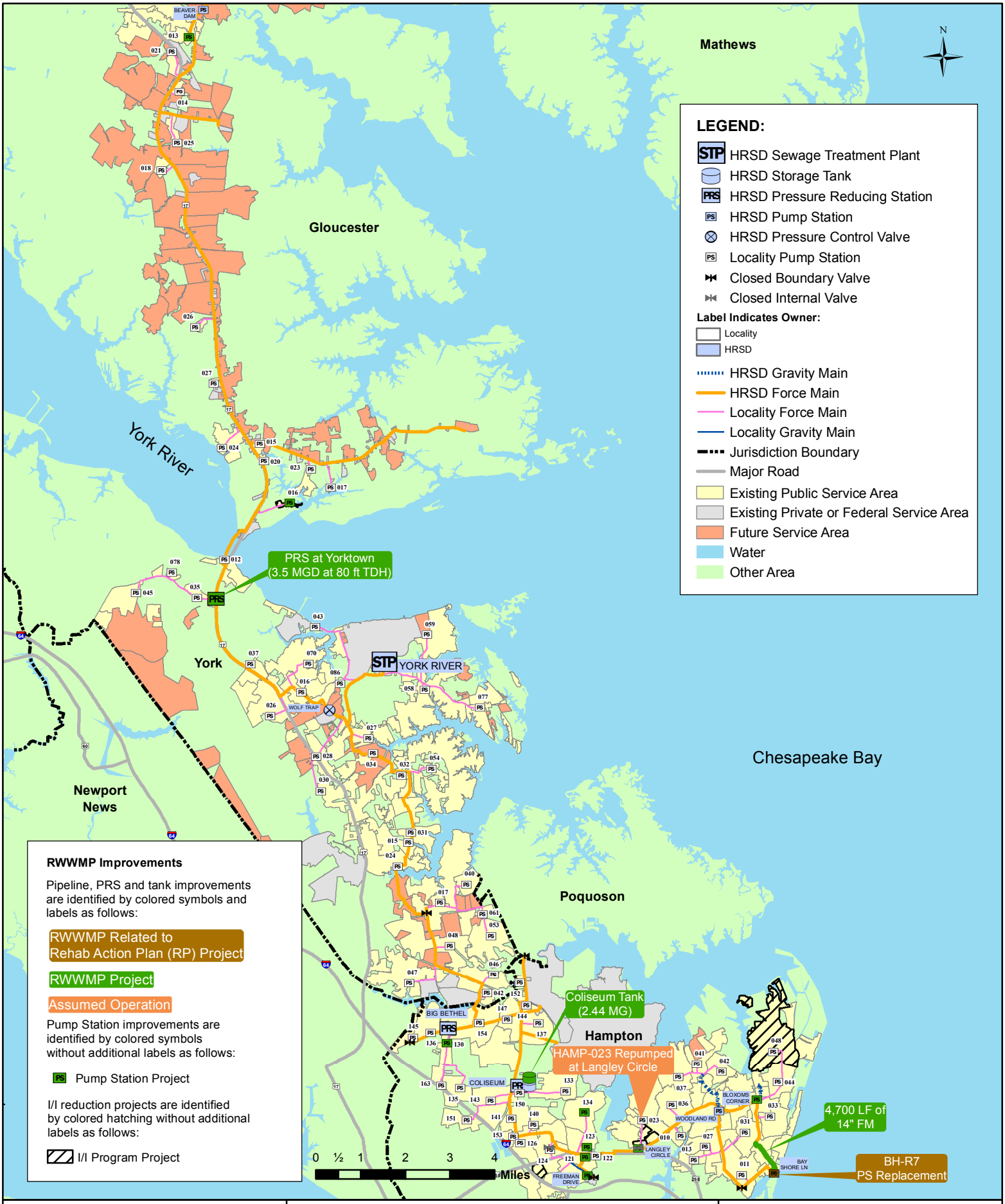
9/19/2017



Regional Wet Weather Management Plan

Appendix C - Figure 7
Williamsburg TP
RWWMP RHM Solution Set
for 4-year 2030 Flow Condition
with RWWMP I/I Program

9/19/2017



HRSD

Regional Wet Weather Management Plan

Appendix C - Figure 8
York River TP
RWWMP RHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

9/19/2017

Appendix C: 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL by Treatment Plant Service Area

Table C-1. Army Base TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-001-D	Terminal Avenue PRS - Discharge	65
PDP-001-U	Terminal Avenue PRS - Suction[1]	16
PDP-002-D	Dovercourt Road PS - Discharge	137
PDP-003-D	North Shore Road PS - Discharge	66
PDP-004-D-2	Taussig Boulevard PS - Low Flow Discharge	5.1
PDP-004-D-1	Taussig Boulevard PS - High Flow Discharge	12
PDP-005	HRSD FM EOL East Little Creek Road (West) upstream of Norfolk PS-077	20
PDP-006	HRSD FM EOL Willoughby near Norfolk PS-015	67

[1] *Suction pressure reported at time of peak discharge pressure*

Table C-2. Atlantic TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-001	Atlantic TP Storage	38
PDP-002	Oceana Storage	64
PDP-003-D	Providence PRS / Storage Facility - Discharge	117
PDP-003-U	Providence PRS / Storage Facility - Suction[1]	40
PDP-004-D	Shipps Corner PRS / Storage Facility - Discharge	104
PDP-004-U	Shipps Corner PRS / Storage Facility - Suction[1]	32
PDP-005-D	Atlantic PRS - Discharge	92
PDP-005-U	Atlantic PRS - Suction[1]	18
PDP-006-D	Courthouse PRS - Discharge	113
PDP-006-U	Courthouse PRS - Suction[1]	37
PDP-007-D	Deep Creek PRS - Discharge[2]	77
PDP-007-U	Deep Creek PRS - Suction[2]	77
PDP-008-D	Dominion Boulevard PRS - Discharge	123
PDP-008-U	Dominion Boulevard PRS - Suction[1]	48
PDP-009-D	Elbow Road PRS - Discharge	117
PDP-009-U	Elbow Road PRS - Suction[1]	38
PDP-010-D	Hillwell Road PRS - Discharge	98
PDP-010-U	Hillwell Road PRS - Suction[1]	30
PDP-011-D	Independence PRS - Discharge	111
PDP-011-U	Independence PRS - Suction[1]	34
PDP-012-D	Kempsville PRS - Discharge	148
PDP-012-U	Kempsville PRS - Suction[1]	89
PDP-013-D	Laskin Road PRS - Discharge	106
PDP-013-U	Laskin Road PRS - Suction[1]	33
PDP-014-D	Pine Tree PRS - Discharge	111
PDP-014-U	Pine Tree PRS - Suction[1]	33
PDP-015-D	Arctic Avenue PS - Discharge	64
PDP-016-D	Doziers Corner PS - Discharge	72
PDP-017-D	Newtown Road PS - Discharge	56
PDP-018-D	Washington District PS - Discharge	72
PDP-020-1	HRSD FM EOL Salem Road near Ferrell Parkway (South of Roundhill Valve)	106
PDP-020-2	HRSD FM EOL Salem Road near Crest Way downstream of VAB-PS-580	107
PDP-021	HRSD FM EOL Atlantic Avenue (Oceanfront Branch) downstream of VAB-PS-102	96
PDP-022	HRSD FM EOL Battlefield Boulevard near Great Bridge Boulevard and Kempsville Road	89

Table C-2. Atlantic TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-023	HRSD FM EOL Camp Pendleton (General Booth Boulevard North) upstream of VAB-PS-125	41
PDP-024	HRSD FM EOL Canal Drive near Military Highway	77
PDP-025	HRSD FM EOL Cedar Rd West near Las Gaviotas Boulevard (West of Las Gaviotas valve) downstream of CHES-PS-192 and 197	55
PDP-026	HRSD FM EOL Cedar Road East near Las Gaviotas Boulevard (East of Las Gaviotas valve) upstream of CHES-PS-230	102
PDP-027	HRSD FM EOL Ches-Liz TP	56
PDP-028	HRSD FM EOL Diamond Springs Road North near Lenox Drive	80
PDP-029	HRSD FM EOL East Little Creek Road (East) upstream of NORF-PS-076	81
PDP-030	HRSD FM EOL Edmonds Corner (South) on Battlefield Boulevard North upstream of CHES-PS-009	68
PDP-031	HRSD FM EOL Elbow Road (and Centerville Turnpike North) downstream of CHES-PS-271 and CHES-PS-208	41
PDP-032	HRSD FM EOL Elizabeth River Crossing (East) upstream of CHES-PS-056	78
PDP-033	HRSD FM EOL Elizabeth River Crossing (West) upstream of CHES-PS-054	77
PDP-034	HRSD FM EOL General Booth Boulevard near Dam Neck Road upstream of VAB-PS-639	63
PDP-035	HRSD FM EOL General Booth Boulevard North near Old Dam Neck Road	21
PDP-036	HRSD FM EOL Kempsville Road East near Centerville Turnpike upstream of VAB-PS-461	108
PDP-037	HRSD FM EOL Kempsville Road near Providence Road upstream of VAB-PS-432	72
PDP-038	HRSD FM EOL Kempsville Road North near Princess Anne Road upstream of VAB-PS-407	47
PDP-039	HRSD FM EOL Kempsville Road South near Princess Anne Road upstream of VAB-PS-417	75
PDP-040	HRSD FM EOL Kempsville Road West near Centerville Turnpike upstream of VAB-PS-472	53
PDP-041	HRSD FM EOL Little Neck Road (Little Neck Branch) downstream of VAB-PS-279	64
PDP-042	HRSD FM EOL London Bridge Road downstream of VAB-PS-540	52
PDP-043	HRSD FM EOL Lynnhaven Parkway (East) near Primrose Lane upstream of Shipps Corner PRS	61
PDP-044	HRSD FM EOL Lynnhaven Parkway (West) near Primrose Lane upstream of VAB-PS-549	81
PDP-045	HRSD FM EOL Lynnhaven Shores (Great Neck Branch) downstream of VAB-PS-200	121
PDP-046	HRSD FM EOL Mount Pleasant Road East near Rebel Road upstream of CHES-PS-065	70
PDP-047	HRSD FM EOL Mount Pleasant Road West near Rebel Road upstream of CHES-PS-063	90
PDP-048	HRSD FM EOL NAS Dam Neck Annex	59
PDP-049	HRSD FM EOL NAS Oceana along Railroad Drive	102

Table C-2. Atlantic TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-050	HRSD FM EOL Northampton Boulevard at Wesleyan Drive downstream of NORF-PS-085 and NORF-PS-121	74
PDP-051	HRSD FM EOL Sandbridge downstream of VAB-PS-631	44
PDP-052	HRSD FM EOL Shore Drive (Pleasure House Point) downstream of VAB-PS-308	81
PDP-053	HRSD FM EOL Southern Boulevard East near Witchduck Road	46
PDP-054	HRSD FM EOL Princess Anne Road near Newtown Road	55
PDP-055	HRSD FM EOL Wellman Street downstream of NORF-PS-038 and NORF-PS-096	61
PDP-056	HRSD FM EOL Woodall Road downstream of NORF-PS-083	81

[1] *Suction pressure reported at time of peak discharge pressure*

[2] *PRS not in operation*

Table C-3. Boat Harbor TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-001	14th Street Storage Facility	5.2
PDP-003-D	25th Street PS - Discharge	35
PDP-004-D	33rd Street PS - Discharge	30
PDP-005-D	Bridge Street PS - Discharge	138
PDP-006-D	Claremont PS - Discharge	83
PDP-007-D	Copeland Park PS - Discharge	88
PDP-008-D	Ferguson Park PS - Discharge	68
PDP-009-D	Hampton University PS - Discharge	7.6
PDP-010-D	Jefferson Avenue PS - Discharge	6.9
PDP-011-D	Newmarket Creek PS - Discharge	72
PDP-012-1	HRSD FM EOL Armistead Avenue North upstream of Hampton PS-107	12
PDP-012-D	Victoria Boulevard PS - Discharge	128
PDP-013-D	Washington Street PS - Discharge	17
PDP-014-1	HRSD FM EOL Mallory Street North upstream of Hampton PS-007	4.7
PDP-14-D	Willard Avenue PS - Discharge	7.4

Table C-4. James River TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-001-D	Tabb PRS / Storage Facility - Discharge	119
PDP-001-U	Tabb PRS / Storage Facility - Suction[1]	50
PDP-002-D	Lucas Creek PRS - Discharge	77
PDP-002-U	Lucas Creek PRS - Suction[1]	15
PDP-003-D	Lucas Creek PS - Discharge	16
PDP-004-D	Hilton School PS - Discharge	23
PDP-005-D	Morrison PS - Discharge	139
PDP-006-1	HRSD FM EOL Reynolds Drive upstream of Normandy Lane PS (downstream of Newport News PS-092)	29
PDP-006-D	Normandy Lane PS - Discharge	75
PDP-007-D	North Avenue PS - Discharge	154
PDP-008-D	Patrick Henry PS - Discharge	71
PDP-009-D	Triton Court PS - Discharge	77
PDP-010	HRSD FM EOL Bethel Landfill (West) upstream of Newport News PS-059	83
PDP-011	HRSD FM EOL Christopher Newport University downstream of Newport News PS-026	90
PDP-012	HRSD FM EOL Harpersville Road downstream of Newport News PS-019	87
PDP-013	HRSD FM EOL Harpersville Road (Morrison PS Alternative Discharge FM)	110
PDP-014	HRSD FM EOL Newport News Williamsburg International Airport	95
PDP-015	HRSD FM EOL Poquoson downstream of Poquoson PS-001	112
PDP-016	HRSD FM EOL Warwick Boulevard downstream of Newport News PS-052	59
PDP-017	HRSD FM EOL Wythe Creek Road (North) upstream of Poquoson PS-003	85
PDP-018	HRSD FM EOL Yorktown Road near Myers Road downstream of York PS-019	125

[1] *Suction pressure reported at time of peak discharge pressure*

Table C-5. Nansemond TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-001-D	Wilroy PRS - Discharge	115
PDP-001-U	Wilroy PRS - Suction[1]	36
PDP-002-D	Bowers Hill PRS - Discharge	105
PDP-002-U	Bowers Hill PRS - Suction[1]	57
PDP-003-D	Constance Road PRS - Discharge	152
PDP-003-U	Constance Road PRS - Suction[1]	75
PDP-004-D	Nansemond River PRS - Discharge	126
PDP-004-U	Nansemond River PRS - Suction[1]	51
PDP-005-D	Pughsville PRS - Discharge	122
PDP-005-U	Pughsville PRS - Suction[1]	45
PDP-006-1	Portsmouth Boulevard EOL downstream of CHES-PS-086 (upstream of Route 337 PRS)	59
PDP-006-D	Route 337 PRS - Discharge	114
PDP-006-U	Route 337 PRS - Suction[1]	52
PDP-007-D	Western Branch PRS - Discharge	126
PDP-007-U	Western Branch PRS - Suction[1]	48
PDP-008-1-1	Cedar Lane EOL downstream of PORT-PS-036 (upstream of Cedar Lane PS)	19
PDP-008-1-2	West Norfolk Road EOL downstream of PORT-PS-040 (upstream of Cedar Lane PS)	23
PDP-008-1-3	HRSD FM EOL Swannanoa Drive downstream of PORT-PS-063 (upstream of Cedar Lane PS)	50
PDP-008-2-1	Wild Duck Lane EOL downstream of Cogentrix (upstream of Cedar Lane PS)	13
PDP-008-D	Cedar Lane PS - Discharge	119
PDP-009-D	Shingle Creek No. 1 PS - Discharge	135
PDP-010-D	Shingle Creek No. 2 PS - Discharge	111
PDP-011	Broadmoor Avenue EOL downstream of CHES-PS-014 (upstream of Bowers Hill PRS)	79
PDP-012	Carolina Road EOL downstream of SUFF-PS-081	102
PDP-013	Holland Road EOL	107
PDP-014	North Main Street EOL downstream of SUFF-PS-012	104
PDP-015	West Windsor Boulevard EOL	113
PDP-016	Smithfield Foods EOL upstream of SMITH-PS-001	136
PDP-017	Sherbrooke Road EOL downstream of CHES-PS-019 (upstream of Bowers Hill PRS)	104

[1] *Suction pressure reported at time of peak discharge pressure*

Table C-6. Virginia Initiative TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-001	May Avenue Storage Facility	51
PDP-002-D	State Street PRS / Storage Facility - Discharge	51
PDP-002-U	State Street PRS / Storage Facility - Suction[1]	17
PDP-003-D	Quail Avenue PRS - Discharge	39
PDP-003-U	Quail Avenue PRS - Suction[2,3]	12
PDP-004-D	Ashland Circle PS - Discharge	97
PDP-005-D	Bainbridge Boulevard PS - Discharge	51
PDP-006-D	Camden Avenue PS - Discharge	143
PDP-007-D	Chesapeake Boulevard PS - Discharge	167
PDP-008-D	Chesterfield Boulevard PS - Discharge	13
PDP-009-D	City Park PS - Discharge	72
PDP-010-D	Colley Avenue PS - Discharge	35
PDP-011-D	Elmhurst Lane PS - Discharge	111
PDP-012-D	Ferebee Avenue PS - Discharge	35
PDP-013-D	Granby Street PS - Discharge	70
PDP-014-D	Hanover Avenue PS - Discharge	64
PDP-015-D	Ingleside Road PS - Discharge	67
PDP-016-D	Jamestown Crescent PS - Discharge	74
PDP-017-D	Luxembourg Avenue PS - Discharge	69
PDP-018-D	Monroe Place PS - Discharge	115
PDP-019-D	Norchester Street PS - Discharge	104
PDP-020-D	Norview Avenue PS - Discharge	25
PDP-021-D	Park Avenue PS - Discharge	114
PDP-022-D	Plume Street PS - Discharge	45
PDP-023-D	Powhatan Avenue PS - Discharge	38
PDP-024-D	Quail Avenue PS - Discharge	39
PDP-025-D	Richmond Crescent PS - Discharge	55
PDP-026-D	Rodman Avenue PS - Discharge	80
PDP-027-D	Seay Avenue PS - Discharge	59
PDP-028-D	State Street PS - Discharge	34
PDP-029-D	Steamboat Creek PS - Discharge	58
PDP-030-D	Virginia Beach Boulevard PS - Discharge	44
PDP-031-D	Willoughby Avenue PS - Discharge	104

Table C-6. Virginia Initiative TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-032	HRSD FM EOL Atlantic Avenue near Providence Road[3]	11
PDP-033	HRSD FM EOL Cypress Street near Selden Avenue downstream of Norfolk PS-134	18
PDP-034	HRSD FM EOL Davis Avenue upstream of Chesapeake PS-103	91
PDP-035	HRSD FM EOL Douglas Avenue upstream of Portsmouth PS-006	68
PDP-036	HRSD FM EOL Effingham Street near Firehouse Lane downstream of Portsmouth PS-002	94
PDP-037	HRSD FM EOL Ford Drive near Springfield Avenue upstream of Steamboat Creek PS[3]	4.5
PDP-038	HRSD FM EOL Norchester Avenue near Victoria Avenue downstream of Norfolk PS-149	120
PDP-039	HRSD FM EOL Raby Road near North Military Highway downstream of Norfolk PS-072	106
PDP-040	HRSD FM EOL Race Street downstream of Portsmouth PS-003	79
PDP-041	HRSD FM EOL Robin Hood Road downstream of Norfolk PS-057	136

[1] Suction pressure reported at time of peak discharge pressure

[2] PRS not in operation

[3] Reported value represents the force main invert elevation within an isolated force main section

Table C-7. Williamsburg TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-001-D	Williamsburg Crossing PRS / Storage Facility - Discharge	176
PDP-001-U	Williamsburg Crossing PRS / Storage Facility - Suction[1]	103
PDP-002-D	Longhill PRS - Discharge	201
PDP-002-U	Longhill PRS - Suction[1]	123
PDP-003-D	Route 199 PRS - Discharge	173
PDP-003-U	Route 199 PRS - Suction[1]	92
PDP-004-D	Colonial Williamsburg PS - Discharge	190
PDP-005-D	Fords Colony PS - Discharge	136
PDP-006-D	Fort Eustis PS - Discharge	183
PDP-007-D	Greensprings PS - Discharge	176
PDP-008-D	Kingsmill PS - Discharge	112
PDP-009-D	Lodge Road PS - Discharge	185
PDP-010-D	Rolling Hills PS - Discharge	180
PDP-011-D	Williamsburg PS - Discharge	141
PDP-012	HRSD FM EOL Fenton Mill Road downstream from York PS-072	152
PDP-013	HRSD FM EOL Barthamsville Road at La Grange Parkway downstream of JCSA PS-010-3	164
PDP-014	HRSD FM EOL Yorktown Road downstream of Newport News PS-172	124

[1] *Suction pressure reported at time of peak discharge pressure*

Table C-8. York River TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak HGL		
Location ID	Location	Peak HGL (feet NAVD 88)
PDP-001-D	Coliseum PRS / Storage Facility - Discharge	144
PDP-001-U	Coliseum PRS / Storage Facility - Suction[1]	61
PDP-002-D	Big Bethel PRS - Discharge	163
PDP-002-U	Big Bethel PRS - Suction[1]	106
PDP-003-D	Yorktown PRS - Discharge	218
PDP-003-U	Yorktown PRS - Suction[1]	140
PDP-004-D	Beaver Dam Booster PS - Discharge	187
PDP-005-1	HRSD FM EOL Bayshore Lane at Atlantic Avenue	77
PDP-005-D	Bay Shore Lane PS - Discharge	136
PDP-006-D	Bloxoms Corner PS - Discharge	72
PDP-007-D	Freeman Drive PS - Discharge	188
PDP-008-D	Langley Circle PS - Discharge	156
PDP-009-D	Woodland Road PS - Discharge	57
PDP-010	HRSD FM EOL Bethel Landfill (East) upstream of Hampton PS-145	40
PDP-011-1	HRSD FM EOL Langley AFB South Branch (at Lee Road)	142
PDP-011-2	HRSD FM EOL Langley AFB North Branch FM (at Commander Shephard Boulevard and Research Drive)	128
PDP-011-3	HRSD FM EOL Wythe Creek Road (South) upstream of HAMP-PS-152	124
PDP-012	HRSD FM EOL Maryus Road (Gloucester County South Branch)	143
PDP-013	HRSD FM EOL T. C. Walker Road (Gloucester County Public School)	174
PDP-014	HRSD FM EOL Yorktown Road downstream of YORK-PS-017	87

[1] *Suction pressure reported at time of peak discharge pressure*

Appendix C: Peak HGL Documentation Sites by Treatment Plant Service Area

Appendix C – Figure 9

Appendix C – Figure 10

Appendix C – Figure 11

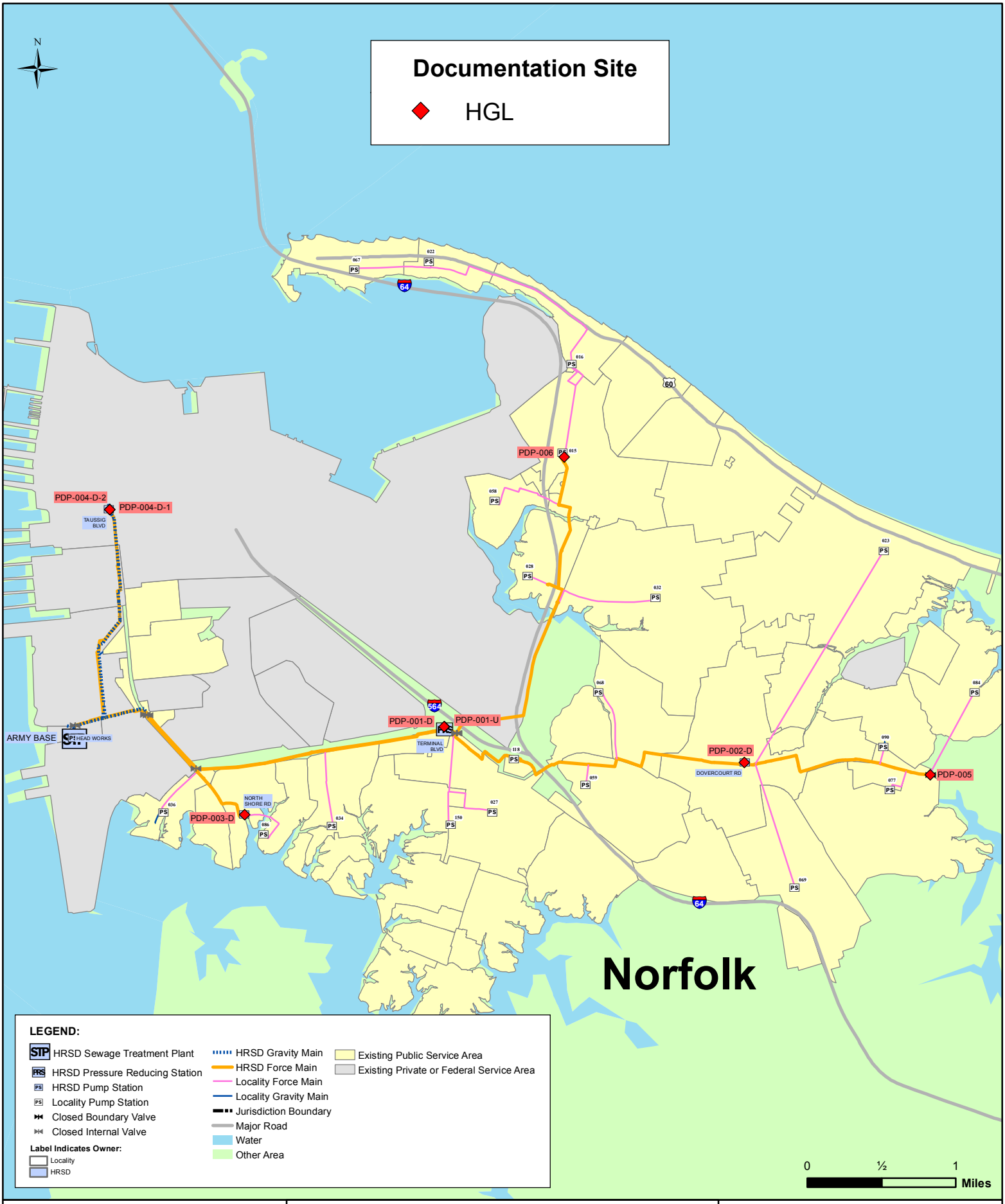
Appendix C – Figure 12

Appendix C – Figure 13

Appendix C – Figure 14

Appendix C – Figure 15

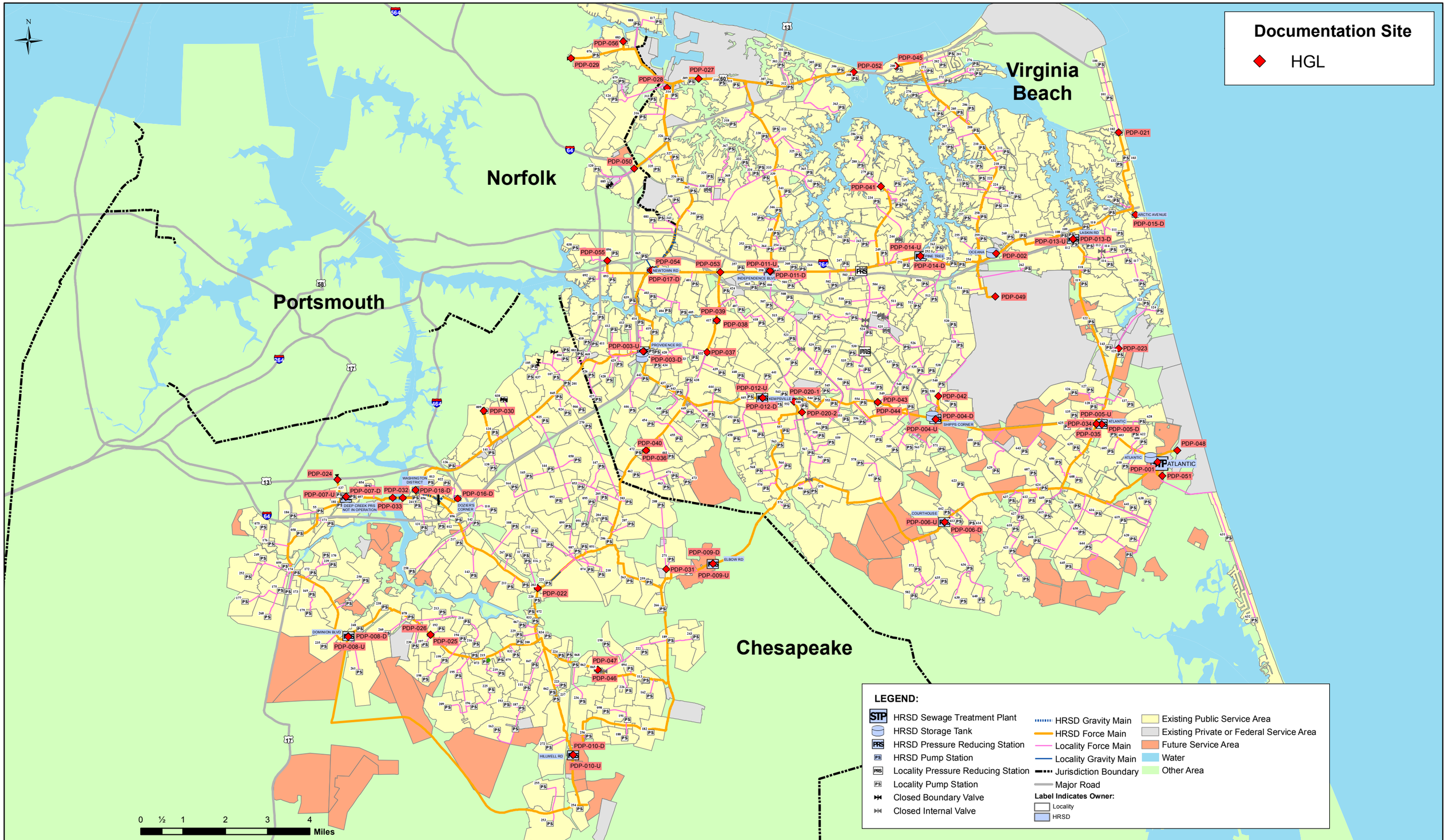
Appendix C – Figure 16



Regional Wet Weather Management Plan

Appendix C - Figure 9
Army Base TP
HGL Documentation Sites

9/19/2017



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Appendix C - Figure 10
Atlantic TP
HGL Documentation Sites

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Regional Wet Weather Management Plan

Appendix C - Figure 11
Boat Harbor TP
HGL Documentation Sites

9/21/2017

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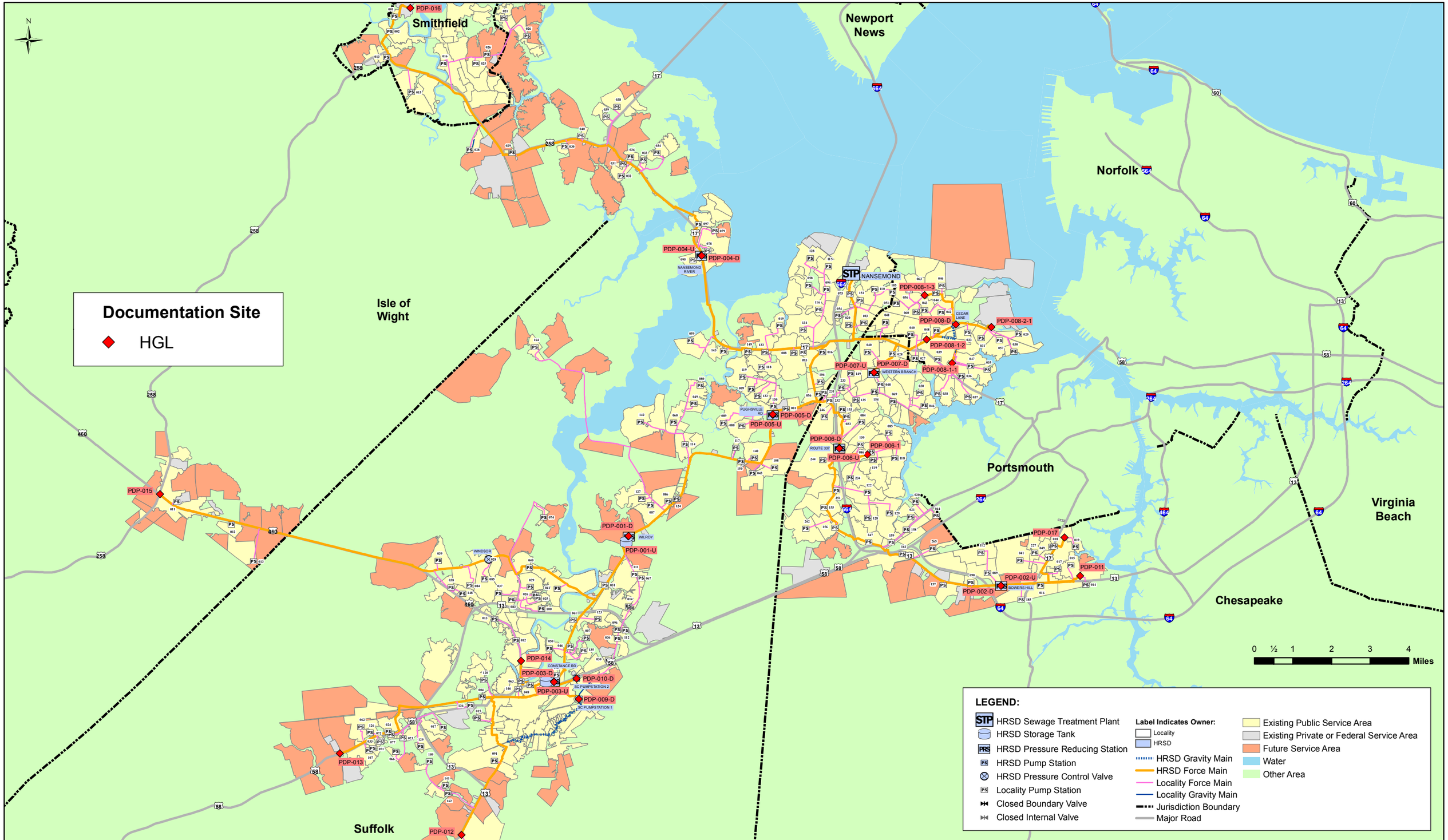
Appendix C - Figure 12
James River TP
HGL Documentation Sites

9/20/2017



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Appendix C - Figure 13
Nansemond TP
HGL Documentation Sites

9/20/2017

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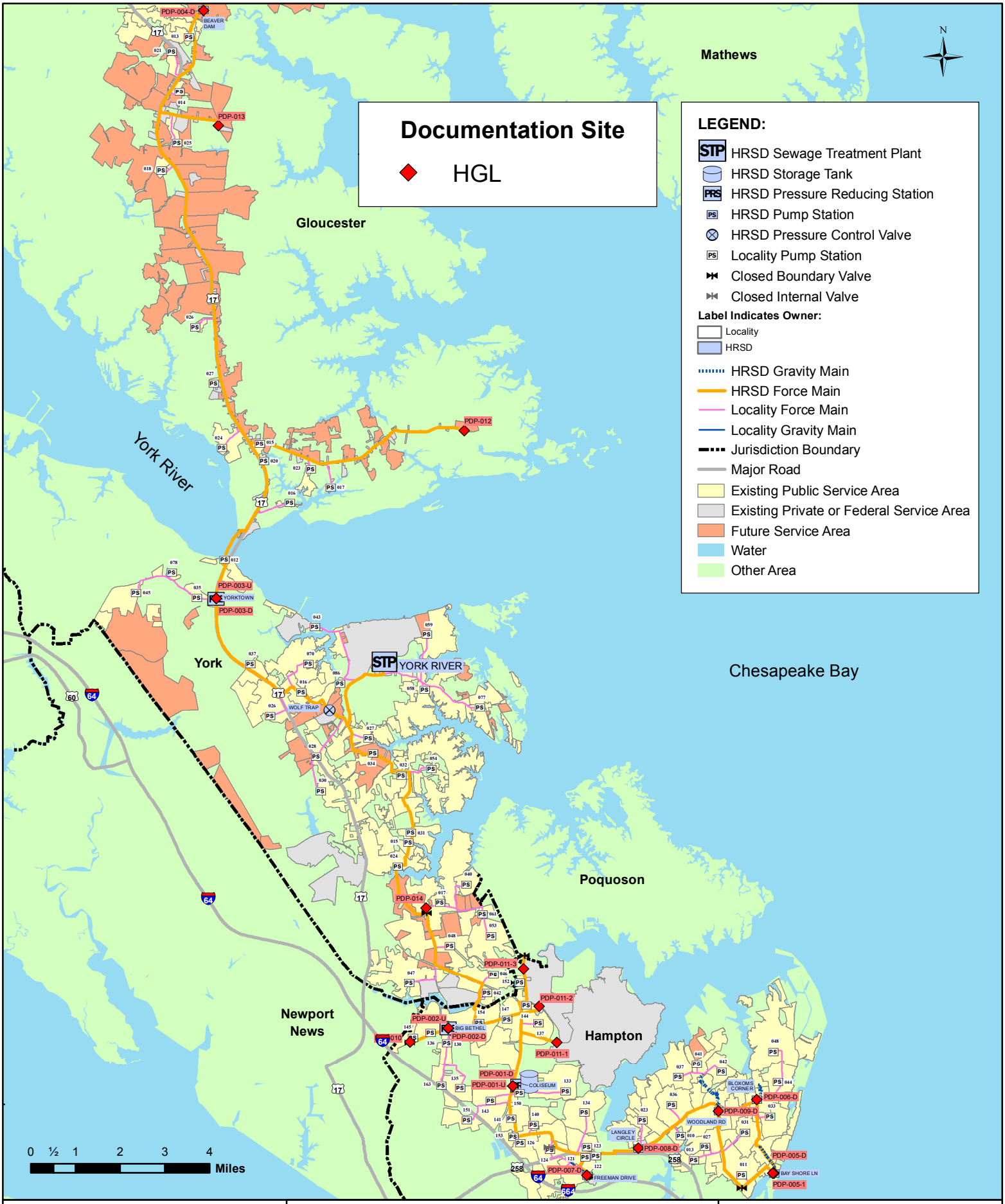
Appendix C - Figure 14
Virginia Initiative TP
HGL Documentation Sites

9/20/2017

Regional Wet Weather Management Plan

Appendix C - Figure 15
Williamsburg TP
HGL Documentation Sites

9/5/2017



Regional Wet Weather Management Plan

Appendix C - Figure 16
York River TP
HGL Documentation Sites

9/20/2017

Appendix C: 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depths by Treatment Plant Service Area

Table C-9. Army Base TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-000	Army Base TP Influent	3.7
DDP-000-1	Hampton Boulevard Gravity Main near Baker Street upstream of Army Base TP[1]	0.3
DDP-002-U-1	Dovercourt Road PS Influent - Gravity	2.3
DDP-003-U-1	North Shore Road PS Influent - Gravity	1.5
DDP-004-D-1	Hampton Boulevard near Cold Storage Road downstream of Taussig Boulevard PS Low Flow Discharge	1.3
DDP-004-U	Taussig Boulevard PS Influent	2.3

[1] Location with low local flow relative to gravity main pipe size downstream of closed mainline valve

Table C-10. Atlantic TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-015-U	Arctic Avenue PS Influent	1.3
DDP-016-U	Doziers Corner PS Influent	1.0
DDP-017-1	HRSD GM EOL Newtown Road near Virginia Beach Boulevard upstream of Newtown Road PS	1.1
DDP-017-U	Newtown Road PS Influent	1.3
DDP-018-1	HRSD GM EOL Neal Street near River Creek Road upstream of Washington District PS	1.9
DDP-018-U	Washington District PS Influent	1.0

Table C-11. Boat Harbor TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-000-2	Jefferson Avenue at 44th Street	3.3
DDP-000-3	Shipyard Branch North at 58th Street and Warwick Boulevard	0.7
DDP-002	58th Street Storage Facility	2.6
DDP-002-1	Jefferson Avenue near 72nd Street upstream of 58th Street Facility	3.1
DDP-002-2	Jefferson Avenue near Mercury Boulevard West upstream of 58th Street Facility	1.0
DDP-002-3	Macon Avenue near Center Avenue (Boat Harbor boundary with James River)[1]	0.0
DDP-003-1	Harbor Road near 23rd Street upstream of 25th Street PS	1.5
DDP-003-U	25th Street PS Influent	2.6
DDP-004-1	Washington Avenue near 38th Street upstream of 33rd Street PS	0.1
DDP-004-2	Washington Avenue near 46th Street upstream of 33rd Street PS	6.5
DDP-004-3	Sunset Terrace near 32nd Street upstream of 33rd Street PS	0.3
DDP-004-U	33rd Street PS Influent	1.3
DDP-005-1	Eaton Street near Queen Street East upstream of Bridge Street PS	3.1
DDP-005-2	Victoria Boulevard near Bridge Street upstream of Bridge Street PS[1]	0.0
DDP-005-U	Bridge Street PS Influent	5.0
DDP-006-1	Indian River Inverted Siphon upstream of Claremont PS (near Terrace Road)	3.1
DDP-006-2	Church Creek Inverted Siphon upstream of Claremont PS	1.9
DDP-006-3	Kecoughtan Road near Sunset Road upstream of Claremont PS	0.1
DDP-006-4	Ivy Home Road near Otley Road upstream of Claremont PS[1]	0.0
DDP-006-U	Claremont PS Influent	1.8
DDP-007-1	Aluminum Avenue near E Street upstream of Copeland Park PS	1.6
DDP-007-2	58th Street near Aberdeen Road upstream of Copeland Park PS	4.5
DDP-007-U	Copeland Park PS Influent	0.8
DDP-008-U	Ferguson Park PS Influent	0.3
DDP-010-1	Boat Harbor TP Operations Building Discharge to Jefferson Avenue PS[1]	0.0
DDP-010-2	Boat Harbor TP Clarifier Discharge to Jefferson Avenue PS[1]	0.0
DDP-010-U	Jefferson Avenue PS Influent	1.4
DDP-011-1	Mercury Boulevard and Orcutt Avenue upstream of Newmarket Creek PS	2.7
DDP-011-1-1	Mercury Blvd near Aberdeen Road upstream of Newmarket Creek PS	0.9
DDP-011-2-1	Orcutt Avenue near Todds Lane upstream of Newmarket Creek PS	0.8
DDP-011-U	Newmarket Creek PS Influent	2.8
DDP-012-1	Lasalle Avenue near Shell Road upstream of Victoria Boulevard PS	2.9
DDP-012-2	Shell Road near Algonquin Road upstream of Victoria Boulevard PS	2.6
DDP-012-U	Victoria Boulevard PS Influent	1.4

Table C-11. Boat Harbor TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-013-1	Pembroke Avenue East near River Street upstream of Washington Street PS	3.4
DDP-013-2	King Street North near Quash Street north of I-64 upstream of Washington Street PS	2.7
DDP-013-3	King Street North near Old Fox Hill Road upstream of Washington Street PS	0.6
DDP-013-U	Washington Street PS Influent	4.8
DDP-014-1	Willard Avenue North near Taylor Avenue East upstream of Willard Avenue PS	0.4
DDP-014-2	Hope Street North near Chamberlin Avenue East upstream of Willard Avenue PS	1.1
DDP-014-U	Willard Avenue PS Influent	0.9

[1] *End of line location without upstream flow*

Table C-12. James River TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-003-U	Lucas Creek PS Influent	0.3
DDP-004-U	Hilton School PS Influent	0.4
DDP-005-U	Morrison PS Influent	0.5
DDP-006-1	Barclay Road near Deep Creek Road upstream of Normandy Lane PS	0.3
DDP-006-U	Normandy Lane PS Influent	1.8
DDP-007-1	Main Street near River Road upstream of North Avenue PS (upstream of Hilton School PS)	0.2
DDP-007-2	Warwick Boulevard near Jones Road upstream of North Avenue PS	0.5
DDP-007-U	North Avenue PS Influent	0.9
DDP-008-U	Patrick Henry PS Influent	1.1
DDP-009-U	Triton Court PS Influent	0.4

Table C-13. Nansemond TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-008-1-1	Cedar Lane EOL (upstream of Cedar Lane PS)	1.2
DDP-008-1-2	West Norfolk Road EOL (upstream of Cedar Lane PS)	2.4
DDP-008-U	Cedar Lane PS Influent	1.6
DDP-009-1	Shingle Creek Gravity Main (White Marsh Road)	2.2
DDP-009-2	Shingle Creek Gravity Main EOL South (Carolina Road)	0.6
DDP-009-3	Shingle Creek Gravity Main EOL North (East Washington Street)	0.7
DDP-009-U	Shingle Creek No. 1 PS Influent	0.9
DDP-010-U	Shingle Creek No. 2 PS Influent	0.6

Table C-14. Virginia Initiative TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-000	Virginia Initiative TP Influent	2.4
DDP-000-2-1	Old Dominion University Branch near Kaufman Hall[1]	0.0
DDP-000-2-2	West 43rd Street near Hampton Boulevard	0.7
DDP-000-2-3	Bluestone Avenue near West 27th Street	3.5
DDP-004-U	Ashland Circle PS Influent	0.9
DDP-005-1	South Main Street near Bainbridge Boulevard upstream of Bainbridge Boulevard PS	0.6
DDP-005-U	Bainbridge Boulevard PS Influent	1.6
DDP-006-U	Camden Avenue PS Influent	1.7
DDP-007-1-1	Norview Avenue near Swells Point Road upstream of Chesapeake Boulevard PS	1.9
DDP-007-2-1	Nansemond Circle near Norview Avenue upstream of Chesapeake Boulevard PS	0.6
DDP-007-3-1	Montgomery Street near Jersey Avenue upstream of Chesapeake Boulevard PS	0.6
DDP-007-4-1	Orange Street near Stephan Court upstream of Chesapeake Boulevard PS	0.1
DDP-007-U	Chesapeake Boulevard PS Influent	1.2
DDP-008-1	Westminster Avenue near Earlscourt Avenue upstream of Chesterfield Boulevard PS	0.5
DDP-008-U	Chesterfield Boulevard PS Influent	8.4
DDP-009-U	City Park PS Influent	0.6
DDP-010-U	Colley Avenue PS Influent	5.9
DDP-011-U	Elmhurst Lane PS Influent	3.1
DDP-012-1	Bainbridge Boulevard near Middle Street upstream of Ferebee Avenue PS	1.3
DDP-012-2	Livingston Avenue near Bainbridge Boulevard upstream of Ferebee Avenue PS	3.4
DDP-012-U	Ferebee Avenue PS Influent	1.3
DDP-013-U	Granby Street PS Influent	0.8
DDP-014-U	Hanover Avenue PS Influent	0.3
DDP-015-U	Ingleside Road PS Influent	2.2
DDP-016-U	Jamestown Crescent PS Influent	0.6
DDP-017-1-1	Luxembourg Avenue PS North Branch near Versailles Avenue	0.5
DDP-017-2-1	Blair Avenue near Dupont Circle upstream of Luxembourg Avenue PS	1.1
DDP-017-2-2	Hancock Avenue near Tait Terrace upstream of Luxembourg Avenue PS[1]	0.0
DDP-017-U	Luxembourg Avenue PS Influent	6.1
DDP-018-U-1	Monroe Place PS Influent	2.2
DDP-019-1-1	Virginia Beach Boulevard near Gondola Road upstream of Norchester Street PS	3.0
DDP-019-U-1	Norchester Street PS Influent 1 North HRSD gravity main	0.5
DDP-019-U-2	Norchester Street PS Influent 2 South HRSD gravity main	0.6

Table C-14. Virginia Initiative TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-020-U	Norview Avenue PS Influent	1.2
DDP-021-1	Bainbridge Boulevard near Redstart Avenue upstream of Park Avenue PS	1.7
DDP-021-U	Park Avenue PS Influent	0.9
DDP-022-U	Plume Street PS Influent	0.6
DDP-023-1	Bolling Avenue near Studeley Avenue upstream of Powhatan Avenue PS	0.4
DDP-023-U	Powhatan Avenue PS Influent	0.7
DDP-024-1	Atlantic Avenue near Broad Street upstream of Quail Avenue PS[1]	0.0
DDP-024-U	Quail Avenue PS Influent	0.9
DDP-025-1	Richmond Crescent near Manchester Avenue upstream of Richmond Crescent PS	0.2
DDP-025-U	Richmond Crescent PS Influent	0.6
DDP-026-U	Rodman Avenue PS Influent	3.1
DDP-027-U	Seay Avenue PS Influent	3.6
DDP-028-1-1	Pearl Street near Ligon Street upstream of State Street PS	1.1
DDP-028-2-1	Mahone Avenue near Craig Street upstream of State Street PS	1.0
DDP-028-2-2	Berkley Avenue near Selden upstream of State Street PS	1.3
DDP-028-U	State Street PS Influent	2.0
DDP-029-1-1	Springfield Avenue near Ford Drive upstream of Steamboat Creek PS	0.2
DDP-029-2-1	Arlington Avenue near Waltham Street upstream of Steamboat Creek PS	0.6
DDP-029-U	Steamboat Creek PS Influent	0.7
DDP-030-U	Virginia Beach Boulevard PS Influent	8.4
DDP-031-U	Willoughby Avenue PS Influent	1.0
DDP-032-1	East Princess Anne Road near McNeal Avenue upstream of Norfolk PS-044	0.6
DDP-032-2	West Norcova Drive near East Norcova Drive upstream of Norfolk PS-044	0.2
DDP-032-U	Norfolk PS-044 Influent	1.2

[1] *End of line location without upstream flow*

Table C-15. Williamsburg TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-004-U	Colonial Williamsburg PS Influent	6.2
DDP-005-U	Fords Colony PS Influent	0.9
DDP-006-1	Monroe Avenue near Kells Drive upstream of Fort Eustis PS	1.5
DDP-006-U	Fort Eustis PS Influent	6.9
DDP-007-U	Greensprings PS Influent	1.3
DDP-008-U	Kingsmill PS Influent	1.9
DDP-009-U	Lodge Road PS Influent	0.8
DDP-010-U	Rolling Hills PS Influent	4.7
DDP-011-U	Williamsburg PS Influent	1.2

Table C-16. York River TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Depth		
Location ID	Location	Peak Depth (feet)
DDP-005-1	Seaboard Avenue near Buckroe Avenue upstream of Bay Shore Lane PS	0.2
DDP-005-U	Bay Shore Lane PS Influent	1.0
DDP-006-1	Beach Road near Catalina Drive upstream of Bloxoms Corner PS	0.3
DDP-006-U	Bloxoms Corner PS Influent	0.7
DDP-008-U	Langley Circle PS Influent	1.5
DDP-009-1	Harris Creek Road near Little Back River Road East upstream of Woodland Road PS	0.6
DDP-009-U	Woodland Road PS Influent	5.1

Appendix C: Peak Depth Documentation Sites by Treatment Plant Service Area

Appendix C – Figure 17

Appendix C – Figure 18

Appendix C – Figure 19

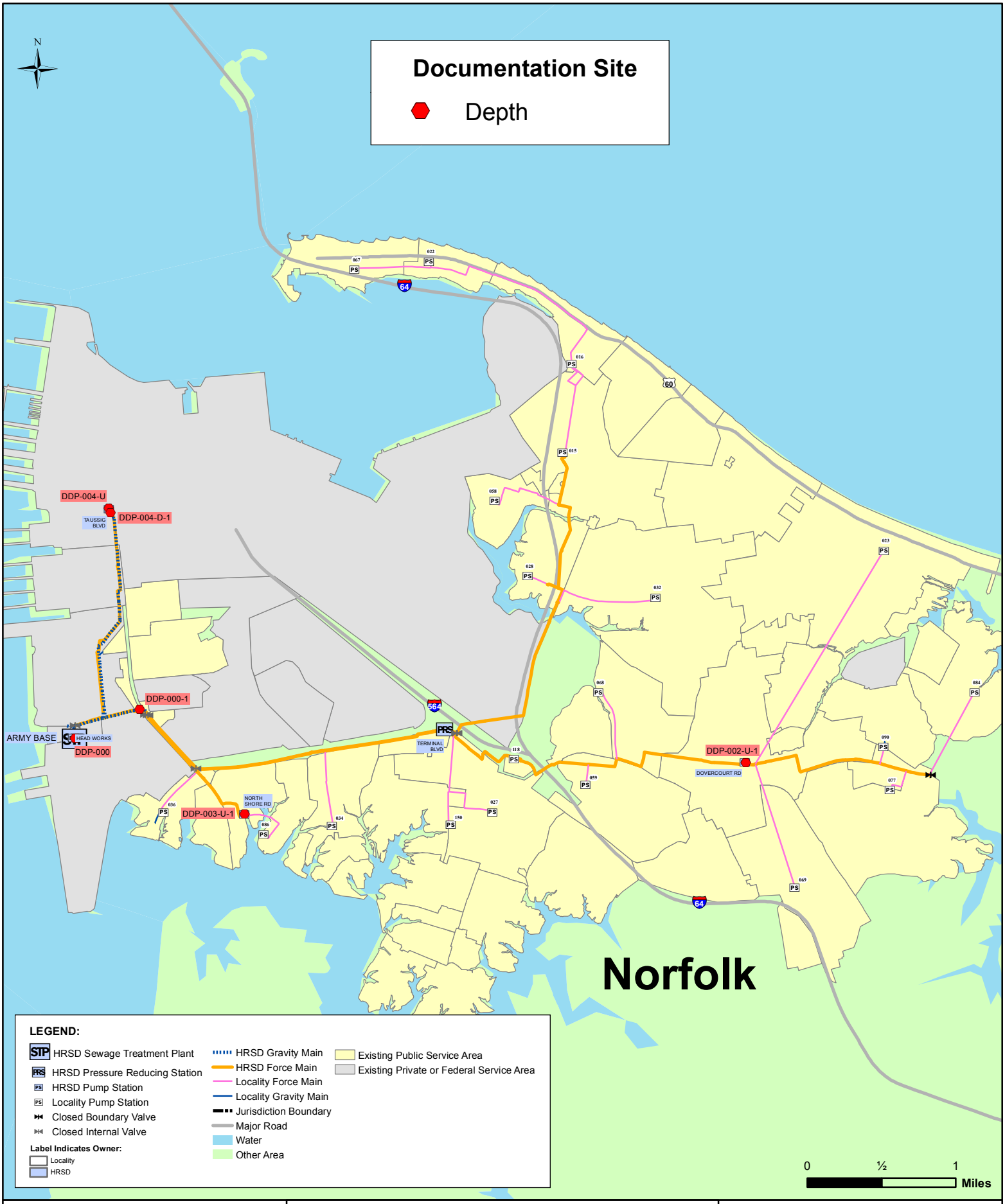
Appendix C – Figure 20

Appendix C – Figure 21

Appendix C – Figure 22

Appendix C – Figure 23

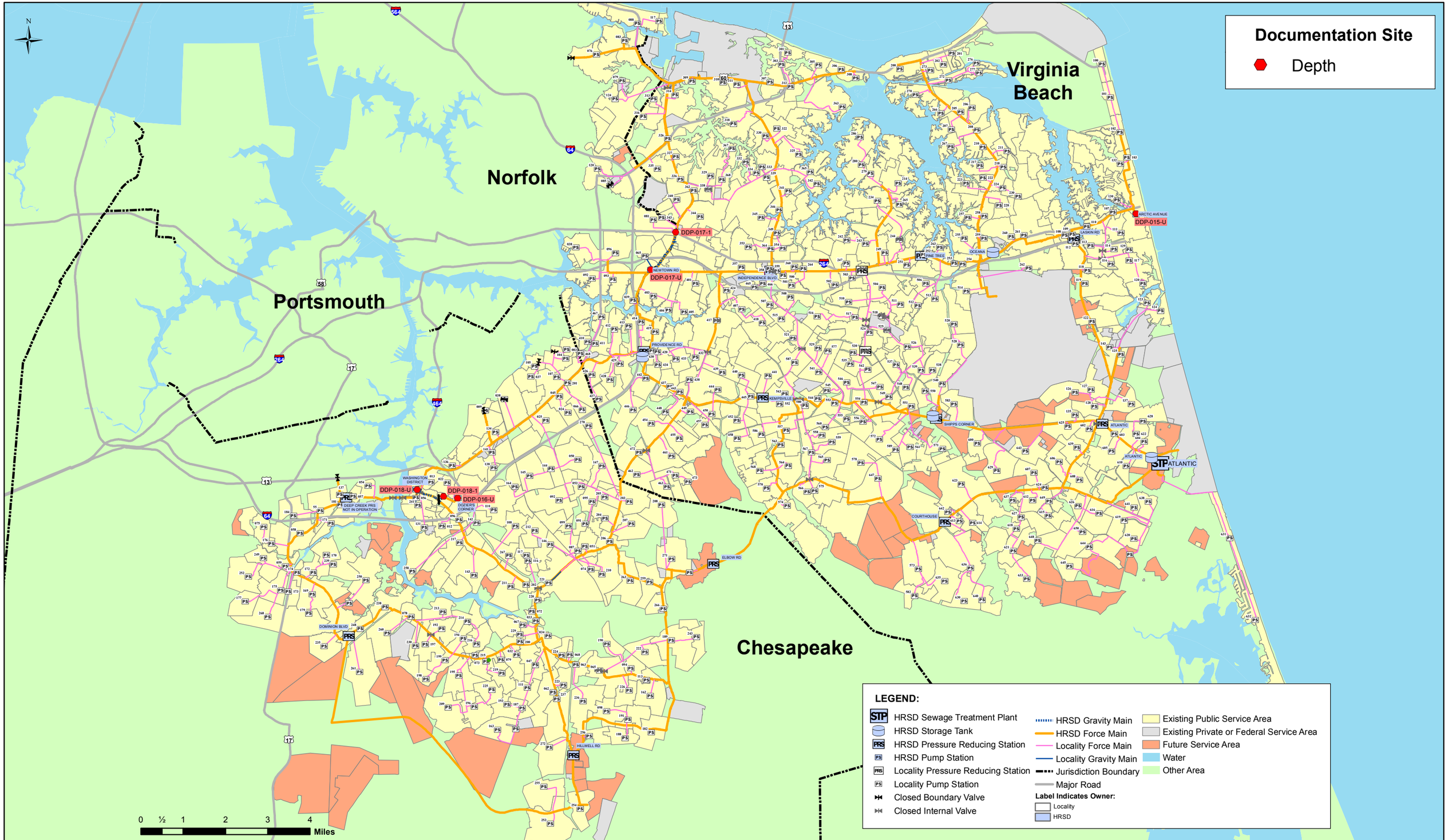
Appendix C – Figure 24



Regional Wet Weather Management Plan

Appendix C - Figure 17
Army Base TP
Depth Documentation Sites

9/20/2017



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Appendix C - Figure 18
Atlantic TP
Depth Documentation Sites

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Appendix C - Figure 19
Boat Harbor TP
Depth Documentation Sites

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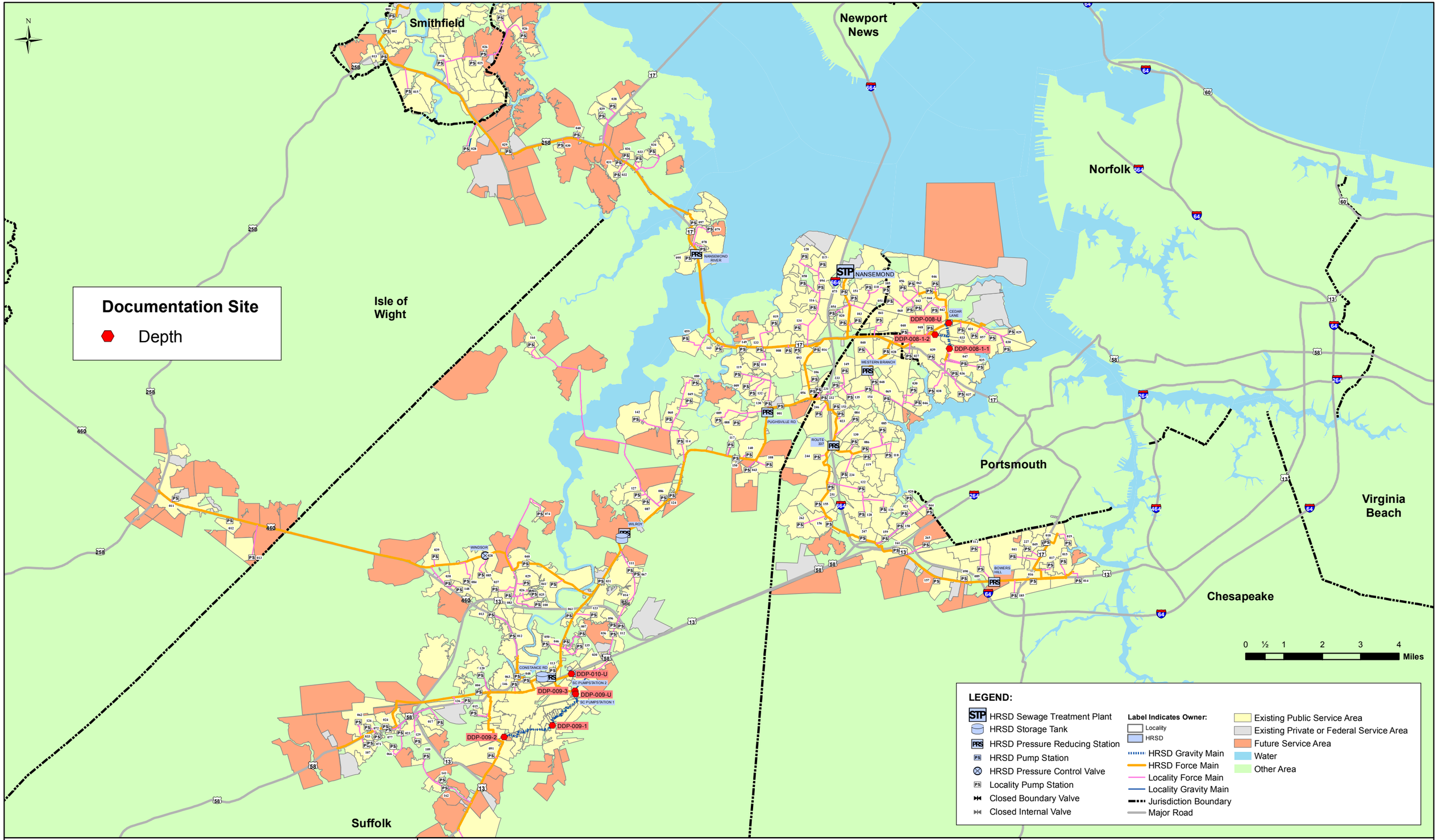
Regional Wet Weather Management Plan

Appendix C - Figure 20
James River TP
Depth Documentation Sites

9/20/2017



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Regional Wet Weather Management Plan

Appendix C - Figure 21
Nansemond TP
Depth Documentation Sites

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Appendix C - Figure 22
Virginia Initiative TP
Depth Documentation Sites

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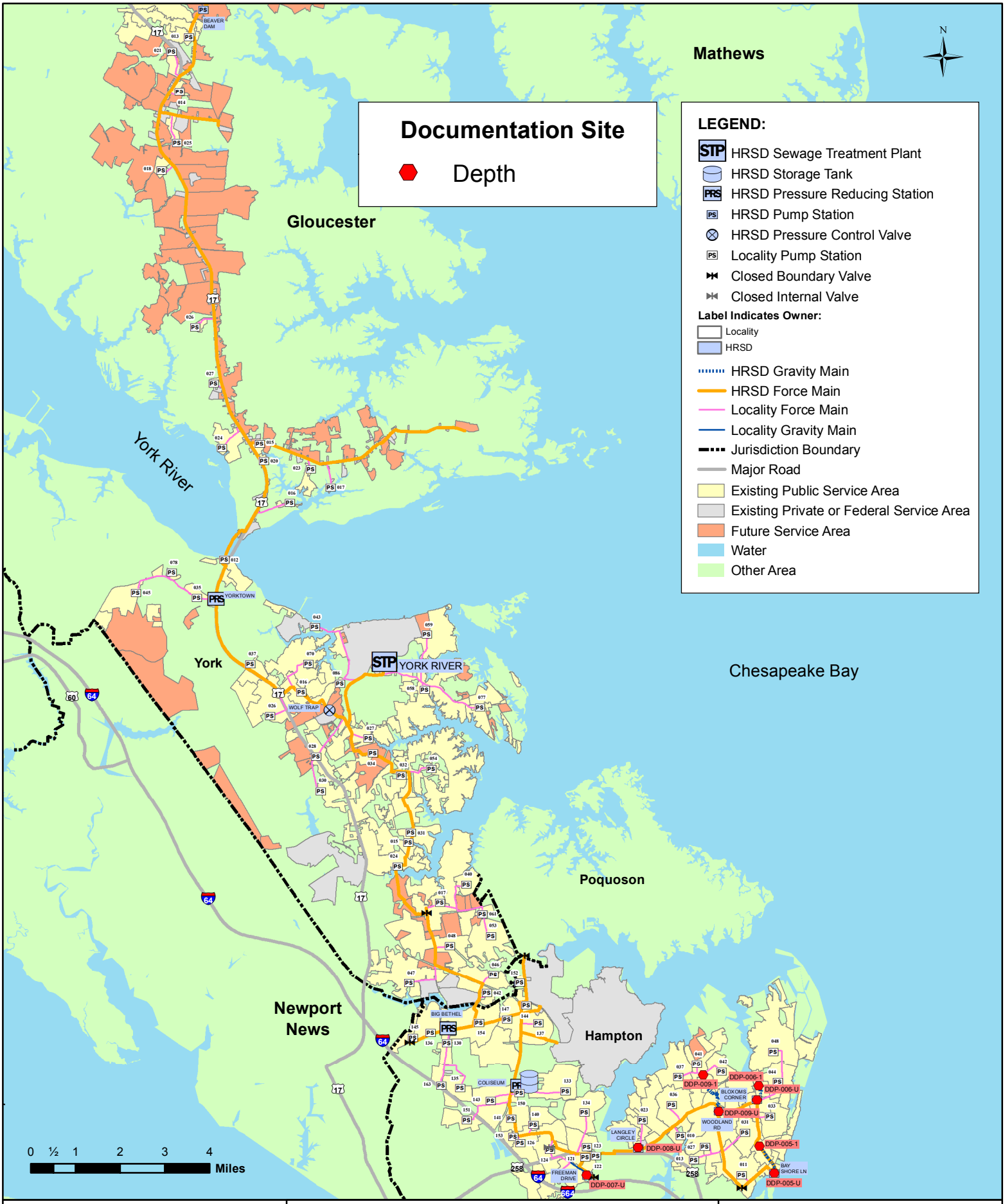
Appendix C - Figure 23
Williamsburg TP
Depth Documentation Sites

9/5/2017



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Regional Wet Weather Management Plan

Appendix C - Figure 24
York River TP
Depth Documentation Sites

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Appendix D: LHM Conveyance System Capacity Enhancement Solutions Table and Maps

LHM Wet Weather Capacity Improvement Elements Table

RWWMP LHM Solution Set Maps

Appendix D: LHM Wet Weather Capacity Improvement Elements Table

LHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix D Map Reference
AB	NORF	FM	NORF-109 FM Extension	Install 200 LF of 4" FM	Figure 7-1
AB	NORF	GM	NORF-H-117-G001 GM Improvement	Install 150 LF of 10" GM	Figure 7-1
AB	NORF	PS	NORF-PS 047	NORF Pump Station 047	Figure 7-1
AB	NORF	PS	NORF-PS 104	NORF Pump Station 104	Figure 7-1
AB	NORF	PS	NORF-PS 111	NORF Pump Station 111	Figure 7-1
AT	CHES	FM	CHES-011 FM Extension	Install 310 LF of 8" FM	Figure 1-1
AT	CHES	GM	CHES-H-109-G001 GM Improvement	Install 1,840 LF of 16" GM	Figure 1-1
AT	CHES	GM	CHES-110 GM Improvement	Install 380 LF of 12" GM	Figure 1-2
AT	CHES	GM	CHES-067 GM Improvement - I	Install 280 LF of 12" GM	Figure 1-2
AT	CHES	GM	CHES-067 GM Improvement - II	Install 2,760 LF of 16" GM	Figure 1-2
AT	CHES	PS	CHES-PS-011	CHES Pump Station 011	Figure 1-1
AT	NORF	FM	NORF-128 FM Improvement	Install 1,380 LF of 4" FM	Figure 7-2
AT	NORF	GM	NORF-076 GM Improvement	Install 560 LF of 12" GM	Figure 7-1
AT	NORF	GM	NORF-038 GM Improvement	Install 560 LF of 10" GM	Figure 7-2
AT	VAB	FM	Manifold FM extension; VAB-PS-215, VAB-PS-225, VAB-PS-226	Extend manifolded forcemain from upstream lift stations PS-215, PS-225 and PS-226 along Five Point Rd. to gravity sewer manhole near Rose Hall Dr. in service area VAB-223	Figure 12-1
AT	VAB	FM	VAB-PS-324 FM Improvement	Install 2,550 LF of 6" FM; VAB-324 discharge force main along Ewell Rd. to gravity sewer manhole in service area VAB-322 near Wakefield Dr.	Figure 12-1
AT	VAB	GM	VAB-120 GM improvement	Install 1,130 LF of 12" GM	Figure 12-1
AT	VAB	GM	VAB-357 GM improvement	Install 590 LF of 10" GM	Figure 12-1
AT	VAB	GM	VAB-465 GM improvement	Install 760 LF of 12" GM	Figure 12-1
AT	VAB	PS	VAB-PS-324	VAB Pump Station 324; Thoroughgood Ewell	Figure 12-1
BH	HAMP	FM	HAMP-020 FM Improvement	Install 1,130 LF of 6" FM	Figure 3
BH	HAMP	FM	HAMP-026 FM Improvement	Install 490 LF of 8" FM	Figure 3
BH	HAMP	FM	HAMP-102 FM Improvement	Install 1,090 LF of 8" FM	Figure 3
BH	HAMP	FM	HAMP-111 FM Improvement	Install 860 LF of 8" FM	Figure 3
BH	HAMP	GM	HAMP-014 GM Improvement -I	Install 30 LF of 12" GM	Figure 3
BH	HAMP	GM	HAMP-014 GM Improvement - II	Install 480 LF of 15" GM	Figure 3
BH	HAMP	GM	HAMP-102 GM Improvement	Install 1,320 LF of 10" GM	Figure 3
BH	HAMP	GM	HAMP-113 GM Improvement	Install 1,880 LF of 15" GM	Figure 3
BH	HAMP	GM	HAMP-115 GM Improvement	Install 40 LF of 12" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G100 GM Improvement	Install 1,000 LF of 12" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G107 GM Improvement - I	Install 30 LF of 8" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G107 GM Improvement - II	Install 580 LF of 14" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G107 GM Improvement - III	Install 960 LF of 16" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G107 GM Improvement - IV	Install 1,760 LF of 18" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G119 GM Improvement - I	Install 1,050 LF of 12" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G119 GM Improvement - II	Install 1,480 LF of 15" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G119 GM Improvement - III	Install 2,380 LF of 16" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G119 GM Improvement - IV	Install 1,250 LF of 18" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G119 GM Improvement - V	Install 2,840 LF of 20" GM	Figure 3
BH	HAMP	GM	HAMP-H-208-G119 GM Improvement -VI	Install 1,090 LF of 24" GM	Figure 3
BH	HAMP	GM	HAMP-H-219-G163 GM Improvement - I	Install 2,480 LF of 18" GM	Figure 3
BH	HAMP	GM	HAMP-H-219-G163 GM Improvement - II	Install 1,530 LF of 20" GM	Figure 3
BH	HAMP	GM	HAMP-H-223-G121 GM Improvement	Install 2,070 LF of 15" GM	Figure 3
BH	HAMP	GM	HAMP-H-223-G122 GM Improvement	Install 10 LF of 10" GM	Figure 3
BH	HAMP	GM	HAMP-H-223-G140 GM Improvement - I	Install 340 LF of 10" GM	Figure 3
BH	HAMP	GM	HAMP-H-223-G140 GM Improvement - II	Install 670 LF of 12" GM	Figure 3
BH	NEWP	GM	NEWP-002 GM Improvement - I	Install 500 LF of 15" GM	Figure 6-3
BH	NEWP	GM	NEWP-002 GM Improvement - II	Install 790 LF of 16" GM	Figure 6-3
BH	NEWP	GM	G05- Riverlands- Jefferson Ave GM Improvement - II	Install 350 LF of 12" GM	Figure 6-3

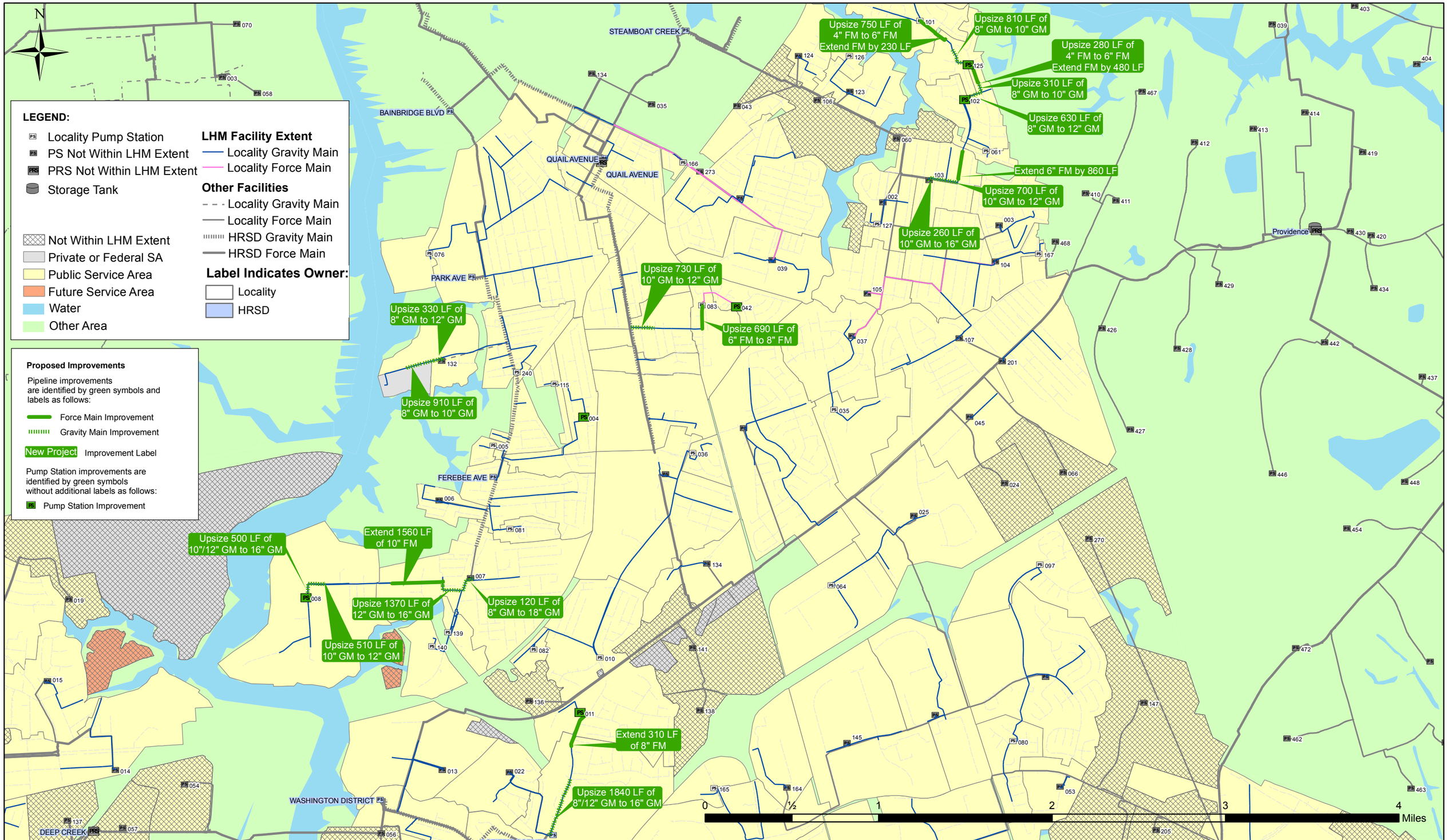
LHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix D Map Reference
BH	NEWP	GM	G05- Riverlands- Jefferson Ave GM Improvement - I	Install 560 LF of 12" GM	Figure 6-3
JR	NEWP	FM	NEWP-043 FM Improvement	Install 2,000 LF of 10" FM	Figure 6-2
JR	NEWP	FM	NEWP-054 FM Improvement	Install 1,140 LF of 10" FM	Figure 6-2
JR	NEWP	FM	NEWP-174 FM Improvement	Install 3,790 LF of 4" FM	Figure 6-2
JR	NEWP	GM	NEWP-019 GM Improvement	Install 750 LF of 10" GM	Figure 6-1
JR	NEWP	GM	NEWP-037 GM Improvement - I	Install 40 LF of 10" GM	Figure 6-2
JR	NEWP	GM	NEWP-037 GM Improvement - II	Install 160 LF of 15" GM	Figure 6-2
JR	NEWP	GM	NEWP-037 GM Improvement - III	Install 4,530 LF of 18" GM	Figure 6-2
JR	NEWP	GM	NEWP-044 GM Improvement - I	Install 590 LF of 14" GM	Figure 6-2
JR	NEWP	GM	NEWP-044 GM Improvement - II	Install 1,320 LF of 18" GM	Figure 6-2
JR	NEWP	GM	NEWP-054 GM Improvement	Install 240 LF of 12" GM	Figure 6-2
JR	NEWP	GM	NEWP-055 GM Improvement	Install 150 LF of 10" GM	Figure 6-2
JR	NEWP	GM	NEWP-068 GM Improvement	Install 890 LF of 12" GM	Figure 6-2
JR	NEWP	GM	NEWP-087 GM Improvement	Install 390 LF of 10" GM	Figure 6-2
JR	NEWP	GM	NEWP-H-221-G001 GM Improvement - I	Install 290 LF of 10" GM	Figure 6-2
JR	NEWP	GM	NEWP-H-221-G001 GM Improvement - II	Install 540 LF of 12" GM	Figure 6-2
JR	NEWP	GM	NEWP-H-221-G001 GM Improvement - III	Install 3,440 LF of 15" GM	Figure 6-2
JR	NEWP	GM	NEWP-H-221-G001 GM Improvement - IV	Install 1,490 LF of 18" GM	Figure 6-2
JR	NEWP	GM	NEWP-013 GM Improvement	Install 910 LF of 12" GM	Figure 6-3
JR	NEWP	PS	NEWP-PS-043	NEWP Pump Station 043	Figure 6-2
JR	NEWP	PS	NEWP-PS-122	NEWP Pump Station 122	Figure 6-2
JR	POQ	GM	POQ-001 GM Improvement	Install 1,400 LF of 15" GM	Figure 8
JR	POQ	GM	POQ-002 GM Improvement	Install 1,160 LF of 12" GM	Figure 8
JR	POQ	GM	POQ-006 GM Improvement - I	Install 540 LF of 10" GM	Figure 8
JR	POQ	GM	POQ-006 GM Improvement - II	Install 240 LF of 12" GM	Figure 8
JR	POQ	GM	POQ-006 GM Improvement - III	Install 120 LF of 15" GM	Figure 8
NA	CHES	FM	CHES-029 FM Improvement	Install 2,220 LF of 6" FM	Figure 1-3
NA	CHES	FM	CHES-070 FM Improvement	Install 850 LF of 4" FM	Figure 1-3
NA	CHES	GM	CHES-016 GM Improvement	Install 320 LF of 12" GM	Figure 1-3
NA	CHES	GM	CHES-089 GM Improvement	Install 3,230 LF of 12" GM	Figure 1-3
NA	CHES	GM	CHES-069 GM Improvement - I	Install 370 LF of 10" GM	Figure 1-3
NA	CHES	GM	CHES-069 GM Improvement - II	Install 710 LF of 12" GM	Figure 1-3
NA	CHES	PS	CHES-PS-121	CHES Pump Station 121	Figure 1-3
NA	CHES	PS	CHES-PS-183	CHES Pump Station 183	Figure 1-3
NA	CHES	PS	CHES-PS-029	CHES Pump Station 029	Figure 1-3
NA	SUFF	FM	SUFF-PS-125 FM extension	Install 2,060 LF of 8" FM; Extension of Suffolk PS-125 discharge force main along Respass Beach Rd. to gravity sewer manhole on Sheffield Ct. North in the service area for Suffolk PS-110.	Figure 11-1
NA	SUFF	GM	SUFF-110 GM improvement	Install 70 LF of 10" GM	Figure 11-1
NA	SUFF	GM	SUFF-031 GM improvement	Install 1,120 LF of 10" GM	Figure 11-2
NA	SUFF	GM	SUFF-048 GM improvement	Install 330 LF of 10" GM	Figure 11-2
NA	SUFF	PS	SUFF-PS-125	SUFF Pump Station 125; Harbour View E Village #2	Figure 11-1
NA	SUFF	PS	SUFF-PS-064	SUFF Pump Station 064; East Suffolk Gardens	Figure 11-2
VIP	CHES	FM	CHES-101 FM Improvement	Install 980 LF of 6" FM	Figure 1-1
VIP	CHES	FM	CHES-102 FM Extension	Install 860 LF of 6" FM	Figure 1-1
VIP	CHES	FM	CHES-125 FM Extension	Install 760 LF of 6" FM	Figure 1-1
VIP	CHES	FM	CHES-008 FM Extension	Install 1,560 LF of 10" FM	Figure 1-1
VIP	CHES	FM	CHES-042 FM Improvement	Install 690 LF of 8" FM	Figure 1-1
VIP	CHES	GM	CHES-102 GM Improvement - I	Install 310 LF of 10" GM	Figure 1-1
VIP	CHES	GM	CHES-102 GM Improvement - II	Install 630 LF of 12" GM	Figure 1-1
VIP	CHES	GM	CHES-103 GM Improvement - I	Install 700 LF of 12" GM	Figure 1-1
VIP	CHES	GM	CHES-103 GM Improvement - II	Install 260 LF of 16" GM	Figure 1-1

LHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix D Map Reference
VIP	CHES	GM	CHES-125 GM Improvement	Install 810 LF of 10" GM	Figure 1-1
VIP	CHES	GM	CHES-007 GM Improvement - I	Install 1,370 LF of 16" GM	Figure 1-1
VIP	CHES	GM	CHES-007 GM Improvement - II	Install 120 LF of 18" GM	Figure 1-1
VIP	CHES	GM	CHES-008 GM Improvement - I	Install 510 LF of 12" GM	Figure 1-1
VIP	CHES	GM	CHES-008 GM Improvement - II	Install 500 LF of 16" GM	Figure 1-1
VIP	CHES	GM	CHES-132 GM Improvement - I	Install 910 LF of 10" GM	Figure 1-1
VIP	CHES	GM	CHES-132 GM Improvement - II	Install 330 LF of 12" GM	Figure 1-1
VIP	CHES	GM	CHES-H-123-G005 GM Improvement	Install 730 LF of 12" GM	Figure 1-1
VIP	CHES	PS	CHES-PS-102	CHES Pump Station 102	Figure 1-1
VIP	CHES	PS	CHES-PS-125	CHES Pump Station 125	Figure 1-1
VIP	CHES	PS	CHES-PS-004	CHES Pump Station 004	Figure 1-1
VIP	CHES	PS	CHES-PS-008	CHES Pump Station 008	Figure 1-1
VIP	CHES	PS	CHES-PS-042	CHES Pump Station 042	Figure 1-1
VIP	NORF	FM	NORF-010 FM Extension	Install 820 LF of 16" FM	Figure 7-2
VIP	NORF	FM	NORF-135 FM Improvement	Install 1,190 LF of 4" FM	Figure 7-2
VIP	NORF	GM	NORF-046 GM Improvement	Install 660 LF of 18" GM	Figure 7-1
VIP	NORF	GM	NORF-010-G001 GM Improvement	Install 890 LF of 18" GM	Figure 7-2
VIP	NORF	GM	NORF-018 GM Improvement	Install 280 LF of 18" GM	Figure 7-2
VIP	NORF	GM	NORF-H-107-G001 GM Improvement	Install 510 LF of 12" GM	Figure 7-2
VIP	NORF	PS	NORF-PS 133	NORF Pump Station 133	Figure 7-2
VIP	NORF	PS	NORF-PS 141	NORF Pump Station 141	Figure 7-2
VIP	PORT	FM	PORT-013 FM Improvement	Install 2,820 LF of 8" FM	Figure 9
VIP	PORT	FM	PORT-018 FM Improvement	Extend 850 LF of 10" FM	Figure 9
VIP	PORT	GM	PORT-003-V003-G001 GM Improvement	Install 1,240 LF of 10" GM	Figure 9
VIP	PORT	GM	PORT-003-V006 GM Improvement - I	Install 160 LF of 12" GM	Figure 9
VIP	PORT	GM	PORT-003-V006 GM Improvement - II	Install 930 LF of 15" GM	Figure 9
VIP	PORT	GM	PORT-006-V004 GM Improvement - I	Install 920 LF of 15" GM	Figure 9
VIP	PORT	GM	PORT-006-V004 GM Improvement - II	Install 170 LF of 18" GM	Figure 9
VIP	PORT	GM	PORT-010 GM Improvement	Install 260 LF of 20" GM	Figure 9
VIP	PORT	GM	PORT-026-G002 GM Improvement	Install 350 LF of 15" GM	Figure 9
VIP	PORT	GM	PORT-H-146-G005 GM Improvement	Install 620 LF of 15" GM	Figure 9
VIP	PORT	PS	PORT-PS-010	PORT Pump Station 010	Figure 9
VIP	PORT	PS	PORT-PS-013	PORT Pump Station 013	Figure 9
VIP	PORT	PS	PORT-PS-018	PORT Pump Station 018	Figure 9
VIP	PORT	PS	PORT-PS-053	PORT Pump Station 053	Figure 9
WB	JCSA	FM	JCSA-PS-003-5 FM improvement	Install 3,030 LF of 3" FM; JCSA PS-003-5 discharge force main along Marclay Rd. to manhole in JCSA PS-003-1 service area near Lake Powell Rd.	Figure 5
WB	JCSA	FM	JCSA-PS-008-4 FM improvement	Install 3,530 LF of 8" FM; JCSA PS-008-4 discharge force main along West Island Rd. and Travis Pond Rd. to connection with discharge force main of JCSA PS-008-8 on Two Rivers road	Figure 5
WB	JCSA	GM	JCSA-001-2 GM improvement	Install 6,720 LF of 18" GM	Figure 5
WB	JCSA	GM	JCSA-001-8 GM improvement	Install 1,910 LF of 10" GM	Figure 5
WB	JCSA	GM	JCSA-002-4 GM improvement - I	Install 970 LF of 12" GM	Figure 5
WB	JCSA	GM	JCSA-002-4 GM improvement - II	Install 3,990 LF of 15" GM	Figure 5
WB	JCSA	GM	JCSA-003-1 GM improvement	Install 400 LF of 10" GM	Figure 5
WB	JCSA	GM	JCSA-003-3 GM improvement	Install 740 LF of 10" GM	Figure 5
WB	JCSA	GM	JCSA-003-6 GM improvement	Install 460 LF of 10" GM	Figure 5
WB	JCSA	GM	JCSA-005-5 GM improvement	Install 340 LF of 12" GM	Figure 5
WB	JCSA	PS	JCSA-PS-003-5	JCSA Pump Station 003-5; Marclay Road	Figure 5
WB	JCSA	PS	JCSA-PS-004-5	JCSA Pump Station 004-5; Rolling Woods Dr	Figure 5
WB	JCSA	PS	JCSA-PS-005-2	JCSA Pump Station 005-2; Red Oak Landing Road	Figure 5

LHM Wet Weather Capacity Improvement Elements					
TP	Asset Ownership	Asset Type	Element Name	Element Description	Appendix D Map Reference
WB	JCSA	PS	JCSA-PS-008-4	JCSA Pump Station 008-4; West Island Road	Figure 5
WB	WILL	FM	WILL-PS-014 FM extension	Install 330 LF of 8" FM; Force main extension along 2nd Street to manhole near intersection of 2nd Street and Broadway Ave	Figure 13
WB	YORK	FM	Mainfold FM Realignment; YORK-PS-009 and YORK-PS-082	Reroute manifolded force main (from intersection of Lee Pkwy/Penniman Rd) directly to HRSD Lodge Rd Pump Station; Kings Creek Plantation and Lakeshead	Figure 14
WB	YORK	GM	YORK-006 GM improvement	Upgrade Influent pipe to wet well; YORK-PS-006	Figure 14
WB	YORK	PS	YORK-PS-006	York Pump Station 006; Hickory Hills	Figure 14
WB	YORK	PS	YORK-PS-065	York Pump Station 065; Schooner Blvd	Figure 14
WB	YORK	PS	YORK-PS-066	York Pump Station 066; Corvette	Figure 14
YR	HAMP	FM	HAMP-022 FM Improvement	Install 280 LF of 8" FM	Figure 3
YR	HAMP	FM	HAMP-032 FM Improvement	Install 1,030 LF of 10" FM	Figure 3
YR	HAMP	FM	HAMP-034 FM Improvement	Install 400 LF of 4" FM	Figure 3
YR	HAMP	GM	HAMP-023 GM Improvement - I	Install 1,000 LF of 8" GM	Figure 3
YR	HAMP	GM	HAMP-023 GM Improvement - II	Install 70 LF of 16" GM	Figure 3
YR	HAMP	GM	HAMP-134 GM Improvement - I	Install 740 LF of 14" GM	Figure 3
YR	HAMP	GM	HAMP-134 GM Improvement - II	Install 190 LF of 16" GM	Figure 3
YR	HAMP	GM	HAMP-H-203-G100 GM Improvement	Install 1,980 LF of 10" GM	Figure 3
YR	HAMP	GM	HAMP-H-203-G119 GM Improvement - I	Install 570 LF of 14" GM	Figure 3
YR	HAMP	GM	HAMP-H-217-G0171-1 GM Improvement	Install 610 LF of 18" GM	Figure 3
YR	HAMP	GM	HAMP-H-203-G119 GM Improvement - II	Install 20 LF of 18" GM	Figure 3
YR	HAMP	PS	HAMP-PS-022	HAMP Pump Station 022	Figure 3

Appendix D: RWWMP LHM Solution Set Maps

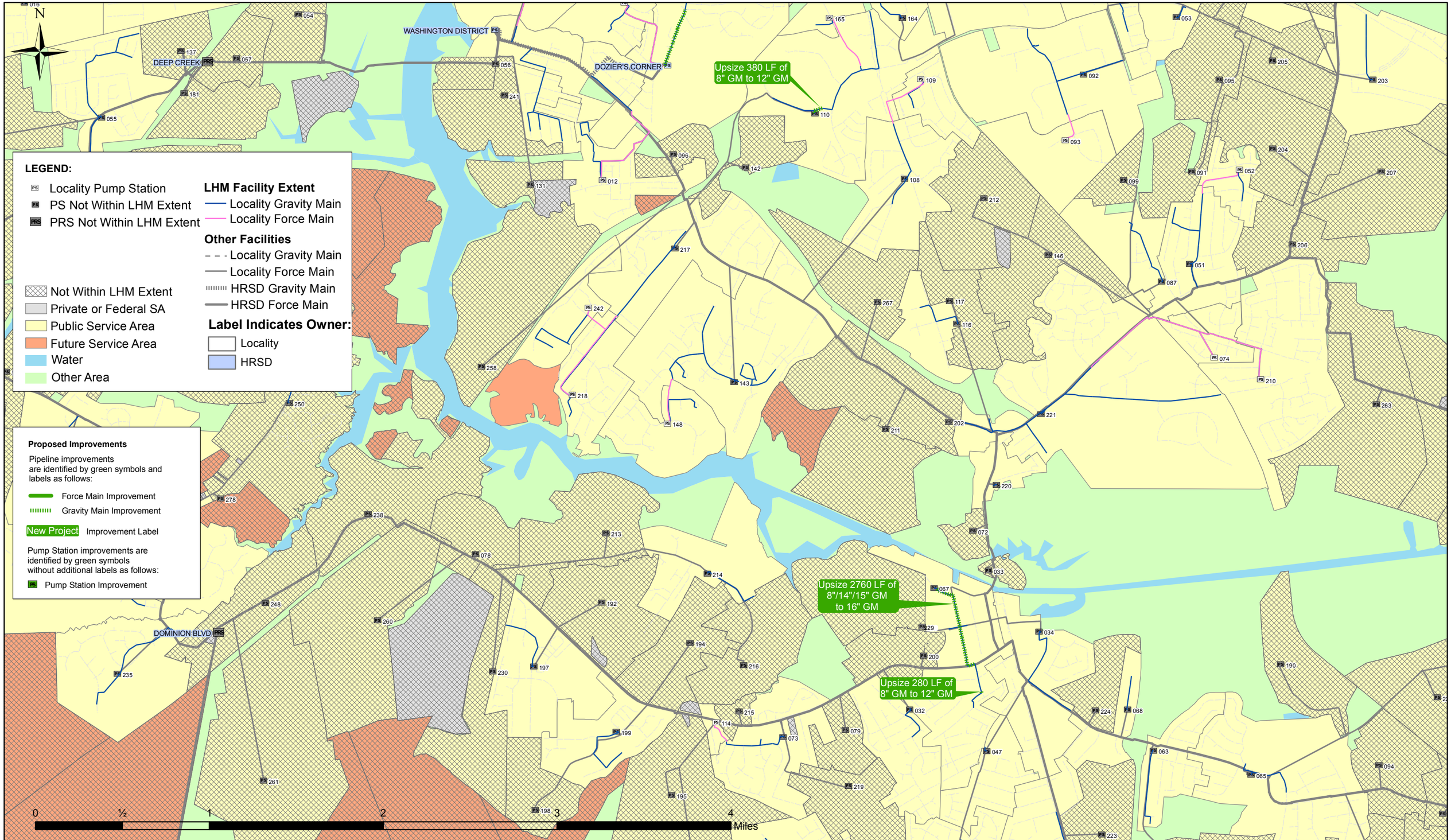
Appendix D – Figure 1-1
Appendix D – Figure 1-2
Appendix D – Figure 1-3
Appendix D – Figure 2
Appendix D – Figure 3
Appendix D – Figure 4-1
Appendix D – Figure 4-2
Appendix D – Figure 5
Appendix D – Figure 6-1
Appendix D – Figure 6-2
Appendix D – Figure 6-3
Appendix D – Figure 7-1
Appendix D – Figure 7-2
Appendix D – Figure 8
Appendix D – Figure 9-1
Appendix D – Figure 9-2
Appendix D – Figure 10
Appendix D – Figure 11-1
Appendix D – Figure 11-2
Appendix D – Figure 12-1
Appendix D – Figure 12-2
Appendix D – Figure 13
Appendix D – Figure 14



Regional Wet Weather Management Plan

Appendix D - Figure 1-1
City of Chesapeake
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 8/15/2017



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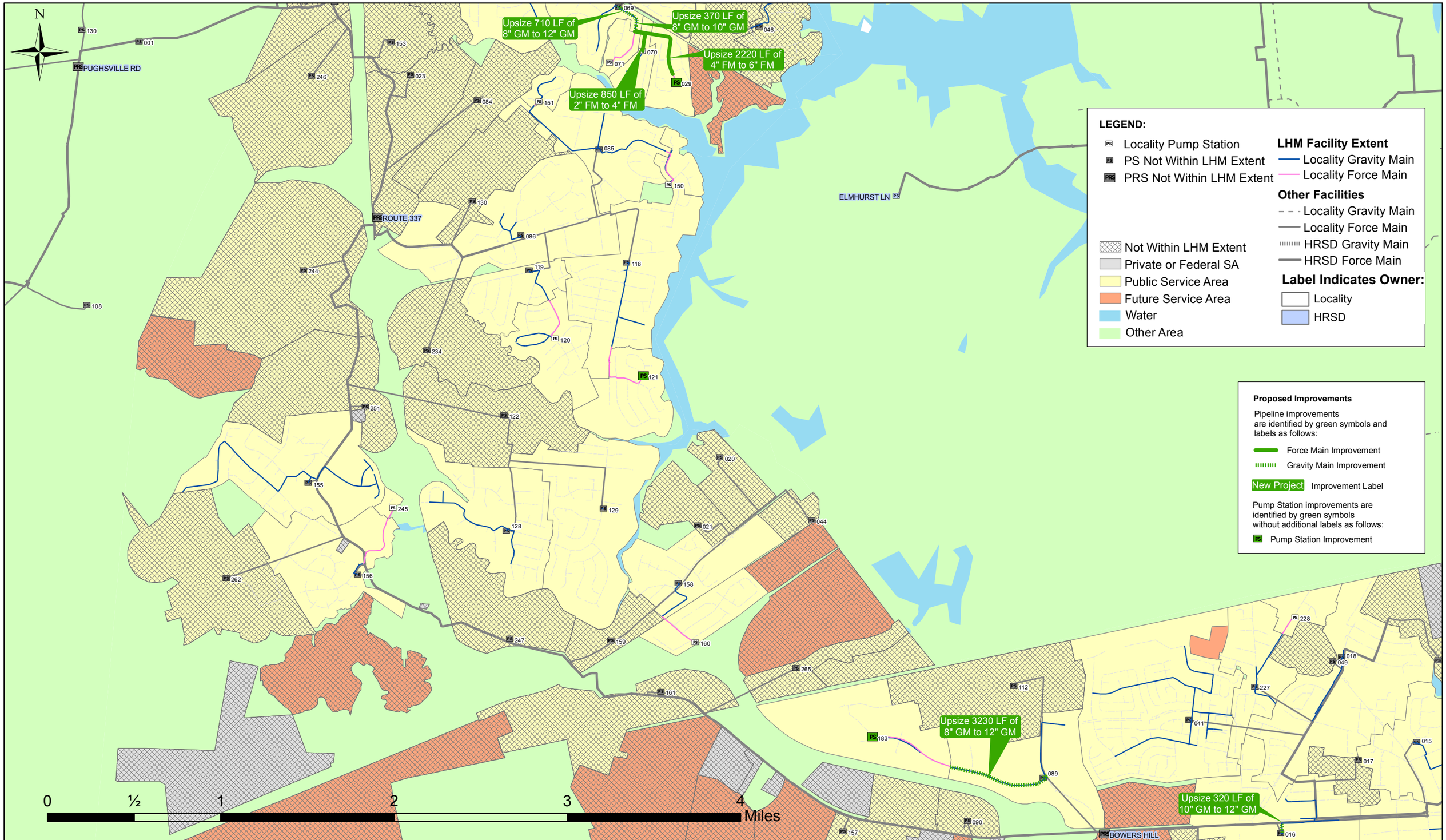
Regional Wet Weather Management Plan

Appendix D - Figure 1-2
City of Chesapeake
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

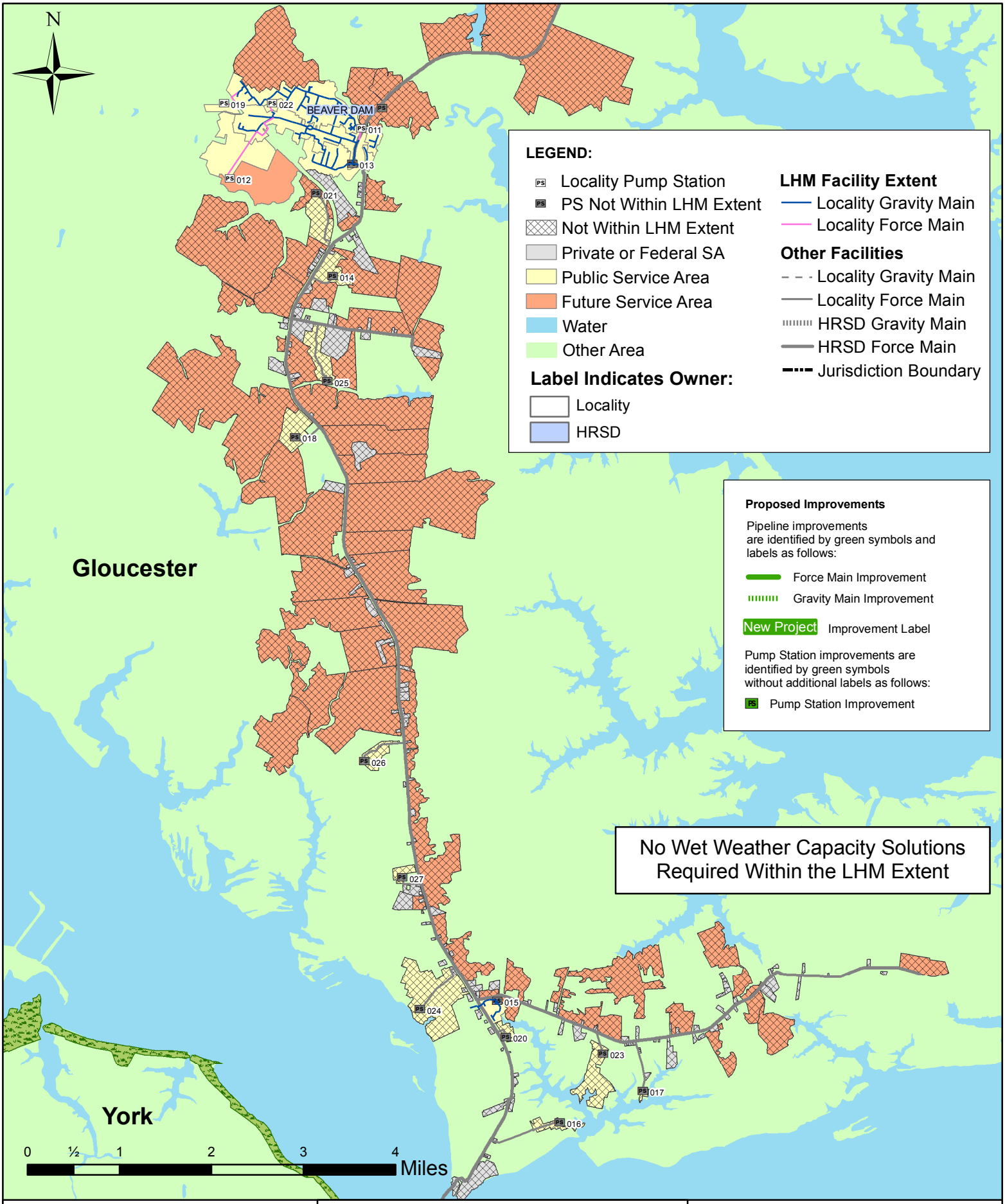
Date: 8/15/2017



Regional Wet Weather Management Plan

Appendix D - Figure 1-3
City of Chesapeake
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 8/15/2017



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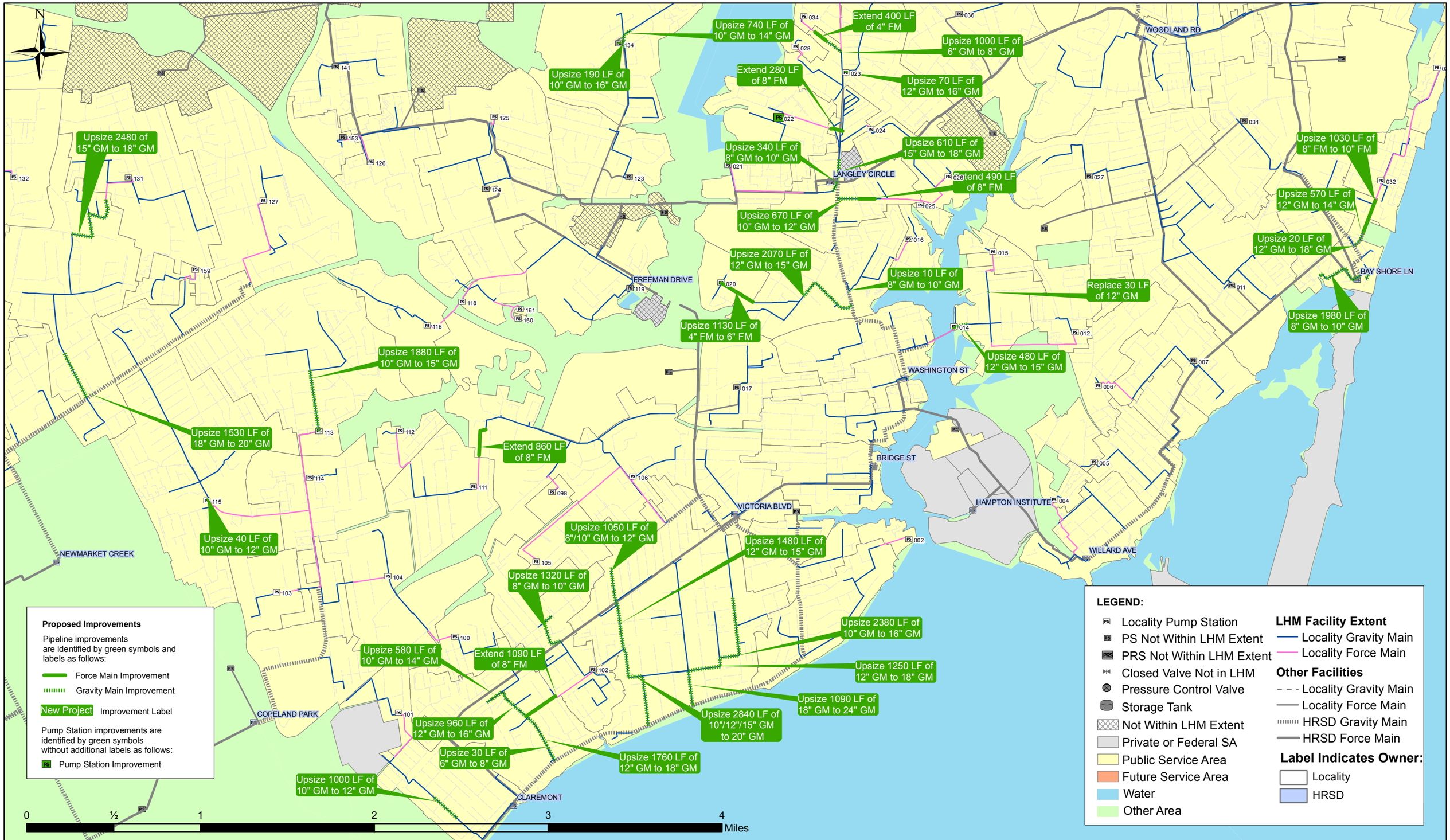
Regional Wet Weather Management Plan

Appendix D - Figure 2
Gloucester County
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017



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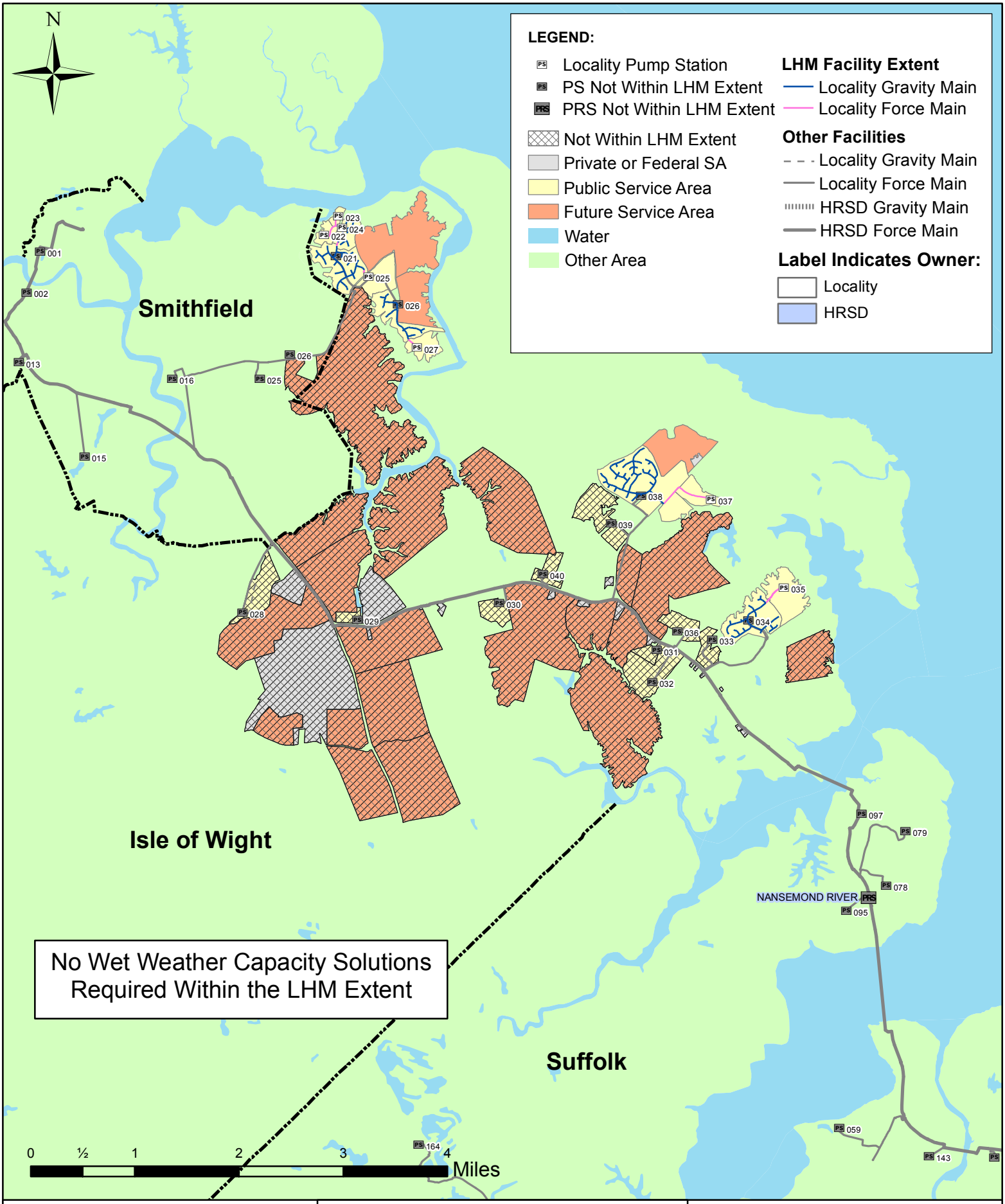
Regional Wet Weather Management Plan

Appendix D - Figure 3
City of Hampton
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/8/2017



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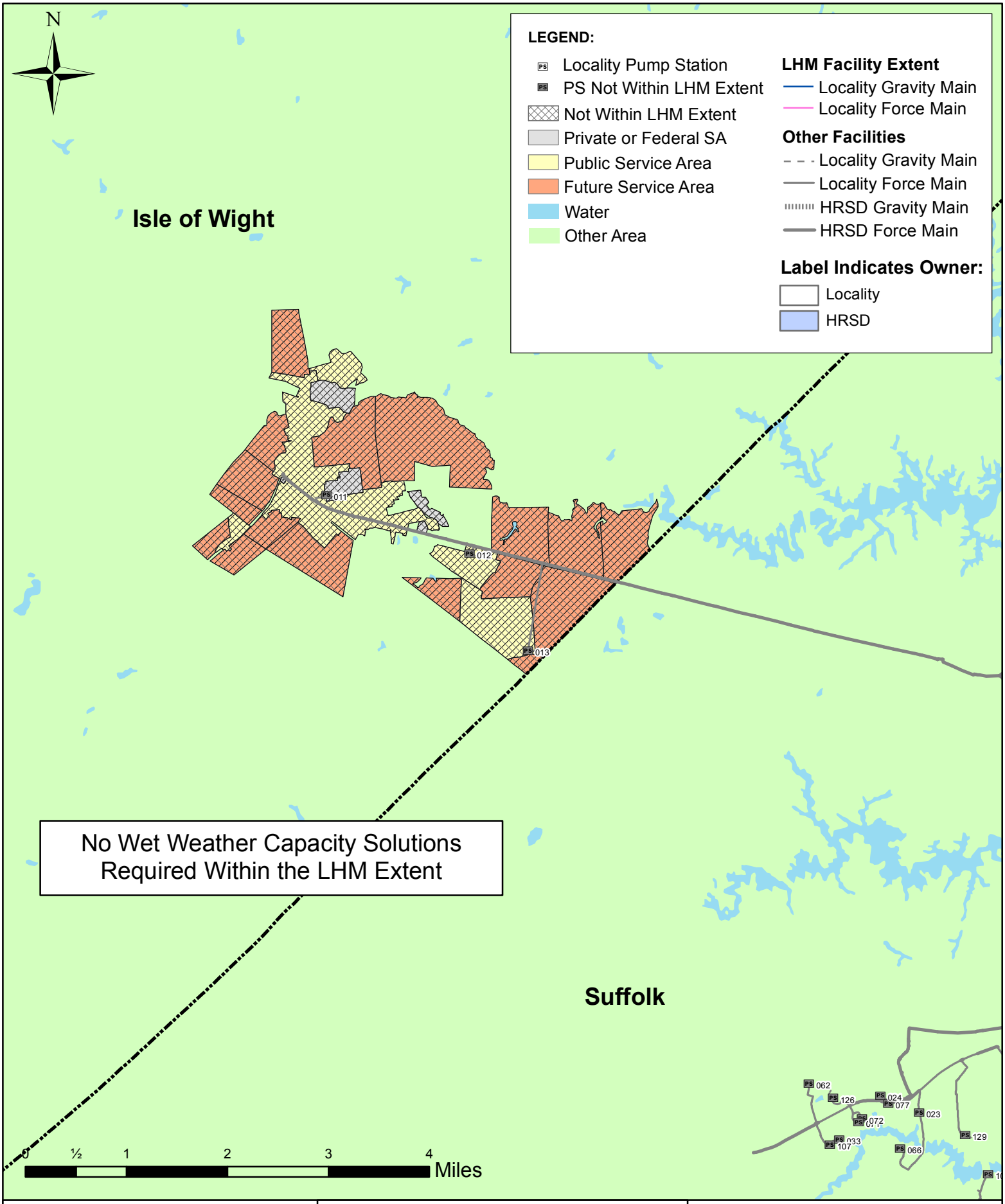
Regional Wet Weather Management Plan

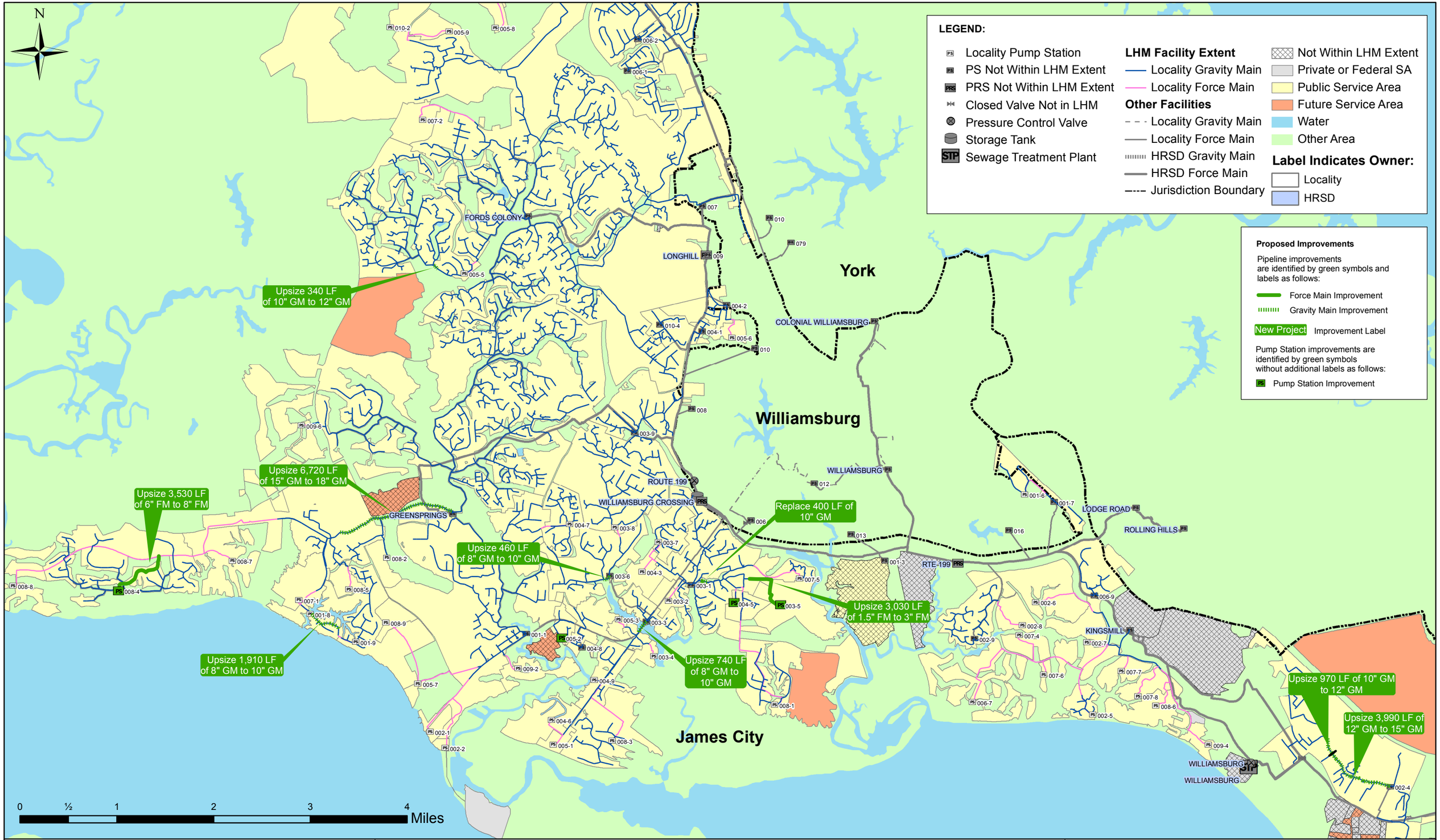
Appendix D - Figure 4-1
Isle of Wight County
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017



HRSD	Regional Wet Weather Management Plan	Appendix D - Figure 4-2 Isle of Wight County RWWMP LHM Solution Set for 4-year 2030 Flow Conditions with RWWMP I/I Program

Date: 9/19/2017



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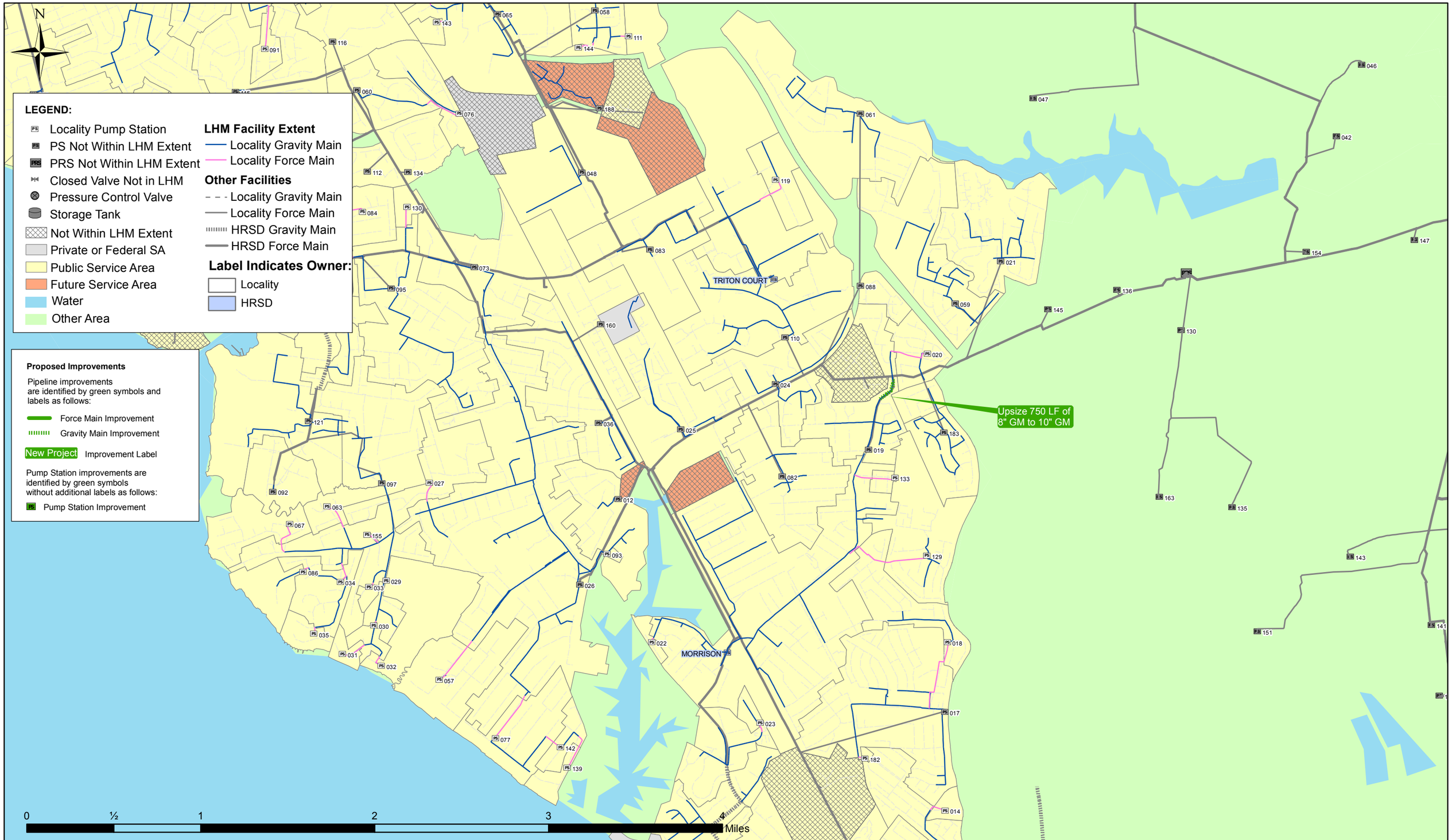
Regional Wet Weather Management Plan

Appendix D - Figure 5
James City Service Authority
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017



Regional Wet Weather Management Plan

Appendix D - Figure 6-1
City of Newport News
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 8/15/2017

HRSD

Regional Wet Weather Management Plan

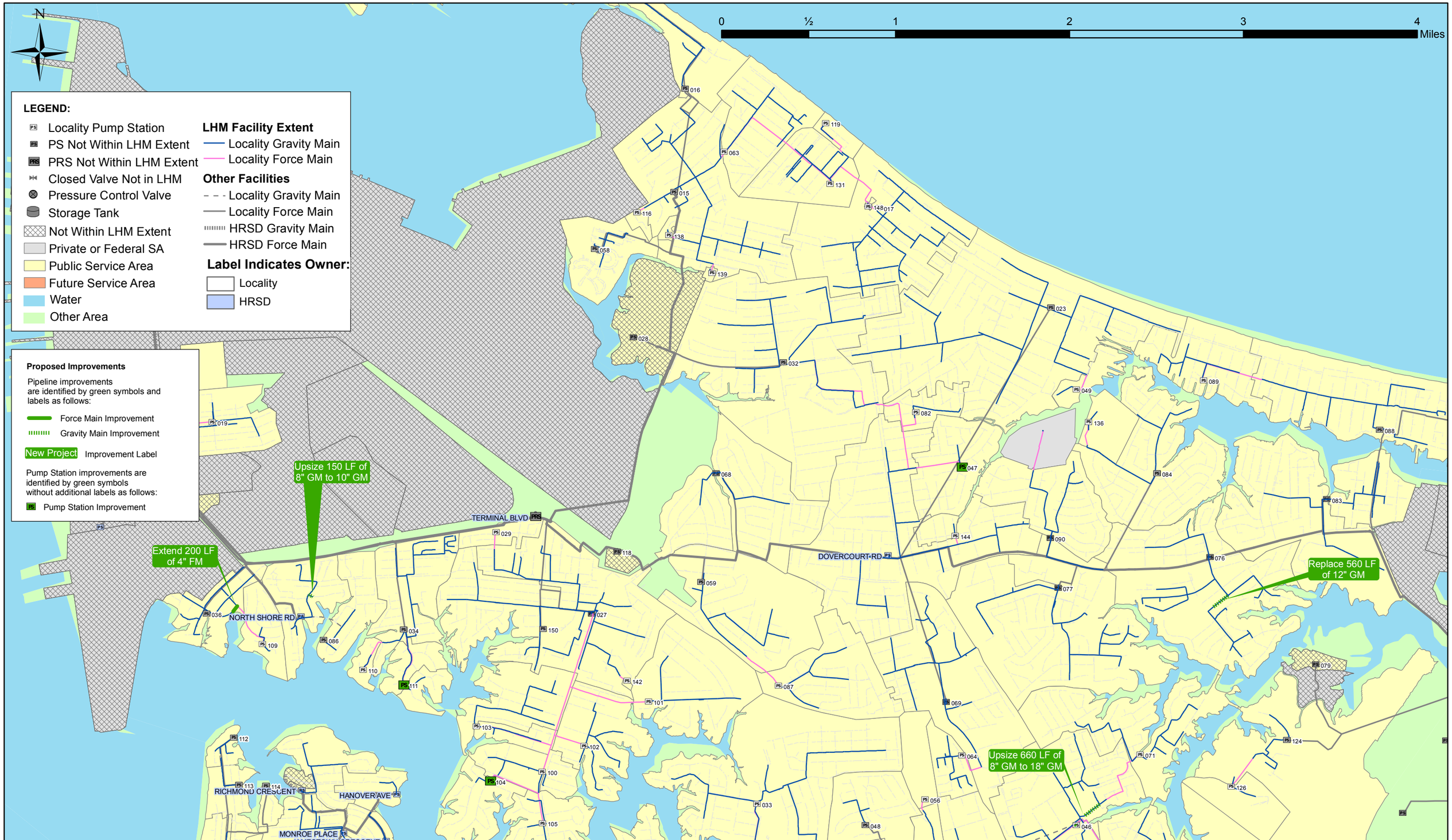
Appendix D - Figure 6-2
City of Newport News
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/8/2017

Regional Wet Weather Management Plan

Appendix D - Figure 6-3
City of Newport News
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 8/15/2017



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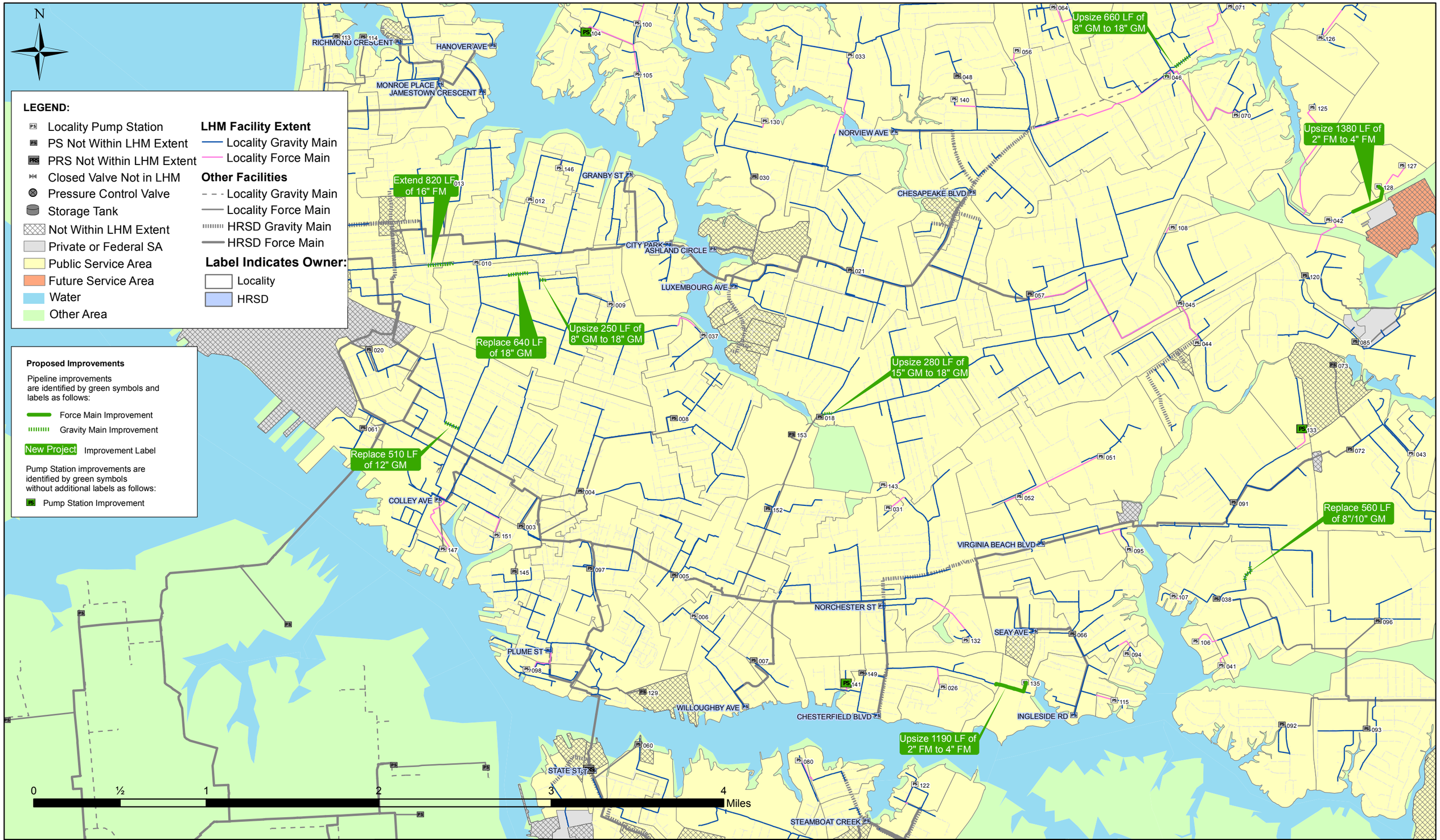
Regional Wet Weather Management Plan

Appendix D - Figure 7-1
City of Norfolk
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

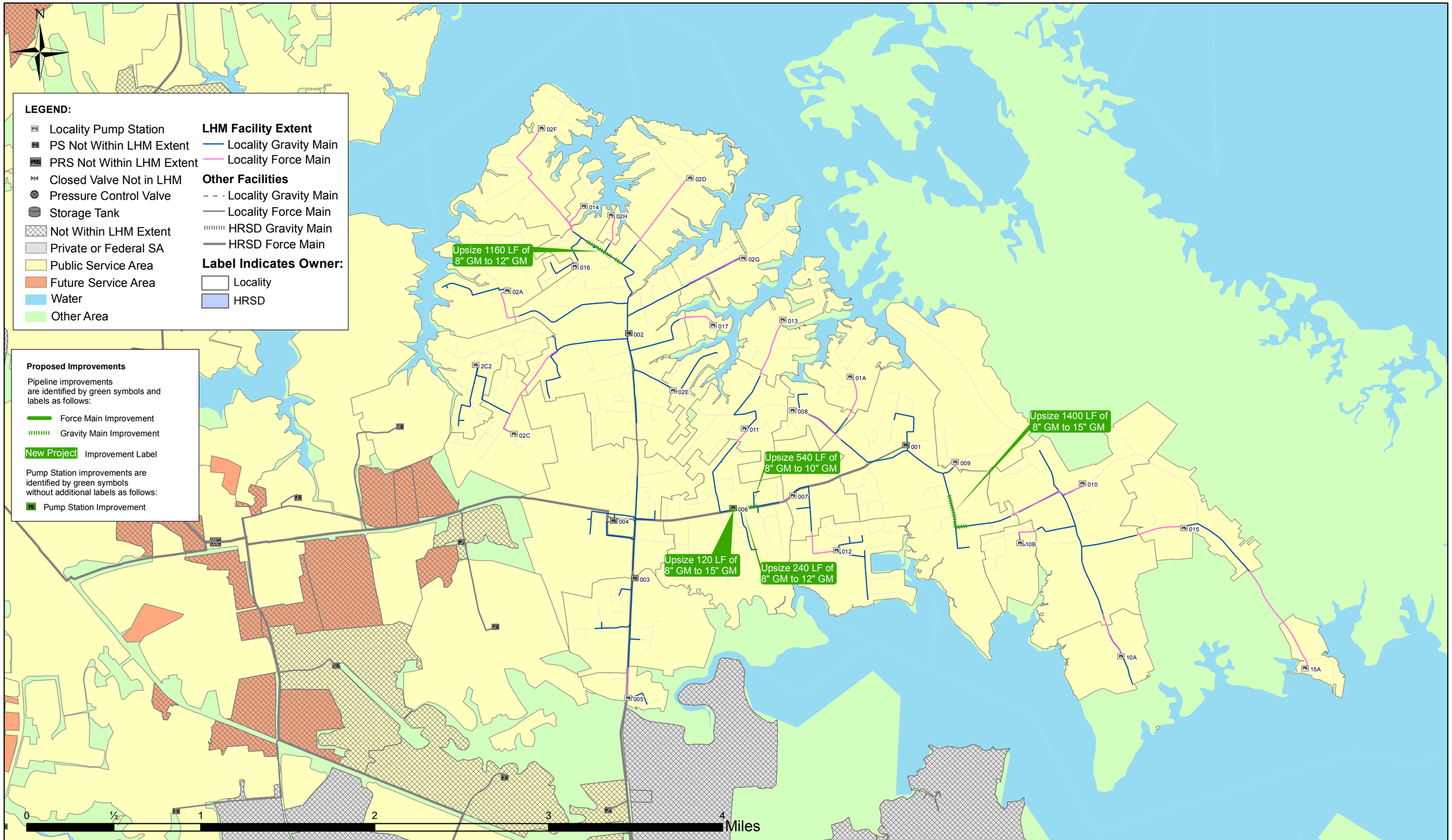
Date: 9/13/2017



Regional Wet Weather Management Plan

Appendix D - Figure 7-2
City of Norfolk
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

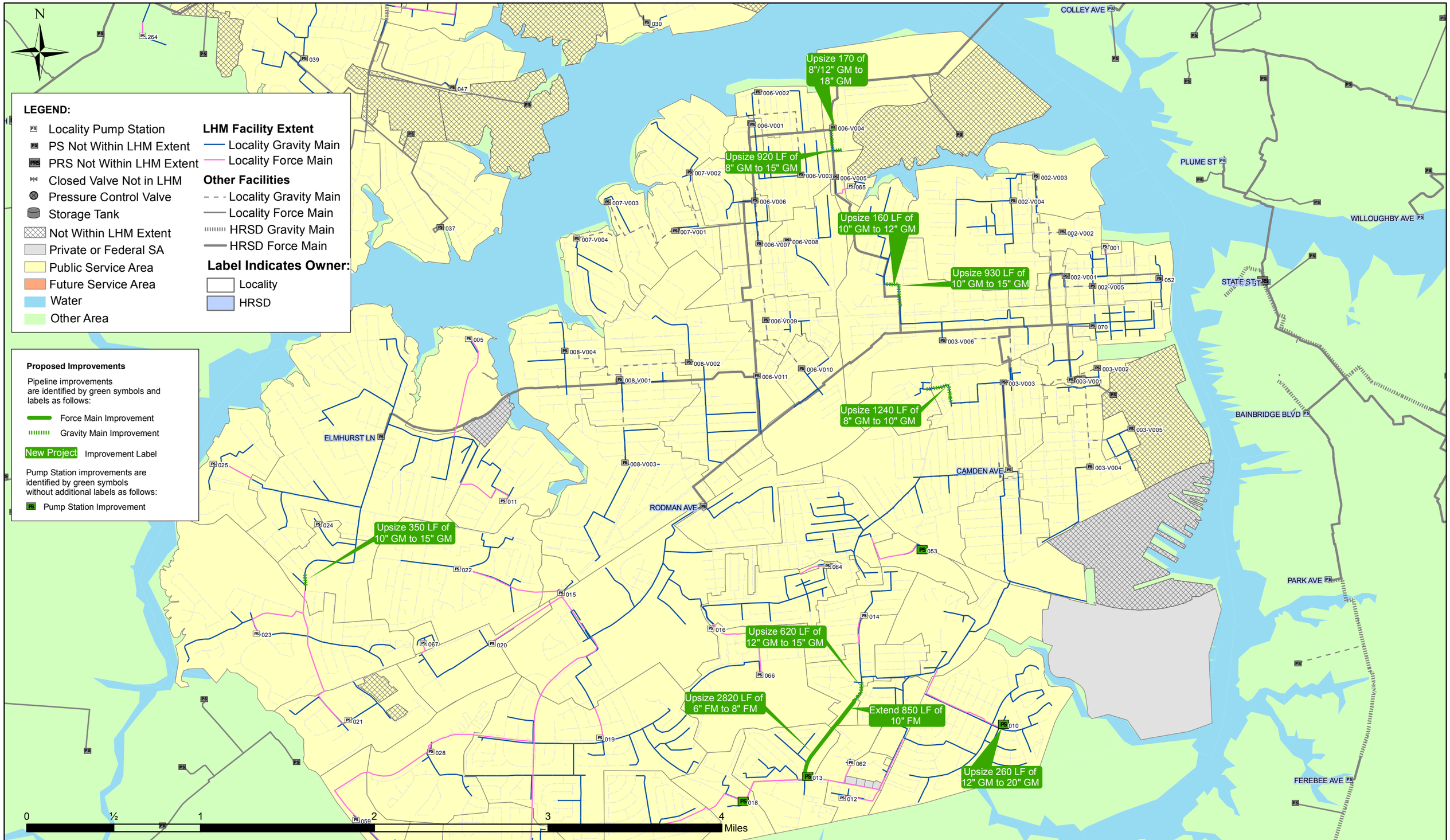
Date: 8/15/2017



Regional Wet Weather Management Plan

Appendix D - Figure 8
City of Poquoson
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

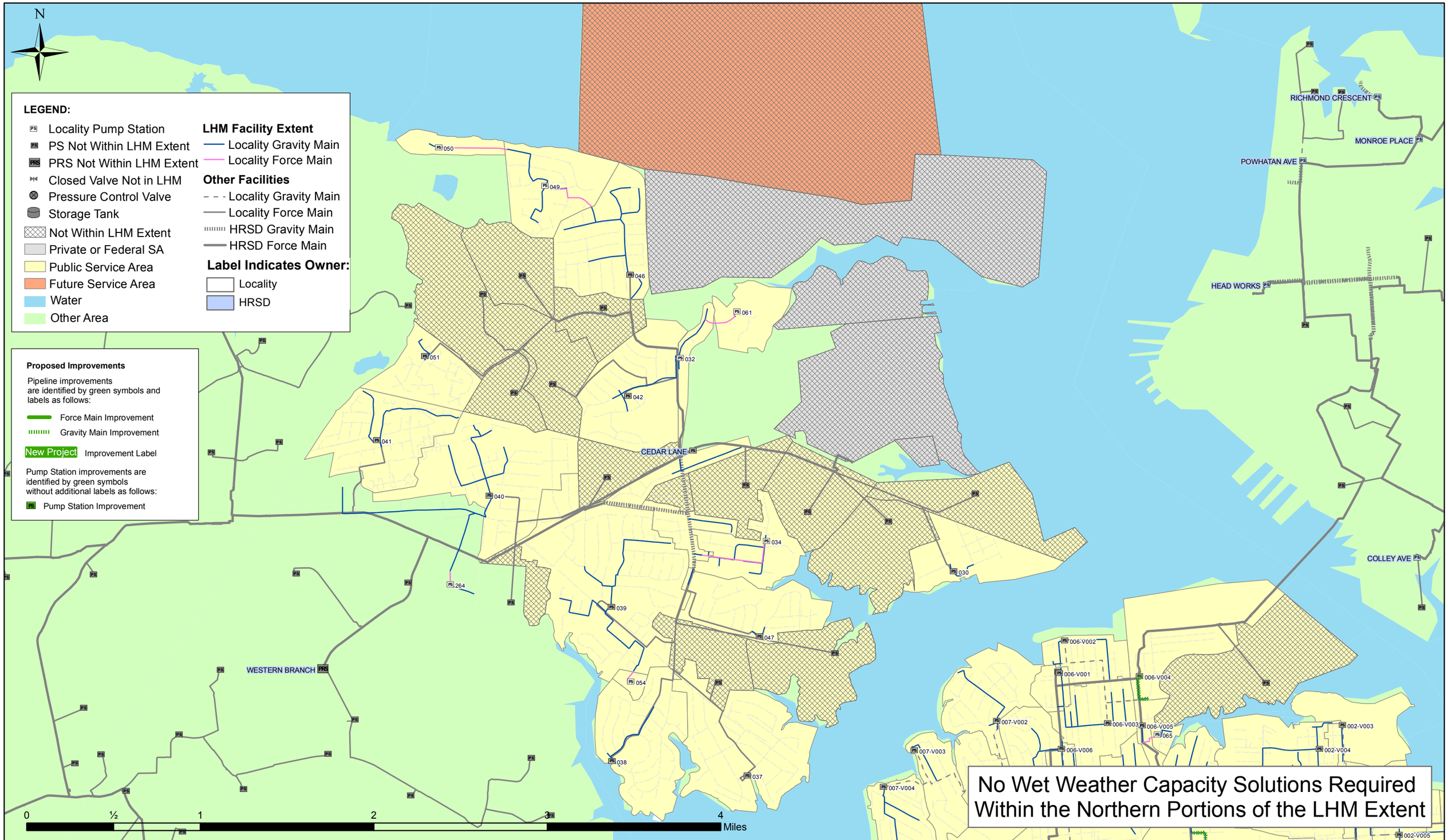
Date: 8/15/2017



Regional Wet Weather Management Plan

Appendix D - Figure 9-1
City of Portsmouth
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/8/2017



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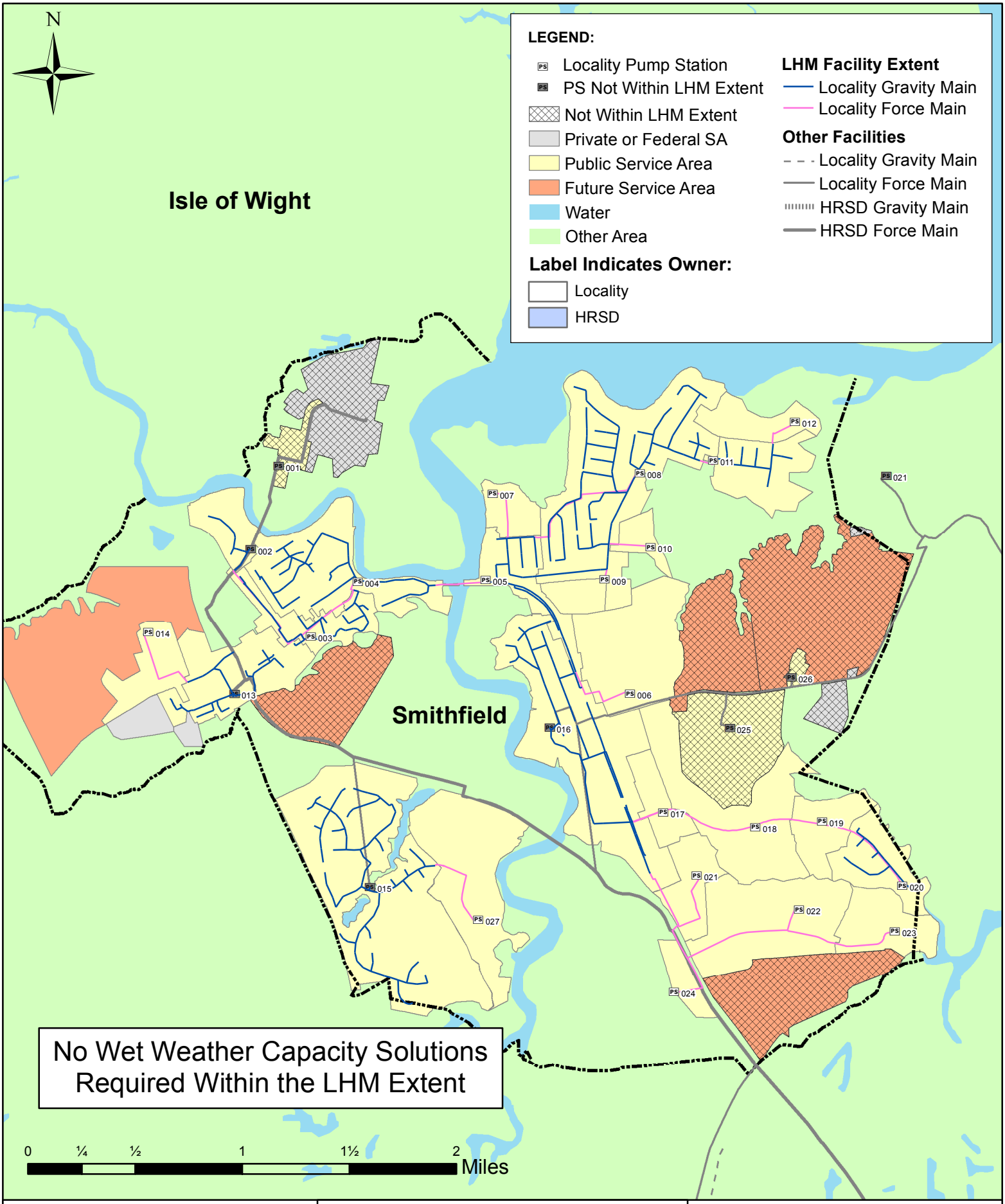
Regional Wet Weather Management Plan

Appendix D - Figure 9-2
City of Portsmouth
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/15/2017



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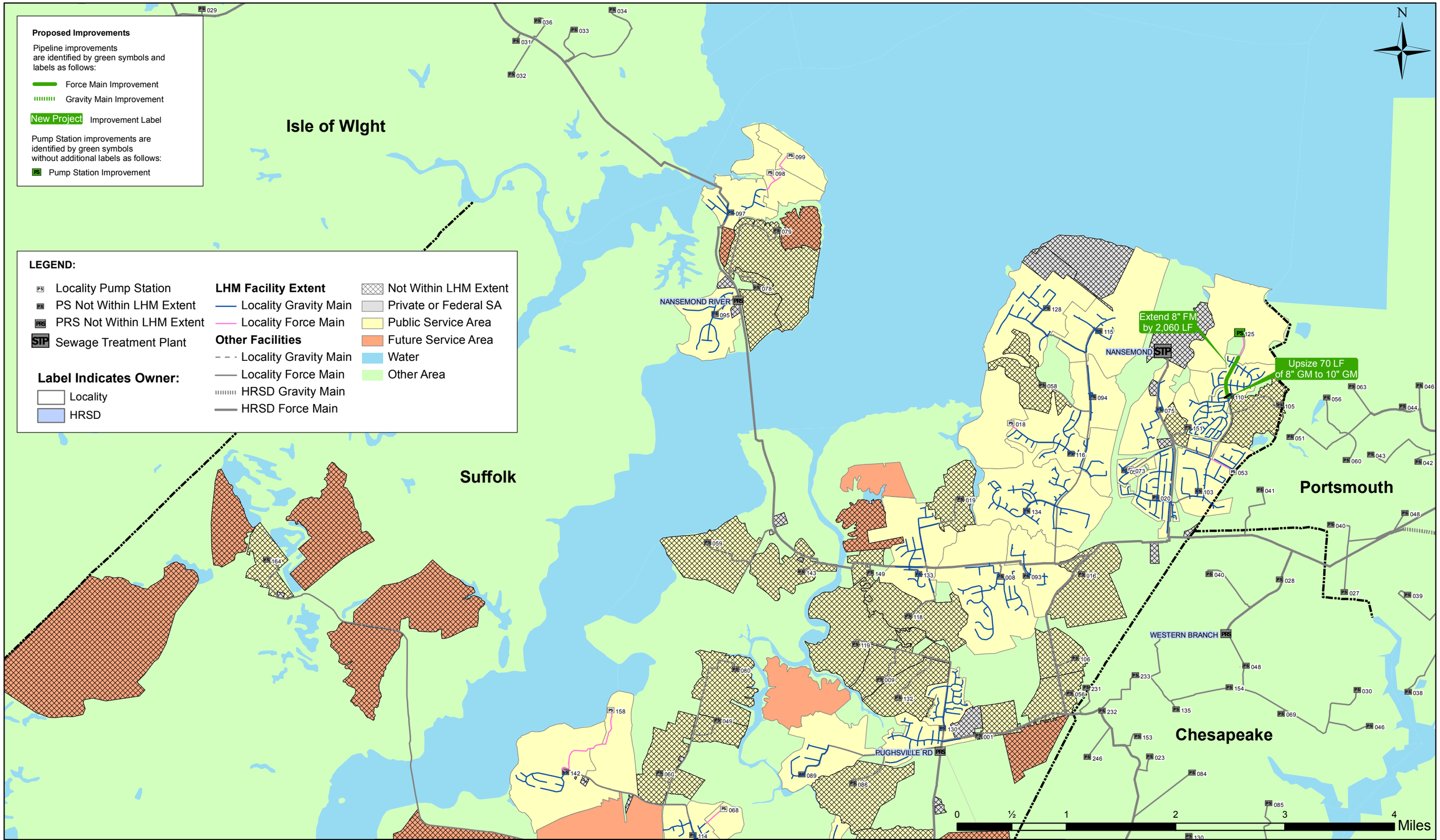
Regional Wet Weather Management Plan

Appendix D - Figure 10
Town of Smithfield
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017



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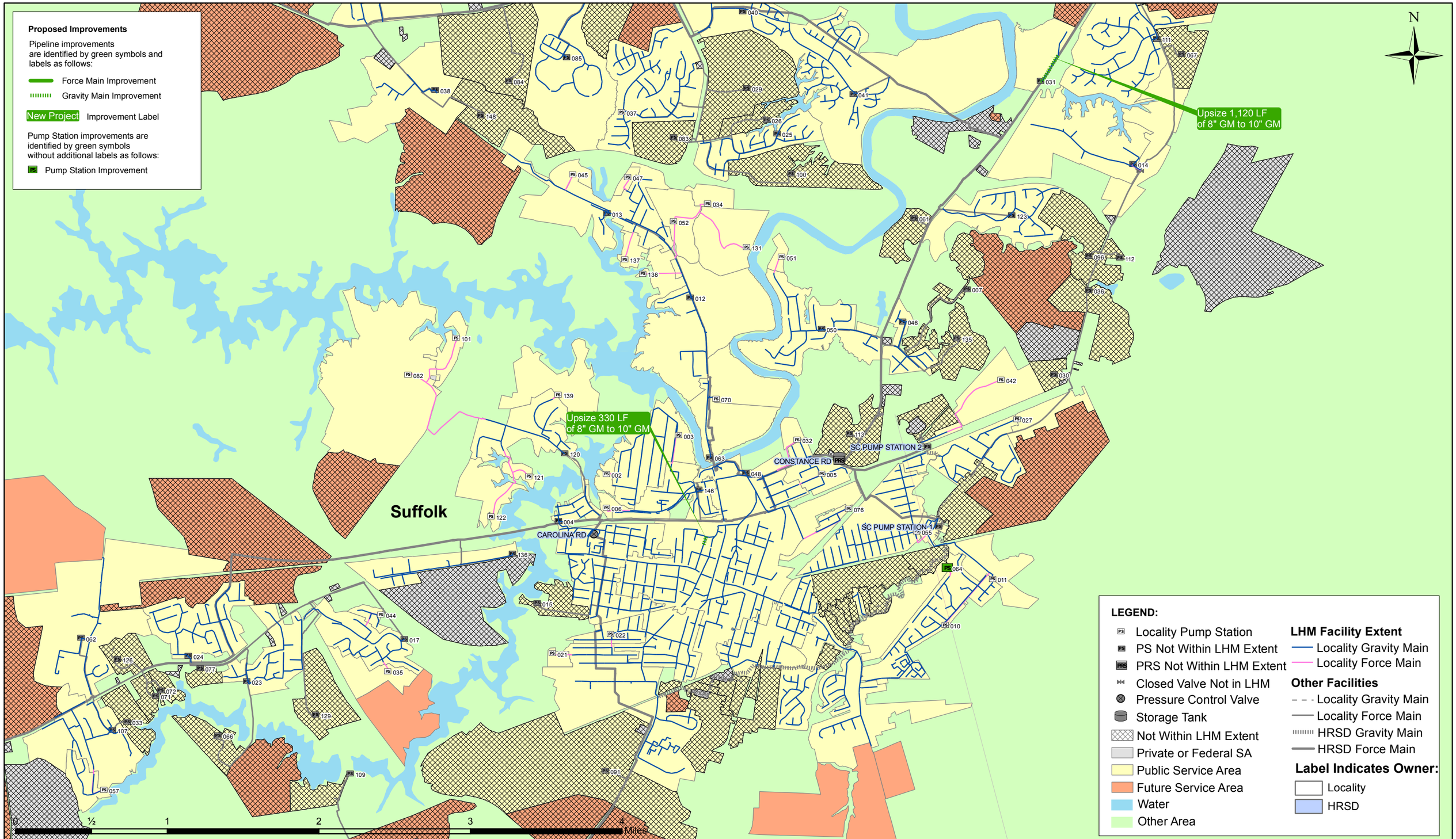
Regional Wet Weather Management Plan

Appendix D - Figure 11-1
City of Suffolk
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017



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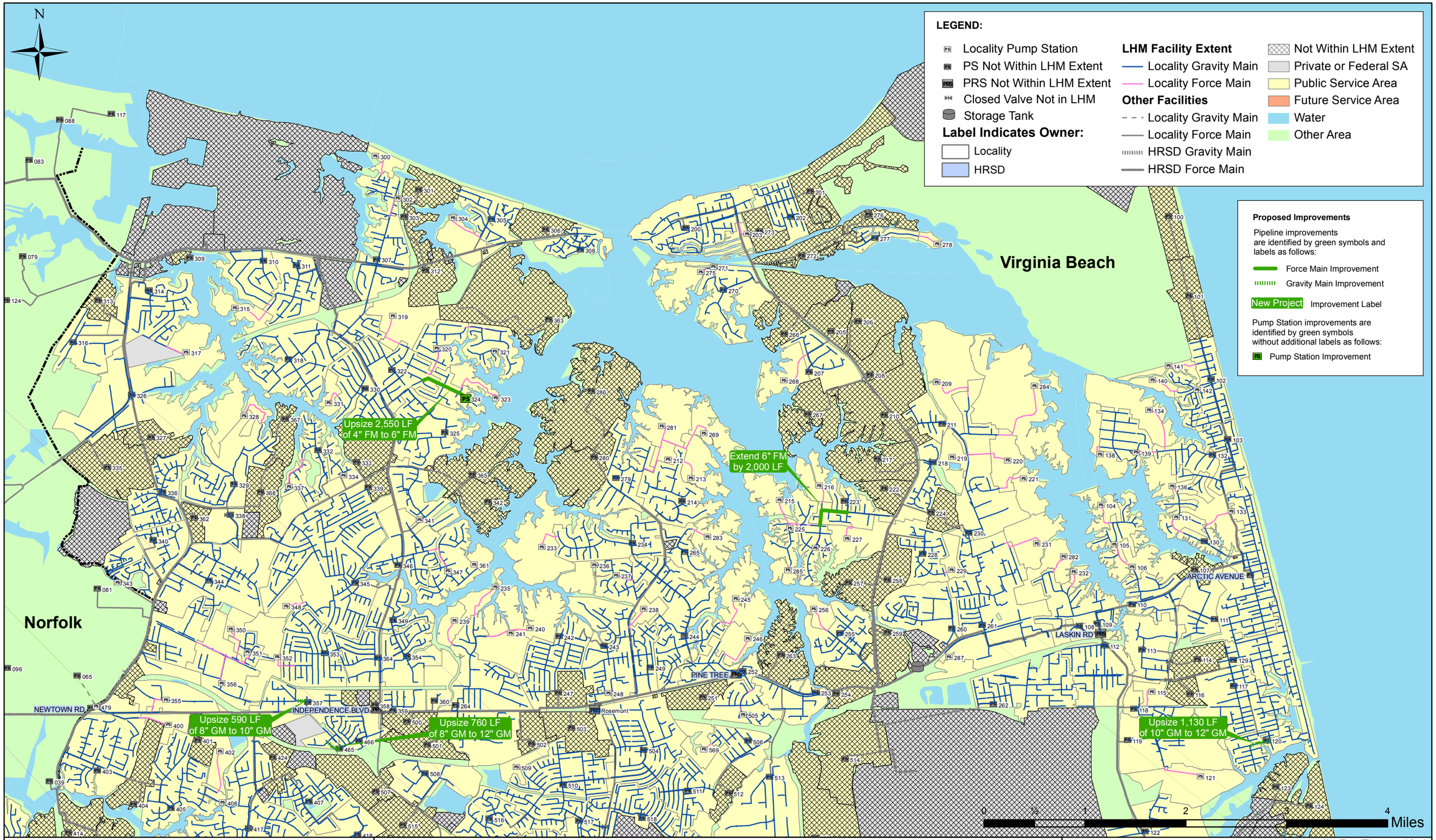
Regional Wet Weather Management Plan

Appendix D - Figure 11-2
City of Suffolk
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017



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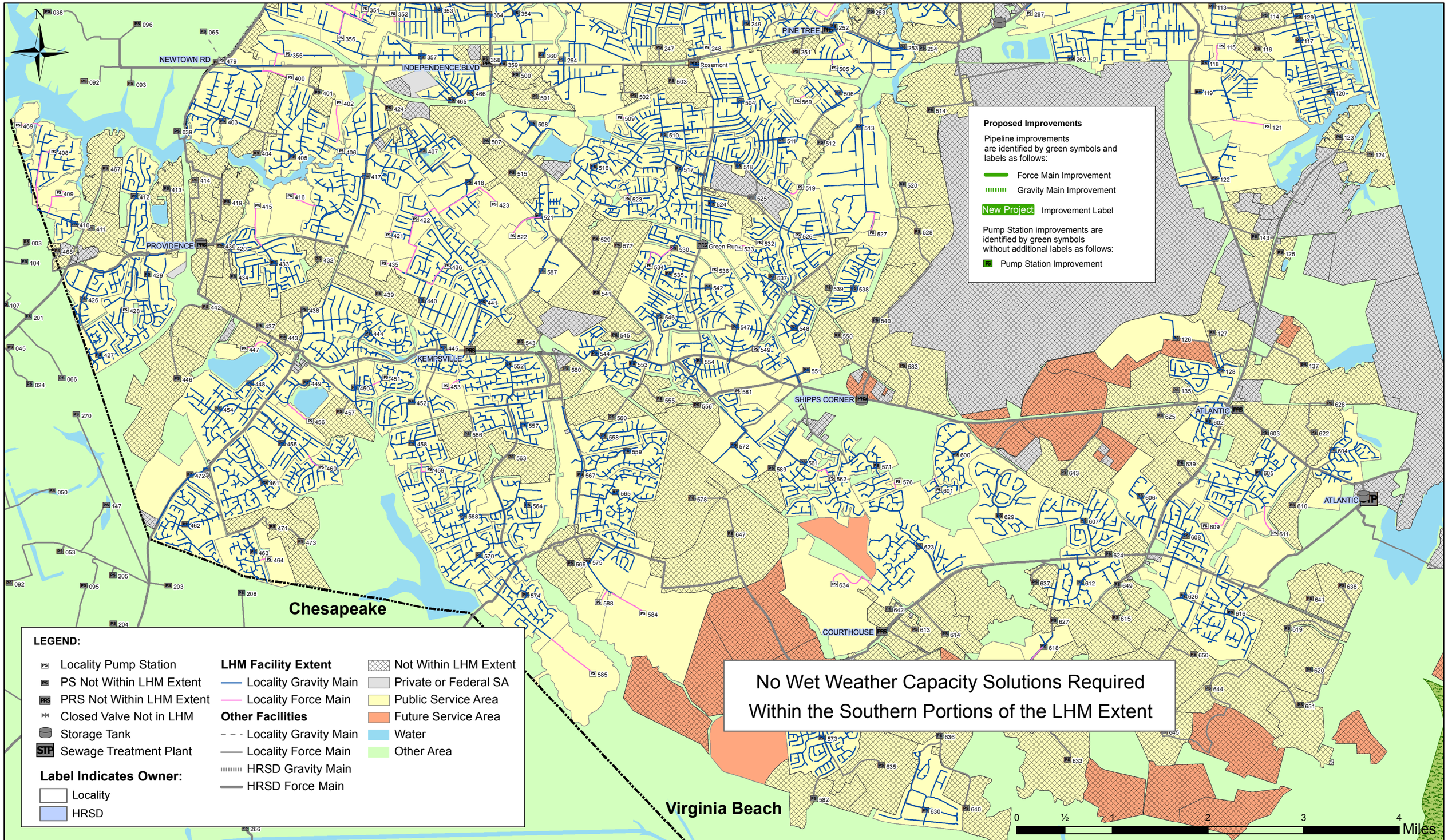
Regional Wet Weather Management Plan

Appendix D - Figure 12-1
City of Virginia Beach
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017

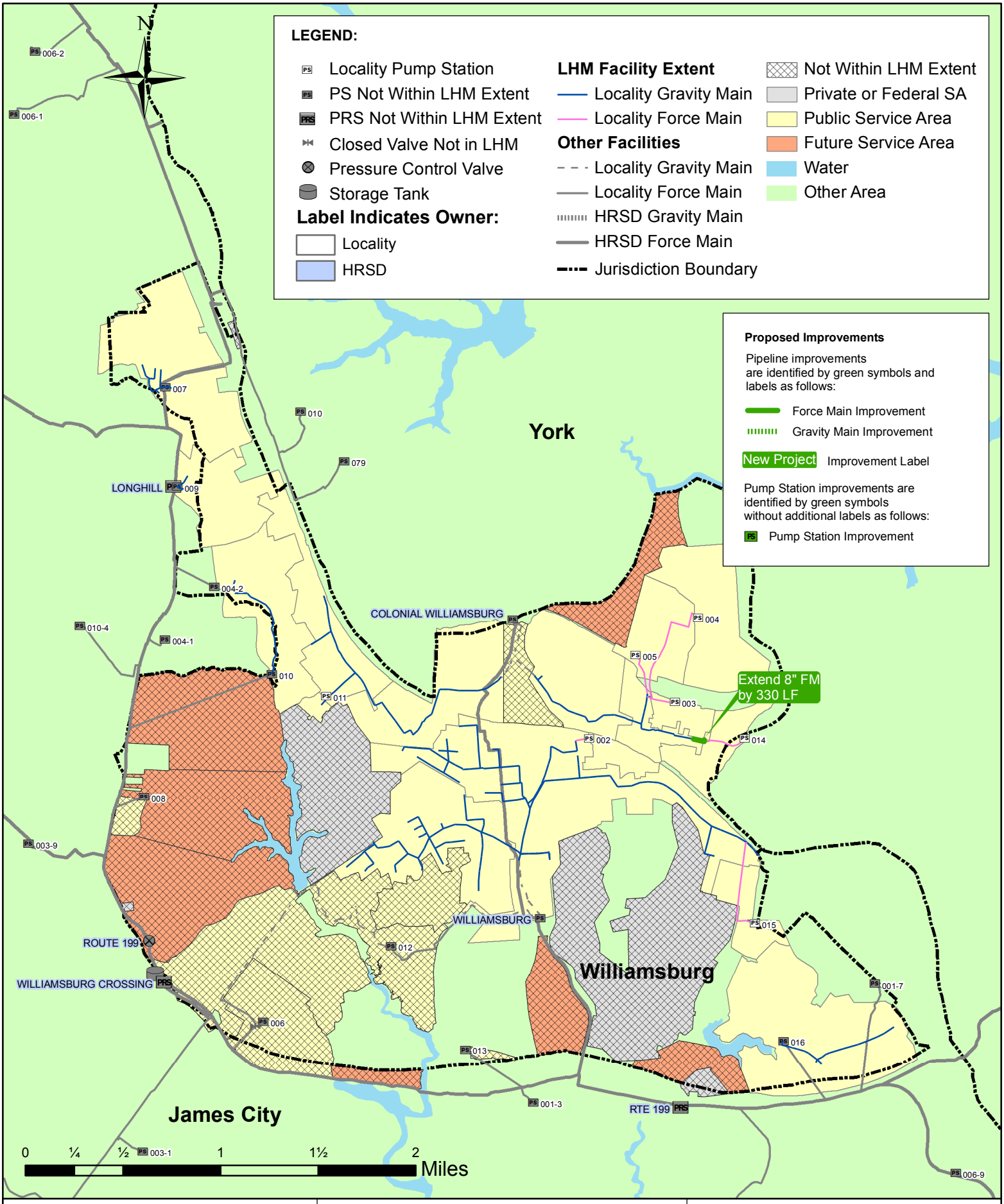


HRSD

Regional Wet Weather Management Plan

Appendix D - Figure 12-2
City of Virginia Beach
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017



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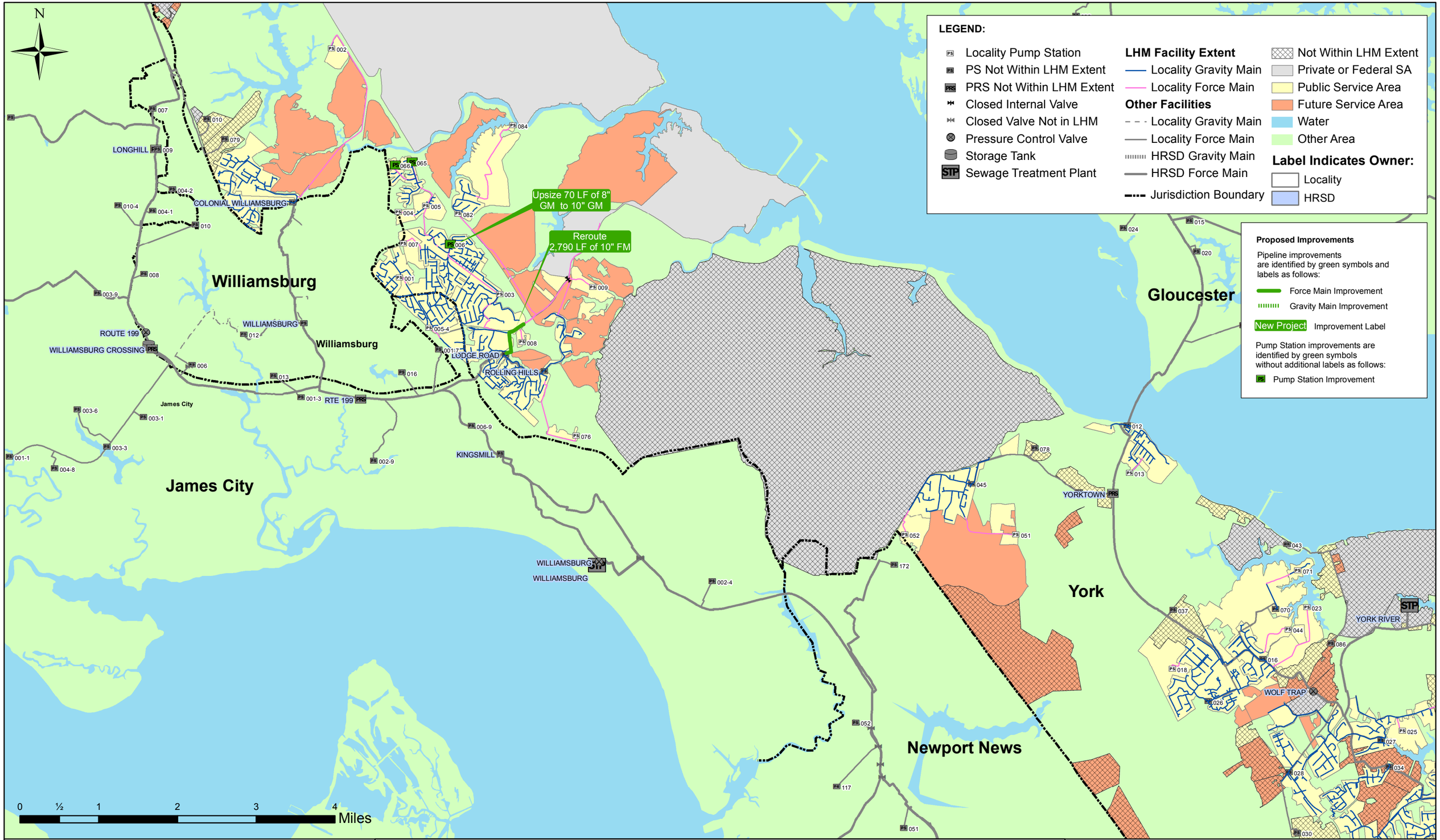
Regional Wet Weather Management Plan

Appendix D - Figure 13
City of Williamsburg
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017



Regional Wet Weather Management Plan

Appendix D - Figure 14
York County
RWWMP LHM Solution Set
for 4-year 2030 Flow Conditions
with RWWMP I/I Program

Date: 9/19/2017

Appendix E: RWWMP Projects with Corresponding Elements Table

Note that some projects and elements listed in the Appendix E table show a cost of $0. These projects are either being funded through a Rehab Plan project or other HRSD CIP project, but are also identified as part of the full RWWMP 4-year LOS solution set. In addition, some Locality gravity main capacity improvements fell within a Comprehensive I/I Reduction Program basin and were considered a zero dollar increase.

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
AB-RWWMP-01					Terminal Blvd./ Hampton Blvd. Force Main Improvements		$0
	RHM	HRSD	AB	FM	Terminal Blvd./ Hampton Blvd. FM	Upgrade 7,300 LF of 30" FM with 36" FM along Terminal Blvd. and Hampton Blvd. from Diven Street to Sewell's Point Elementary School	$0
AB-RWWMP-02					Terminal PRS Upgrade		$8,997
	RHM	HRSD	AB	PRS	Terminal PRS	Upgrade PRS to 55 ft. of assistance - Existing Location	$8,997
AB-RWWMP-03					Norfolk City System Improvements D		$5,122
	RHM	NORF	AB	PS	NORF-PS-016	NORF Pump Station 016	$947
	RHM	NORF	AB	PS	NORF-PS-022	NORF Pump Station 022	$757
	LHM	NORF	AB	PS	NORF-PS 047	NORF Pump Station 047	$1,140
	RHM	NORF	AB	PS	NORF-PS-068	NORF Pump Station 068	$1,521
	LHM	NORF	AB	PS	NORF-PS 104	NORF Pump Station 104	$757
AB-RWWMP-04					Norfolk City System Improvements E		$1,301
	LHM	NORF	AB	FM	NORF-109 FM Extension	Install 200 LF of 4" FM	$49
	LHM	NORF	AB	GM	NORF-H-117-G001 GM Improvement	Install 150 LF of 10" GM	$112
	LHM	NORF	AB	PS	NORF-PS 111	NORF Pump Station 111	$1,140
AT-RWWMP-01					Chesapeake High-Priority Project 1		$24,765
	RHM	CHES	AT	FM	CHES-PS-067 FM	Install 1,930 LF of 10" Discharge force main downstream of Chesapeake pump station 067 (114 Mann Dr.)	$798
	LHM	CHES	AT	GM	CHES-067 GM Improvement - I	Install 280 LF of 12" GM	$0
	LHM	CHES	AT	GM	CHES-067 GM Improvement - II	Install 2,760 LF of 16" GM	$0
	RHM	CHES	AT	PS	CHES-PS-072	CHES Pump Station 072; 100 Tilden Ave	$219
	I/I Program	CHES	AT	I/I Reduc	CHES-032 General I/I Reduction Plan	Catchment(s): CHES-032	$3,452
	I/I Program	CHES	AT	I/I Reduc	CHES-047 Data-Driven I/I Reduction Plan	Catchment(s): CHES-047	$2,650
	I/I Program	CHES	AT	I/I Reduc	CHES-067 Comprehensive I/I Reduction Plan	Catchment(s): CHES-067	$12,819
	I/I Program	CHES	AT	I/I Reduc	CHES-111 General I/I Reduction Plan	Catchment(s): CHES-111	$4,828
AT-RWWMP-02					VAB I/I Reduction Project A		$5,019
	I/I Program	VAB	AT	I/I Reduc	VAB-558 Data-Driven I/I Reduction Plan	Catchment(s): VAB-558	$2,933
	I/I Program	VAB	AT	I/I Reduc	VAB-602 Data-Driven I/I Reduction Plan	Catchment(s): VAB-602	$2,086
AT-RWWMP-03					Great Bridge Blvd. GM Improvement		$4,989
	RHM	HRSD	AT	GM	Great Bridge Blvd. GM Improvement - I	Upgrade 3,530 LF of 18" GM with 24" GM	$4,330
	RHM	HRSD	AT	GM	Great Bridge Blvd. GM Improvement - II	Upgrade 760 LF of 15" GM with 18" GM	$659
AT-RWWMP-04					Atlantic TP Equalization Tank and Effluent Screening		$24,436
	STP	HRSD	AT	STP	Atlantic STP Upgrades	Equalization tank 4.1MG and additional effluent screening	$24,436
AT-RWWMP-05					Atlantic PRS Upgrade		$38,996
	RHM	HRSD	AT	PRS	Atlantic PRS	Upgrade PRS to 80 ft of assistance - Existing Location	$38,996

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
AT-RWWMP-06					Birdneck-General Booth Blvd. Force Main Improvements		$26,852
	RHM	HRSD	AT	FM	Birdneck - General Booth Blvd. FM - I	Parallel a new 42" with existing 42" (54" Equivalent) - Install 5,310 LF along General Booth Blvd. from easement connection North of Berknor Drive to Dam Neck Road.	$7,736
	RHM	HRSD	AT	FM	Birdneck - General Booth Blvd. FM - II	Parallel a new 42" with existing 42" (54" Equivalent) - Install 11,500 LF new FM along Birdneck Road from Owl Creek Golf Course to General Booth Blvd.	$14,310
	RHM	HRSD	AT	FM	Birdneck - General Booth Blvd. FM - III	Parallel a new 42" with existing 42" (54" Equivalent) - 3,000 LF along Birdneck Road from Southern Blvd to Owl Creek Golf Course	$4,806
AT-RWWMP-07					Hillwell PRS		$8,636
	RHM	HRSD	AT	PRS	Hillwell PRS	Install new PRS with 70 ft of assistance - New Location	$8,636
AT-RWWMP-08					Dozier's Corner PS Upgrade		$2,848
	RHM	HRSD	AT	PS	Dozier's Corner PS	SS-PS-109	$2,848
AT-RWWMP-09					Battlefield Blvd South IFM Improvements		$14,895
	RHM	HRSD	AT	FM	Battlefield Blvd South FM - I	Parallel 5,850 LF of 24" new FM along Battlefield Blvd South from intersection of Johnstown Rd and Mt. Pleasant Rd. to Edna St.	$6,292
	RHM	HRSD	AT	FM	Battlefield Blvd South FM - II	Install 8,580 LF of 24" FM Along Battlefield Blvd from Edna St. to Hillwell Road	$8,603
AT-RWWMP-10					Laskin Road PRS Upgrade		$21,347
	RHM	HRSD	AT	PRS	Laskin Road PRS	Upgrade PRS to 80 ft of assistance - Existing Location	$21,347
AT-RWWMP-11					Shipps Corner Storage Tank		$12,192
	RHM	HRSD	AT	Storage	Shipps Corner Storage	Install new 3.1 MG storage tank	$12,192
AT-RWWMP-12					Oceana Storage Tank		$16,900
	RHM	HRSD	AT	Storage	Oceana Storage	Install new 4.9 MG storage tank	$16,900
AT-RWWMP-13					Lynnhaven Parkway Force Main Improvements		$20,341
	RHM	HRSD	AT	FM	Lynnhaven Pkwy FM	Upgrade 8,500 of 42" GM along Buckner Blvd from Lynnhaven Pkwy to Holland Road	$20,341
AT-RWWMP-14					Kempsville PRS Upgrade		$13,528
	RHM	HRSD	AT	PRS	Kempsville PRS	Upgrade PRS to 65 ft of assistance - Existing Location	$13,528
AT-RWWMP-15					Elbow Road PRS		$15,330
	RHM	HRSD	AT	PRS	Elbow Road PRS	Install permanent PRS with 80 ft of assistance - Existing Location	$15,330
AT-RWWMP-16					Virginia Beach Blvd. FM Improvements		$32,720
	RHM	HRSD	AT	FM	Virginia Beach Blvd. FM - I	Parallel a new 30 in and new 24 in (36" Equivalent) and associated locality connections (Based on old line connections) - Install 10,000 LF new FM along Virginia Beach Blvd. from Independence PRS to Lynn Shores Dr (New Alignment)	$18,375
	RHM	HRSD	AT	FM	Virginia Beach Blvd. FM - II	Parallel a new 30 inch with existing 24 in (36" Equivalent) - Install 5,100 LF new FM along Virginia Beach Blvd. from Lynn Shores Dr to Little Neck Road	$6,053

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
AT-RWWMP-16 continued							
	RHM	HRSD	AT	FM	Virginia Beach Blvd. FM - III	Parallel 1,200 LF new 30" FM with existing 24" (36" Equivalent) along Virginia Beach Blvd. from Little Neck Rd to West of Groveland Rd.	$2,719
	RHM	HRSD	AT	FM	Virginia Beach Blvd. FM - IV	Parallel 4,420 LF new 36" FM with existing 24" (42" Equivalent) along Virginia Beach Blvd. from West of Groveland Rd. to Pine Tree PRS	$5,573
AT-RWWMP-17					Courthouse PRS		$17,300
	RHM	HRSD	AT	PRS	Courthouse PRS	Install permanent PRS with 80 ft of assistance - New Location	$17,300
AT-RWWMP-18					Chesapeake City System Improvements D		$3,430
	LHM	CHES	AT	FM	CHES-011 FM Extension	Install 310 LF of 8" FM	$131
	RHM	CHES	AT	FM	CHES-PS-073 Jumper	Install 30 LF of 6" Jumper to connect PS073 to a FM d/s of PS219	$112
	LHM	CHES	AT	GM	CHES-110 GM Improvement	Install 380 LF of 12" GM	$220
	LHM	CHES	AT	GM	CHES-H-109-G001 GM Improvement	Install 1,840 LF of 16" GM	$1,285
	LHM	CHES	AT	PS	CHES-PS-011	CHES Pump Station 011	$565
	RHM	CHES	AT	PS	CHES-PS-012	CHES Pump Station 012; 935 Mains Creek Rd.	$947
	RHM	CHES	AT	PS	CHES-PS-056	CHES Pump Station 056; 4632 Bainbridge Blvd	$170
AT-RWWMP-19					Great Bridge Blvd. IFM Improvement		$5,470
	RHM	HRSD	AT	FM	Great Bridge Blvd. FM	Downsize 7,100 LF of 24" FM to 20" FM along Great Bridge Blvd from Battlefield Blvd to Willow Pt Arch to improve self cleaning velocities	$5,470
AT-RWWMP-20					Chesapeake Southern Loop IFM (Cedar Rd. to Hillcrest Pkwy.)		$30,428
	RHM	HRSD	AT	FM	Dominion Blvd; Chesapeake Southern Loop FM	Install 47,650 LF of 24" FM as part of the Chesapeake Southern Loop from Cedar Rd. to Battlefield Blvd.	$30,428
AT-RWWMP-21					Pine Tree PRS Upgrade		$18,774
	RHM	HRSD	AT	PRS	Pine Tree PRS	Upgrade PRS to 80 ft of assistance - Existing Location	$18,774
AT-RWWMP-22					Dominion Blvd. PRS		$5,555
	RHM	HRSD	AT	PRS	Dominion Blvd. PRS	Install new PRS with 75 ft of assistance - New Location	$5,555
AT-RWWMP-23					Virginia Beach PS 120 Upgrade and Gravity Main Improvement		$4,754
	LHM	VAB	AT	GM	VAB-120 GM improvement	Install 1,130 LF of 12" GM	$595
	RHM	VAB	AT	PS	VAB-PS-120	VAB Pump Station 120; Terrace Ave	$4,159
AT-RWWMP-24					Independence PRS Upgrade		$13,362
	RHM	HRSD	AT	PRS	Independence PRS	Upgrade PRS to 80 ft of assistance - Existing Location	$13,362
AT-RWWMP-25					Chesapeake I/I Reduction Project C		$17,300
	I/I Program	CHES	AT	I/I Reduc	CHES-072 Data-Driven I/I Reduction Plan	Catchment(s): CHES-072	$773
	I/I Program	CHES	AT	I/I Reduc	CHES-074 General I/I Reduction Plan	Catchment(s): CHES-074	$2,140
	I/I Program	CHES	AT	I/I Reduc	CHES-116 Data-Driven I/I Reduction Plan	Catchment(s): CHES-116	$2,065
	I/I Program	CHES	AT	I/I Reduc	CHES-220 Comprehensive I/I Reduction Plan	Catchment(s): CHES-220	$2,272
	I/I Program	CHES	AT	I/I Reduc	CHES-221 General I/I Reduction Plan	Catchment(s): CHES-221	$10,050

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
AT-RWWMP-26					Virginia Beach PS 324 Upgrade and Five Point Rd. FM Extension		$2,345
	LHM	VAB	AT	FM	Manifold FM extension; VAB-PS-215, VAB-PS-225, VAB-PS-226	Extend manifolded forcemain from upstream lift stations PS-215, PS-225 and PS-226 along Five Point Rd. to gravity sewer manhole near Rose Hall Dr. in service area VAB-223	$614
	LHM	VAB	AT	FM	VAB-PS-324 FM Improvement	Install 2,550 LF of 6" FM; VAB-324 discharge force main along Ewell Rd. to gravity sewer manhole in service area VAB-322 near Wakefield Dr.	$784
	LHM	VAB	AT	PS	VAB-PS-324	VAB Pump Station 324; Thoroughgood Ewell	$947
AT-RWWMP-27					VAB I/I Reduction Project C		$18,667
	I/I Program	VAB	AT	I/I Reduc	VAB-248 Comprehensive I/I Reduction Plan	Catchment(s): VAB-248	$1,326
	I/I Program	VAB	AT	I/I Reduc	VAB-349 Data-Driven I/I Reduction Plan	Catchment(s): VAB-349	$5,784
	I/I Program	VAB	AT	I/I Reduc	VAB-359 Comprehensive I/I Reduction Plan	Catchment(s): VAB-359	$2,967
	I/I Program	VAB	AT	I/I Reduc	VAB-360 Data-Driven I/I Reduction Plan	Catchment(s): VAB-360	$1,193
	I/I Program	VAB	AT	I/I Reduc	VAB-364 Data-Driven I/I Reduction Plan	Catchment(s): VAB-364	$3,248
	I/I Program	VAB	AT	I/I Reduc	VAB-502 Data-Driven I/I Reduction Plan	Catchment(s): VAB-502	$2,076
	I/I Program	VAB	AT	I/I Reduc	VAB-509 General I/I Reduction Plan	Catchment(s): VAB-509	$2,073
AT-RWWMP-28					Virginia Beach City System Improvements A		$4,561
	RHM	VAB	AT	PS	VAB-PS-455	VAB Pump Station 455; Brigadoon Waff	$2,281
	RHM	VAB	AT	PS	VAB-PS-508	VAB Pump Station 508; Mount Trashmore	$1,140
	RHM	VAB	AT	PS	VAB-PS-544	VAB Pump Station 544; Green Run Dahlia South	$1,140
AT-RWWMP-29					VAB I/I Reduction Project B		$5,961
	I/I Program	VAB	AT	I/I Reduc	VAB-318 General I/I Reduction Plan	Catchment(s): VAB-318	$5,961
AT-RWWMP-30					VAB I/I Reduction Project D		$18,165
	LHM	VAB	AT	GM	VAB-357 GM improvement	Install 590 LF of 10" GM	$0
	LHM	VAB	AT	GM	VAB-465 GM improvement	Install 760 LF of 12" GM	$0
	I/I Program	VAB	AT	I/I Reduc	VAB-357 Comprehensive I/I Reduction Plan	Catchment(s): VAB-357	$6,593
	I/I Program	VAB	AT	I/I Reduc	VAB-465 Comprehensive I/I Reduction Plan	Catchment(s): VAB-465	$4,456
	I/I Program	VAB	AT	I/I Reduc	VAB-466 Comprehensive I/I Reduction Plan	Catchment(s): VAB-466	$7,116
AT-RWWMP-31					Chesapeake I/I Reduction Project D		$4,756
	I/I Program	CHES	AT	I/I Reduc	CHES-063 Data-Driven I/I Reduction Plan	Catchment(s): CHES-063	$1,887
	I/I Program	CHES	AT	I/I Reduc	CHES-197 Data-Driven I/I Reduction Plan	Catchment(s): CHES-197	$1,748
	I/I Program	CHES	AT	I/I Reduc	CHES-214 Data-Driven I/I Reduction Plan	Catchment(s): CHES-214	$1,121
AT-RWWMP-32					VAB I/I Reduction Project E		$9,021
	I/I Program	VAB	AT	I/I Reduc	VAB-218 Data-Driven I/I Reduction Plan	Catchment(s): VAB-218	$914
	I/I Program	VAB	AT	I/I Reduc	VAB-256 Comprehensive I/I Reduction Plan	Catchment(s): VAB-256	$1,154
	I/I Program	VAB	AT	I/I Reduc	VAB-260 Data-Driven I/I Reduction Plan	Catchment(s): VAB-260	$6,953

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
AT-RWWMP-33					VAB I/I Reduction Project F		$15,906
	I/I Program	VAB	AT	I/I Reduc	VAB-007a Comprehensive I/I Reduction Plan	Catchment(s): VAB-H-115-G007-A	$9,121
	I/I Program	VAB	AT	I/I Reduc	VAB-338 Comprehensive I/I Reduction Plan	Catchment(s): VAB-338	$3,126
	I/I Program	VAB	AT	I/I Reduc	VAB-340_NSF_Rehab_Only General I/I Reduction Plan	Catchment(s): VAB-340	$1,570
	I/I Program	VAB	AT	I/I Reduc	VAB-350 Data-Driven I/I Reduction Plan	Catchment(s): VAB-350	$597
	I/I Program	VAB	AT	I/I Reduc	VAB-401 Data-Driven I/I Reduction Plan	Catchment(s): VAB-401	$1,492
AT-RWWMP-34					Chesapeake I/I Reduction Project H		$14,101
	I/I Program	CHES	AT	I/I Reduc	CHES-009 Comprehensive I/I Reduction Plan	Catchment(s): CHES-009	$11,055
	I/I Program	CHES	AT	I/I Reduc	CHES-134 Comprehensive I/I Reduction Plan	Catchment(s): CHES-134	$3,046
AT-RWWMP-35					Chesapeake I/I Reduction Project F		$11,110
	I/I Program	CHES	AT	I/I Reduc	CHES-013 General I/I Reduction Plan	Catchment(s): CHES-013	$3,256
	I/I Program	CHES	AT	I/I Reduc	CHES-096 Data-Driven I/I Reduction Plan	Catchment(s): CHES-096	$352
	I/I Program	CHES	AT	I/I Reduc	CHES-164 Comprehensive I/I Reduction Plan	Catchment(s): CHES-164	$2,639
	I/I Program	CHES	AT	I/I Reduc	CHES-165 Data-Driven I/I Reduction Plan	Catchment(s): CHES-165	$842
	I/I Program	CHES	AT	I/I Reduc	CHES-931-G1 General I/I Reduction Plan	Catchment(s): CHES-H-131-G001	$1,778
	I/I Program	CHES	AT	I/I Reduc	CHES-931-G2 General I/I Reduction Plan	Catchment(s): CHES-H-131-G002	$2,244
AT-RWWMP-36					Norfolk I/I Reduction Project M		$21,866
	I/I Program	NORF	AT	I/I Reduc	NORF-H-115 Comprehensive I/I Reduction Plan	Catchment(s): NORF-H-115-G001; NORF-H-115-G002; NORF-H-115-G003	$12,696
	I/I Program	NORF	AT	I/I Reduc	NORF-PS-081 General I/I Reduction Plan	Catchment(s): NORF-081	$9,170
AT-RWWMP-37					VAB I/I Reduction Project G		$10,897
	I/I Program	VAB	AT	I/I Reduc	VAB-343a Comprehensive I/I Reduction Plan	Catchment(s): VAB-343-A	$4,175
	I/I Program	VAB	AT	I/I Reduc	VAB-343b Comprehensive I/I Reduction Plan	Catchment(s): VAB-343-B	$6,722
AT-RWWMP-38					Norfolk City System Improvements F		$959
	LHM	NORF	AT	FM	NORF-128 FM Improvement	Install 1,380 LF of 4" FM	$344
	LHM	NORF	AT	GM	NORF-038 GM Improvement	Install 560 LF of 10" GM	$314
	LHM	NORF	AT	GM	NORF-076 GM Improvement	Install 560 LF of 12" GM	$301
BH-RWWMP-01					Claremont PS Upgrade, Chesapeake Ave. Pipe Improvements and 14th St Storage Tank		$48,559
	RHM	HRSD	BH	GM	Claremont Ave GM Improvement -I	Upgrade 6,490 LF to 42" GM	$8,892
	RHM	HRSD	BH	GM	Claremont Ave GM Improvement -II	Upgrade 2,180 LF of 24" GM to 36" GM	$2,548
	RHM	HRSD	BH	PS	Claremont PS	NS-PS-208	$13,101
	RHM	HRSD	BH	Siphon	Claremont Siphon - Chesapeake Ave and Robinson Rd	Upgrade 70 LF of 42" inverted siphon along Chesapeake Avenue upstream of NS-PS-208	$3,129
	RHM	HRSD	BH	Siphon	Claremont Siphon - Indian River	Upgrade 70 LF of 42" inverted siphon along Chesapeake Avenue upstream of NS-PS-208	$3,129
	RHM	HRSD	BH	Storage	14th St Storage	Install new 4.3 MG storage tank	$17,760

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
BH-RWWMP-02					Hampton I/I Reduction Project A		$16,898
	RHM	HAMP	BH	FM	HAMP PS 006 FM Improvement	Extend 730 LF of 8" discharge force main along Chamberlin Avenue into a City gravity manhole near North Mallory Street to reroute flow to the end of the HRSD GM interceptor along North Hope Street upstream of Willard Avenue PS.	$408
	I/I Program	HAMP	BH	I/I Reduc	HAMP-225H-107 General I/I Reduction Plan	Catchment(s): HAMP-H-225-G107	$5,372
	I/I Program	HAMP	BH	I/I Reduc	HAMP-225H-117 Comprehensive I/I Reduction Plan	Catchment(s): HAMP-H-225-G117	$8,233
	I/I Program	HAMP	BH	I/I Reduc	HAMP-225H-124 General I/I Reduction Plan	Catchment(s): HAMP-H-225-G124	$2,885
BH-RWWMP-03					Washington St Gravity Main Improvements		$4,291
	RHM	HRSD	BH	GM	Washington St GM Improvement - I	Install 1,040 LF of 24" GM	$1,409
	RHM	HRSD	BH	GM	Washington St GM Improvement - II	Install 2,380 LF of 30" GM	$2,882
BH-RWWMP-04					58th St Storage Tank		$11,456
	RHM	HRSD	BH	Storage	58th St Storage	Install new 2.5 MG storage tank	$11,456
BH-RWWMP-05					Hampton I/I Reduction Project C		$5,781
	I/I Program	HAMP	BH	I/I Reduc	HAMP-017 Data-Driven I/I Reduction Plan	Catchment(s): HAMP-017	$5,781
BH-RWWMP-06					Copeland Park PS Upgrade		$4,900
	RHM	HRSD	BH	PS	Copeland Park PS	NS-PS-209	$4,900
BH-RWWMP-07					Newmarket Creek PS Upgrade		$7,645
	RHM	HRSD	BH	PS	Newmarket Creek PS	NS-PS-219	$7,645
BH-RWWMP-08					Mercury Blvd and Newmarket Gravity Main Improvements		$7,570
	RHM	HRSD	BH	GM	Mercury Blvd and Newmarket GM Improvement - I	Install 3,090 LF of 30" GM; Gravity main u/s of Newmarket Creek PS	$3,120
	RHM	HRSD	BH	GM	Mercury Blvd and Newmarket GM Improvement - II	Install 3,780 LF of 36" GM	$4,450
BH-RWWMP-09					Copeland Park Gravity Main Improvement		$2,227
	RHM	HRSD	BH	GM	Copeland Park GM Improvement	Upgrade 2,260 LF of 24" GM to 36" GM; U/S of Copeland Park PS along railroad tracks to Aluminium Avenue (NG-109)	$2,227
BH-RWWMP-10					Newport News I/I Reduction Project B		$3,235
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA001635 General I/I Reduction Plan	Catchment(s): NEWP-011	$884
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003200 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G031	$493
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003202 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G033	$995
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003401 General I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G053	$619
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003402 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G054	$244
BH-RWWMP-11					35th Street Gravity Main Improvement		$2,039
	RHM	HRSD	BH	GM	35th St GM Improvement	Upgrade 1,470 LF of 18" GM with 24" GM	$2,039

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
BH-RWWMP-12					Hampton City System Improvements B		$12,028
	RHM	HAMP	BH	FM	HAMP PS 002 FM Improvement	Extend 1,200 LF of 4" discharge force main along Ivy Home Road into a City gravity manhole near Congress Avenue to reroute flow to the HRSD GM interceptor along Kecoughtan Road upstream of Claremont Avenue PS.	$649
	LHM	HAMP	BH	FM	HAMP-102 FM Improvement	Install 1,090 LF of 8" FM	$460
	LHM	HAMP	BH	GM	HAMP-102 GM Improvement	Install 1,320 LF of 10" GM	$668
	LHM	HAMP	BH	GM	HAMP-H-208-G100 GM Improvement	Install 1,000 LF of 12" GM	$500
	LHM	HAMP	BH	GM	HAMP-H-208-G107 GM Improvement - I	Install 30 LF of 8" GM	$43
	LHM	HAMP	BH	GM	HAMP-H-208-G107 GM Improvement - II	Install 580 LF of 14" GM	$315
	LHM	HAMP	BH	GM	HAMP-H-208-G107 GM Improvement - III	Install 960 LF of 16" GM	$675
	LHM	HAMP	BH	GM	HAMP-H-208-G107 GM Improvement - IV	Install 1,760 LF of 18" GM	$1,288
	LHM	HAMP	BH	GM	HAMP-H-208-G119 GM Improvement - I	Install 1,050 LF of 12" GM	$559
	LHM	HAMP	BH	GM	HAMP-H-208-G119 GM Improvement - II	Install 1,480 LF of 15" GM	$972
	LHM	HAMP	BH	GM	HAMP-H-208-G119 GM Improvement - III	Install 2,380 LF of 16" GM	$1,526
	LHM	HAMP	BH	GM	HAMP-H-208-G119 GM Improvement - IV	Install 1,250 LF of 18" GM	$885
	LHM	HAMP	BH	GM	HAMP-H-208-G119 GM Improvement - V	Install 2,840 LF of 20" GM	$2,382
	LHM	HAMP	BH	GM	HAMP-H-208-G119 GM Improvement -VI	Install 1,090 LF of 24" GM	$1,106
BH-RWWMP-13					Hampton City System Improvements C		$4,428
	LHM	HAMP	BH	GM	HAMP-113 GM Improvement	Install 1,880 LF of 15" GM	$1,234
	LHM	HAMP	BH	GM	HAMP-115 GM Improvement	Install 40 LF of 12" GM	$53
	LHM	HAMP	BH	GM	HAMP-H-219-G163 GM Improvement - I	Install 2,480 LF of 18" GM	$1,784
	LHM	HAMP	BH	GM	HAMP-H-219-G163 GM Improvement - II	Install 1,530 LF of 20" GM	$1,357
BH-RWWMP-14					Newport News I/I Reduction Project F		$14,332
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003300 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G061	$480
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003302 General I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G063	$681
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003303 General I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G064	$1,248
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003801 General I/I Reduction Plan	Catchment(s): NEWP-H-BH4-G011	$1,456
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003802 General I/I Reduction Plan	Catchment(s): NEWP-H-BH4-G012	$759
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003803 Data-Driven I/I Reduction Plan	Catchment(s): NEWP-H-BH4-G013	$1,108
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003804 Data-Driven I/I Reduction Plan	Catchment(s): NEWP-H-BH4-G014	$746
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA004300 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G071	$3,332
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA004301 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G072	$2,659
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA004302 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G073	$1,863

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
BH-RWWMP-15					Hampton City System Improvements D		$3,316
	LHM	HAMP	BH	FM	HAMP-020 FM Improvement	Install 1,130 LF of 6" FM	$347
	LHM	HAMP	BH	FM	HAMP-026 FM Improvement	Install 490 LF of 8" FM	$208
	LHM	HAMP	BH	FM	HAMP-111 FM Improvement	Install 860 LF of 8" FM	$364
	LHM	HAMP	BH	GM	HAMP-014 GM Improvement -I	Install 30 LF of 12" GM	$43
	LHM	HAMP	BH	GM	HAMP-014 GM Improvement - II	Install 480 LF of 15" GM	$358
	LHM	HAMP	BH	GM	HAMP-H-223-G121 GM Improvement	Install 2,070 LF of 15" GM	$1,396
	LHM	HAMP	BH	GM	HAMP-H-223-G122 GM Improvement	Install 10 LF of 10" GM	$36
	LHM	HAMP	BH	GM	HAMP-H-223-G140 GM Improvement - I	Install 340 LF of 10" GM	$195
	LHM	HAMP	BH	GM	HAMP-H-223-G140 GM Improvement - II	Install 670 LF of 12" GM	$369
BH-RWWMP-16					Newport News I/I Reduction Project I		$20,776
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA001660 General I/I Reduction Plan	Catchment(s): NEWP-089	$9,540
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003601 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G081	$1,696
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003700 General I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G021	$2,365
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003701 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-BH1-G022	$7,175
BH-RWWMP-17					Newport News I/I Reduction Project H		$1,217
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA001705 Data-Driven I/I Reduction Plan	Catchment(s): NEWP-004	$1,217
BH-RWWMP-18					Newport News I/I Reduction Project J		$4,614
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA003906 General I/I Reduction Plan	Catchment(s): NEWP-H-BH3-G096	$1,526
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA004100 General I/I Reduction Plan	Catchment(s): NEWP-H-201-G100	$421
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA004101 General I/I Reduction Plan	Catchment(s): NEWP-H-201-G101	$1,409
	I/I Program	NEWP	BH	I/I Reduc	NEWP-WCPSA004103 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-201-G103	$1,259
JR-RWWMP-01					Jefferson Avenue IFM Improvement		$0
	RHM	HRSD	JR	FM	Jefferson Avenue FM Improvement	Upgrade 6,520 LF of 12" , 14", 16" FM with 30 " FM	$0
JR-RWWMP-02					Tabb PRS and Storage Tank		$10,060
	RHM	HRSD	JR	PRS	Tabb PRS	Install new PRS with 80 ft. of assistance - New Location	$4,518
	RHM	HRSD	JR	Storage	Tabb Storage	Install new 1 MG storage tank	$5,542
JR-RWWMP-03					James River TP Secondary Clarifiers and RAS Pumps		$44,700
	STP	HRSD	JR	STP	James River STP Upgrades	Additional secondary clarifiers and RAS Pumps	$44,700
JR-RWWMP-04					Lucas Creek PRS Upgrade		$13,195
	RHM	HRSD	JR	PRS	Lucas Creek PRS	Upgrade PRS to 65 ft. of assistance - Existing Location	$13,195
JR-RWWMP-05					Newport News PS 68 Upgrade and Gravity Main Improvement		$2,056
	LHM	NEWP	JR	GM	NEWP-068 GM Improvement	Install 890 LF of 12" GM	$535
	RHM	NEWP	JR	PS	NEWP-PS-068	NEWP PS-068 (WWPCP)	$1,521

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
JR-RWWMP-06					Newport News I/I Reduction Project A		$8,766
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA001565 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-023	$716
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003005 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-207-G005	$2,096
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003007 General I/I Reduction Plan	Catchment(s): NEWP-H-207-G007	$1,994
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003008 General I/I Reduction Plan	Catchment(s): NEWP-H-207-G008	$1,507
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003010 Data-Driven I/I Reduction Plan	Catchment(s): NEWP-H-207-G010	$2,453
JR-RWWMP-07					Newport News City System Improvements A		$9,648
	LHM	NEWP	BH	GM	NEWP-002 GM Improvement - I	Install 500 LF of 15" GM	$340
	LHM	NEWP	BH	GM	NEWP-002 GM Improvement - II	Install 790 LF of 16" GM	$541
	LHM	NEWP	BH	GM	G05- Riverlands- Jefferson Ave GM Improvement - II	Install 350 LF of 12" GM	$210
	LHM	NEWP	BH	GM	G05- Riverlands- Jefferson Ave GM Improvement - I	Install 560 LF of 12" GM	$301
	LHM	NEWP	JR	FM	NEWP-054 FM Improvement	Install 1,140 LF of 10" FM	$657
	LHM	NEWP	JR	FM	NEWP-174 FM Improvement	Install 3,790 LF of 4" FM	$943
	LHM	NEWP	JR	GM	NEWP-019 GM Improvement	Install 750 LF of 10" GM	$397
	LHM	NEWP	JR	GM	NEWP-037 GM Improvement - I	Install 40 LF of 10" GM	$52
	LHM	NEWP	JR	GM	NEWP-044 GM Improvement - I	Install 590 LF of 14" GM	$334
	LHM	NEWP	JR	GM	NEWP-044 GM Improvement - II	Install 1,320 LF of 18" GM	$979
	LHM	NEWP	JR	GM	NEWP-054 GM Improvement	Install 240 LF of 12" GM	$156
	LHM	NEWP	JR	GM	NEWP-055 GM Improvement	Install 150 LF of 10" GM	$96
	LHM	NEWP	JR	GM	NEWP-087 GM Improvement	Install 390 LF of 10" GM	$261
	LHM	NEWP	JR	GM	NEWP-H-221-G001 GM Improvement - I	Install 290 LF of 10" GM	$155
	LHM	NEWP	JR	GM	NEWP-H-221-G001 GM Improvement - II	Install 540 LF of 12" GM	$294
	LHM	NEWP	JR	GM	NEWP-H-221-G001 GM Improvement - III	Install 3,440 LF of 15" GM	$2,366
	LHM	NEWP	JR	GM	NEWP-H-221-G001 GM Improvement - IV	Install 1,490 LF of 18" GM	$1,086
	RHM	NEWP	WB	FM	NEWP-PS-172 FM	Upsize 1,160 LF of 6" FM downstream of PS172 along Crafford Road	$480
JR-RWWMP-08					Newport News City System Improvements B		$9,838
	LHM	NEWP	JR	FM	NEWP-043 FM Improvement	Install 2,000 LF of 10" FM	$1,152
	LHM	NEWP	JR	GM	NEWP-037 GM Improvement - II	Install 160 LF of 15" GM	$126
	LHM	NEWP	JR	GM	NEWP-037 GM Improvement - III	Install 4,530 LF of 18" GM	$3,242
	RHM	NEWP	JR	PS	NEWP-PS-019	NEWP PS 019 (WWPAS)	$947
	LHM	NEWP	JR	PS	NEWP-PS-043	NEWP Pump Station 043	$2,090
	LHM	NEWP	JR	PS	NEWP-PS-122	NEWP Pump Station 122	$2,281
JR-RWWMP-09					Poquoson PS 001 Upgrade		$3,223
	RHM	POQ	JR	PS	POQ-PS-001	POQ Pump Station 001	$3,223

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
JR-RWWMP-10					Morrison PS Upgrade		$3,035
	RHM	HRSD	JR	PS	Morrison PS	NS-PS-218	$3,035
JR-RWWMP-11					Newport News I/I Reduction Project C		$17,092
	LHM	NEWP	JR	GM	NEWP-013 GM Improvement	Install 910 LF of 12" GM	$494
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA001575 General I/I Reduction Plan	Catchment(s): NEWP-013	$8,856
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA001600 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-015	$7,742
JR-RWWMP-12					Newport News I/I Reduction Project D		$12,272
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003002 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-212-G001	$2,602
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003003 General I/I Reduction Plan	Catchment(s): NEWP-H-207-G003	$2,147
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003004 Comprehensive I/I Reduction Plan	Catchment(s): NEWP-H-207-G004	$3,526
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003500 Data-Driven I/I Reduction Plan	Catchment(s): NEWP-H-207-G500	$984
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003502 General I/I Reduction Plan	Catchment(s): NEWP-H-207-G502	$903
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003503 General I/I Reduction Plan	Catchment(s): NEWP-H-207-G503	$1,363
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA003504 Data-Driven I/I Reduction Plan	Catchment(s): NEWP-H-207-G504	$747
JR-RWWMP-13					Newport News I/I Reduction Project E		$1,954
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA001430 General I/I Reduction Plan	Catchment(s): NEWP-H-220-G001; NEWP-H-220-G002; NEWP-H-220-G003; NEWP-H-220-G004; NEWP-H-220-G005; NEWP-H-220-G006	$1,954
JR-RWWMP-14					Poquoson City System Improvements A		$2,051
	LHM	POQ	JR	GM	POQ-001 GM Improvement	Install 1,400 LF of 15" GM	$894
	LHM	POQ	JR	GM	POQ-002 GM Improvement	Install 1,160 LF of 12" GM	$606
	LHM	POQ	JR	GM	POQ-006 GM Improvement - I	Install 540 LF of 10" GM	$291
	LHM	POQ	JR	GM	POQ-006 GM Improvement - II	Install 240 LF of 12" GM	$140
	LHM	POQ	JR	GM	POQ-006 GM Improvement - III	Install 120 LF of 15" GM	$120
JR-RWWMP-15					Newport News I/I Reduction Project G		$5,005
	I/I Program	NEWP	JR	I/I Reduc	NEWP-WCPSA001180 Data-Driven I/I Reduction Plan	Catchment(s): NEWP-049	$5,005
JR-RWWMP-16					York County PS 019 Upgrade		$2,469
	RHM	YORK	JR	PS	YORK-PS-019	YORK Pump Station 019; King's Villa	$2,469
NA-RWWMP-01					Chesapeake High-Priority Project 2		$36,167
	I/I Program	CHES	NA	I/I Reduc	CHES-016 Comprehensive I/I Reduction Plan	Catchment(s): CHES-016	$15,402
	I/I Program	CHES	NA	I/I Reduc	CHES-018 Comprehensive I/I Reduction Plan	Catchment(s): CHES-018	$18,065
	I/I Program	CHES	NA	I/I Reduc	CHES-227 Data-Driven I/I Reduction Plan	Catchment(s): CHES-227	$2,700
	RHM	HRSD	NA	FM	Jumper FM CHES-PS-041	150 LF of 16" Jumper FM; d/s of CHES-PS-41; along Canal Drive to S. Military Hwy	$0
	LHM	CHES	NA	GM	CHES-016 GM Improvement	Install 320 LF of 12" GM	$0

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
NA-RWWMP-02					Shingle Creek Pump Stations and Force Main/Gravity Main Installations		$0
	RHM	HRSD	NA	FM	Shingle Creek FM Improvement - I	Install 2,730 LF of 8 " FM; SS-PS-SC2 discharge force main along US 460 to Elm St.	$0
	RHM	HRSD	NA	FM	Shingle Creek FM Improvement - II	Install 4,370 LF of 16 " FM; SS-PS-SC1 discharge force main to US 460 and Elm St.	$0
	RHM	HRSD	NA	FM	Shingle Creek FM Improvement - III	Install 780 LF of 18 " FM; SS-PS-SC1 and -SC2 joint force main along US 460 past Wilroy Road	$0
	RHM	HRSD	NA	GM	Shingle Creek GM Improvement - II	Install 250 LF of 21" GM; Shingle Creek Interceptor upstream of PS-SC1	$0
	RHM	HRSD	NA	GM	Shingle Creek GM Improvement - III	Install 590 LF of 18" GM; Shingle Creek Interceptor upstream of PS-SC1	$0
	RHM	HRSD	NA	GM	Shingle Creek GM Improvement - IV	Install 420 LF of 8" GM; Shingle Creek Interceptor upstream of PS-SC2	$0
	RHM	HRSD	NA	GM	Shingle Creek GM Improvement - V	Install 900 LF of 12" GM; Shingle Creek Interceptor upstream of PS-SC2	$0
	RHM	HRSD	NA	PS	Shingle Creek PS 1 (Suffolk PS Replacement 1)	SS-PS-SC1	$0
	RHM	HRSD	NA	PS	Shingle Creek PS 2 (Suffolk PS Replacement 2)	SS-PS-SC2	$0
NA-RWWMP-03					Wilroy PRS and Storage Tank		$19,423
	RHM	HRSD	NA	PRS	Wilroy PRS	Install new PRS with 80 ft of assistance - New Location	$7,784
	RHM	HRSD	NA	Storage	Wilroy Storage	Install new 2.9 MG storage tank	$11,639
NA-RWWMP-04					Shingle Creek Interceptor Gravity Main Improvement		$8,727
	RHM	HRSD	NA	GM	Shingle Creek GM Improvement - I	upgrade 6,360 LF of 18" GM with 21" GM; Shingle Creek Interceptor (upstream of RP extent to the south)	$8,727
NA-RWWMP-05					Chesapeake I/I Reduction Project A		$5,606
	I/I Program	CHES	NA	I/I Reduc	CHES-089 Comprehensive I/I Reduction Plan	Catchment(s): CHES-089	$5,606
	LHM	CHES	NA	GM	CHES-089 GM Improvement	Install 3,230 LF of 12" GM	$0
NA-RWWMP-06					Suffolk I/I Reduction Project A		$6,202
	I/I Program	SUFF	NA	I/I Reduc	SUFF-017 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-017	$5,286
	I/I Program	SUFF	NA	I/I Reduc	SUFF-023 Data-Driven I/I Reduction Plan	Catchment(s): SUFF-023	$916
NA-RWWMP-07					Chesapeake City System Improvements A		$5,486
	RHM	CHES	NA	FM	Holland Blvd FM Improvement	Upsize 90 LF of 4" to 10" FM; d/s of CHES-PS-089; Along Holland Blvd to Cavalier Blvd	$173
	RHM	CHES	NA	PS	CHES-PS-089	CHES Pump Station 089; 1022 Cavalier Blvd	$2,469
	LHM	CHES	NA	PS	CHES-PS-121	CHES Pump Station 121	$757
	RHM	CHES	NA	PS	CHES-PS-158	CHES Pump Station 158; 4236 Airline Blvd	$947
	LHM	CHES	NA	PS	CHES-PS-183	CHES Pump Station 183	$1,140
NA-RWWMP-08					Suffolk I/I Reduction Project B		$15,255
	I/I Program	SUFF	NA	I/I Reduc	SUFF-004 Data-Driven I/I Reduction Plan	Catchment(s): SUFF-004	$12,626
	I/I Program	SUFF	NA	I/I Reduc	SUFF-022 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-022	$2,629

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
NA-RWWMP-09					Suffolk I/I Reduction Project C		$13,515
	I/I Program	SUFF	NA	I/I Reduc	SUFF-003 General I/I Reduction Plan	Catchment(s): SUFF-003	$3,226
	I/I Program	SUFF	NA	I/I Reduc	SUFF-032 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-032	$1,466
	I/I Program	SUFF	NA	I/I Reduc	SUFF-063 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-063	$1,889
	I/I Program	SUFF	NA	I/I Reduc	SUFF-076 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-076	$1,071
	I/I Program	SUFF	NA	I/I Reduc	SUFF-146 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-146	$5,863
NA-RWWMP-10					Suffolk I/I Reduction Project D		$30,367
	LHM	SUFF	NA	GM	SUFF-048 GM improvement	Install 330 LF of 10" GM	$0
	I/I Program	SUFF	NA	I/I Reduc	SUFF-048 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-048	$30,367
NA-RWWMP-11					Constance Rd PRS		$9,316
	RHM	HRSD	NA	PRS	Constance Rd PRS	Install new PRS with 80 ft of assistance - New Location	$9,316
NA-RWWMP-12					Cedar Lane Gravity Main Improvement		$778
	RHM	HRSD	NA	GM	Cedar Lane PS GM Improvement	Upgrade 910 LF from 18" to 24" GM upstream of Cedar Lane PS	$778
NA-RWWMP-13					Suffolk I/I Reduction Project E		$18,303
	I/I Program	SUFF	NA	I/I Reduc	SUFF-064 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-064	$4,423
	I/I Program	SUFF	NA	I/ Reduc	SUFF-ShingleCreek-Group Data-Driven I/I Reduction Plan	Catchment(s): SUFF-594; SUFF-595; SUFF-601; SUFF-602; SUFF-604; SUFF-610; SUFF-611; SUFF-614; SUFF-615; SUFF-616; SUFF-621; SUFF-624; SUFF-625	$13,880
NA-RWWMP-14					Cedar Lane PS Upgrade and Portsmouth PS 47 Force Main Jumper		$14,555
	RHM	HRSD	NA	FM	Jumper FM PORT-PS-047	25 LF of 8" Jumper; d/s of PORT-047; direct connect PS discharge to HRSD FM	$91
	RHM	HRSD	NA	PS	Cedar Lane PS	SS-PS-104	$14,464
NA-RWWMP-15					Suffolk I/I Reduction Project F		$5,684
	I/I Program	SUFF	NA	I/I Reduc	SUFF-027 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-027	$1,767
	I/I Program	SUFF	NA	I/I Reduc	SUFF-042 Comprehensive I/I Reduction Plan	Catchment(s): SUFF-042	$1,839
	I/I Program	SUFF	NA	I/I Reduc	SUFF-517 General I/I Reduction Plan	Catchment(s): SUFF-517	$2,078
NA-RWWMP-16					Western Branch PRS		$4,691
	RHM	HRSD	NA	PRS	Western Branch PRS	Install new PRS with 80 ft of assistance - New Location	$4,691
NA-RWWMP-17					Suffolk City System Improvements A		$5,869
	RHM	SUFF	NA	FM	Respass Beach Rd FM	Upsize 930 LF of 8" to 10" FM; d/s of SUFF-PS-110; Along Respass Beach Rd. to Burbage Lake Cir.	$521
	LHM	SUFF	NA	FM	SUFF-PS-125 FM extension	Install 2,060 LF of 8" FM; Extension of Suffolk PS-125 discharge force main along Respass Beach Rd. to gravity sewer manhole on Sheffield Ct. North in the service area for Suffolk PS-110.	$872
	RHM	SUFF	NA	FM	East Washington St FM	Extend 10" FM by 1,230 LF; u/s of SS-PS-SC1; Along East Washington Street	$699

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
NA-RWWMP-17 continued							
	RHM	SUFF	NA	FM	Old Town Point Rd FM	Upsize 3,000 LF of 4" to 8" FM; d/s of SUFF-PS-054; Along Old Town Point Rd to College Dr HRSD connection point	$1,471
	LHM	SUFF	NA	GM	SUFF-031 GM improvement	Install 1,120 LF of 10" GM	$552
	LHM	SUFF	NA	GM	SUFF-110 GM improvement	Install 70 LF of 10" GM	$63
	LHM	SUFF	NA	PS	SUFF-PS-064	SUFF Pump Station 064; East Suffolk Gardens	$170
	LHM	SUFF	NA	PS	SUFF-PS-125	SUFF Pump Station 125; Harbour View E Village #2	$1,521
NA-RWWMP-18					Chesapeake I/I Reduction Project E		$4,412
	I/I Program	CHES	NA	I/I Reduc	CHES-026 Comprehensive I/I Reduction Plan	Catchment(s): CHES-026	$4,412
NA-RWWMP-19					Chesapeake City System Improvements E		$7,051
	LHM	CHES	NA	FM	CHES-029 FM Improvement	Install 2,220 LF of 6" FM	$683
	LHM	CHES	NA	FM	CHES-070 FM Improvement	Install 850 LF of 4" FM	$212
	LHM	CHES	NA	GM	CHES-069 GM Improvement - I	Install 370 LF of 10" GM	$204
	LHM	CHES	NA	GM	CHES-069 GM Improvement - II	Install 710 LF of 12" GM	$417
	LHM	CHES	NA	PS	CHES-PS-029	CHES Pump Station 029	$757
	RHM	CHES	NA	PS	CHES-PS-046	CHES Pump Station 046; 3733 Cannon Point Dr	$1,521
	RHM	CHES	NA	PS	CHES-PS-069	CHES Pump Station 069; 4224 Meadowood Dr	$2,281
	RHM	CHES	NA	PS	CHES-PS-084	CHES Pump Station 084; 2415 Drum Creek Rd	$757
	RHM	CHES	NA	PS	CHES-PS-246	CHES Pump Station 246; 3000 Bromay St	$219
NA-RWWMP-20					Nansemond River PRS		$6,072
	RHM	HRSD	NA	PRS	Nansemond River PRS	Install new PRS with 80 ft of assistance - New Location	$6,072
NA-RWWMP-21					Isle of Wight PS 13 and PS 26 Upgrades		$1,514
	RHM	IOW	NA	PS	IOW-PS-013	IOW Pump Station 013; Shirley T. Holland #2	$757
	RHM	IOW	NA	PS	IOW-PS-026	IOW Pump Station 026; Gatling Pointe	$757
VIP-RWWMP-01					Park Ave. PS, Ferebee Ave. PS Upgrades and Sanitary Sewer 1950 Gravity Main Improvements		$0
	RHM	HRSD	VIP	GM	Park Ave. GM Improvements - I	Upgrade 3,720 LF of 18" and 24" to 30" GM	$0
	RHM	HRSD	VIP	GM	Park Ave. GM Improvements - II	Upgrade 2,170 LF of 18" GM to 24" GM	$0
	RHM	HRSD	VIP	PS	Ferebee Ave PS	SS-PS-110	$0
	RHM	HRSD	VIP	PS	Park Ave PS	SS-PS-119	$0
VIP-RWWMP-02					HRSD Larchmont Area Pump Station Upgrades		$0
	RHM	HRSD	VIP	PS	Monroe Place PS	SS-PS-114	$0
	RHM	HRSD	VIP	PS	Richmond Crescent PS	SS-PS-124	$0
	RHM	HRSD	VIP	PS	Hanover Ave PS	SS-PS-141	$0
	RHM	HRSD	VIP	PS	Jamestown Crescent PS	SS-PS-142	$0

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
VIP-RWWMP-03					Chesapeake Blvd PS, Ashland Circle PS and City Park PS Upgrades		$0
	RHM	HRSD	VIP	PS	Ashland Circle PS	SS-PS-102	$0
	RHM	HRSD	VIP	PS	Chesapeake Blvd. PS	SS-PS-105	$0
	RHM	HRSD	VIP	PS	City Park PS	SS-PS-106	$0
VIP-RWWMP-04					Portsmouth High-Priority Project 1		$64,108
	I/I Program	PORT	VIP	I/I Reduc	PORT-01 Comprehensive I/I Reduction Plan	Catchment(s): PORT-001	$606
	I/I Program	PORT	VIP	I/I Reduc	PORT-02 General I/I Reduction Plan	Catchment(s): PORT-002-V001; PORT-002-V002; PORT-002-V003; PORT-002-V004; PORT-002-V005	$14,877
	I/I Program	PORT	VIP	I/I Reduc	PORT-04 General I/I Reduction Plan	Catchment(s): PORT-H-146-G001	$1,707
	I/I Program	PORT	VIP	I/I Reduc	PORT-04-LOP65-1 Data-Driven I/I Reduction Plan	Catchment(s): PORT-H-146-G008	$3,598
	I/I Program	PORT	VIP	I/I Reduc	PORT-04-LOP65-2 Data-Driven I/I Reduction Plan	Catchment(s): PORT-H-146-G009	$5,315
	I/I Program	PORT	VIP	I/I Reduc	PORT-04-LOP65-3 Data-Driven I/I Reduction Plan	Catchment(s): PORT-H-146-G010	$486
	RHM	PORT	VIP	GM	Camden Ave. GM Improvement - I	Upgrade 1,670 LF of 12" GM to 15" GM	$1,354
	RHM	PORT	VIP	GM	Camden Ave. GM Improvement - II	Upgrade 2,170 LF of 17" GM to 21" GM and 370 LF of 15" GM to 18" GM	$1,723
	RHM	PORT	VIP	PS	PORT-PS-002	PORT Pump Station 002; Glasgow Street PS	$4,716
	RHM	PORT	VIP	PS	PORT-PS-008	PORT Pump Station 008; Clifford Street PS	$7,645
	RHM	HRSD	VIP	PS	Camden Ave. PS	SS-PS-146	$22,082
VIP-RWWMP-05					State Street PRS and Storage Tank		$14,661
	RHM	HRSD	VIP	PRS	State St PRS	Install new PRS with 35ft of assistance - New Location	$5,211
	RHM	HRSD	VIP	Storage	State Street Storage	Install new 2.3 MG storage tank	$9,450
VIP-RWWMP-06					Robin Hood Road Force Main Improvement		$0
	RHM	HRSD	VIP	FM	Robin Hood Road FM Improvement	Upgrade 3,630 LF 12” FM with 16” FM along Robin Hood Rd. from PS-057 to Chesapeake Blvd.	$0
VIP-RWWMP-07					Ford Dr. Gravity Main Improvement		$0
	RHM	HRSD	VIP	GM	Ford Dr. GM Improvement	Upgrade 560 LF of 8" GM with 10" GM - CIP includes rehab for pipeline and manholes outside of VIP-GM-R100 project scope	$0
VIP-RWWMP-08					Norfolk PS 20 Force Main Realignment		$428
	RHM	NORF	VIP	FM	NORF-PS-020 FM Realignment	Connection to HRSD Portsmouth FM from NORF-PS-020; Install 900 LF of 6" FM	$428
VIP-RWWMP-09					Norfolk I/I Reduction Project A		$4,423
	I/I Program	NORF	VIP	I/I Reduc	NORF-H-130 Data-Driven I/I Reduction Plan	Catchment(s): NORF-H-130-G001	$4,423
VIP-RWWMP-10					Virginia Initiative Plant RWI Pumps and Equalization Tank		$26,969
	STP	HRSD	VIP	STP	VIP STP Upgrades	RWI pumps and Equalization Tank	$26,969
VIP-RWWMP-11					Portsmouth PS 6 and PS 55 Upgrades		$5,291
	RHM	PORT	VIP	PS	PORT-PS-006	PORT Pump Station 006; Douglas Avenue PS	$4,344
	RHM	PORT	VIP	PS	PORT-PS-055	PORT Pump Station 055; Pinners Point PS	$947

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
VIP-RWWMP-12					May Ave. Storage Tank		$8,277
	RHM	HRSD	VIP	Storage	May Ave. Storage	Install new 1.9 MG storage tank	$8,277
VIP-RWWMP-13					Willoughby Ave PS Upgrade		$2,281
	RHM	HRSD	VIP	PS	Willoughby Ave PS	SS-PS-132	$2,281
VIP-RWWMP-14					Norfolk City System Improvements A		$5,246
	LHM	NORF	VIP	FM	NORF-135 FM Improvement	Install 1,190 LF of 4" FM	$297
	RHM	NORF	VIP	FM	Victoria Ave FM	Install 1,100 LF of 12" FM Immediately d/s from NORF PS-149, along Victoria Ave and Norchester Ave to I-264.	$599
	LHM	NORF	VIP	PS	NORF-PS 141	NORF Pump Station 141	$565
	RHM	NORF	VIP	PS	NORF-PS-149	NORF Pump Station 149	$3,785
VIP-RWWMP-15					Norchester Gravity Main Improvement		$3,231
	RHM	HRSD	VIP	GM	Norchester St. GM Improvement	Upgrade 2,930 LF of 24" GM to 27" GM	$3,231
VIP-RWWMP-16					Norfolk City System Improvements B		$2,978
	RHM	NORF	VIP	FM	Raby Rd. FM Improvement	Upgrade 75 LF of 6" to 10" FM	$149
	RHM	NORF	VIP	PS	NORF-PS-091	NORF Pump Station 091	$2,659
	LHM	NORF	VIP	PS	NORF-PS 133	NORF Pump Station 133	$170
VIP-RWWMP-17					Norfolk I/I Reduction Project B		$23,906
	I/I Program	NORF	VIP	I/I Reduc	NORF-PS-005 General I/I Reduction Plan	Catchment(s): NORF-005	$9,291
	I/I Program	NORF	VIP	I/I Reduc	NORF-PS-097 Comprehensive I/I Reduction Plan	Catchment(s): NORF-097	$14,364
	RHM	NORF	VIP	GM	NORF PS 097 GM Improvement	Upgrade 50 LF of 6" GM to 12" GM	$251
VIP-RWWMP-18					Seay Avenue Force Main Improvement		$2,164
	RHM	HRSD	VIP	FM	Seay Avenue PS Line FM Improvement	Upgrade 3,750 LF 8" FM with 12" FM from Seay Ave. PS to Virginia Beach Blvd.	$2,164
VIP-RWWMP-19					Ferebee Avenue PS Gravity Influent Improvement		$1,072
	RHM	HRSD	VIP	GM	Ferebee Avenue GM Influent Improvement	Upgrade 1,100 LF of 18" GM with 24" GM along Bainbridge Blvd	$1,072
VIP-RWWMP-20					Chesapeake PS 7 Upgrade		$2,090
	RHM	CHES	VIP	PS	CHES-PS-007	CHES Pump Station 007; 1101 Freeman Ave	$2,090
VIP-RWWMP-21					Norfolk City System Improvements C		$2,594
	RHM	NORF	VIP	FM	Powhatan and Magnolia Ave Manifolded FM Improvement - I	Upgrade 1,700 LF of 4" FM with 6" FM along Powhatan Ave. from PS-112 to Walnut Hill St.	$663
	RHM	NORF	VIP	FM	Powhatan and Magnolia Ave Manifolded FM Improvement - II	Upgrade 670 LF of 6" FM with 8" FM along Powhatan Ave. from Magnolia Ave. to Powhatan Ave. PS	$363
	RHM	NORF	VIP	FM	Powhatan and Magnolia Ave Manifolded FM Improvement - III	Upgrade 1,400 LF of 6" FM with 8" FM along Powhatan Ave. from Walnut Hill St. to Magnolia Ave.	$623
	RHM	NORF	VIP	FM	Powhatan and Magnolia Ave Manifolded FM Improvement - IV	Upgrade 2,800 LF of 3" FM with 4" FM from PS-114 along Westwood Ter. to Powhatan Ave. & Magnolia Ave.	$945

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
VIP-RWWMP-22					Steamboat Creek PS and Chesapeake Blvd PS Force Main Improvements		$445
	RHM	HRSD	VIP	FM	Chesapeake Blvd FM	Upsize 110 ft of 12-inch force main to 16-inch immediately d/s from Chesapeake Blvd PS to Chesapeake Blvd.	$114
	RHM	HRSD	VIP	FM	Steamboat Creek FM Improvement	Install 340 LF of 16" FM downstream of Steamboat Creek PS	$331
VIP-RWWMP-23					Portsmouth I/I Reduction Project A		$20,514
	I/I Program	PORT	VIP	I/I Reduc	PORT-04-LOP66-1 Data-Driven I/I Reduction Plan	Catchment(s): PORT-H-146-G006	$1,709
	I/I Program	PORT	VIP	I/I Reduc	PORT-04-LOP72-1 Data-Driven I/I Reduction Plan	Catchment(s): PORT-H-146-G002	$2,228
	I/I Program	PORT	VIP	I/I Reduc	PORT-04-LOP72-2 Data-Driven I/I Reduction Plan	Catchment(s): PORT-H-146-G003	$2,832
	I/I Program	PORT	VIP	I/I Reduc	PORT-04-LOP72-4 Data-Driven I/I Reduction Plan	Catchment(s): PORT-H-146-G005	$2,416
	I/I Program	PORT	VIP	I/I Reduc	PORT-10 Data-Driven I/I Reduction Plan	Catchment(s): PORT-010	$10,301
	I/I Program	PORT	VIP	I/I Reduc	PORT-12 Data-Driven I/I Reduction Plan	Catchment(s): PORT-012	$1,028
VIP-RWWMP-24					Portsmouth I/I Reduction Project B		$26,103
	I/I Program	PORT	VIP	I/I Reduc	PORT-03 General I/I Reduction Plan	Catchment(s): PORT-003-V001; PORT-003-V002; PORT-003-V004; PORT-003-V005; PORT-003-V006	$26,103
VIP-RWWMP-25					Ingleside Rd. PS Upgrade		$0
	RHM	HRSD	VIP	PS	Ingleside Rd PS	SS-PS-148	$0
VIP-RWWMP-26					Chesapeake City System Improvements B		$7,178
	LHM	CHES	VIP	FM	CHES-008 FM Extension	Install 1,560 LF of 10" FM	$898
	LHM	CHES	VIP	FM	CHES-042 FM Improvement	Install 690 LF of 8" FM	$292
	LHM	CHES	VIP	GM	CHES-007 GM Improvement - I	Install 1,370 LF of 16" GM	$949
	LHM	CHES	VIP	GM	CHES-007 GM Improvement - II	Install 120 LF of 18" GM	$129
	LHM	CHES	VIP	GM	CHES-008 GM Improvement - I	Install 510 LF of 12" GM	$266
	LHM	CHES	VIP	GM	CHES-008 GM Improvement - II	Install 500 LF of 16" GM	$367
	LHM	CHES	VIP	GM	CHES-132 GM Improvement - I	Install 910 LF of 10" GM	$429
	LHM	CHES	VIP	GM	CHES-132 GM Improvement - II	Install 330 LF of 12" GM	$197
	LHM	CHES	VIP	GM	CHES-H-123-G005 GM Improvement	Install 730 LF of 12" GM	$398
	LHM	CHES	VIP	PS	CHES-PS-004	CHES Pump Station 004	$219
	LHM	CHES	VIP	PS	CHES-PS-008	CHES Pump Station 008	$2,469
	LHM	CHES	VIP	PS	CHES-PS-042	CHES Pump Station 042	$565
VIP-RWWMP-27					Norfolk I/I Reduction Project C		$14,517
	I/I Program	NORF	VIP	II Reduc	NORF-PS-008 General I/I Reduction Plan	Catchment(s): NORF-008-G001; NORF-153	$14,517
VIP-RWWMP-28					Bainbridge Blvd Gravity Main Improvement		$555
	RHM	HRSD	VIP	GM	Bainbridge Blvd. PS GM Improvement	Upgrade 760 LF of 8" GM with 12" GM along Bainbridge Blvd between S Main Street and Lancaster Street	$555

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
VIP-RWWMP-29					Portsmouth I/I Reduction Project C		$13,225
	I/I Program	PORT	VIP	I/I Reduc	PORT-03-LOP35-1 General I/I Reduction Plan	Catchment(s): PORT-003-V003-G001	$8,142
	I/I Program	PORT	VIP	I/I Reduc	PORT-03-LOP35-2 General I/I Reduction Plan	Catchment(s): PORT-003-V003-G002	$1,885
	LHM	PORT	VIP	GM	PORT-003-V003-G001 GM Improvement	Install 1,240 LF of 10" GM	$636
	LHM	PORT	VIP	GM	PORT-003-V006 GM Improvement - I	Install 160 LF of 12" GM	$137
	LHM	PORT	VIP	GM	PORT-003-V006 GM Improvement - II	Install 930 LF of 15" GM	$666
	LHM	PORT	VIP	GM	PORT-006-V004 GM Improvement - I	Install 920 LF of 15" GM	$596
	LHM	PORT	VIP	GM	PORT-006-V004 GM Improvement - II	Install 170 LF of 18" GM	$172
	LHM	PORT	VIP	GM	PORT-010 GM Improvement	Install 260 LF of 20" GM	$316
	LHM	PORT	VIP	GM	PORT-026-G002 GM Improvement	Install 350 LF of 15" GM	$237
	LHM	PORT	VIP	GM	PORT-H-146-G005 GM Improvement	Install 620 LF of 15" GM	$438
VIP-RWWMP-30					Norfolk I/I Reduction Project D		$10,903
	I/I Program	NORF	VIP	I/I Reduc	NORF-PS-004 General I/I Reduction Plan	Catchment(s): NORF-004	$10,903
VIP-RWWMP-31					Portsmouth City System Improvements A		$6,811
	LHM	PORT	VIP	FM	PORT-013 FM Improvement	Install 2,820 LF of 8" FM	$1,192
	LHM	PORT	VIP	FM	PORT-018 FM Improvement	Extend 850 LF of 10" FM	$490
	LHM	PORT	VIP	PS	PORT-PS-010	PORT Pump Station 010	$1,521
	LHM	PORT	VIP	PS	PORT-PS-013	PORT Pump Station 013	$1,521
	LHM	PORT	VIP	PS	PORT-PS-018	PORT Pump Station 018	$1,330
	LHM	PORT	VIP	PS	PORT-PS-053	PORT Pump Station 053	$757
VIP-RWWMP-32					Norfolk I/I Reduction Project E		$3,569
	I/I Program	NORF	VIP	I/I Reduc	NORF-PS-020 Data-Driven I/I Reduction Plan	Catchment(s): NORF-020	$3,569
VIP-RWWMP-33					Norfolk I/I Reduction Project I		$47,076
	I/I Program	NORF	VIP	I/I Reduc	NORF-H-107 Comprehensive I/I Reduction Plan	Catchment(s): NORF-H-107-G001	$47,076
	LHM	NORF	VIP	GM	NORF-H-107-G001 GM Improvement	Install 510 LF of 12" GM	$0
VIP-RWWMP-34					Norfolk I/I Reduction Project F		$4,167
	I/I Program	NORF	VIP	I/I Reduc	NORF-003-G001 Comprehensive I/I Reduction Plan	Catchment(s): NORF-003-G001	$4,167
VIP-RWWMP-35					Chesapeake City System Improvements C		$5,158
	LHM	CHES	VIP	FM	CHES-101 FM Improvement	Install 980 LF of 6" FM	$301
	LHM	CHES	VIP	FM	CHES-102 FM Extension	Install 860 LF of 6" FM	$264
	LHM	CHES	VIP	FM	CHES-125 FM Extension	Install 760 LF of 6" FM	$234
	LHM	CHES	VIP	GM	CHES-102 GM Improvement - I	Install 310 LF of 10" GM	$162
	LHM	CHES	VIP	GM	CHES-102 GM Improvement - II	Install 630 LF of 12" GM	$349
	LHM	CHES	VIP	GM	CHES-103 GM Improvement - I	Install 700 LF of 12" GM	$365
	LHM	CHES	VIP	GM	CHES-103 GM Improvement - II	Install 260 LF of 16" GM	$202

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
VIP-RWWMP-35 continued							
	LHM	CHES	VIP	GM	CHES-125 GM Improvement	Install 810 LF of 10" GM	$438
	RHM	CHES	VIP	PS	CHES-PS-060	CHES Pump Station 060; 1000 Oleander Ave	$565
	LHM	CHES	VIP	PS	CHES-PS-102	CHES Pump Station 102	$1,521
	LHM	CHES	VIP	PS	CHES-PS-125	CHES Pump Station 125	$757
VIP-RWWMP-36					Chesapeake I/I Reduction Project B		$8,407
	I/I Program	CHES	VIP	I/I Reduc	CHES-919-G1 Data-Driven I/I Reduction Plan	Catchment(s): CHES-H-119-G001	$8,407
VIP-RWWMP-37					Norfolk I/I Reduction Project H		$9,007
	I/I Program	NORF	VIP	I/I Reduc	NORF-H-103 Comprehensive I/I Reduction Plan	Catchment(s): NORF-H-103-G001; NORF-H-103-G002; NORF-H-103-G003; NORF-H-103-G004	$9,007
VIP-RWWMP-38					Norfolk I/I Reduction Project G		$17,377
	I/I Program	NORF	VIP	I/I Reduc	NORF-009-G001 Comprehensive I/I Reduction Plan	Catchment(s): NORF-009-G001	$8,201
	I/I Program	NORF	VIP	I/I Reduc	NORF-009-G002 Comprehensive I/I Reduction Plan	Catchment(s): NORF-009-G002	$3,874
	I/I Program	NORF	VIP	I/I Reduc	NORF-PS-012 General I/I Reduction Plan	Catchment(s): NORF-012	$2,498
	I/I Program	NORF	VIP	I/I Reduc	NORF-PS-037 Comprehensive I/I Reduction Plan	Catchment(s): NORF-037	$2,803
VIP-RWWMP-39					Norfolk I/I Reduction Project L		$21,721
	I/I Program	NORF	VIP	I/I Reduc	NORF-PS-010 General I/I Reduction Plan	Catchment(s): NORF-010-G001; NORF-010-G002	$21,721
VIP-RWWMP-40					Norfolk I/I Reduction Project J		$4,359
	I/I Program	NORF	VIP	I/I Reduc	NORF-H122-G1 General I/I Reduction Plan	Catchment(s): NORF-H-122-G001	$3,309
	I/I Program	NORF	VIP	I/I Reduc	NORF-H122-G2 General I/I Reduction Plan	Catchment(s): NORF-H-122-G002	$1,049
VIP-RWWMP-41					Norfolk I/I Reduction Project K		$12,378
	I/I Program	NORF	VIP	I/I Reduc	NORF-H-106 General I/I Reduction Plan	Catchment(s): NORF-H-106-G002	$797
	I/I Program	NORF	VIP	I/I Reduc	NORF-H106-G1 General I/I Reduction Plan	Catchment(s): NORF-H-106-G001	$2,704
	I/I Program	NORF	VIP	I/I Reduc	NORF-H-113 General I/I Reduction Plan	Catchment(s): NORF-H-113-G001	$4,629
	I/I Program	NORF	VIP	I/I Reduc	NORF-H113-G1 Comprehensive I/I Reduction Plan	Catchment(s): NORF-H-113-G004; NORF-H-113-G005; NORF-H-113-G006	$2,536
	I/I Program	NORF	VIP	I/I Reduc	NORF-H113-G2 General I/I Reduction Plan	Catchment(s): NORF-H-113-G002; NORF-H-113-G003	$1,712
VIP-RWWMP-42					Chesapeake I/I Reduction Project G		$9,220
	I/I Program	CHES	VIP	I/I Reduc	CHES-039 General I/I Reduction Plan	Catchment(s): CHES-039	$1,917
	I/I Program	CHES	VIP	I/I Reduc	CHES-043 General I/I Reduction Plan	Catchment(s): CHES-043	$1,167
	I/I Program	CHES	VIP	I/I Reduc	CHES-060 General I/I Reduction Plan	Catchment(s): CHES-060	$438
	I/I Program	CHES	VIP	I/I Reduc	CHES-100 Data-Driven I/I Reduction Plan	Catchment(s): CHES-100	$934
	I/I Program	CHES	VIP	I/I Reduc	CHES-101 General I/I Reduction Plan	Catchment(s): CHES-101	$3,754
	I/I Program	CHES	VIP	I/I Reduc	CHES-124 Data-Driven I/I Reduction Plan	Catchment(s): CHES-124	$1,010

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
VIP-RWWMP-43					Norfolk I/I Reduction Project N		$11,618
	I/I Program	NORF	VIP	I/I Reduc	NORF-H-127-10 Comprehensive I/I Reduction Plan	Catchment(s): NORF-H-127-G010	$1,318
	I/I Program	NORF	VIP	I/I Reduc	NORF-H127-3 Comprehensive I/I Reduction Plan	Catchment(s): NORF-H-127-G003	$1,309
	I/I Program	NORF	VIP	I/I Reduc	NORF-H127-4 Comprehensive I/I Reduction Plan	Catchment(s): NORF-H-127-G004	$607
	I/I Program	NORF	VIP	I/I Reduc	NORF-H127-5 Comprehensive I/I Reduction Plan	Catchment(s): NORF-H-127-G005	$2,241
	I/I Program	NORF	VIP	I/I Reduc	NORF-H127-G2 General I/I Reduction Plan	Catchment(s): NORF-H-127-G002	$2,363
	I/I Program	NORF	VIP	I/I Reduc	NORF-H128-G2 General I/I Reduction Plan	Catchment(s): NORF-H-128-G004	$2,022
	I/I Program	NORF	VIP	I/I Reduc	NORF-PS-060 General I/I Reduction Plan	Catchment(s): NORF-060	$1,758
VIP-RWWMP-44					Norfolk City System Improvements G		$2,854
	LHM	NORF	VIP	FM	NORF-010 FM Extension	Install 820 LF of 16" FM	$690
	RHM	NORF	VIP	FM	NORF-PS-048 FM Realignment	1,575 LF of 6" FM NORF PS-048 Reroute to GM u/s of Chesapeake Blvd. PS	$809
	LHM	NORF	VIP	GM	NORF-010-G001 GM Improvement	Install 890 LF of 18" GM	$653
	LHM	NORF	VIP	GM	NORF-018 GM Improvement	Install 280 LF of 18" GM	$213
	LHM	NORF	VIP	GM	NORF-046 GM Improvement	Install 660 LF of 18" GM	$489
WB-RWWMP-01					JCSA I/I Reduction Project A		$18,648
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA3-3 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-003-3	$1,186
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA3-6 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-003-6	$3,030
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA3-8 General I/I Reduction Plan	Catchment(s): JCSA-003-8	$12,755
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA4-5 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-004-5	$1,023
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA5-1 Comprehensive I/I Reduction Plan	Catchment(s): JCSA-005-1	$654
WB-RWWMP-02					Williamsburg Crossing PRS, Force Main and Storage Tank		$19,985
	RHM	HRSD	WB	FM	Williamsburg Crossing FM	Install 2,090 LF of 24" FM; Routing Jamestown Rd flow to co-located Tank/PRS (Williamsburg Crossing)	$1,844
	RHM	HRSD	WB	PRS	Williamsburg Crossing PRS	Install new PRS with 70 ft of assistance - New Location	$10,161
	RHM	HRSD	WB	Storage	Williamsburg Crossing Storage	Install 1.8 MG Storage Tank	$7,980
WB-RWWMP-03					Route 199 PRS		$14,025
	RHM	HRSD	WB	PRS	Route 199 PRS	Upgrade PRS to 80 ft of assistance - Existing Location	$14,025
WB-RWWMP-04					Colonial Williamsburg PS Extended Wet Well		$225
	RHM	HRSD	WB	Storage	Colonial Williamsburg Extended WW	extended wet well storage at Colonial Williamsburg PS	$225
WB-RWWMP-05					JCSA System Improvements A		$12,025
	LHM	JCSA	WB	FM	JCSA-PS-008-4 FM improvement	Install 3,530 LF of 8" FM; JCSA PS-008-4 discharge force main along West Island Rd. and Travis Pond Rd. to connection with discharge force main of JCSA PS-008-8 on Two Rivers road	$1,493
	LHM	JCSA	WB	GM	JCSA-001-2 GM improvement	Install 6,720 LF of 18" GM	$4,732
	LHM	JCSA	WB	GM	JCSA-001-8 GM improvement	Install 1,910 LF of 10" GM	$976

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
WB-RWWMP-05 continued							
	LHM	JCSA	WB	GM	JCSA-002-4 GM improvement - I	Install 970 LF of 12" GM	$540
	LHM	JCSA	WB	GM	JCSA-002-4 GM improvement - II	Install 3,990 LF of 15" GM	$2,748
	LHM	JCSA	WB	GM	JCSA-005-5 GM improvement	Install 340 LF of 12" GM	$206
	LHM	JCSA	WB	PS	JCSA-PS-008-4	JCSA Pump Station 008-4; West Island Road	$1,330
WB-RWWMP-06					Williamsburg I/I Reduction Project A		$11,296
	I/I Program	WILL	WB	I/I Reduc	WILL-005 Comprehensive I/I Reduction Plan	Catchment(s): WILL-005	$3,134
	I/I Program	WILL	WB	I/I Reduc	WILL-12A-8 Comprehensive I/I Reduction Plan	Catchment(s): WILL-012-A8	$3,424
	I/I Program	WILL	WB	I/I Reduc	WILL-12A-9 Data-Driven I/I Reduction Plan	Catchment(s): WILL-012-A9	$940
	I/I Program	WILL	WB	I/I Reduc	WILL-14 Data-Driven I/I Reduction Plan	Catchment(s): WILL-014	$757
	I/I Program	WILL	WB	I/I Reduc	WILL-226A-5 Data-Driven I/I Reduction Plan	Catchment(s): WILL-H-226-G001	$3,040
WB-RWWMP-07					York County I/I Reduction Project A		$16,302
	LHM	YORK	WB	GM	YORK-006 GM improvement	Upgrade Influent pipe to wet well; YORK-PS-006	$0
	I/I Program	YORK	WB	I/I Reduc	YORK-006 Comprehensive I/I Reduction Plan	Catchment(s): YORK-006	$16,302
WB-RWWMP-08					Williamsburg PS 12 Upgrade and PS 14 FM Improvement		$3,550
	LHM	WILL	WB	FM	WILL-PS-014 FM extension	Extend 330 LF of 8" FM along 2nd St	$140
	RHM	WB	WB	PS	WILL-PS-012	WILL Pump Station 012	$3,410
WB-RWWMP-09					Longhill PRS		$7,615
	RHM	HRSD	WB	PRS	Longhill PRS	Install new PRS with 80 ft of assistance - New Location	$7,615
WB-RWWMP-10					JCSA System Improvements B		$11,273
	LHM	JCSA	WB	FM	JCSA-PS-003-5 FM improvement	Install 3,030 LF of 3" FM; JCSA PS-003-5 discharge force main along Marclay Rd. to manhole in JCSA PS-003-1 service area near Lake Powell Rd.	$672
	RHM	JCSA	WB	FM	JCSA-PS-003-6 FM Realignment - I	Upgrade existing 2,740 LF of 8" FM to 16" FM; Inclusion of JCSA-PS-003-6 as terminal station	$1,218
	RHM	JCSA	WB	FM	JCSA-PS-003-6 FM Realignment - II	Install 920 LF of new 16" FM; Inclusion of JCSA-PS-003-6 as terminal station	$406
	LHM	JCSA	WB	GM	JCSA-003-1 GM improvement	Install 400 LF of 10" GM	$231
	LHM	JCSA	WB	GM	JCSA-003-3 GM improvement	Install 740 LF of 10" GM	$344
	LHM	JCSA	WB	GM	JCSA-003-6 GM improvement	Install 460 LF of 10" GM	$258
	RHM	JCSA	WB	PS	JCSA-PS-003-3	JCSA Pump Station 003-3; Lake Powell	$1,901
	LHM	JCSA	WB	PS	JCSA-PS-003-5	JCSA Pump Station 003-5; Marclay Road	$170
	RHM	JCSA	WB	PS	JCSA-PS-003-6	JCSA Pump Station 003-6; Hickory Signpost Rd, conversion to terminal station	$4,900
	LHM	JCSA	WB	PS	JCSA-PS-004-5	JCSA Pump Station 004-5; Rolling Woods Dr	$113
	RHM	JCSA	WB	PS	JCSA-PS-004-8	JCSA Pump Station 004-8; Raleigh Square	$947
	LHM	JCSA	WB	PS	JCSA-PS-005-2	JCSA Pump Station 005-2; Red Oak Landing Road	$113

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
WB-RWWMP-11					JCSA PS 006-2 Upgrade		$2,281
	RHM	JCSA	WB	PS	JCSA-PS-006-2	JCSA Pump Station 006-2; Forest Heights Road	$2,281
WB-RWWMP-12					York County I/I Reduction Project B		$7,724
	I/I Program	YORK	WB	I/I Reduc	YORK-229-2 Comprehensive I/I Reduction Plan	Catchment(s): YORK-229-2	$7,724
WB-RWWMP-13					JCSA I/I Reduction Project B		$5,271
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA1-5 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-001-5	$2,463
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA6-2-A Data-Driven I/I Reduction Plan	Catchment(s): JCSA-006-2-A	$2,808
WB-RWWMP-14					York County I/I Reduction Project C		$9,172
	I/I Program	YORK	WB	I/I Reduc	YORK-001 Comprehensive I/I Reduction Plan	Catchment(s): YORK-001	$4,241
	I/I Program	YORK	WB	I/I Reduc	YORK-003 Data-Driven I/I Reduction Plan	Catchment(s): YORK-003	$4,931
WB-RWWMP-15					JCSA I/I Reduction Project C		$5,851
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA1-6 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-001-6	$656
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA6-9 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-006-9	$5,195
WB-RWWMP-16					JCSA I/I Reduction Project D		$9,584
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA10-4 Comprehensive I/I Reduction Plan	Catchment(s): JCSA-010-4	$3,728
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA4-1 Comprehensive I/I Reduction Plan	Catchment(s): JCSA-004-1	$1,234
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA4-2 Comprehensive I/I Reduction Plan	Catchment(s): JCSA-004-2	$4,622
WB-RWWMP-17					JCSA I/I Reduction Project E		$13,056
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA1-2 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-001-2	$2,754
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA1-8 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-001-8	$1,073
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA1-9 Comprehensive I/I Reduction Plan	Catchment(s): JCSA-001-9	$7,076
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA3-9 Data-Driven I/I Reduction Plan	Catchment(s): JCSA-003-9	$2,153
WB-RWWMP-18					JCSA I/I Reduction Project F		$26,855
	I/I Program	JCSA	WB	I/I Reduc	JCSA-LSA3-1 Comprehensive I/I Reduction Plan	Catchment(s): JCSA-003-1	$26,855
WB-RWWMP-19					Lodge Rd. PS Extended Wet Well		$225
	RHM	HRSD	WB	Storage	Lodge Rd. Extended WW	extended wet well storage at Lodge Rd PS	$225
WB-RWWMP-20					York County System Improvements A		$5,057
	LHM	YORK	WB	FM	Mainfold FM Realignment; YORK-PS-009 and YORK-PS-082	Reroute manifolded force main (from intersection of Lee Pkwy/Penniman Rd) directly to HRSD Lodge Rd Pump Station; Kings Creek Plantation and Lakeshead	$1,608
	LHM	YORK	WB	PS	YORK-PS-006	York Pump Station 006; Hickory Hills	$2,090
	LHM	YORK	WB	PS	YORK-PS-065	York Pump Station 065; Schooner Blvd	$1,140
	LHM	YORK	WB	PS	YORK-PS-066	York Pump Station 066; Corvette	$219
YR-RWWMP-01					Coliseum Storage Tank Addition		$10,443
	RHM	HRSD	YR	Storage	Coliseum Storage	Add 2.4 MG Storage Tank to Coliseum site	$10,443

RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
YR-RWWMP-02					Langley Circle PS Upgrade		$17,131
	RHM	HRSD	YR	PS	Langley Circle	NS-PS-217	$17,131
YR-RWWMP-03					Hampton I/I Reduction Project B		$13,809
	I/I Program	HAMP	YR	I/I Reduc	HAMP-045 Comprehensive I/I Reduction Plan	Catchment(s): HAMP-045	$867
	I/I Program	HAMP	YR	I/I Reduc	HAMP-048 Comprehensive I/I Reduction Plan	Catchment(s): HAMP-048	$12,941
YR-RWWMP-04					Freeman Drive PS Upgrade		$3,223
	RHM	HRSD	YR	PS	Freeman Drive	NS-PS-238	$3,223
YR-RWWMP-05					Bay Shore Lane PS Upgrade and Force Main Improvement		$7,594
	RHM	HRSD	YR	FM	Bay Shore Lane FM	New Bayshore Lane PS discharge force main to route flow parallel to the influent gravity line along Seaboard Avenue to the existing HRSD forcemain near Nickerson Boulevard; Install 4,700 LF of 14” FM	$2,509
	RHM	HRSD	YR	PS	Bay Shore Lane	NS-PS-203	$5,085
YR-RWWMP-06					Hampton I/I Reduction Project D		$4,083
	I/I Program	HAMP	YR	I/I Reduc	HAMP-024 Comprehensive I/I Reduction Plan	Catchment(s): HAMP-024	$1,736
	I/I Program	HAMP	YR	I/I Reduc	HAMP-217H-121 Comprehensive I/I Reduction Plan	Catchment(s): HAMP-H-217-G0171-1	$2,347
	LHM	HAMP	YR	GM	HAMP-H-217-G0171-1 GM Improvement	Install 610 LF of 18" GM	$0
YR-RWWMP-07					Hampton City System Improvements A		$11,343
	LHM	HAMP	YR	FM	HAMP-022 FM Improvement	Install 280 LF of 8" FM	$118
	LHM	HAMP	YR	FM	HAMP-032 FM Improvement	Install 1,030 LF of 10" FM	$594
	LHM	HAMP	YR	FM	HAMP-034 FM Improvement	Install 400 LF of 4" FM	$100
	LHM	HAMP	YR	GM	HAMP-023 GM Improvement - I	Install 1,000 LF of 8" GM	$483
	LHM	HAMP	YR	GM	HAMP-023 GM Improvement - II	Install 70 LF of 16" GM	$107
	LHM	HAMP	YR	GM	HAMP-134 GM Improvement - I	Install 740 LF of 14" GM	$403
	LHM	HAMP	YR	GM	HAMP-134 GM Improvement - II	Install 190 LF of 16" GM	$166
	LHM	HAMP	YR	GM	HAMP-H-203-G100 GM Improvement	Install 1,980 LF of 10" GM	$1,055
	LHM	HAMP	YR	GM	HAMP-H-203-G119 GM Improvement - I	Install 570 LF of 14" GM	$310
	LHM	HAMP	YR	GM	HAMP-H-203-G119 GM Improvement - II	Install 20 LF of 18" GM	$43
	LHM	HAMP	YR	PS	HAMP-PS-022	HAMP Pump Station 022	$1,521
	RHM	HAMP	YR	PS	HAMP-121	HAMP Pump Station 121; Westminister PS	$757
	RHM	HAMP	YR	PS	HAMP-123	HAMP Pump Station 123; Riverdale Dr	$1,901
	RHM	HAMP	YR	PS	HAMP-134	HAMP Pump Station 134; Tidemill Ln	$3,785
YR-RWWMP-08					Bloxom's Corner PS Upgrade		$947
	RHM	HRSD	YR	PS	Bloxom's Corner	NS-PS-204	$947

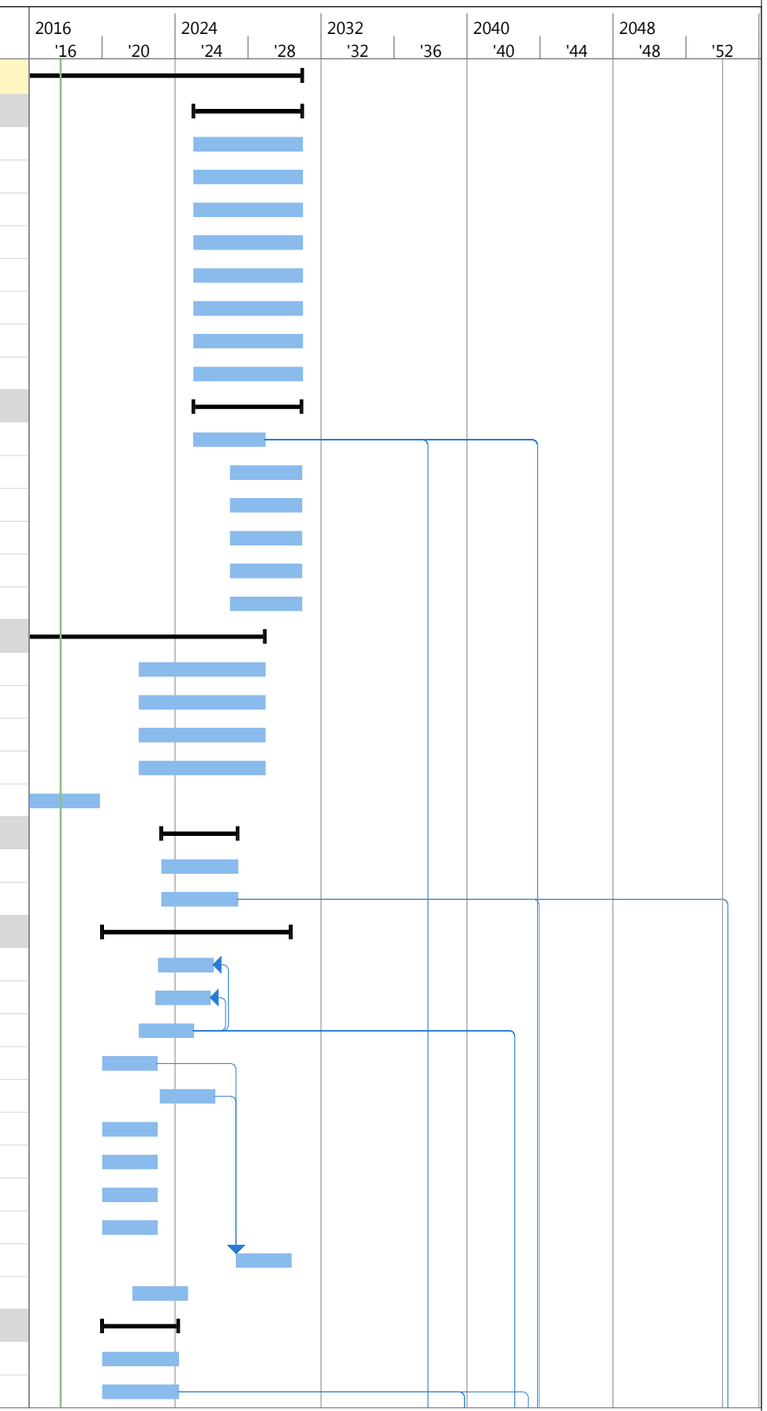
RWWMP Project Summary							
RWWMP Project ID	Element Source	Asset Ownership	TP	Asset Type	Name	Description	Total Cost Estimate ($ Thousands)
YR-RWWMP-09					Hampton PS 130 Upgrade		$1,330
	RHM	HAMP	YR	PS	HAMP-130	HAMP Pump Station 130; Big Bethel PS	$1,330
YR-RWWMP-10					Hampton I/I Reduction Project E		$1,056
	I/I Program	HAMP	YR	I/I Reduc	HAMP-117 Comprehensive I/I Reduction Plan	Catchment(s): HAMP-117	$1,056
YR-RWWMP-11					Yorktown PRS		$4,518
	RHM	HRSD	YR	PRS	Yorktown PRS	Install new PRS with 80 ft of assistance - New Location	$4,518
YR-RWWMP-12					Gloucester County I/I Reduction Project A		$864
	I/I Program	GLOU	YR	I/I Reduc	GLOU-16 Comprehensive I/I Reduction Plan	Catchment(s): GLOU-016	$864
YR-RWWMP-13					Gloucester County PS 13 and PS 16 Upgrades		$3,980
	RHM	GLOU	YR	PS	GLOU-013	GLOU Pump Station 013; Gloucester Courthouse PS	$3,223
	RHM	GLOU	YR	PS	GLOU-016	GLOU Pump Station 016; Rt 1202 Terrapin Cove Road	$757

Appendix F: RWWMP Schedule Gantt Charts

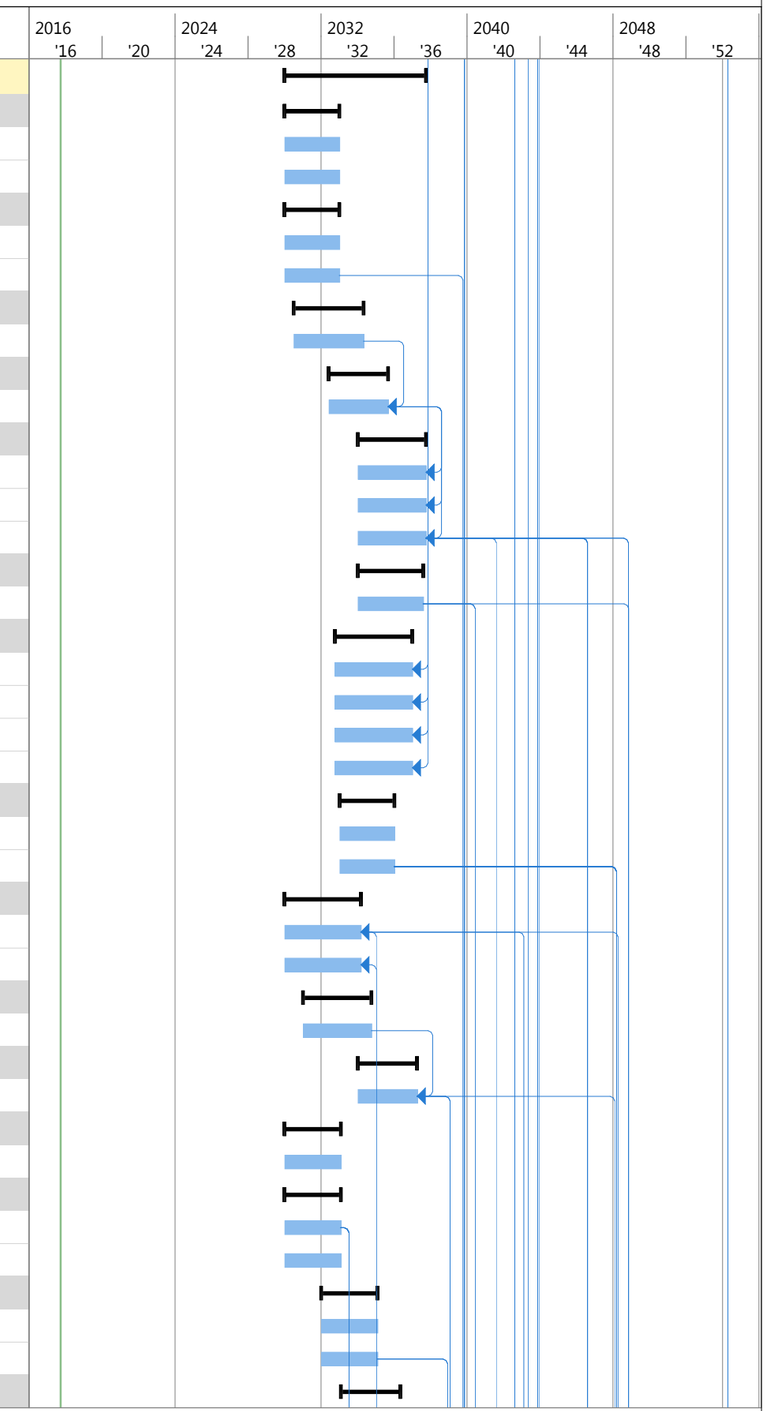
Note the RWWMP schedule contained in this Appendix was used to generate the cashflow used in the Financial Capability Assessment.

HRSD Regional Wet Weather Management Plan Schedule

ID	Element Name	Start	Finish	Cost ($M)	Predecessors
	Phasing: High Priority			**$207.68**	
	RWWMP Project: AT-RWWMP-01 - Chesapeake High Priority Project 1			**$24.77**	
87	CHES-032 General I/I Reduction Plan	1/1/25	12/16/30	$3.45	
88	CHES-047 Data-Driven I/I Reduction Plan	1/1/25	12/16/30	$2.65	
89	CHES-067 Comprehensive I/I Reduction Plan	1/1/25	12/16/30	$12.82	
84	CHES-067 GM Improvement - I	1/1/25	12/16/30	$0.00	
85	CHES-067 GM Improvement - II	1/1/25	12/16/30	$0.00	
90	CHES-111 General I/I Reduction Plan	1/1/25	12/16/30	$4.83	
83	CHES-PS-067 FM	1/1/25	12/16/30	$0.80	
86	CHES-PS-072	1/1/25	12/16/30	$0.22	
	RWWMP Project: BH-RWWMP-01 - Claremont PS Upgrade, Chesapeake Ave. Pipe Improvements and 1			**$48.56**	
112	14th St Storage	1/1/25	11/30/28	$17.76	
107	Claremont Ave GM Improvement -I	1/1/27	12/2/30	$8.89	
108	Claremont Ave GM Improvement -II	1/1/27	12/2/30	$2.55	
109	Claremont PS	1/1/27	12/2/30	$13.10	
110	Claremont Siphon - Chesapeake Ave and Robinson Rd	1/1/27	12/2/30	$3.13	
111	Claremont Siphon - Indian River	1/1/27	12/2/30	$3.13	
	RWWMP Project: NA-RWWMP-01 - Chesapeake High Priority Project 2			**$36.17**	
268	CHES-016 Comprehensive I/I Reduction Plan	1/3/22	11/29/28	$15.40	
271	CHES-016 GM Improvement	1/3/22	11/29/28	$0.00	
269	CHES-018 Comprehensive I/I Reduction Plan	1/3/22	11/29/28	$18.06	
270	CHES-227 Data-Driven I/I Reduction Plan	1/3/22	11/29/28	$2.70	
272	Jumper FM CHES-PS-041	12/5/12	11/3/19	$0.00	
	RWWMP Project: NA-RWWMP-03 - Wilroy PRS and Storage Tank			**$19.42**	
231	Wilroy PRS	4/1/23	6/1/27	$7.78	
232	Wilroy Storage	4/1/23	6/1/27	$11.64	
	RWWMP Project: VIP-RWWMP-04 - Portsmouth High Priority Project 1			**$64.11**	
328	Camden Ave. GM Improvement - I	1/26/23	1/25/26	$1.35	332FF
329	Camden Ave. GM Improvement - II	12/1/22	11/30/25	$1.72	332FF
332	Camden Ave. PS	1/3/22	1/2/25	$22.08	
322	PORT-01 Comprehensive I/I Reduction Plan	1/1/20	12/31/22	$0.61	
323	PORT-02 General I/I Reduction Plan	3/1/23	2/28/26	$14.88	
324	PORT-04 General I/I Reduction Plan	1/1/20	12/31/22	$1.71	
325	PORT-04-LOP65-1 Data-Driven I/I Reduction Plan	1/1/20	12/31/22	$3.60	
326	PORT-04-LOP65-2 Data-Driven I/I Reduction Plan	1/1/20	12/31/22	$5.31	
327	PORT-04-LOP65-3 Data-Driven I/I Reduction Plan	1/1/20	12/31/22	$0.49	
330	PORT-PS-002	5/3/27	5/2/30	$4.72	323,322
331	PORT-PS-008	9/1/21	9/2/24	$7.64	
	RWWMP Project: VIP-RWWMP-05 - State Street PRS and Storage Tank			**$14.66**	
358	State St PRS	1/1/20	3/1/24	$5.21	
359	State Street Storage	1/1/20	3/1/24	$9.45	

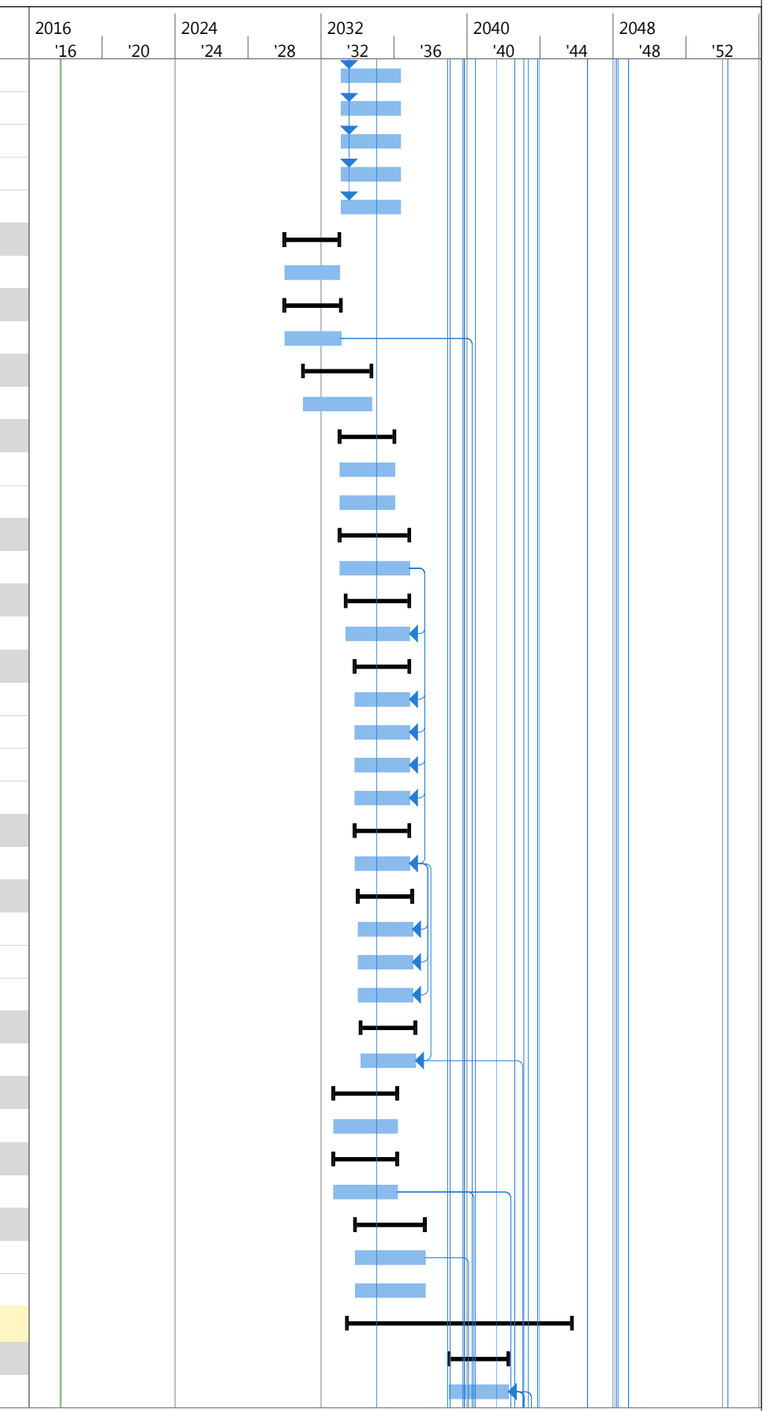


ID	Element Name	Start	Finish	Cost ($M)	Predecessors
	Phasing: Phase 1			**$326.76**	
	RWWMP Project: AT-RWWMP-02 - VAB I/I Reduction Project E			**$5.02**	
51	VAB-558 Data-Driven I/I Reduction Plan	1/1/30	12/31/32	$2.93	
52	VAB-602 Data-Driven I/I Reduction Plan	1/1/30	12/31/32	$2.09	
	RWWMP Project: AT-RWWMP-03 - Great Bridge Blvd. GM Improvement			**$4.99**	
53	Great Bridge Blvd GM Improvement - I	1/1/30	12/31/32	$4.33	
54	Great Bridge Blvd GM Improvement - II	1/1/30	12/31/32	$0.66	
	RWWMP Project: AT-RWWMP-04 - Atlantic TP Storage Tank			**$24.44**	
11	AT STP Upgrades	7/1/30	4/28/34	$24.44	
	RWWMP Project: AT-RWWMP-05 - Atlantic PRS Upgrade			**$39.00**	
12	Atlantic PRS	6/1/32	8/31/35	$39.00	11FF
	RWWMP Project: AT-RWWMP-06 - Birdneck-General Booth Blvd. Force Main Improvements			**$26.85**	
14	Birdneck - General Booth Blvd. FM - I	1/1/34	9/30/37	$7.74	12FF
15	Birdneck - General Booth Blvd. FM - II	1/1/34	9/30/37	$14.31	12FF
16	Birdneck - General Booth Blvd. FM - III	1/1/34	9/30/37	$4.81	12FF
	RWWMP Project: AT-RWWMP-07 - Hillwell PRS			**$8.64**	
91	Hillwell PRS	1/2/34	8/2/37	$8.64	
	RWWMP Project: BH-RWWMP-02 - Hampton I/I Reduction Project A			**$16.90**	
530	HAMP PS 006 FM Improvement	10/1/32	12/30/36	$0.41	112FF
115	HAMP-225H-107 General I/I Reduction Plan	10/1/32	12/30/36	$5.37	112FF
116	HAMP-225H-117 Comprehensive I/I Reduction Plan	10/1/32	12/30/36	$8.23	112FF
117	HAMP-225H-124 General I/I Reduction Plan	10/1/32	12/30/36	$2.89	112FF
	RWWMP Project: BH-RWWMP-03 - Washington St Gravity Main Improvements			**$4.29**	
113	Washington St GM Improvement - I	1/3/33	1/3/36	$1.41	
114	Washington St GM Improvement - II	1/3/33	1/3/36	$2.88	
	RWWMP Project: JR-RWWMP-02 - Tabb PRS and Storage Tank			**$10.06**	
182	Tabb PRS	1/1/30	3/2/34	$4.52	180FF
181	Tabb Storage	1/1/30	3/2/34	$5.54	180FF
	RWWMP Project: JR-RWWMP-03 - James River TP Secondary Clarifiers and RAS Pumps			**$44.70**	
190	James River STP Upgrades	1/1/31	10/2/34	$44.70	
	RWWMP Project: JR-RWWMP-04 - Lucas Creek PRS Upgrade			**$13.19**	
208	Lucas Creek PRS	1/2/34	4/2/37	$13.19	190FF
	RWWMP Project: NA-RWWMP-04 - Shingle Creek Interceptor Gravity Main Improvement			**$8.73**	
243	Shingle Creek GM Improvement - I	1/1/30	1/30/33	$8.73	
	RWWMP Project: NA-RWWMP-05 - Chesapeake I/I Reduction Project E			**$5.61**	
278	CHES-089 Comprehensive I/I Reduction Plan	1/1/30	1/30/33	$5.61	
279	CHES-089 GM Improvement	1/1/30	1/30/33	$0.00	
	RWWMP Project: NA-RWWMP-06 - Suffolk I/I Reduction Project A			**$6.20**	
252	SUFF-017 Comprehensive I/I Reduction Plan	1/1/32	1/30/35	$5.29	
253	SUFF-023 Data-Driven I/I Reduction Plan	1/1/32	1/30/35	$0.92	
	RWWMP Project: NA-RWWMP-07 - Chesapeake City System Improvements B			**$5.49**	

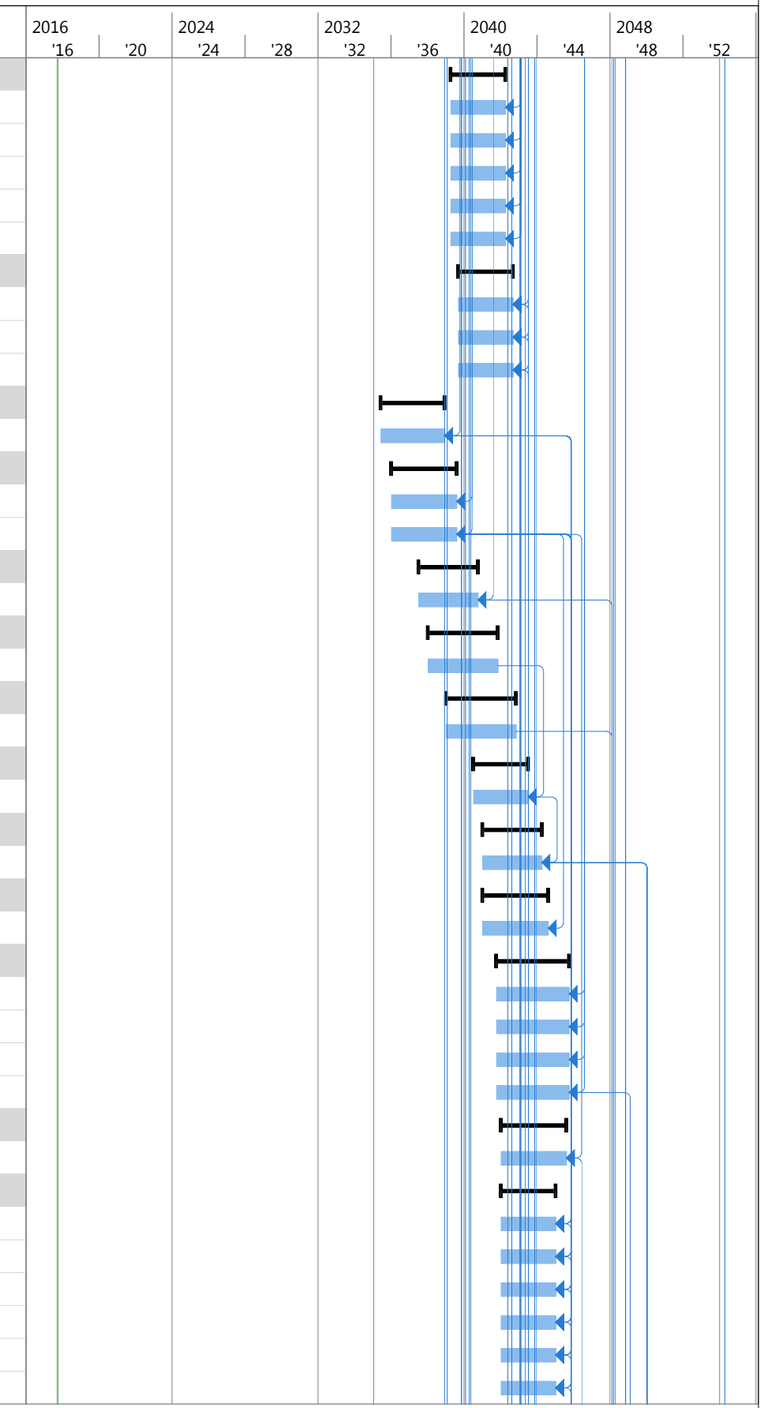


HRSD Regional Wet Weather Management Plan Schedule

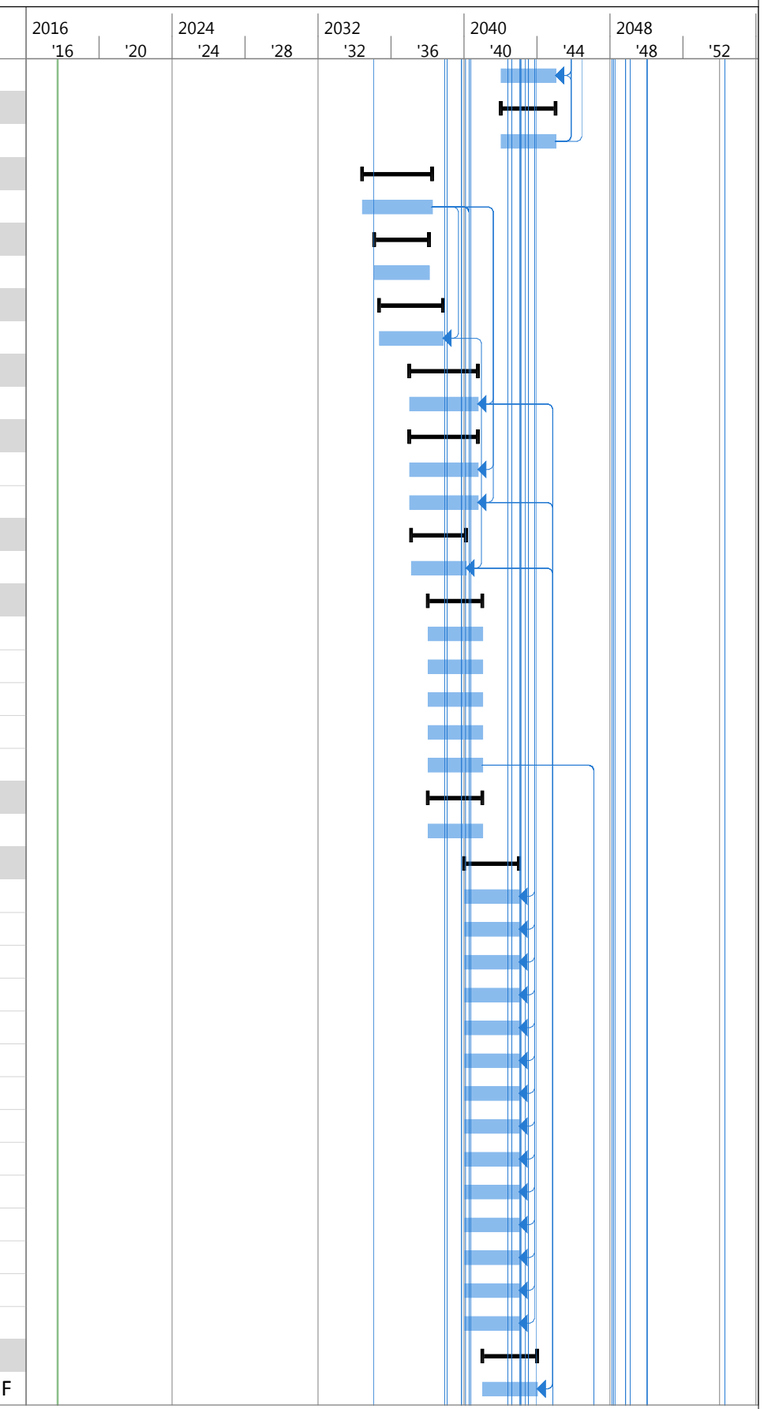
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
274	CHES-PS-089	1/31/33	5/1/36	$2.47	278
275	CHES-PS-121	1/31/33	5/1/36	$0.76	278
276	CHES-PS-158	1/31/33	5/1/36	$0.95	278
277	CHES-PS-183	1/31/33	5/1/36	$1.14	278
273	Holland Blvd FM Improvement	1/31/33	5/1/36	$0.17	278
	RWWMP Project: VIP-RWWMP-08 - Norfolk PS 20 Force Main Realignment			**$0.43**	
311	NORF-PS-020 FM Realignment	1/1/30	12/31/32	$0.43	
	RWWMP Project: VIP-RWWMP-09 - Norfolk I/I Reduction Project B			**$4.42**	
312	NORF-H-130 Data-Driven I/I Reduction Plan	1/1/30	1/30/33	$4.42	
	RWWMP Project: VIP-RWWMP-10 - Virginia Initiative Plant RWI Pumps and Equalization Tank			**$26.97**	
297	VIP STP Upgrades	1/1/31	9/30/34	$26.97	
	RWWMP Project: VIP-RWWMP-11 - Portsmouth PS 6 and PS 55 Upgrades			**$5.29**	
333	PORT-PS-006	1/3/33	1/3/36	$4.34	
334	PORT-PS-055	1/3/33	1/3/36	$0.95	
	RWWMP Project: VIP-RWWMP-12 - May Ave Storage Tank			**$8.28**	
298	May Ave Storage	1/3/33	10/31/36	$8.28	
	RWWMP Project: VIP-RWWMP-13 - Willoughby Ave PS Upgrade			**$2.28**	
310	Willoughby Ave PS	5/4/33	10/31/36	$2.28	298FF
	RWWMP Project: VIP-RWWMP-14 - Norfolk City System Improvements E			**$5.25**	
305	NORF-135 FM Improvement	11/1/33	10/31/36	$0.30	298FF
309	NORF-PS-149	11/1/33	10/31/36	$3.78	298FF
308	NORF-PS 141	11/1/33	10/31/36	$0.57	298FF
306	Victoria Ave FM	11/1/33	10/31/36	$0.60	298FF
	RWWMP Project: VIP-RWWMP-15 - Norchester Gravity Main Improvement			**$3.23**	
299	Norchester St. GM Improvement	11/2/33	10/31/36	$3.23	298FF
	RWWMP Project: VIP-RWWMP-16 - Norfolk City System Improvements D			**$2.98**	
302	NORF-PS 133	1/1/34	12/31/36	$0.17	299FF
301	NORF-PS-091	1/1/34	12/31/36	$2.66	299FF
300	Raby Rd FM Improvement	1/1/34	12/31/36	$0.15	299FF
	RWWMP Project: VIP-RWWMP-18 - Seay Avenue Force Main Improvement			**$2.16**	
303	Seay Avenue PS Line FM Improvement	3/2/34	3/1/37	$2.16	299FF
	RWWMP Project: YR-RWWMP-01 - Coliseum Storage Tank Addition			**$10.44**	
499	Coliseum Storage	9/1/32	3/1/36	$10.44	
	RWWMP Project: YR-RWWMP-02 - Langley Circle PS Upgrade			**$17.13**	
500	Langley Circle	9/1/32	3/3/36	$17.13	
	RWWMP Project: YR-RWWMP-03 - Hampton I/I Reduction Project E			**$13.81**	
522	HAMP-045 Comprehensive I/I Reduction Plan	11/7/33	9/6/37	$0.87	
521	HAMP-048 Comprehensive I/I Reduction Plan	11/7/33	9/6/37	$12.94	
	Phasing: Phase 2			**$678.69**	
	RWWMP Project: AB-RWWMP-02 - Terminal PRS Upgrade			**$9.00**	
2	Terminal PRS	1/3/39	4/3/42	$9.00	1FF



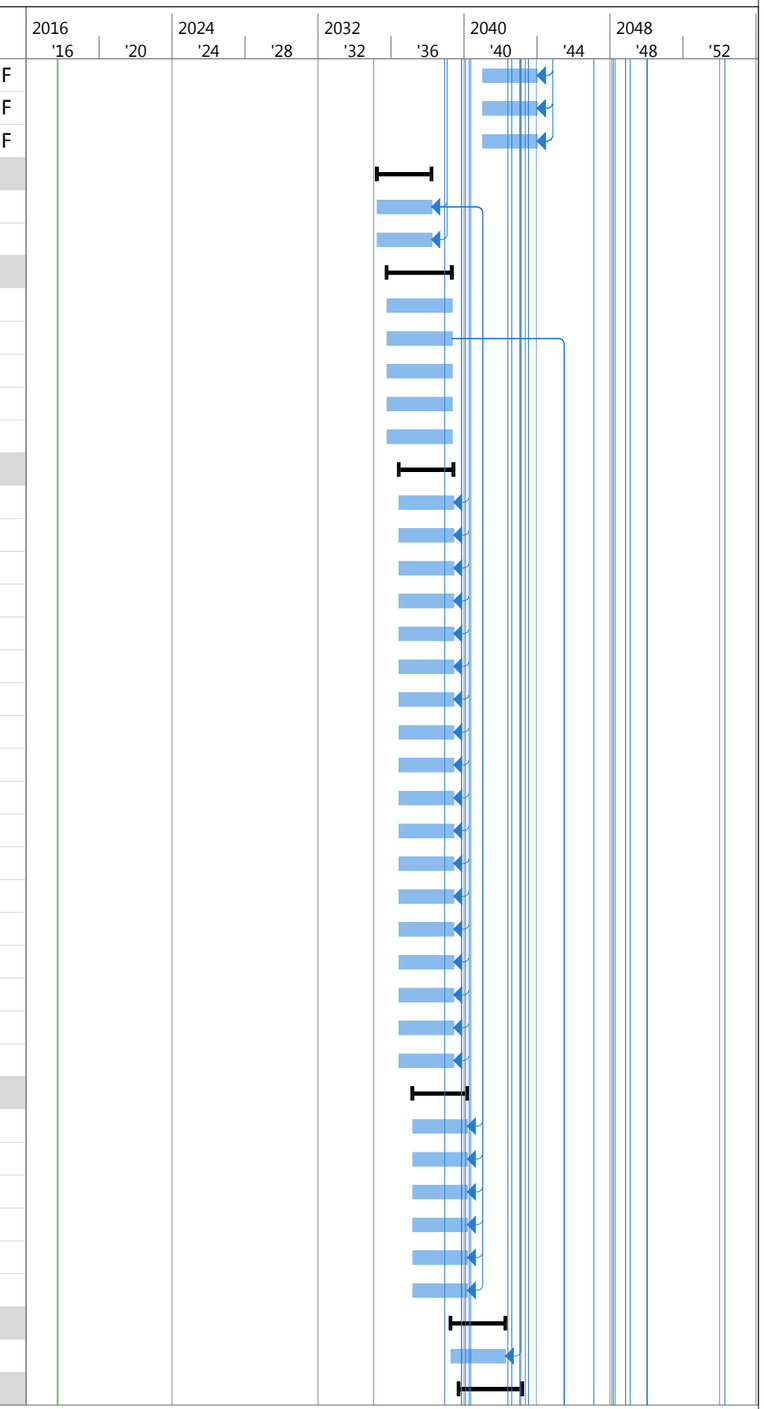
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
	RWWMP Project: AB-RWWMP-03 - Norfolk City System Improvements A			**$5.12**	
5	NORF-PS 047	4/4/39	4/3/42	$1.14	2FF
7	NORF-PS 104	4/4/39	4/3/42	$0.76	2FF
3	NORF-PS-016	4/4/39	4/3/42	$0.95	2FF
4	NORF-PS-022	4/4/39	4/3/42	$0.76	2FF
6	NORF-PS-068	4/4/39	4/3/42	$1.52	2FF
	RWWMP Project: AB-RWWMP-04 - Norfolk City System Improvements B			**$1.30**	
8	NORF-109 FM Extension	9/1/39	8/31/42	$0.05	2FF,1FF
9	NORF-H-117-G001 GM Improvement	9/1/39	8/31/42	$0.11	1FF,2FF
10	NORF-PS 111	9/1/39	8/31/42	$1.14	1FF,2FF
	RWWMP Project: AT-RWWMP-08 - Dozier's Corner PS Upgrade			**$2.85**	
55	Dozier's Corner PS	6/1/35	11/29/38	$2.85	54FF
	RWWMP Project: AT-RWWMP-09 - Battlefield Blvd South IFM Improvements			**$14.90**	
92	Battlefield Blvd South FM - I	1/1/36	8/1/39	$6.29	91FF
93	Battlefield Blvd South FM - II	1/1/36	8/1/39	$8.60	91FF
	RWWMP Project: AT-RWWMP-10 - Laskin Road PRS Upgrade			**$21.35**	
17	Laskin Road PRS	7/1/37	9/27/40	$21.35	16FF
	RWWMP Project: AT-RWWMP-11 - Shipps Corner Storage Tank			**$12.19**	
45	Shipps Corner Storage	1/1/38	10/31/41	$12.19	
	RWWMP Project: AT-RWWMP-12 - Oceana Storage Tank			**$16.90**	
18	Oceana Storage	1/3/39	10/31/42	$16.90	
	RWWMP Project: AT-RWWMP-13 - Lynnhaven Parkway Force Main Improvements			**$20.34**	
46	Lynnhaven Pkwy FM	7/1/40	7/1/43	$20.34	45FF
	RWWMP Project: AT-RWWMP-14 - Kempsville PRS Upgrade			**$13.53**	
47	Kempsville PRS	1/1/41	4/1/44	$13.53	46FF
	RWWMP Project: AT-RWWMP-15 - Elbow Road PRS			**$15.33**	
94	Elbow Road PRS	1/1/41	8/1/44	$15.33	93FF
	RWWMP Project: AT-RWWMP-16 - Virginia Beach Blvd. FM Improvements			**$32.72**	
20	Virginia Beach Blvd. FM - I	10/1/41	9/28/45	$18.38	16FF
21	Virginia Beach Blvd. FM - II	10/1/41	9/28/45	$6.05	16FF
22	Virginia Beach Blvd. FM - III	10/1/41	9/28/45	$2.72	16FF
23	Virginia Beach Blvd. FM - IV	10/1/41	9/28/45	$5.57	16FF
	RWWMP Project: AT-RWWMP-17 - Courthouse PRS			**$17.30**	
95	Courthouse PRS	1/1/42	8/1/45	$17.30	93FF,96FF
	RWWMP Project: AT-RWWMP-18 - Chesapeake City System Improvements A			**$3.43**	
56	CHES-011 FM Extension	1/2/42	1/1/45	$0.13	55FF,93FF,96FF
58	CHES-110 GM Improvement	1/2/42	1/1/45	$0.22	55FF,93FF,96FF
59	CHES-H-109-G001 GM Improvement	1/2/42	1/1/45	$1.29	55FF,93FF,96FF
60	CHES-PS-011	1/2/42	1/1/45	$0.57	55FF,93FF,96FF
61	CHES-PS-012	1/2/42	1/1/45	$0.95	55FF,93FF,96FF
62	CHES-PS-056	1/2/42	1/1/45	$0.17	55FF,93FF,96FF



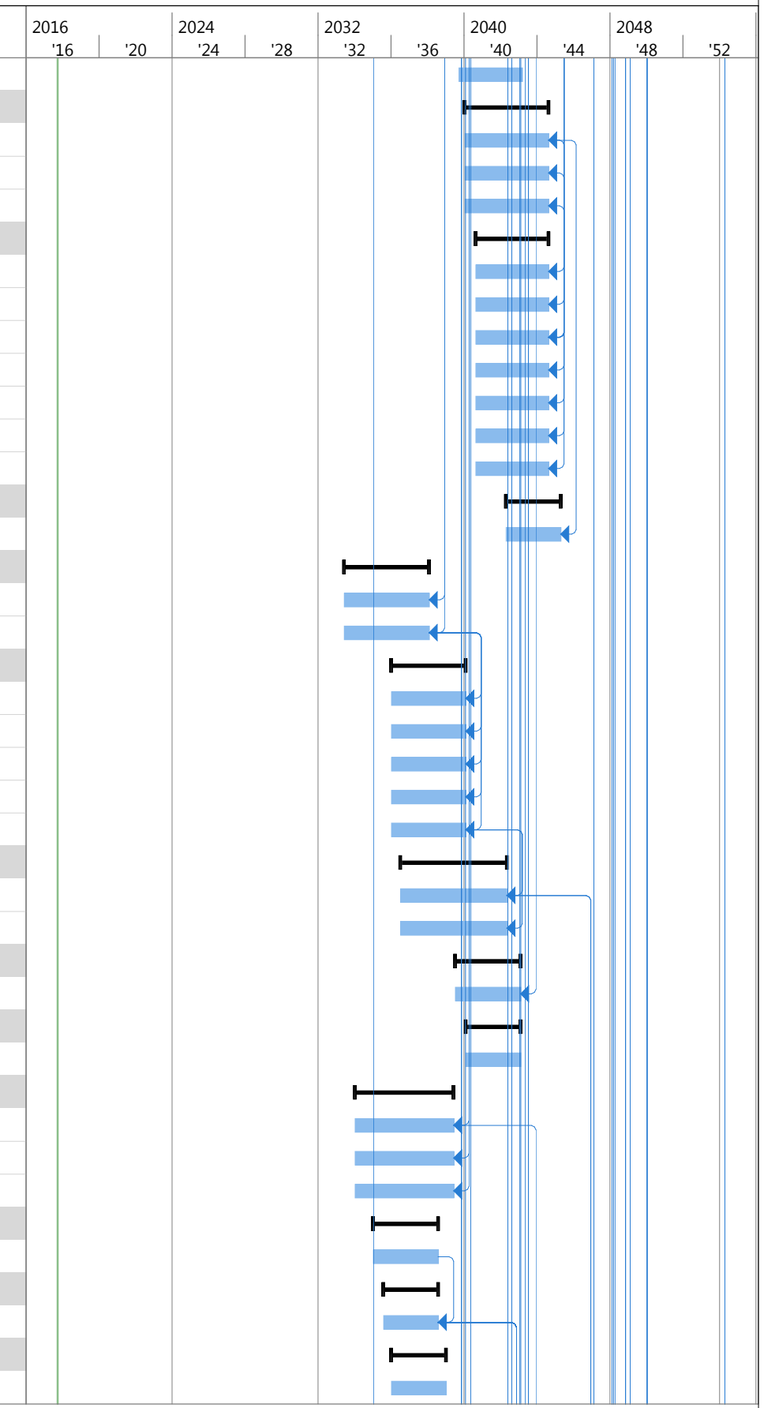
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
57	CHES-PS-073 Jumper	1/2/42	1/1/45	$0.11	93FF,55FF,96FF
	RWWMP Project: AT-RWWMP-19 - Great Bridge Blvd IFM Improvement			**$5.47**	
96	Great Bridge Blvd FM	1/2/42	1/1/45	$5.47	
	RWWMP Project: BH-RWWMP-04 - 58th St Storage Tank			**$11.46**	
144	58th St Storage	6/1/34	3/31/38	$11.46	
	RWWMP Project: BH-RWWMP-05 - Hampton I/I Reduction Project B			**$5.78**	
118	HAMP-017 Data-Driven I/I Reduction Plan	1/29/35	1/28/38	$5.78	
	RWWMP Project: BH-RWWMP-06 - Copeland Park PS Upgrade			**$4.90**	
173	Copeland Park PS	5/3/35	10/31/38	$4.90	144FF
	RWWMP Project: BH-RWWMP-07 - Newmarket Creek PS Upgrade			**$7.64**	
143	Newmarket Creek PS	1/1/37	9/30/40	$7.64	144FF
	RWWMP Project: BH-RWWMP-08 - Mercury Blvd and Newmarket Gravity Main Improvements			**$7.57**	
141	Mercury Blvd and Newmarket GM Improvement - I	1/1/37	9/30/40	$3.12	144FF
142	Mercury Blvd and Newmarket GM Improvement - II	1/1/37	9/30/40	$4.45	144FF
	RWWMP Project: BH-RWWMP-09 - Copeland Park Gravity Main Improvement			**$2.23**	
174	Copeland Park GM Improvement	2/2/37	2/2/40	$2.23	173FF
	RWWMP Project: BH-RWWMP-10 - Newport News I/I Reduction Project A			**$3.23**	
146	NEWP-WCPSA001635 General I/I Reduction Plan	1/1/38	12/31/40	$0.88	
147	NEWP-WCPSA003200 Comprehensive I/I Reduction Plan	1/1/38	12/31/40	$0.49	
148	NEWP-WCPSA003202 Comprehensive I/I Reduction Plan	1/1/38	12/31/40	$0.99	
149	NEWP-WCPSA003401 General I/I Reduction Plan	1/1/38	12/31/40	$0.62	
150	NEWP-WCPSA003402 Comprehensive I/I Reduction Plan	1/1/38	12/31/40	$0.24	
	RWWMP Project: BH-RWWMP-11 - 35th Street Gravity Main Improvement			**$2.04**	
145	35th St GM Improvement	1/1/38	12/31/40	$2.04	
	RWWMP Project: BH-RWWMP-12 - Hampton City System Improvements A			**$12.03**	
529	HAMP PS 002 FM Improvement	1/2/40	1/1/43	$0.65	112FF
119	HAMP-102 FM Improvement	1/2/40	1/1/43	$0.46	112FF
120	HAMP-102 GM Improvement	1/2/40	1/1/43	$0.67	112FF
121	HAMP-H-208-G100 GM Improvement	1/2/40	1/1/43	$0.50	112FF
122	HAMP-H-208-G107 GM Improvement - I	1/2/40	1/1/43	$0.04	112FF
123	HAMP-H-208-G107 GM Improvement - II	1/2/40	1/1/43	$0.32	112FF
124	HAMP-H-208-G107 GM Improvement - III	1/2/40	1/1/43	$0.68	112FF
125	HAMP-H-208-G107 GM Improvement - IV	1/2/40	1/1/43	$1.29	112FF
126	HAMP-H-208-G119 GM Improvement - I	1/2/40	1/1/43	$0.56	112FF
127	HAMP-H-208-G119 GM Improvement - II	1/2/40	1/1/43	$0.97	112FF
128	HAMP-H-208-G119 GM Improvement - III	1/2/40	1/1/43	$1.53	112FF
129	HAMP-H-208-G119 GM Improvement - IV	1/2/40	1/1/43	$0.89	112FF
130	HAMP-H-208-G119 GM Improvement - V	1/2/40	1/1/43	$2.38	112FF
131	HAMP-H-208-G119 GM Improvement -VI	1/2/40	1/1/43	$1.11	112FF
	RWWMP Project: BH-RWWMP-13 - Hampton City System Improvements C			**$4.43**	
178	HAMP-113 GM Improvement	1/1/41	1/1/44	$1.23	174FF,143FF,142FF



ID	Element Name	Start	Finish	Cost ($M)	Predecessors
179	HAMP-115 GM Improvement	1/1/41	1/1/44	$0.05	174FF,143FF,142FF
176	HAMP-H-219-G163 GM Improvement - I	1/1/41	1/1/44	$1.78	174FF,143FF,142FF
177	HAMP-H-219-G163 GM Improvement - II	1/1/41	1/1/44	$1.36	174FF,143FF,142FF
	RWWMP Project: JR-RWWMP-05 - Newport News PS 68 Upgrade and Gravity Main Improvement			**$2.06**	
210	NEWP-068 GM Improvement	3/19/35	3/18/38	$0.54	208FF
209	NEWP-PS-068	3/19/35	3/18/38	$1.52	208FF
	RWWMP Project: JR-RWWMP-06 - Newport News I/I Reduction Project F			**$8.77**	
192	NEWP-WCPSA001565 Comprehensive I/I Reduction Plan	10/1/35	5/1/39	$0.72	
196	NEWP-WCPSA003005 Comprehensive I/I Reduction Plan	10/1/35	5/1/39	$2.10	
195	NEWP-WCPSA003007 General I/I Reduction Plan	10/1/35	5/1/39	$1.99	
194	NEWP-WCPSA003008 General I/I Reduction Plan	10/1/35	5/1/39	$1.51	
193	NEWP-WCPSA003010 Data-Driven I/I Reduction Plan	10/1/35	5/1/39	$2.45	
	RWWMP Project: JR-RWWMP-07 - Newport News City System Improvements B			**$9.65**	
172	G05- Riverlands- Jefferson Ave GM Improvement - I	6/2/36	6/2/39	$0.30	144FF
171	G05- Riverlands- Jefferson Ave GM Improvement - II	6/2/36	6/2/39	$0.21	144FF
169	NEWP-002 GM Improvement - I	6/2/36	6/2/39	$0.34	144FF
170	NEWP-002 GM Improvement - II	6/2/36	6/2/39	$0.54	144FF
218	NEWP-019 GM Improvement	6/2/36	6/2/39	$0.40	144FF
223	NEWP-037 GM Improvement - I	6/2/36	6/2/39	$0.05	144FF
225	NEWP-044 GM Improvement - I	6/2/36	6/2/39	$0.33	144FF
224	NEWP-044 GM Improvement - II	6/2/36	6/2/39	$0.98	144FF
227	NEWP-054 FM Improvement	6/2/36	6/2/39	$0.66	144FF
228	NEWP-054 GM Improvement	6/2/36	6/2/39	$0.16	144FF
229	NEWP-055 GM Improvement	6/2/36	6/2/39	$0.10	144FF
226	NEWP-087 GM Improvement	6/2/36	6/2/39	$0.26	144FF
230	NEWP-174 FM Improvement	6/2/36	6/2/39	$0.94	144FF
222	NEWP-H-221-G001 GM Improvement - I	6/2/36	6/2/39	$0.16	144FF
221	NEWP-H-221-G001 GM Improvement - II	6/2/36	6/2/39	$0.29	144FF
220	NEWP-H-221-G001 GM Improvement - III	6/2/36	6/2/39	$2.37	144FF
219	NEWP-H-221-G001 GM Improvement - IV	6/2/36	6/2/39	$1.09	144FF
496	NEWP-PS-172 FM	6/2/36	6/2/39	$0.48	144FF
	RWWMP Project: JR-RWWMP-08 - Newport News City System Improvements A			**$9.84**	
214	NEWP-037 GM Improvement - II	3/3/37	3/2/40	$0.13	210FF
212	NEWP-037 GM Improvement - III	3/3/37	3/2/40	$3.24	210FF
215	NEWP-043 FM Improvement	3/3/37	3/2/40	$1.15	210FF
211	NEWP-PS-019	3/3/37	3/2/40	$0.95	210FF
213	NEWP-PS-043	3/3/37	3/2/40	$2.09	210FF
216	NEWP-PS-122	3/3/37	3/2/40	$2.28	210FF
	RWWMP Project: JR-RWWMP-09 - Poquoson PS 001 Upgrade			**$3.22**	
184	POQ-PS-001	4/4/39	4/3/42	$3.22	182FF
	RWWMP Project: JR-RWWMP-10 - Morrison PS Upgrade			**$3.03**	



ID	Element Name	Start	Finish	Cost ($M)	Predecessors
191	Morrison PS	9/9/39	3/9/43	$3.03	
	RWWMP Project: JR-RWWMP-11 - Newport News I/I Reduction Project H			**$17.09**	
206	NEWP-013 GM Improvement	1/13/40	8/14/44	$0.49	203FF
204	NEWP-WCPSA001575 General I/I Reduction Plan	1/13/40	8/14/44	$8.86	203FF
205	NEWP-WCPSA001600 Comprehensive I/I Reduction Plan	1/13/40	8/14/44	$7.74	203FF
	RWWMP Project: JR-RWWMP-12 - Newport News I/I Reduction Project G			**$12.27**	
202	NEWP-WCPSA003002 Comprehensive I/I Reduction Plan	8/15/40	8/14/44	$2.60	196FF
201	NEWP-WCPSA003003 General I/I Reduction Plan	8/15/40	8/14/44	$2.15	196FF
203	NEWP-WCPSA003004 Comprehensive I/I Reduction Plan	8/15/40	8/14/44	$3.53	196FF
197	NEWP-WCPSA003500 Data-Driven I/I Reduction Plan	8/15/40	8/14/44	$0.98	196FF
200	NEWP-WCPSA003502 General I/I Reduction Plan	8/15/40	8/14/44	$0.90	196FF
199	NEWP-WCPSA003503 General I/I Reduction Plan	8/15/40	8/14/44	$1.36	196FF
198	NEWP-WCPSA003504 Data-Driven I/I Reduction Plan	8/15/40	8/14/44	$0.75	196FF
	RWWMP Project: JR-RWWMP-13 - Newport News I/I Reduction Project I			**$1.95**	
207	NEWP-WCPSA001430 General I/I Reduction Plan	4/14/42	4/13/45	$1.95	206FF
	RWWMP Project: NA-RWWMP-08 - Suffolk I/I Reduction Project B			**$15.25**	
254	SUFF-004 Data-Driven I/I Reduction Plan	6/1/33	1/29/38	$12.63	253FF
255	SUFF-022 Comprehensive I/I Reduction Plan	6/1/33	1/29/38	$2.63	253FF
	RWWMP Project: NA-RWWMP-09 - Suffolk I/I Reduction Project C			**$13.51**	
256	SUFF-003 General I/I Reduction Plan	1/3/36	2/1/40	$3.23	255FF
257	SUFF-032 Comprehensive I/I Reduction Plan	1/3/36	2/1/40	$1.47	255FF
258	SUFF-063 Comprehensive I/I Reduction Plan	1/3/36	2/1/40	$1.89	255FF
259	SUFF-076 Comprehensive I/I Reduction Plan	1/3/36	2/1/40	$1.07	255FF
260	SUFF-146 Comprehensive I/I Reduction Plan	1/3/36	2/1/40	$5.86	255FF
	RWWMP Project: NA-RWWMP-10 - Suffolk I/I Reduction Project D			**$30.37**	
262	SUFF-048 Comprehensive I/I Reduction Plan	7/3/36	5/2/42	$30.37	260FF
261	SUFF-048 GM improvement	7/3/36	5/2/42	$0.00	260FF
	RWWMP Project: NA-RWWMP-11 - Constance Rd PRS			**$9.32**	
233	Constance Rd PRS	7/1/39	1/29/43	$9.32	232FF
	RWWMP Project: NA-RWWMP-12 - Cedar Lane Gravity Main Improvement			**$0.78**	
280	Cedar Lane PS GM Improvement	1/31/40	1/30/43	$0.78	
	RWWMP Project: VIP-RWWMP-17 - Norfolk I/I Reduction Project C			**$23.91**	
315	NORF PS 097 GM Improvement	1/2/34	6/2/39	$0.25	312FF
313	NORF-PS-005 General I/I Reduction Plan	1/2/34	6/2/39	$9.29	312FF
314	NORF-PS-097 Comprehensive I/I Reduction Plan	1/2/34	6/2/39	$14.36	312FF
	RWWMP Project: VIP-RWWMP-19 - Ferebee Avenue PS Gravity Influent Improvement			**$1.07**	
365	Ferebee Avenue GM Influent Improvement	1/1/35	7/30/38	$1.07	
	RWWMP Project: VIP-RWWMP-20 - Chesapeake PS 7 Upgrade			**$2.09**	
366	CHES-PS-007	7/31/35	7/30/38	$2.09	365FF
	RWWMP Project: VIP-RWWMP-21 - Norfolk City System Improvements F			**$2.59**	
415	Powhatan and Magnolia Ave Manifolded FM Improvement - I	1/1/36	12/31/38	$0.66	



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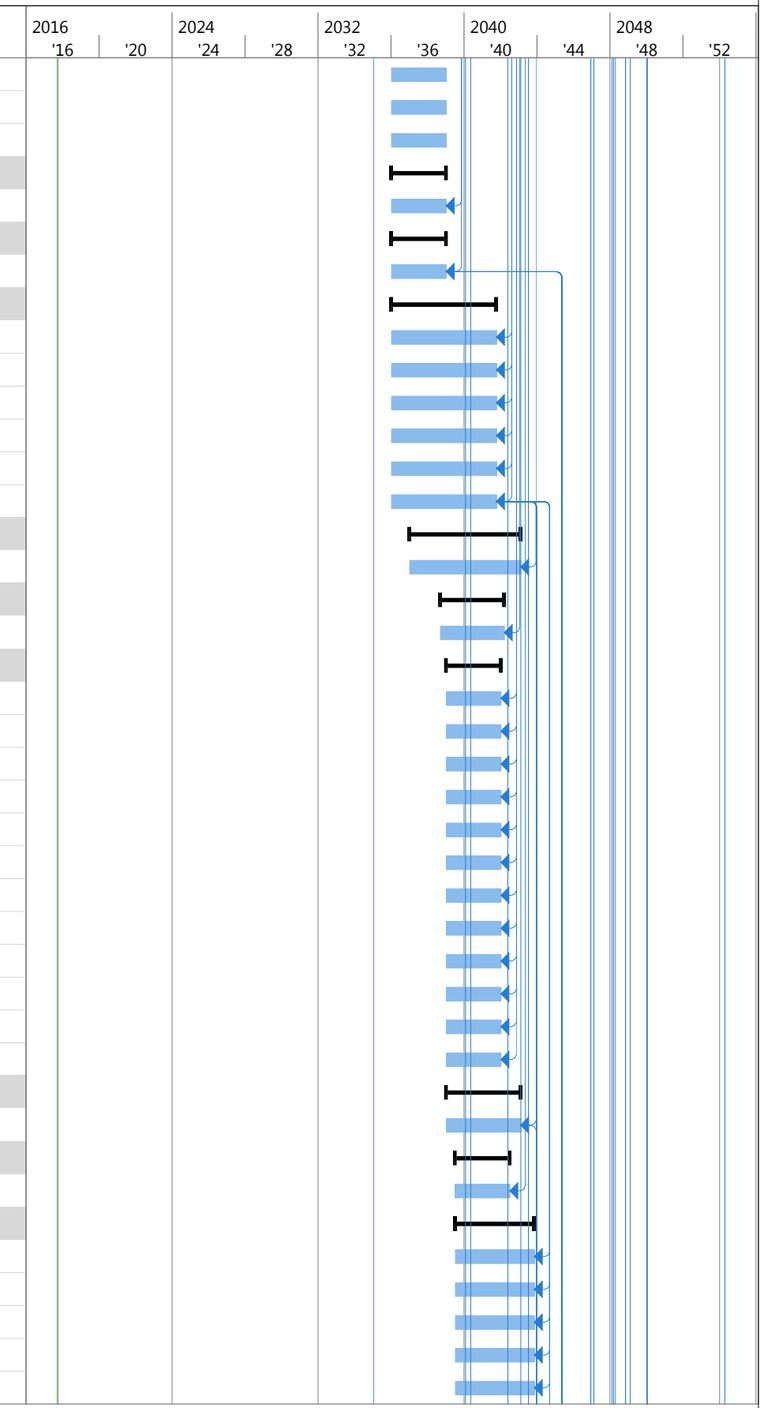
416	Powhatan and Magnolia Ave Manifolded FM Improvement - II	1/1/36	12/31/38	$0.36	
417	Powhatan and Magnolia Ave Manifolded FM Improvement - III	1/1/36	12/31/38	$0.62	
418	Powhatan and Magnolia Ave Manifolded FM Improvement - IV	1/1/36	12/31/38	$0.94	
	RWWMP Project: VIP-RWWMP-22 - Chesapeake Blvd FM Improvement and Related PS Upgrades			**$0.11**	
307	Chesapeake Blvd FM	1/1/36	12/31/38	$0.11	359FF
	RWWMP Project: VIP-RWWMP-22 - Steamboat Creek Force Main Improvement			**$0.33**	
367	Steamboat Creek FM Improvement	1/1/36	12/31/38	$0.33	359FF
	RWWMP Project: VIP-RWWMP-23 - Portsmouth I/I Reduction Project A			**$20.51**	
335	PORT-04-LOP66-1 Data-Driven I/I Reduction Plan	1/2/36	9/30/41	$1.71	332FF
336	PORT-04-LOP72-1 Data-Driven I/I Reduction Plan	1/2/36	9/30/41	$2.23	332FF
337	PORT-04-LOP72-2 Data-Driven I/I Reduction Plan	1/2/36	9/30/41	$2.83	332FF
338	PORT-04-LOP72-4 Data-Driven I/I Reduction Plan	1/2/36	9/30/41	$2.42	332FF
339	PORT-10 Data-Driven I/I Reduction Plan	1/2/36	9/30/41	$10.30	332FF
340	PORT-12 Data-Driven I/I Reduction Plan	1/2/36	9/30/41	$1.03	332FF
	RWWMP Project: VIP-RWWMP-24 - Portsmouth I/I Reduction Project B			**$26.10**	
341	PORT-03 General I/I Reduction Plan	1/1/37	1/30/43	$26.10	340FF
	RWWMP Project: VIP-RWWMP-25 - Ingleside Rd PS Upgrade			**$0.00**	
304	Ingleside Rd PS	9/6/38	3/6/42	$0.00	303FF
	RWWMP Project: VIP-RWWMP-26 - Chesapeake City System Improvements E			**$7.18**	
397	CHES-007 GM Improvement - I	1/3/39	1/1/42	$0.95	366FF
398	CHES-007 GM Improvement - II	1/3/39	1/1/42	$0.13	366FF
395	CHES-008 FM Extension	1/3/39	1/1/42	$0.90	366FF
399	CHES-008 GM Improvement - I	1/3/39	1/1/42	$0.27	366FF
400	CHES-008 GM Improvement - II	1/3/39	1/1/42	$0.37	366FF
396	CHES-042 FM Improvement	1/3/39	1/1/42	$0.29	366FF
401	CHES-132 GM Improvement - I	1/3/39	1/1/42	$0.43	366FF
402	CHES-132 GM Improvement - II	1/3/39	1/1/42	$0.20	366FF
403	CHES-H-123-G005 GM Improvement	1/3/39	1/1/42	$0.40	366FF
404	CHES-PS-004	1/3/39	1/1/42	$0.22	366FF
405	CHES-PS-008	1/3/39	1/1/42	$2.47	366FF
406	CHES-PS-042	1/3/39	1/1/42	$0.57	366FF
	RWWMP Project: VIP-RWWMP-27 - Norfolk I/I Reduction Project D			**$14.52**	
316	NORF-PS-008 General I/I Reduction Plan	1/3/39	1/30/43	$14.52	315FF
	RWWMP Project: VIP-RWWMP-28 - Bainbridge Blvd Gravity Main Improvement			**$0.56**	
381	Bainbridge Blvd. PS GM Improvement	6/28/39	6/27/42	$0.56	359FF
	RWWMP Project: VIP-RWWMP-29 - Portsmouth I/I Reduction Project C			**$13.22**	
344	PORT-003-V003-G001 GM Improvement	7/1/39	10/29/43	$0.64	340FF
345	PORT-003-V006 GM Improvement - I	7/1/39	10/29/43	$0.14	340FF
346	PORT-003-V006 GM Improvement - II	7/1/39	10/29/43	$0.67	340FF
347	PORT-006-V004 GM Improvement - I	7/1/39	10/29/43	$0.60	340FF
348	PORT-006-V004 GM Improvement - II	7/1/39	10/29/43	$0.17	340FF



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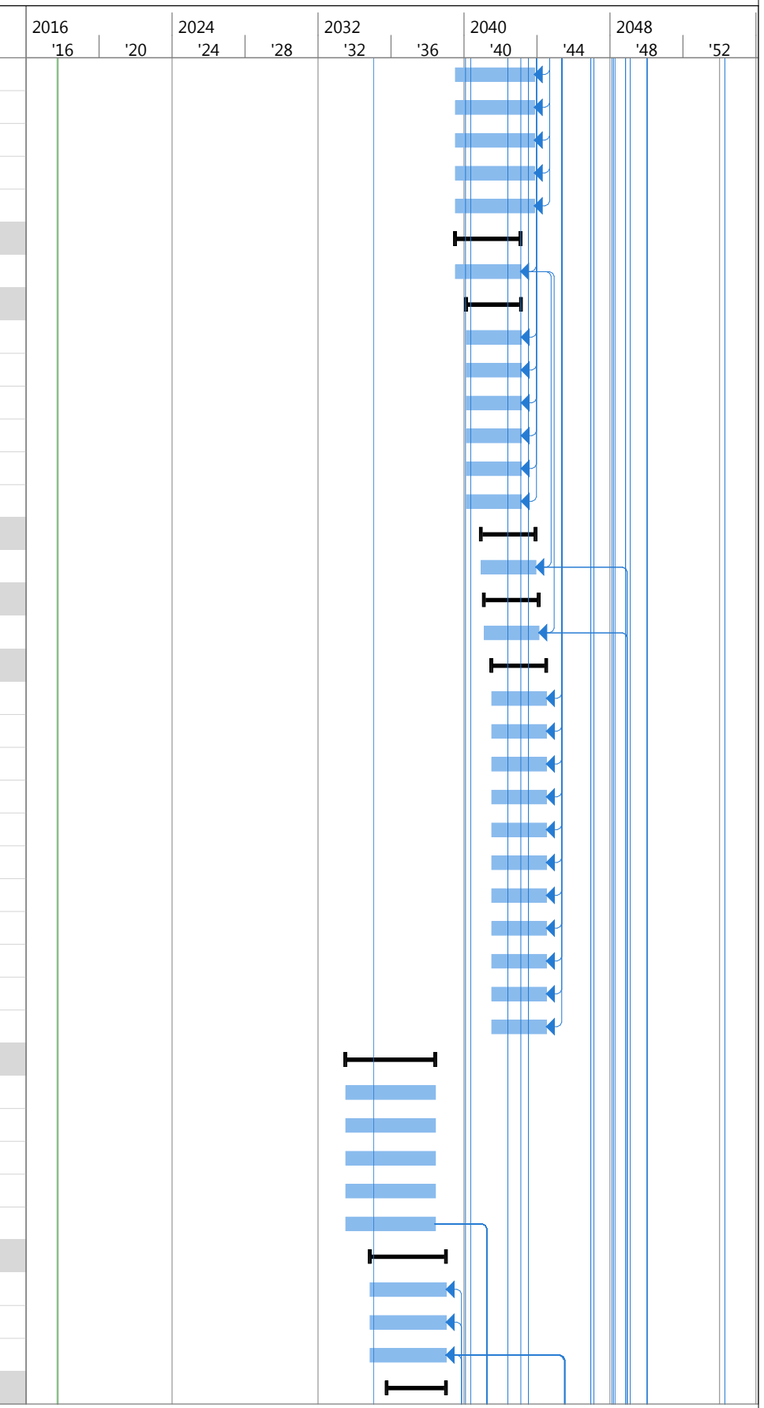
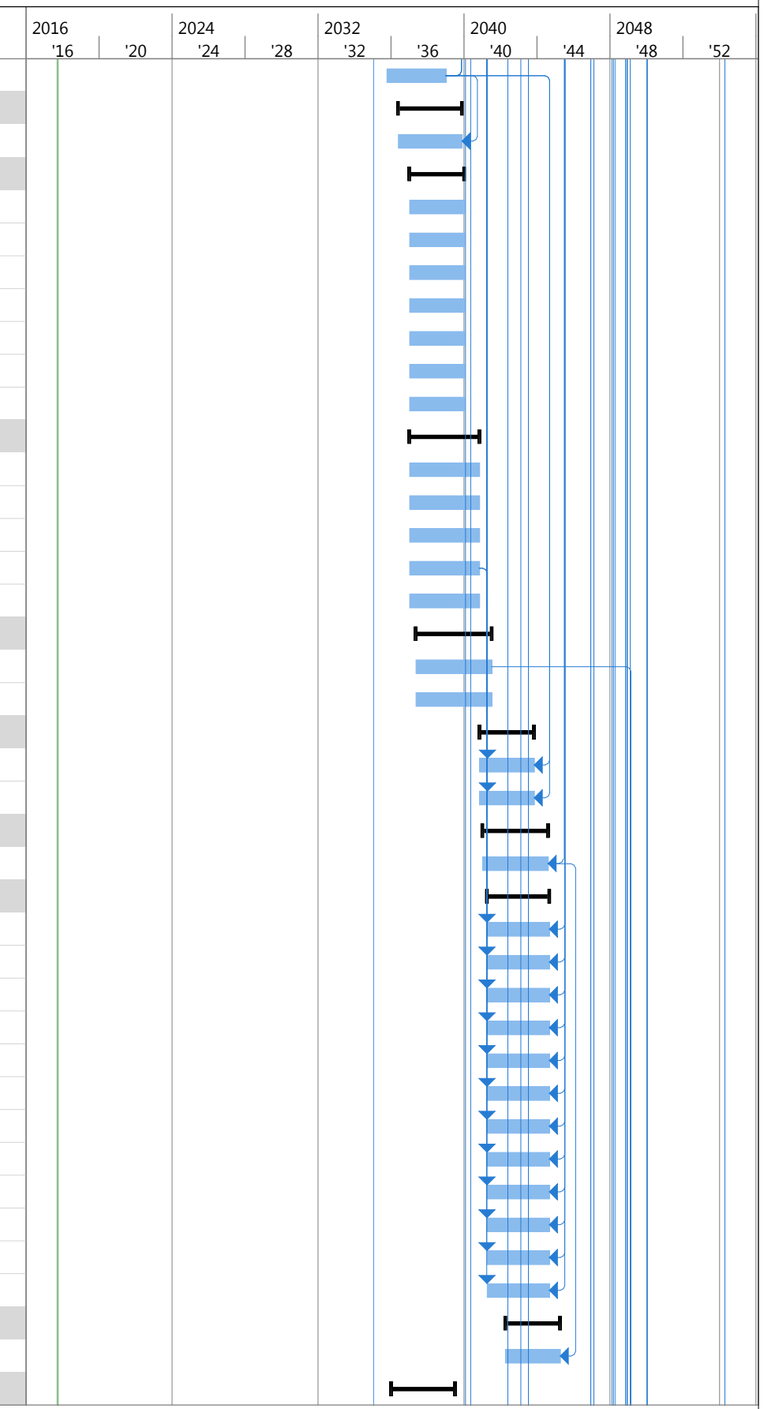
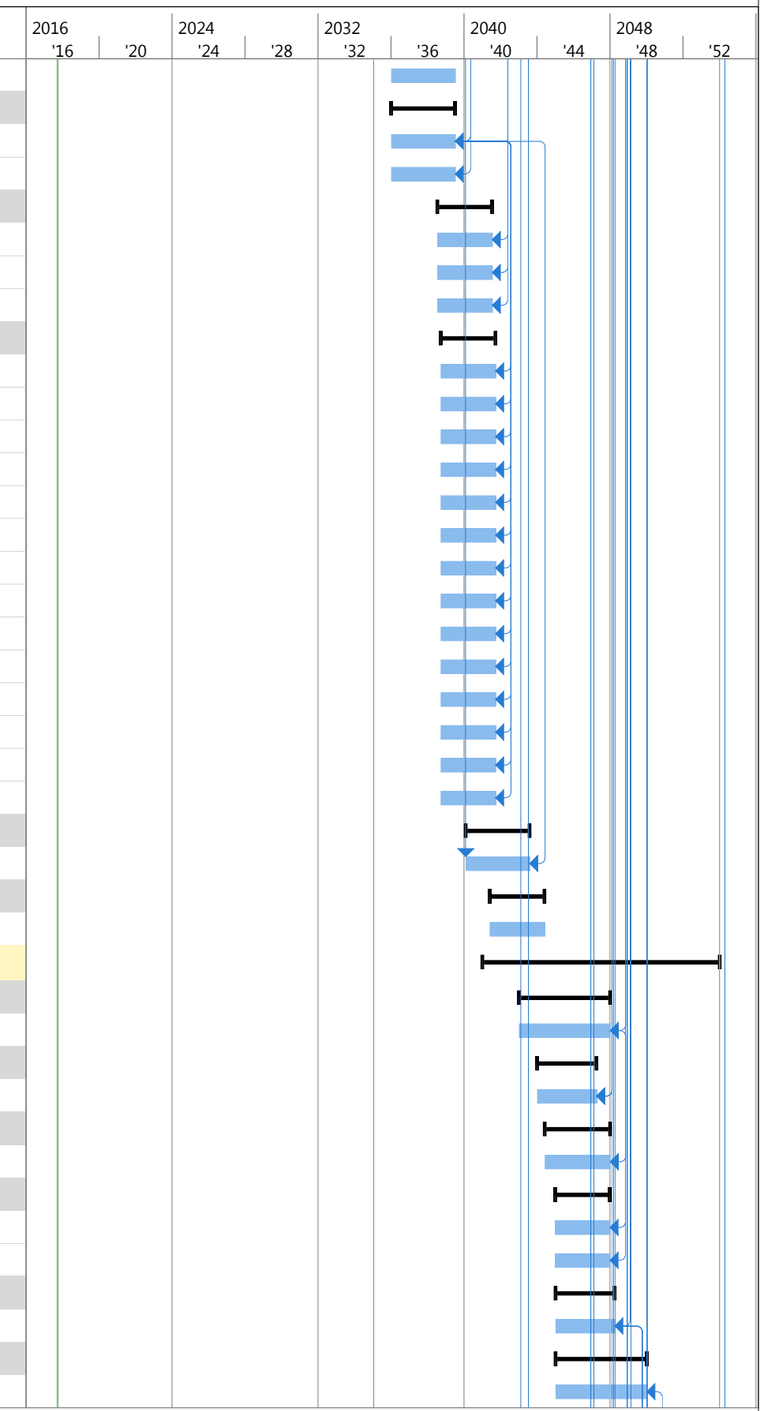
349	PORT-010 GM Improvement	7/1/39	10/29/43	$0.32	340FF
350	PORT-026-G002 GM Improvement	7/1/39	10/29/43	$0.24	340FF
342	PORT-03-LOP35-1 General I/I Reduction Plan	7/1/39	10/29/43	$8.14	340FF
343	PORT-03-LOP35-2 General I/I Reduction Plan	7/1/39	10/29/43	$1.88	340FF
351	PORT-H-146-G005 GM Improvement	7/1/39	10/29/43	$0.44	340FF
	RWWMP Project: VIP-RWWMP-30 - Norfolk I/I Reduction Project E			**$10.90**	
317	NORF-PS-004 General I/I Reduction Plan	7/4/39	1/30/43	$10.90	316FF
	RWWMP Project: VIP-RWWMP-31 - Portsmouth City System Improvements A			**$6.81**	
352	PORT-013 FM Improvement	2/10/40	2/9/43	$1.19	340FF
353	PORT-018 FM Improvement	2/10/40	2/9/43	$0.49	340FF
354	PORT-PS-010	2/10/40	2/9/43	$1.52	340FF
355	PORT-PS-013	2/10/40	2/9/43	$1.52	340FF
356	PORT-PS-018	2/10/40	2/9/43	$1.33	340FF
357	PORT-PS-053	2/10/40	2/9/43	$0.76	340FF
	RWWMP Project: VIP-RWWMP-32 - Norfolk I/I Reduction Project G			**$3.57**	
319	NORF-PS-020 Data-Driven I/I Reduction Plan	11/29/40	11/29/43	$3.57	317FF
	RWWMP Project: VIP-RWWMP-34 - Norfolk I/I Reduction Project F			**$4.17**	
318	NORF-003-G001 Comprehensive I/I Reduction Plan	1/29/41	1/29/44	$4.17	317FF
	RWWMP Project: VIP-RWWMP-35 - Chesapeake City System Improvements D			**$5.16**	
368	CHES-101 FM Improvement	7/1/41	6/30/44	$0.30	367FF
369	CHES-102 FM Extension	7/1/41	6/30/44	$0.26	367FF
371	CHES-102 GM Improvement - I	7/1/41	6/30/44	$0.16	367FF
372	CHES-102 GM Improvement - II	7/1/41	6/30/44	$0.35	367FF
373	CHES-103 GM Improvement - I	7/1/41	6/30/44	$0.37	367FF
374	CHES-103 GM Improvement - II	7/1/41	6/30/44	$0.20	367FF
370	CHES-125 FM Extension	7/1/41	6/30/44	$0.23	367FF
375	CHES-125 GM Improvement	7/1/41	6/30/44	$0.44	367FF
376	CHES-PS-060	7/1/41	6/30/44	$0.57	367FF
377	CHES-PS-102	7/1/41	6/30/44	$1.52	367FF
378	CHES-PS-125	7/1/41	6/30/44	$0.76	367FF
	RWWMP Project: WB-RWWMP-01 - JCSA I/I Reduction Project E			**$18.65**	
483	JCSA-LSA3-3 Data-Driven I/I Reduction Plan	7/1/33	5/31/38	$1.19	
484	JCSA-LSA3-6 Data-Driven I/I Reduction Plan	7/1/33	5/31/38	$3.03	
485	JCSA-LSA3-8 General I/I Reduction Plan	7/1/33	5/31/38	$12.76	
482	JCSA-LSA4-5 Data-Driven I/I Reduction Plan	7/1/33	5/31/38	$1.02	
486	JCSA-LSA5-1 Comprehensive I/I Reduction Plan	7/1/33	5/31/38	$0.65	
	RWWMP Project: WB-RWWMP-02 - Williamsburg Crossing PRS, Force Main and Storage Tank			**$19.98**	
437	Williamsburg Crossing FM	10/31/34	12/30/38	$1.84	436FF
438	Williamsburg Crossing PRS	10/31/34	12/30/38	$10.16	436FF
439	Williamsburg Crossing Storage	10/31/34	12/30/38	$7.98	436FF
	RWWMP Project: WB-RWWMP-03 - Route 199 PRS			**$14.03**	



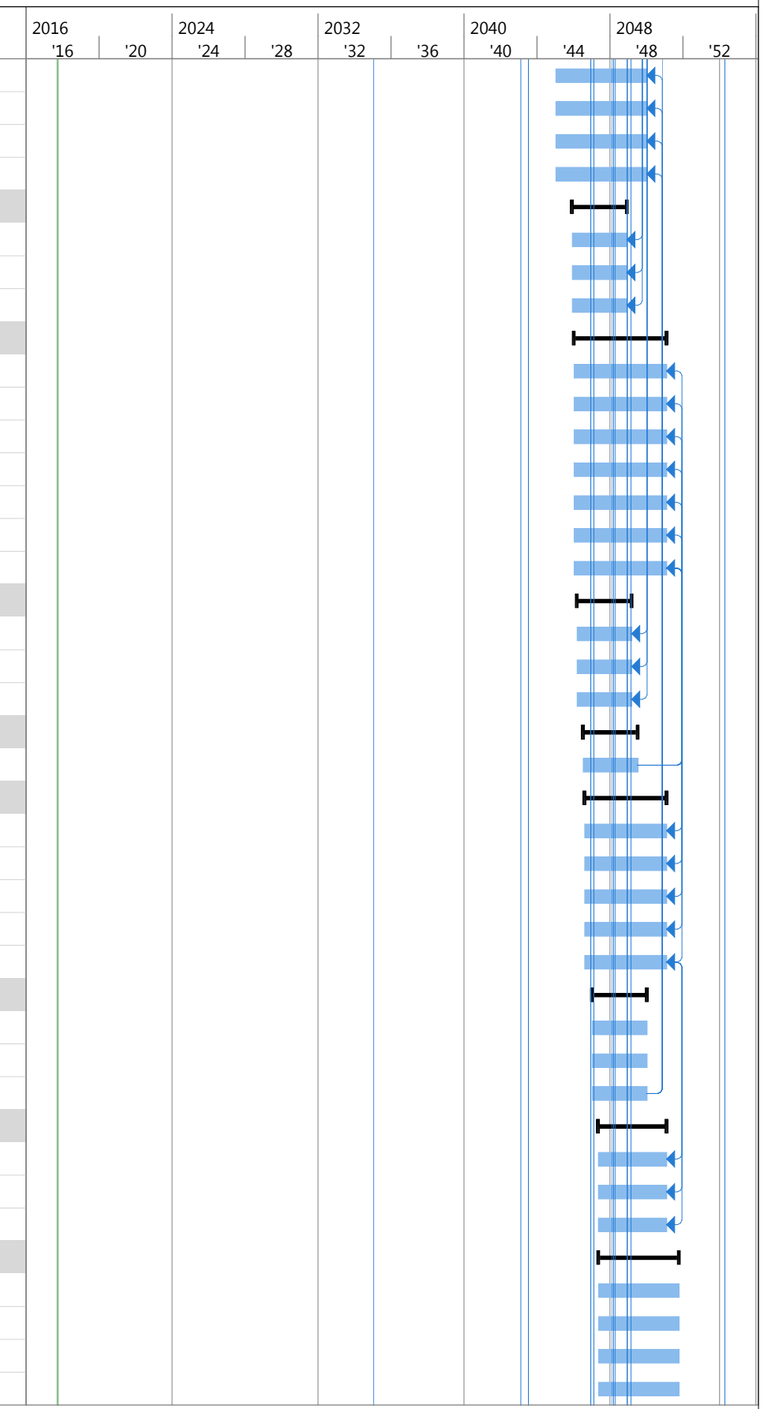
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
436	Route 199 PRS	10/1/35	12/30/38	$14.03	
	RWWMP Project: WB-RWWMP-04 - Colonial Williamsburg PS Extended Wet Well			**$0.23**	
460	Colonial Williamsburg Extended WW	5/19/36	11/17/39	$0.23	436FF
	RWWMP Project: WB-RWWMP-05 - JCSA System Improvements A			**$12.02**	
454	JCSA-001-2 GM improvement	1/1/37	12/30/39	$4.73	
455	JCSA-001-8 GM improvement	1/1/37	12/30/39	$0.98	
456	JCSA-002-4 GM improvement - I	1/1/37	12/30/39	$0.54	
457	JCSA-002-4 GM improvement - II	1/1/37	12/30/39	$2.75	
458	JCSA-005-5 GM improvement	1/1/37	12/30/39	$0.21	
459	JCSA-PS-008-4	1/1/37	12/30/39	$1.33	
453	JCSA-PS-008-4 FM improvement	1/1/37	12/30/39	$1.49	
	RWWMP Project: WB-RWWMP-06 - Williamsburg I/I Reduction Project A			**$11.30**	
463	WILL-005 Comprehensive I/I Reduction Plan	1/1/37	10/31/40	$3.13	
464	WILL-12A-8 Comprehensive I/I Reduction Plan	1/1/37	10/31/40	$3.42	
465	WILL-12A-9 Data-Driven I/I Reduction Plan	1/1/37	10/31/40	$0.94	
467	WILL-14 Data-Driven I/I Reduction Plan	1/1/37	10/31/40	$0.76	
466	WILL-226A-5 Data-Driven I/I Reduction Plan	1/1/37	10/31/40	$3.04	
	RWWMP Project: WB-RWWMP-07 - York County I/I Reduction Project B			**$16.30**	
493	YORK-006 Comprehensive I/I Reduction Plan	5/6/37	7/5/41	$16.30	
492	YORK-006 GM improvement	5/6/37	7/5/41	$0.00	
	RWWMP Project: WB-RWWMP-08 - Williamsburg PS 12 Ugrade and PS 14 FM Improvement			**$3.55**	
462	WILL-PS-012	11/1/40	11/1/43	$3.41	436FF,467
461	WILL-PS-014 FM extension	11/1/40	11/1/43	$0.14	436FF,467
	RWWMP Project: WB-RWWMP-09 - Longhill PRS			**$7.61**	
440	Longhill PRS	1/1/41	8/1/44	$7.61	439FF
	RWWMP Project: WB-RWWMP-10 - JCSA System Improvements B			**$11.27**	
470	JCSA-003-1 GM improvement	4/1/41	8/30/44	$0.23	439FF,486
471	JCSA-003-3 GM improvement	4/1/41	8/30/44	$0.34	439FF,486
477	JCSA-003-6 GM improvement	4/1/41	8/30/44	$0.26	439FF,486
478	JCSA-PS-003-3	4/1/41	8/30/44	$1.90	439FF,486
472	JCSA-PS-003-5	4/1/41	8/30/44	$0.17	439FF,486
469	JCSA-PS-003-5 FM improvement	4/1/41	8/30/44	$0.67	439FF,486
479	JCSA-PS-003-6	4/1/41	8/30/44	$4.90	439FF,486
475	JCSA-PS-003-6 FM Realignment - I	4/1/41	8/30/44	$1.22	439FF,486
476	JCSA-PS-003-6 FM Realignment - II	4/1/41	8/30/44	$0.41	439FF,486
473	JCSA-PS-004-5	4/1/41	8/30/44	$0.11	439FF,486
480	JCSA-PS-004-8	4/1/41	8/30/44	$0.95	439FF,486
474	JCSA-PS-005-2	4/1/41	8/30/44	$0.11	439FF,486
	RWWMP Project: WB-RWWMP-11 - JCSA PS 006-2 Upgrade			**$2.28**	
441	JCSA-PS-006-2	4/2/42	4/1/45	$2.28	440FF
	RWWMP Project: YR-RWWMP-04 - Freeman Drive PS Upgrade			**$3.22**	



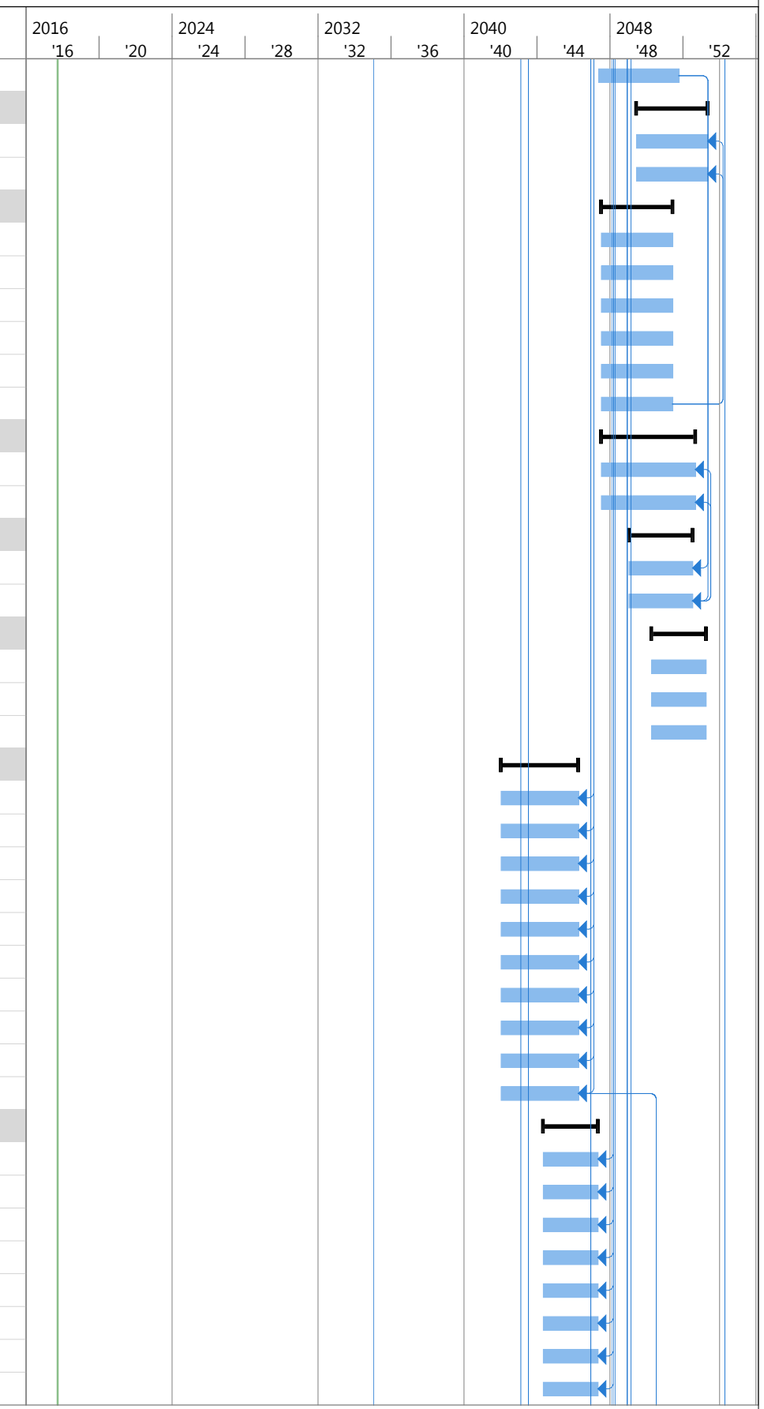
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
514	Freeman Drive	1/1/36	7/1/39	$3.22	
	RWWMP Project: YR-RWWMP-05 - Bay Shore Lane PS Upgrade and Force Main Improvement			**$7.59**	
498	Bay Shore Lane	1/1/36	7/1/39	$5.09	500FF
497	Bay Shore Lane FM	1/1/36	7/1/39	$2.51	500FF
	RWWMP Project: YR-RWWMP-06 - Hampton I/I Reduction Project C			**$4.08**	
519	HAMP-024 Comprehensive I/I Reduction Plan	7/14/38	7/13/41	$1.74	500FF
518	HAMP-217H-121 Comprehensive I/I Reduction Plan	7/14/38	7/13/41	$2.35	500FF
517	HAMP-H-217-G0171-1 GM Improvement	7/14/38	7/13/41	$0.00	500FF
	RWWMP Project: YR-RWWMP-07 - Hampton City System Improvements D			**$11.34**	
505	HAMP-022 FM Improvement	9/16/38	9/15/41	$0.12	498FF
507	HAMP-023 GM Improvement - I	9/16/38	9/15/41	$0.48	498FF
504	HAMP-023 GM Improvement - II	9/16/38	9/15/41	$0.11	498FF
512	HAMP-032 FM Improvement	9/16/38	9/15/41	$0.59	498FF
513	HAMP-034 FM Improvement	9/16/38	9/15/41	$0.10	498FF
511	HAMP-121	9/16/38	9/15/41	$0.76	498FF
509	HAMP-123	9/16/38	9/15/41	$1.90	498FF
510	HAMP-134	9/16/38	9/15/41	$3.78	498FF
501	HAMP-134 GM Improvement - I	9/16/38	9/15/41	$0.40	498FF
502	HAMP-134 GM Improvement - II	9/16/38	9/15/41	$0.17	498FF
508	HAMP-H-203-G100 GM Improvement	9/16/38	9/15/41	$1.06	498FF
503	HAMP-H-203-G119 GM Improvement - I	9/16/38	9/15/41	$0.31	498FF
528	HAMP-H-203-G119 GM Improvement - II	9/16/38	9/15/41	$0.04	498FF
506	HAMP-PS-022	9/16/38	9/15/41	$1.52	498FF
	RWWMP Project: YR-RWWMP-08 - Bloxom's Corner PS Upgrade			**$0.95**	
515	Bloxom's Corner	1/30/40	7/30/43	$0.95	498FF,522
	RWWMP Project: YR-RWWMP-09 - Hampton PS 130 Upgrade			**$1.33**	
516	HAMP-130	5/24/41	5/23/44	$1.33	
	Phasing: Phase 3			**$587.65**	
	RWWMP Project: AT-RWWMP-20 - Chesapeake Southern Loop IFM (Cedar Rd. to Hillcrest Pkwy.)			**$30.43**	
97	Dominion Blvd; Chesapeake Southern Loop FM	1/1/43	1/1/48	$30.43	91FF
	RWWMP Project: AT-RWWMP-21 - Pine Tree PRS Upgrade			**$18.77**	
19	Pine Tree PRS	1/1/44	4/3/47	$18.77	18FF,17FF
	RWWMP Project: AT-RWWMP-22 - Dominion Blvd. PRS			**$5.56**	
98	Dominion Blvd. PRS	6/2/44	1/1/48	$5.56	97FF
	RWWMP Project: AT-RWWMP-23 - Virginia Beach PS 120 Upgrade and Gravity Main Improvement			**$4.75**	
24	VAB-120 GM improvement	12/26/44	12/26/47	$0.60	16FF
25	VAB-PS-120	12/26/44	12/26/47	$4.16	16FF
	RWWMP Project: AT-RWWMP-24 - Independence PRS Upgrade			**$13.36**	
13	Independence PRS	1/1/45	3/31/48	$13.36	23FF
	RWWMP Project: AT-RWWMP-25 - Chesapeake I/I Reduction Project D			**$17.30**	
102	CHES-072 Data-Driven I/I Reduction Plan	1/3/45	12/31/49	$0.77	101FF



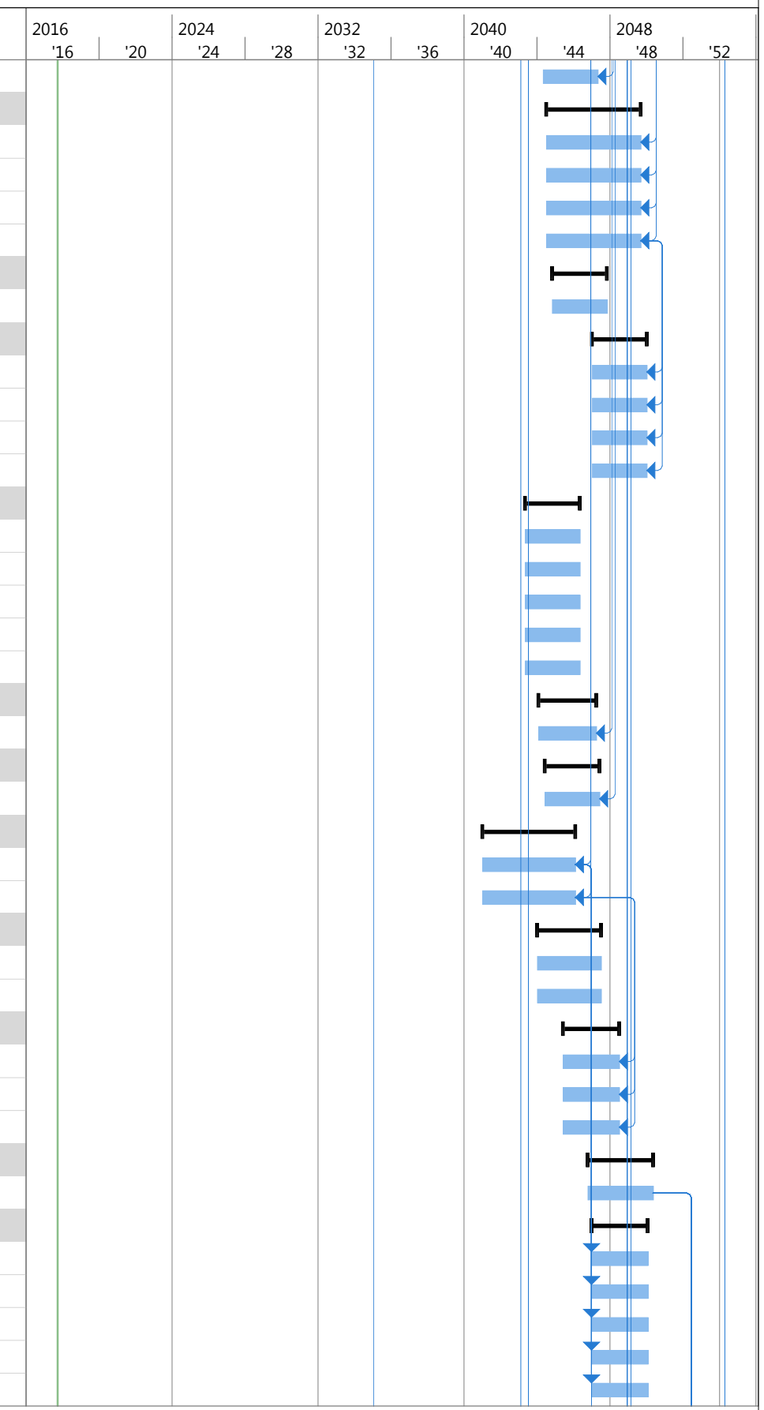
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
103	CHES-074 General I/I Reduction Plan	1/3/45	12/31/49	$2.14	101FF
104	CHES-116 Data-Driven I/I Reduction Plan	1/3/45	12/31/49	$2.06	101FF
105	CHES-220 Comprehensive I/I Reduction Plan	1/3/45	12/31/49	$2.27	101FF
106	CHES-221 General I/I Reduction Plan	1/3/45	12/31/49	$10.05	101FF
	RWWMP Project: AT-RWWMP-26 - Virginia Beach PS 324 Upgrade and Five Point Rd FM Extension			**$2.35**	
42	Manifold FM extension; VAB-PS-215, VAB-PS-225, VAB-PS-226	11/29/45	11/28/48	$0.61	13FF
44	VAB-PS-324	11/29/45	11/28/48	$0.95	13FF
43	VAB-PS-324 FM Improvement	11/29/45	11/28/48	$0.78	13FF
	RWWMP Project: AT-RWWMP-27 - VAB I/I Reduction Project B			**$18.67**	
27	VAB-248 Comprehensive I/I Reduction Plan	1/1/46	1/30/51	$1.33	26FF
28	VAB-349 Data-Driven I/I Reduction Plan	1/1/46	1/30/51	$5.78	26FF
29	VAB-359 Comprehensive I/I Reduction Plan	1/1/46	1/30/51	$2.97	26FF
30	VAB-360 Data-Driven I/I Reduction Plan	1/1/46	1/30/51	$1.19	26FF
31	VAB-364 Data-Driven I/I Reduction Plan	1/1/46	1/30/51	$3.25	26FF
32	VAB-502 Data-Driven I/I Reduction Plan	1/1/46	1/30/51	$2.08	26FF
33	VAB-509 General I/I Reduction Plan	1/1/46	1/30/51	$2.07	26FF
	RWWMP Project: AT-RWWMP-28 - Virginia Beach City System Improvements A			**$4.56**	
48	VAB-PS-455	3/2/46	3/1/49	$2.28	47FF
49	VAB-PS-508	3/2/46	3/1/49	$1.14	47FF
50	VAB-PS-544	3/2/46	3/1/49	$1.14	47FF
	RWWMP Project: AT-RWWMP-29 - VAB I/I Reduction Project A			**$5.96**	
26	VAB-318 General I/I Reduction Plan	7/2/46	7/1/49	$5.96	
	RWWMP Project: AT-RWWMP-30 - VAB I/I Reduction Project C			**$18.17**	
36	VAB-357 Comprehensive I/I Reduction Plan	8/2/46	1/30/51	$6.59	33FF
34	VAB-357 GM improvement	8/2/46	1/30/51	$0.00	33FF
37	VAB-465 Comprehensive I/I Reduction Plan	8/2/46	1/30/51	$4.46	33FF
35	VAB-465 GM improvement	8/2/46	1/30/51	$0.00	33FF
38	VAB-466 Comprehensive I/I Reduction Plan	8/2/46	1/30/51	$7.12	33FF
	RWWMP Project: AT-RWWMP-31 - Chesapeake I/I Reduction Project C			**$4.76**	
99	CHES-063 Data-Driven I/I Reduction Plan	1/1/47	12/31/49	$1.89	
100	CHES-197 Data-Driven I/I Reduction Plan	1/1/47	12/31/49	$1.75	
101	CHES-214 Data-Driven I/I Reduction Plan	1/1/47	12/31/49	$1.12	
	RWWMP Project: AT-RWWMP-32 - VAB I/I Reduction Project D			**$9.02**	
39	VAB-218 Data-Driven I/I Reduction Plan	5/2/47	1/30/51	$0.91	38FF
40	VAB-256 Comprehensive I/I Reduction Plan	5/2/47	1/30/51	$1.15	38FF
41	VAB-260 Data-Driven I/I Reduction Plan	5/2/47	1/30/51	$6.95	38FF
	RWWMP Project: AT-RWWMP-33 - VAB I/I Reduction Project F			**$15.91**	
74	VAB-007a Comprehensive I/I Reduction Plan	5/6/47	10/4/51	$9.12	
75	VAB-338 Comprehensive I/I Reduction Plan	5/6/47	10/4/51	$3.13	
76	VAB-340_NSF_Rehab_Only General I/I Reduction Plan	5/6/47	10/4/51	$1.57	
77	VAB-350 Data-Driven I/I Reduction Plan	5/6/47	10/4/51	$0.60	



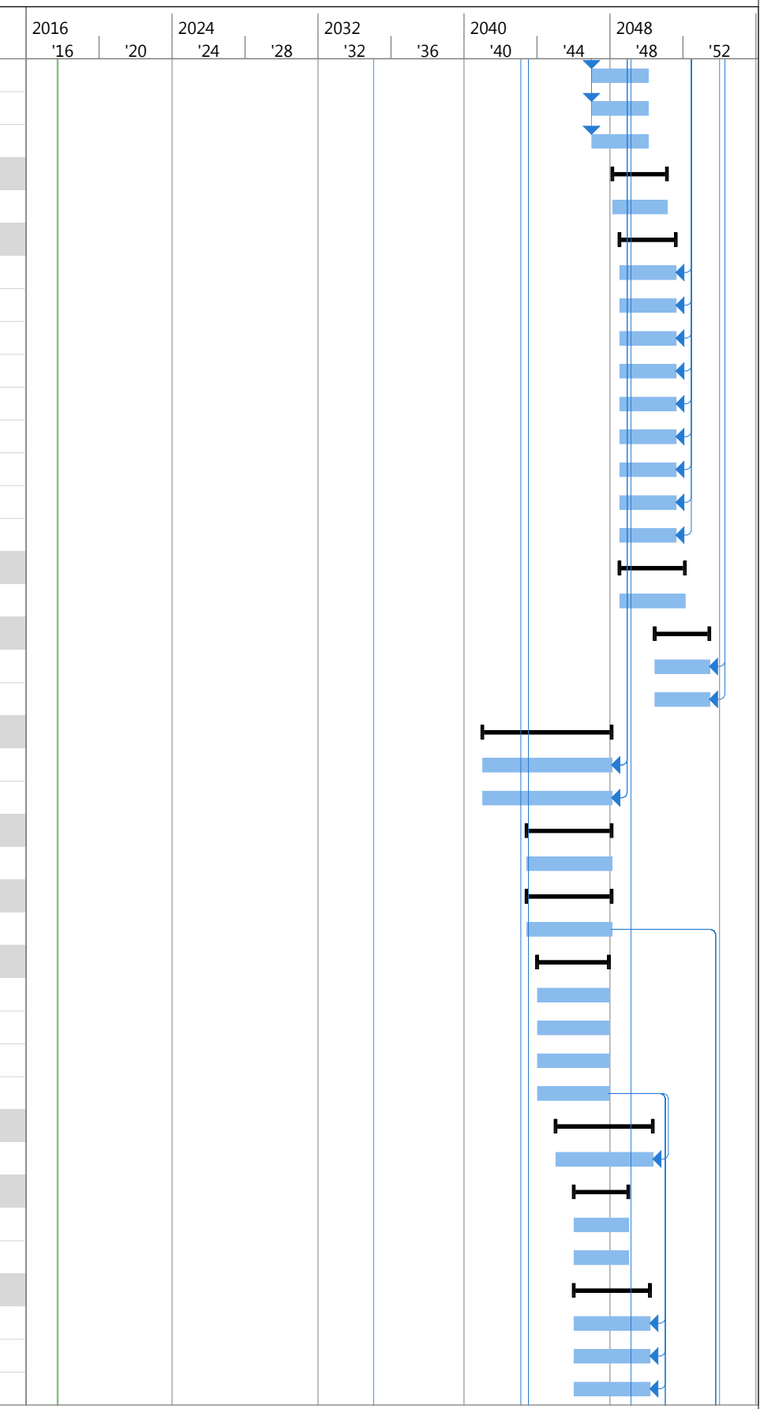
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
78	VAB-401 Data-Driven I/I Reduction Plan	5/6/47	10/4/51	$1.49	
	RWWMP Project: AT-RWWMP-34 - Chesapeake I/I Reduction Project A			**$14.10**	
63	CHES-009 Comprehensive I/I Reduction Plan	6/1/49	4/30/53	$11.05	70FF
64	CHES-134 Comprehensive I/I Reduction Plan	6/1/49	4/30/53	$3.05	70FF
	RWWMP Project: AT-RWWMP-35 - Chesapeake I/I Reduction Project B			**$11.11**	
65	CHES-013 General I/I Reduction Plan	7/1/47	5/30/51	$3.26	
66	CHES-096 Data-Driven I/I Reduction Plan	7/1/47	5/30/51	$0.35	
67	CHES-164 Comprehensive I/I Reduction Plan	7/1/47	5/30/51	$2.64	
68	CHES-165 Data-Driven I/I Reduction Plan	7/1/47	5/30/51	$0.84	
69	CHES-931-G1 General I/I Reduction Plan	7/1/47	5/30/51	$1.78	
70	CHES-931-G2 General I/I Reduction Plan	7/1/47	5/30/51	$2.24	
	RWWMP Project: AT-RWWMP-36 - Norfolk I/I Reduction Project A			**$21.87**	
81	NORF-H-115 Comprehensive I/I Reduction Plan	7/1/47	8/28/52	$12.70	80FF
82	NORF-PS-081 General I/I Reduction Plan	7/1/47	8/28/52	$9.17	80FF
	RWWMP Project: AT-RWWMP-37 - VAB I/I Reduction Project G			**$10.90**	
79	VAB-343a Comprehensive I/I Reduction Plan	1/1/49	7/1/52	$4.18	78FF
80	VAB-343b Comprehensive I/I Reduction Plan	1/1/49	7/1/52	$6.72	78FF
	RWWMP Project: AT-RWWMP-38 - Norfolk City System Improvements C			**$0.96**	
72	NORF-038 GM Improvement	3/31/50	3/30/53	$0.31	
73	NORF-076 GM Improvement	3/31/50	3/30/53	$0.30	
71	NORF-128 FM Improvement	3/31/50	3/30/53	$0.34	
	RWWMP Project: BH-RWWMP-14 - Newport News I/I Reduction Project B			**$14.33**	
151	NEWP-WCPSA003300 Comprehensive I/I Reduction Plan	1/1/42	4/1/46	$0.48	150FF
152	NEWP-WCPSA003302 General I/I Reduction Plan	1/1/42	4/1/46	$0.68	150FF
153	NEWP-WCPSA003303 General I/I Reduction Plan	1/1/42	4/1/46	$1.25	150FF
154	NEWP-WCPSA003801 General I/I Reduction Plan	1/1/42	4/1/46	$1.46	150FF
155	NEWP-WCPSA003802 General I/I Reduction Plan	1/1/42	4/1/46	$0.76	150FF
156	NEWP-WCPSA003803 Data-Driven I/I Reduction Plan	1/1/42	4/1/46	$1.11	150FF
157	NEWP-WCPSA003804 Data-Driven I/I Reduction Plan	1/1/42	4/1/46	$0.75	150FF
158	NEWP-WCPSA004300 Comprehensive I/I Reduction Plan	1/1/42	4/1/46	$3.33	150FF
159	NEWP-WCPSA004301 Comprehensive I/I Reduction Plan	1/1/42	4/1/46	$2.66	150FF
160	NEWP-WCPSA004302 Comprehensive I/I Reduction Plan	1/1/42	4/1/46	$1.86	150FF
	RWWMP Project: BH-RWWMP-15 - Hampton City System Improvements B			**$3.32**	
136	HAMP-014 GM Improvement - II	4/25/44	4/25/47	$0.36	114FF
135	HAMP-014 GM Improvement -I	4/25/44	4/25/47	$0.04	114FF
132	HAMP-020 FM Improvement	4/25/44	4/25/47	$0.35	114FF
133	HAMP-026 FM Improvement	4/25/44	4/25/47	$0.21	114FF
134	HAMP-111 FM Improvement	4/25/44	4/25/47	$0.36	114FF
137	HAMP-H-223-G121 GM Improvement	4/25/44	4/25/47	$1.40	114FF
138	HAMP-H-223-G122 GM Improvement	4/25/44	4/25/47	$0.04	114FF
139	HAMP-H-223-G140 GM Improvement - I	4/25/44	4/25/47	$0.20	114FF



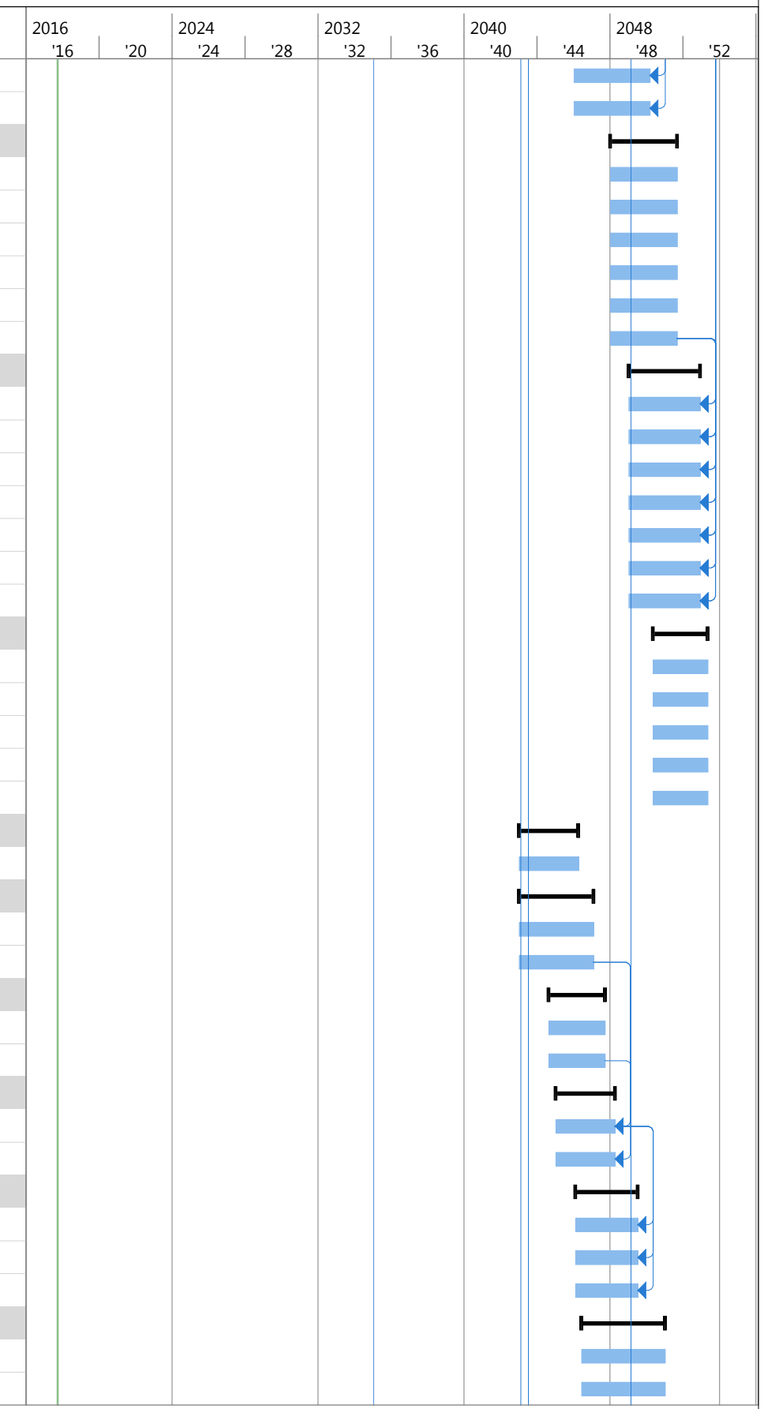
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
140	HAMP-H-223-G140 GM Improvement - II	4/25/44	4/25/47	$0.37	114FF
	RWWMP Project: BH-RWWMP-16 - Newport News I/I Reduction Project C			**$20.78**	
161	NEWP-WCPSA001660 General I/I Reduction Plan	7/1/44	8/30/49	$9.54	160FF
162	NEWP-WCPSA003601 Comprehensive I/I Reduction Plan	7/1/44	8/30/49	$1.70	160FF
163	NEWP-WCPSA003700 General I/I Reduction Plan	7/1/44	8/30/49	$2.37	160FF
164	NEWP-WCPSA003701 Comprehensive I/I Reduction Plan	7/1/44	8/30/49	$7.18	160FF
	RWWMP Project: BH-RWWMP-17 - Newport News I/I Reduction Project E			**$1.22**	
175	NEWP-WCPSA001705 Data-Driven I/I Reduction Plan	10/24/44	10/24/47	$1.22	
	RWWMP Project: BH-RWWMP-18 - Newport News I/I Reduction Project D			**$4.61**	
165	NEWP-WCPSA003906 General I/I Reduction Plan	1/1/47	12/31/49	$1.53	164FF
166	NEWP-WCPSA004100 General I/I Reduction Plan	1/1/47	12/31/49	$0.42	164FF
167	NEWP-WCPSA004101 General I/I Reduction Plan	1/1/47	12/31/49	$1.41	164FF
168	NEWP-WCPSA004103 Comprehensive I/I Reduction Plan	1/1/47	12/31/49	$1.26	164FF
	RWWMP Project: JR-RWWMP-14 - Poquoson City System Improvements A			**$2.05**	
185	POQ-001 GM Improvement	5/1/43	5/2/46	$0.89	
189	POQ-002 GM Improvement	5/1/43	5/2/46	$0.61	
188	POQ-006 GM Improvement - I	5/1/43	5/2/46	$0.29	
187	POQ-006 GM Improvement - II	5/1/43	5/2/46	$0.14	
186	POQ-006 GM Improvement - III	5/1/43	5/2/46	$0.12	
	RWWMP Project: JR-RWWMP-15 - Newport News I/I Reduction Project J			**$5.00**	
217	NEWP-WCPSA001180 Data-Driven I/I Reduction Plan	1/25/44	3/25/47	$5.00	208FF
	RWWMP Project: JR-RWWMP-16 - York County PS 019 Upgrade			**$2.47**	
183	YORK-PS-019	6/1/44	6/1/47	$2.47	182FF
	RWWMP Project: NA-RWWMP-13 - Suffolk I/I Reduction Project E			**$18.30**	
263	SUFF-064 Comprehensive I/I Reduction Plan	1/1/41	1/30/46	$4.42	262FF
264	SUFF-ShingleCreek-Group Data-Driven I/I Reduction Plan	1/1/41	1/30/46	$13.88	262FF
	RWWMP Project: NA-RWWMP-14 - Cedar Lane PS Upgrade and Portsmouth PS 47 Force Main Jumper			**$14.56**	
282	Cedar Lane PS	1/1/44	7/1/47	$14.46	
281	Jumper FM PORT-PS-047	1/1/44	7/1/47	$0.09	
	RWWMP Project: NA-RWWMP-15 - Suffolk I/I Reduction Project F			**$5.68**	
265	SUFF-027 Comprehensive I/I Reduction Plan	6/1/45	6/30/48	$1.77	264FF
266	SUFF-042 Comprehensive I/I Reduction Plan	6/1/45	6/30/48	$1.84	264FF
267	SUFF-517 General I/I Reduction Plan	6/1/45	6/30/48	$2.08	264FF
	RWWMP Project: NA-RWWMP-16 - Western Branch PRS			**$4.69**	
283	Western Branch PRS	10/8/46	5/8/50	$4.69	
	RWWMP Project: NA-RWWMP-17 - Suffolk City System Improvements A			**$5.87**	
246	East Washington St FM	12/24/46	1/22/50	$0.70	263
247	Old Town Point Rd FM	12/24/46	1/22/50	$1.47	263
244	Respass Beach Rd FM	12/24/46	1/22/50	$0.52	263
248	SUFF-031 GM improvement	12/24/46	1/22/50	$0.55	263
249	SUFF-110 GM improvement	12/24/46	1/22/50	$0.06	263



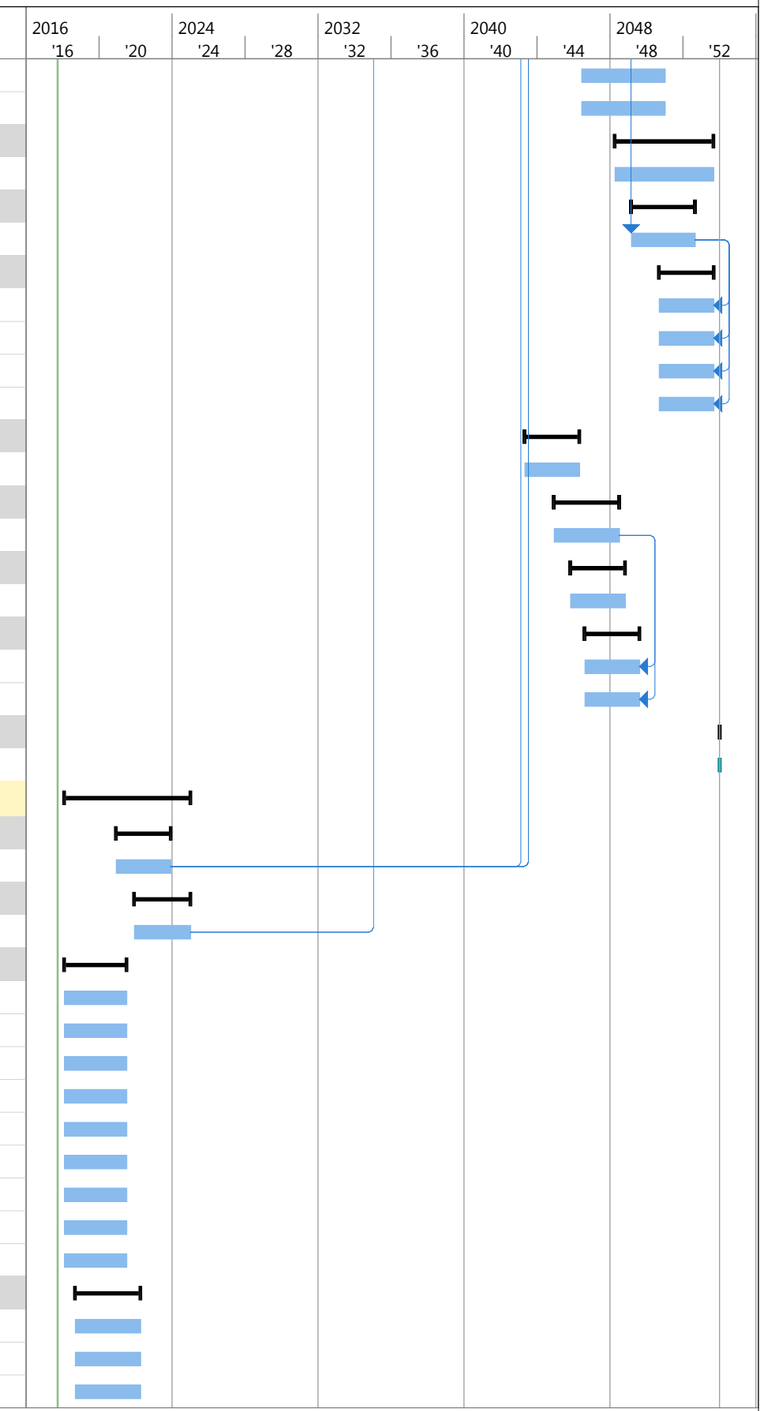
ID	Element Name	Start	Finish	Cost ($M)	Predecessors
250	SUFF-PS-064	12/24/46	1/22/50	$0.17	263
251	SUFF-PS-125	12/24/46	1/22/50	$1.52	263
245	SUFF-PS-125 FM extension	12/24/46	1/22/50	$0.87	263
	RWWMP Project: NA-RWWMP-18 - Chesapeake I/I Reduction Project F			**$4.41**	
293	CHES-026 Comprehensive I/I Reduction Plan	2/12/48	2/11/51	$4.41	
	RWWMP Project: NA-RWWMP-19 - Chesapeake City System Improvements C			**$7.05**	
284	CHES-029 FM Improvement	7/7/48	8/6/51	$0.68	283FF
286	CHES-069 GM Improvement - I	7/7/48	8/6/51	$0.20	283FF
287	CHES-069 GM Improvement - II	7/7/48	8/6/51	$0.42	283FF
285	CHES-070 FM Improvement	7/7/48	8/6/51	$0.21	283FF
288	CHES-PS-029	7/7/48	8/6/51	$0.76	283FF
289	CHES-PS-046	7/7/48	8/6/51	$1.52	283FF
290	CHES-PS-069	7/7/48	8/6/51	$2.28	283FF
291	CHES-PS-084	7/7/48	8/6/51	$0.76	283FF
292	CHES-PS-246	7/7/48	8/6/51	$0.22	283FF
	RWWMP Project: NA-RWWMP-20 - Nansemond River PRS			**$6.07**	
294	Nansemond River PRS	7/7/48	2/5/52	$6.07	
	RWWMP Project: NA-RWWMP-21 - Isle of Wight PS 13 and PS 26 Upgrades			**$1.51**	
295	IOW-PS-013	6/6/50	6/5/53	$0.76	232FF
296	IOW-PS-026	6/6/50	6/5/53	$0.76	232FF
	RWWMP Project: VIP-RWWMP-33 - Norfolk I/I Reduction Project H			**$47.08**	
320	NORF-H-107 Comprehensive I/I Reduction Plan	1/1/41	1/30/48	$47.08	318FF,319FF
321	NORF-H-107-G001 GM Improvement	1/1/41	1/30/48	$0.00	318FF,319FF
	RWWMP Project: VIP-RWWMP-36 - Chesapeake I/I Reduction Project G			**$8.41**	
379	CHES-919-G1 Data-Driven I/I Reduction Plan	6/1/43	1/29/48	$8.41	
	RWWMP Project: VIP-RWWMP-37 - Norfolk I/I Reduction Project J			**$9.01**	
380	NORF-H-103 Comprehensive I/I Reduction Plan	6/1/43	1/29/48	$9.01	
	RWWMP Project: VIP-RWWMP-38 - Norfolk I/I Reduction Project L			**$17.38**	
426	NORF-009-G001 Comprehensive I/I Reduction Plan	1/1/44	12/2/47	$8.20	
427	NORF-009-G002 Comprehensive I/I Reduction Plan	1/1/44	12/2/47	$3.87	
428	NORF-PS-012 General I/I Reduction Plan	1/1/44	12/2/47	$2.50	
429	NORF-PS-037 Comprehensive I/I Reduction Plan	1/1/44	12/2/47	$2.80	
	RWWMP Project: VIP-RWWMP-39 - Norfolk I/I Reduction Project N			**$21.72**	
435	NORF-PS-010 General I/I Reduction Plan	1/2/45	5/2/50	$21.72	429FF
	RWWMP Project: VIP-RWWMP-40 - Norfolk I/I Reduction Project K			**$4.36**	
424	NORF-H122-G1 General I/I Reduction Plan	1/1/46	12/29/48	$3.31	
425	NORF-H122-G2 General I/I Reduction Plan	1/1/46	12/29/48	$1.05	
	RWWMP Project: VIP-RWWMP-41 - Norfolk I/I Reduction Project M			**$12.38**	
430	NORF-H-106 General I/I Reduction Plan	1/1/46	3/2/50	$0.80	429FF
432	NORF-H-113 General I/I Reduction Plan	1/1/46	3/2/50	$4.63	429FF
431	NORF-H106-G1 General I/I Reduction Plan	1/1/46	3/2/50	$2.70	429FF



ID	Element Name	Start	Finish	Cost ($M)	Predecessors
433	NORF-H113-G1 Comprehensive I/I Reduction Plan	1/1/46	3/2/50	$2.54	429FF
434	NORF-H113-G2 General I/I Reduction Plan	1/1/46	3/2/50	$1.71	429FF
	RWWMP Project: VIP-RWWMP-42 - Chesapeake I/I Reduction Project H			**$9.22**	
389	CHES-039 General I/I Reduction Plan	1/1/48	8/31/51	$1.92	
390	CHES-043 General I/I Reduction Plan	1/1/48	8/31/51	$1.17	
391	CHES-060 General I/I Reduction Plan	1/1/48	8/31/51	$0.44	
392	CHES-100 Data-Driven I/I Reduction Plan	1/1/48	8/31/51	$0.93	
393	CHES-101 General I/I Reduction Plan	1/1/48	8/31/51	$3.75	
394	CHES-124 Data-Driven I/I Reduction Plan	1/1/48	8/31/51	$1.01	
	RWWMP Project: VIP-RWWMP-43 - Norfolk I/I Reduction Project I			**$11.62**	
382	NORF-H-127-10 Comprehensive I/I Reduction Plan	1/1/49	11/30/52	$1.32	380FF,394FF
383	NORF-H127-3 Comprehensive I/I Reduction Plan	1/1/49	11/30/52	$1.31	380FF,394FF
384	NORF-H127-4 Comprehensive I/I Reduction Plan	1/1/49	11/30/52	$0.61	380FF,394FF
385	NORF-H127-5 Comprehensive I/I Reduction Plan	1/1/49	11/30/52	$2.24	380FF,394FF
386	NORF-H127-G2 General I/I Reduction Plan	1/1/49	11/30/52	$2.36	380FF,394FF
387	NORF-H128-G2 General I/I Reduction Plan	1/1/49	11/30/52	$2.02	380FF,394FF
388	NORF-PS-060 General I/I Reduction Plan	1/1/49	11/30/52	$1.76	380FF,394FF
	RWWMP Project: VIP-RWWMP-44 - Norfolk City System Improvements G			**$2.85**	
419	NORF-010 FM Extension	5/3/50	5/2/53	$0.69	
421	NORF-010-G001 GM Improvement	5/3/50	5/2/53	$0.65	
422	NORF-018 GM Improvement	5/3/50	5/2/53	$0.21	
423	NORF-046 GM Improvement	5/3/50	5/2/53	$0.49	
420	NORF-PS-048 FM Realignment	5/3/50	5/2/53	$0.81	
	RWWMP Project: WB-RWWMP-12 - York County I/I Reduction Project A			**$7.72**	
468	YORK-229-2 Comprehensive I/I Reduction Plan	1/1/43	4/1/46	$7.72	
	RWWMP Project: WB-RWWMP-13 - JCSA I/I Reduction Project A			**$5.27**	
442	JCSA-LSA1-5 Data-Driven I/I Reduction Plan	1/1/43	1/30/47	$2.46	
443	JCSA-LSA6-2-A Data-Driven I/I Reduction Plan	1/1/43	1/30/47	$2.81	
	RWWMP Project: WB-RWWMP-14 - York County I/I Reduction Project C			**$9.17**	
494	YORK-001 Comprehensive I/I Reduction Plan	8/15/44	9/14/47	$4.24	
495	YORK-003 Data-Driven I/I Reduction Plan	8/15/44	9/14/47	$4.93	
	RWWMP Project: WB-RWWMP-15 - JCSA I/I Reduction Project B			**$5.85**	
445	JCSA-LSA1-6 Data-Driven I/I Reduction Plan	1/2/45	4/2/48	$0.66	443FF
444	JCSA-LSA6-9 Data-Driven I/I Reduction Plan	1/2/45	4/2/48	$5.19	443FF
	RWWMP Project: WB-RWWMP-16 - JCSA I/I Reduction Project C			**$9.58**	
447	JCSA-LSA4-1 Comprehensive I/I Reduction Plan	1/30/46	6/30/49	$1.23	445FF
448	JCSA-LSA4-2 Comprehensive I/I Reduction Plan	1/30/46	6/30/49	$4.62	445FF
446	JCSA-LSA10-4 Comprehensive I/I Reduction Plan	1/30/46	6/30/49	$3.73	445FF
	RWWMP Project: WB-RWWMP-17 - JCSA I/I Reduction Project F			**$13.06**	
487	JCSA-LSA1-2 Data-Driven I/I Reduction Plan	6/1/46	12/30/50	$2.75	
488	JCSA-LSA1-8 Data-Driven I/I Reduction Plan	6/1/46	12/30/50	$1.07	

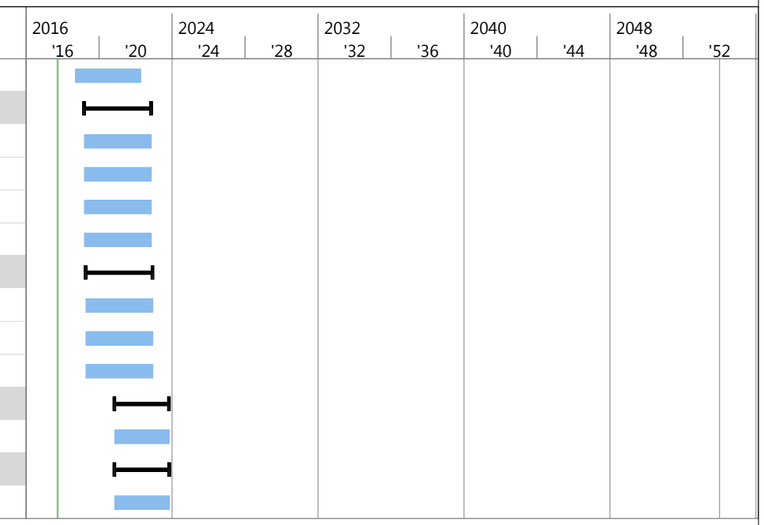


ID	Element Name	Start	Finish	Cost ($M)	Predecessors
489	JCSA-LSA1-9 Comprehensive I/I Reduction Plan	6/1/46	12/30/50	$7.08	
490	JCSA-LSA3-9 Data-Driven I/I Reduction Plan	6/1/46	12/30/50	$2.15	
	RWWMP Project: WB-RWWMP-18 - JCSA I/I Reduction Project D			**$26.85**	
481	JCSA-LSA3-1 Comprehensive I/I Reduction Plan	4/1/48	8/29/53	$26.85	
	RWWMP Project: WB-RWWMP-19 - Lodge Rd PS Extended Wet Well			**$0.23**	
491	Lodge Rd Extended WW	2/23/49	8/23/52	$0.23	493,495
	RWWMP Project: WB-RWWMP-20 - York County System Improvements A			**$5.06**	
452	Mainfold FM Realignment; YORK-PS-009 and YORK-PS-082	9/1/50	9/2/53	$1.61	491FF
449	YORK-PS-006	9/1/50	9/2/53	$2.09	491FF
450	YORK-PS-065	9/1/50	9/2/53	$1.14	491FF
451	YORK-PS-066	9/1/50	9/2/53	$0.22	491FF
	RWWMP Project: YR-RWWMP-10 - Hampton I/I Reduction Project D			**$1.06**	
520	HAMP-117 Comprehensive I/I Reduction Plan	4/23/43	4/22/46	$1.06	
	RWWMP Project: YR-RWWMP-11 - Yorktown PRS			**$4.52**	
523	Yorktown PRS	12/1/44	7/1/48	$4.52	
	RWWMP Project: YR-RWWMP-12 - Gloucester County I/I Reduction Project A			**$0.86**	
526	GLOU-16 Comprehensive I/I Reduction Plan	10/23/45	10/22/48	$0.86	
	RWWMP Project: YR-RWWMP-13 - Gloucester County PS 13 Upgrade			**$3.98**	
524	GLOU-013	8/9/46	8/8/49	$3.22	523FF
525	GLOU-016	8/9/46	8/8/49	$0.76	523FF
	RWWMP Project: ZZ-CLOSEOUT - Closeout			**$0.00**	
527	Closeout	1/1/54	1/1/54	$0.00	
	Phasing: Rehab Action Plan			**$0.00**	
	RWWMP Project: AB-RWWMP-01 - Terminal Blvd/ Hampton Blvd Force Main Improvements			**$0.00**	
1	Terminal Blvd/ Hampton Blvd FM	12/2/20	12/2/23	$0.00	
	RWWMP Project: JR-RWWMP-01 - Jefferson Avenue IFM Improvement			**$0.00**	
180	Jefferson Avenue FM Improvement	12/3/21	1/1/25	$0.00	
	RWWMP Project: NA-RWWMP-02 - Shingle Creek Pump Stations and Force Main/Gravity Main Installa			**$0.00**	
234	Shingle Creek FM Improvement - I	2/1/18	7/2/21	$0.00	
235	Shingle Creek FM Improvement - II	2/1/18	7/2/21	$0.00	
236	Shingle Creek FM Improvement - III	2/1/18	7/2/21	$0.00	
237	Shingle Creek GM Improvement - II	2/1/18	7/2/21	$0.00	
238	Shingle Creek GM Improvement - III	2/1/18	7/2/21	$0.00	
239	Shingle Creek GM Improvement - IV	2/1/18	7/2/21	$0.00	
240	Shingle Creek GM Improvement - V	2/1/18	7/2/21	$0.00	
241	Shingle Creek PS 1 (Suffolk PS Replacement 1)	2/1/18	7/2/21	$0.00	
242	Shingle Creek PS 2 (Suffolk PS Replacement 2)	2/1/18	7/2/21	$0.00	
	RWWMP Project: VIP-RWWMP-01 - Park Ave. PS, Ferebee Ave. PS Upgrades and Sanitary Sewer 1950 (			**$0.00**	
362	Ferebee Ave PS	9/3/18	4/3/22	$0.00	
363	Park Ave PS	9/3/18	4/3/22	$0.00	
360	Park Ave. GM Improvements - I	9/3/18	4/3/22	$0.00	



HRSD Regional Wet Weather Management Plan Schedule

ID	Element Name	Start	Finish	Cost ($M)	Predecessors
361	Park Ave. GM Improvements - II	9/3/18	4/3/22	$0.00	
	RWWMP Project: VIP-RWWMP-02 - HRSD Larchmont Area Pump Station Upgrades			**$0.00**	
409	Hanover Ave PS	3/4/19	11/1/22	$0.00	
410	Jamestown Crescent PS	3/4/19	11/1/22	$0.00	
407	Monroe Place PS	3/4/19	11/1/22	$0.00	
408	Richmond Crescent PS	3/4/19	11/1/22	$0.00	
	RWWMP Project: VIP-RWWMP-03 - Chesapeake Blvd FM Improvement and Related PS Upgrades			**$0.00**	
411	Ashland Circle PS	4/4/19	12/2/22	$0.00	
412	Chesapeake Blvd. PS	4/4/19	12/2/22	$0.00	
413	City Park PS	4/4/19	12/2/22	$0.00	
	RWWMP Project: VIP-RWWMP-06 - Robin Hood Road Force Main Improvement			**$0.00**	
414	Robin Hood Road FM Improvement	10/30/20	10/30/23	$0.00	
	RWWMP Project: VIP-RWWMP-07 - Ford Dr Gravity Main Improvement			**$0.00**	
364	Ford Drive GM Improvement	10/30/20	11/1/23	$0.00	



Appendix G: Peak Flow Table and Maps

4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow by Treatment Plant Service Area

Peak Flow Documentation Sites by Treatment Plant Service Area

Appendix G: 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow by Treatment Plant Service Area

Table G-1. Army Base TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-000	Army Base TP	24,600
FDP-000-1	Hampton Boulevard Gravity Main near Baker Street upstream of Army Base TP[1]	700
FDP-001	Terminal Avenue PRS - Discharge	15,300
FDP-002-D	Dovercourt Road PS - Discharge	5,000
FDP-002-U-1	Dovercourt Road PS - Inflow 1 - Gravity	1,100
FDP-002-U-2	Dovercourt Road PS - Inflow 2 - Force Main	4,000
FDP-003-D	North Shore Road PS - Discharge	770
FDP-003-U-1	North Shore Road PS - Inflow 1 - Gravity	520
FDP-003-U-2	North Shore Road PS - Inflow 2 - Force Main	350
FDP-004-D-1	Taussig Boulevard PS - Low Flow Discharge - Gravity	2,300
FDP-004-D-2	Taussig Boulevard PS - High Flow Discharge - Force Main	3,400
FDP-004-U	Taussig Boulevard PS - Inflow	4,900
FDP-005	Granby Street East FM (Taussig Boulevard Branch)	5,500
FDP-006	Granby Street North FM (Willoughby Branch)	4,600

[1] *Location with low local flow downstream of closed mainline valve*

Table G-2. Atlantic TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-000	Atlantic TP Flow	93,000
FDP-001-1	Atlantic TP Storage Facility North Branch	72,500
FDP-001-2	Atlantic TP Storage Facility South Branch	31,000
FDP-001-D	Atlantic TP Storage Facility - Downstream[1]	79,400
FDP-001-U	Atlantic TP Storage Facility - Upstream	102,000
FDP-002-D	Oceana Storage Facility - Downstream[1]	24,800
FDP-002-U	Oceana Storage Facility - Upstream	38,400
FDP-003-1	Providence Road FM East (Newtown Road Branch)	18,400
FDP-003-2	Providence Road FM West (Military Highway Branch)	13,000
FDP-003-D	Providence PRS / Storage Facility - Downstream[1]	16,400
FDP-003-U	Providence PRS / Storage Facility - Upstream	31,100
FDP-004-D	Shipps Corner PRS / Storage Facility - Downstream[1]	27,100
FDP-004-U	Shipps Corner PRS / Storage Facility - Upstream	34,800
FDP-005	Atlantic PRS	69,300
FDP-006	Courthouse PRS	25,400
FDP-007	Deep Creek PRS	300
FDP-008	Dominion PRS	4,400
FDP-009	Elbow Road PRS	22,100
FDP-010	Hillwell Road PRS	11,400
FDP-010-1	Battlefield Boulevard South FM - North	6,800
FDP-010-2	Battlefield Boulevard South FM - South	4,900
FDP-011	Independence PRS	19,400
FDP-012	Kempsville PRS	23,400
FDP-013	Laskin Road PRS	34,200
FDP-013-1	Laskin Road East FM (Oceanfront Branch)	8,900
FDP-014	Pine Tree PRS	28,600
FDP-015-D	Arctic Avenue PS - Discharge	4,500
FDP-015-U	Arctic Avenue PS - Inflow	4,500
FDP-016-D	Doziers Corner PS - Discharge	2,100
FDP-016-U	Doziers Corner PS - Inflow	2,100
FDP-017-1	Newtown Road near Virginia Beach Boulevard upstream of Newtown Road PS	2,200
FDP-017-D	Newtown Road PS - Discharge	6,500
FDP-017-U	Newtown Road PS - Inflow	6,300
FDP-018-1	Neal Street near River Creek Road upstream of Washington District PS	2,100
FDP-018-D	Washington District PS - Discharge	3,400
FDP-018-U	Washington District PS - Inflow	3,400

Table G-2. Atlantic TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-019	Butts Station Road FM (at Centerville Turnpike)	9,000
FDP-020	Roundhill Drive FM (at Elbow Road)	3,600

[1] *Simulated passing rate reported as average flow rate over the duration that the storage facility is filling*

Table G-3. Boat Harbor TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flows		
Location ID	Location	Peak Flow (gpm)
FDP-000	Boat Harbor TP	33,200
FDP-000-1	Terminal Avenue near 21st Street downstream of 24th Street Inverted Siphon	15,700
FDP-000-2	Jefferson Avenue at 44th Street	6,800
FDP-000-3-1	Shipyard Branch North at 58th Street and Warwick Boulevard	460
FDP-001-D	14th Street Storage Facility - Downstream[1]	15,900
FDP-001-U	14th Street Storage Facility - Upstream	26,000
FDP-002-D	58th Street Storage Facility - Downstream[1]	4,500
FDP-002-U	58th Street Storage Facility - Upstream	9,700
FDP-003-D	25th Street PS - Discharge	620
FDP-003-U	25th Street PS - Inflow	620
FDP-004-1	Washington Avenue near 38th Street upstream of 33rd Street PS	48
FDP-004-2	Washington Avenue near 46th Street upstream of 33rd Street PS	2,100
FDP-004-D	33rd Street PS - Discharge	4,300
FDP-004-U	33rd Street PS - Inflow	4,300
FDP-005-1	Eaton Street near Queen Street East upstream of Bridge Street PS	8,400
FDP-005-D	Bridge Street PS - Discharge	9,400
FDP-005-U	Bridge Street PS - Inflow	8,900
FDP-006-1	Indian River Inverted Siphon upstream of Claremont PS (near Terrace Road)	7,700
FDP-006-2	Church Creek Inverted Siphon upstream of Claremont PS	1,400
FDP-006-3	Kecoughtan Road near Sunset Road upstream of Claremont PS	31
FDP-006-D	Claremont PS - Discharge	12,300
FDP-006-U	Claremont PS - Inflow	12,300
FDP-007-1	Aluminum Avenue near E Street upstream of Copeland Park PS	3,800
FDP-007-2	58th Street near Aberdeen Road upstream of Copeland Park PS	1,500
FDP-007-D	Copeland Park PS - Discharge	4,700
FDP-007-U	Copeland Park PS - Inflow	4,700
FDP-008-D	Ferguson Park PS - Discharge	170
FDP-008-U	Ferguson Park PS - Inflow	170
FDP-009-D	Hampton University PS - Discharge	590
FDP-010-D	Jefferson Avenue PS - Discharge	920
FDP-010-U-1	Jefferson Avenue PS - Inflow Newport News	850
FDP-010-U-2	Jefferson Avenue PS - Inflow HRSD	72
FDP-011-1	Mercury Boulevard Branch at Orcutt Avenue upstream of Newmarket Creek PS	4,800
FDP-011-1-1	Mercury Boulevard near Aberdeen Road upstream of Newmarket Creek PS	580
FDP-011-2	Orcutt Avenue Branch at Mercury Boulevard upstream of Newmarket Creek PS	2,400
FDP-011-2-1	Orcutt Avenue near Todds Lane upstream of Newmarket Creek PS	960

Table G-3. Boat Harbor TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flows		
Location ID	Location	Peak Flow (gpm)
FDP-011-D	Newmarket Creek PS - Discharge	7,600
FDP-011-U	Newmarket Creek PS - Inflow	7,600
FDP-012-1	Lasalle Avenue near Shell Road upstream of Victoria Boulevard PS	2,200
FDP-012-2	Shell Road near Algonquin Road upstream of Victoria Boulevard PS	1,300
FDP-012-D	Victoria Boulevard PS - Discharge	2,400
FDP-012-U	Victoria Boulevard PS - Inflow	2,400
FDP-013-1	Pembroke Avenue East near River Street upstream of Washington Street PS	980
FDP-013-2	King Street North near Quash Street north of I-64 upstream of Washington Street PS	3,500
FDP-013-3	King Street North near Old Fox Hill Road upstream of Washington Street PS	310
FDP-013-D	Washington Street PS - Discharge	4,300
FDP-013-U	Washington Street PS - Inflow	4,300
FDP-014-1	Willard Avenue near Taylor Avenue East upstream of Willard Avenue PS	580
FDP-014-2	Hope Street North near Chamberlin Avenue East upstream of Willard Avenue PS	420
FDP-014-D	Willard Avenue PS - Discharge	3,200
FDP-014-U	Willard Avenue PS - Inflow	3,200

[1] *Simulated passing rate reported as average flow rate over the duration that the storage facility is filling*

Table G-4. James River TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-000	James River TP	37,600
FDP-000-1	James River TP Influent North (Lucas Creek Road Branch)	19,500
FDP-000-2	James River TP Influent South (Riverview Parkway Branch)	21,300
FDP-001-D	Tabb PRS / Storage Facility - Downstream[1]	2,400
FDP-001-U	Tabb PRS / Storage Facility - Upstream	5,400
FDP-002	Lucas Creek PRS - Discharge	22,100
FDP-002-1	Lucas Creek FM North (Warwick Boulevard Branch)	6,800
FDP-002-2	Lucas Creek FM East (Patrick Henry PS Branch)	14,700
FDP-003-D	Lucas Creek PS - Discharge	840
FDP-003-U	Lucas Creek PS - Inflow	730
FDP-004-D	Hilton School PS - Discharge	230
FDP-004-U	Hilton School PS - Inflow	220
FDP-005-D	Morrison PS - Discharge	1,700
FDP-005-U	Morrison PS - Inflow	1,700
FDP-006-1	Barclay Road near Deep Creek Road upstream of Normandy Lane PS	790
FDP-006-D	Normandy Lane PS - Discharge	1,200
FDP-006-U	Normandy Lane PS - Inflow	1,200
FDP-007-2	Warwick Boulevard near Jones Road upstream of North Avenue PS	360
FDP-007-D	North Avenue PS - Discharge	2,600
FDP-007-U	North Avenue PS - Inflow	2,600
FDP-008-D	Patrick Henry PS - Discharge	4,500
FDP-008-U	Patrick Henry PS - Inflow	4,400
FDP-009-D	Triton Court PS - Discharge	540
FDP-009-U	Triton Court PS - Inflow	470
FDP-010	Maxwell Lane near Warwick Boulevard (Normandy Lane PS Branch)	1,800
FDP-011	Huxley Place FM near Carnegie Drive (Action Plan Project)	10,900
FDP-013	J. Clyde Morris Boulevard FM (Eastern Branch)	3,600
FDP-014	Jefferson Avenue FM (near City Center Boulevard)	7,300
FDP-015-1	Palomino Drive near Warwick Boulevard (Patrick Henry PS Branch) - North	7,200
FDP-015-2	Palomino Drive near Warwick Boulevard (Patrick Henry PS Branch) - South	7,100
FDP-016	Yorktown Road near Cardinal Lane downstream of York PS-019	1,300

[1] *Simulated passing rate reported as average flow rate over the duration that the storage facility is filling*

Table G-5. Nansemond TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-000	Nansemond TP Headworks Influent	34,900
FDP-001-D	Wilroy PRS / Storage Facility - Downstream[1]	8,100
FDP-001-U	Wilroy PRS / Storage Facility - Upstream	15,300
FDP-002	Bowers Hill PRS	4,400
FDP-003	Constance Road PRS	11,600
FDP-004	Nansemond River PRS	4,900
FDP-005	Pughsville Road PRS	10,900
FDP-006	Route 337 PRS	10,200
FDP-006-1	Route 337 FM South (Jolliff Road Branch)	8,700
FDP-006-2	Route 337 FM East (Portsmouth Boulevard Branch)	2,300
FDP-007	Western Branch PRS	2,400
FDP-008-D	Cedar Lane PS - Discharge	8,700
FDP-008-U-1	Cedar Lane PS - Inflow West (Cedar Lane)	6,800
FDP-008-U-2	Cedar Lane PS - Inflow East (West Norfolk Rd)	1,900
FDP-008-1-1	Cedar Lane EOL (upstream of Cedar Lane PS)	2,300
FDP-008-1-2	West Norfolk Road EOL (upstream of Cedar Lane PS)	2,100
FDP-009-D	Shingle Creek PS No.1 Discharge	4,000
FDP-009-U	Shingle Creek PS No.1 Inflow	4,000
FDP-009-1	Shingle Creek Gravity Main (White Marsh Road)	1,500
FDP-009-2	Shingle Creek Gravity Main EOL South (Carolina Road)	680
FDP-009-3	Shingle Creek Gravity Main EOL North (East Washington Street)	720
FDP-010-D	Shingle Creek PS No.2 Discharge	740
FDP-010-U	Shingle Creek PS No.2 Inflow	740
FDP-011	Bridge Road FM (at Judah Lane)	7,300
FDP-012	Carolina Road FM (at Pitchkettle Road)	1,500
FDP-013	George Washington Highway FM (at Military Highway and Baugher Avenue)	2,000
FDP-014	Holland Road FM (at Lincoln Ave)	2,600
FDP-015	North Main Street FM (at Suffolk Constants Wharf)	3,700
FDP-016	Town Point Road FM (at Crowdy Boulevard)	21,000
FDP-017	Western Branch Boulevard FM (at College Drive)	8,900
FDP-018	Windsor Branch FM (at Wilroy Road)	3,300

[1] *Simulated passing rate reported as average flow rate over the duration that the storage facility is filling*

Table G-6. Virginia Initiative TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-000	Virginia Initiative TP Headworks Effluent	70,100
FDP-000-U-1	Virginia Initiative TP Headworks Inflow 1 - Force main Influent	33,000
FDP-000-U-2	Virginia Initiative TP Headworks Inflow 2 - Gravity Influent North	21,500
FDP-000-U-3	Virginia Initiative TP Headworks Inflow 3 - Gravity Influent South	20,400
FDP-001-D	May Avenue Storage Facility - Downstream[1]	7,100
FDP-001-U	May Avenue Storage Facility - Upstream	13,600
FDP-002-D	State Street PRS / Storage Facility - Downstream[1]	8,200
FDP-002-U	State Street PRS / Storage Facility - Upstream	16,500
FDP-003	Quail Avenue PRS[2]	4,200
FDP-004-D	Ashland Circle PS - Discharge	280
FDP-004-U	Ashland Circle PS - Inflow	280
FDP-005-D	Bainbridge Boulevard PS - Discharge	1,400
FDP-005-U-1	Bainbridge Boulevard PS - Inflow 1 - HRSD gravity main	970
FDP-005-U-2	Bainbridge Boulevard PS - Inflow 2 - Norfolk gravity main	390
FDP-005-1	South Main Street near Bainbridge Boulevard upstream of Bainbridge Boulevard PS	660
FDP-006-D	Camden Avenue PS - Discharge	11,700
FDP-006-U	Camden Avenue PS - Inflow	11,700
FDP-007-D	Chesapeake Boulevard PS - Discharge	4,000
FDP-007-U	Chesapeake Boulevard PS - Inflow	4,000
FDP-007-1-1	Norview Avenue near Swells Point Road upstream of Chesapeake Boulevard PS	1,700
FDP-007-2-1	Nansemond Circle near Norview Avenue upstream of Chesapeake Boulevard PS	560
FDP-007-3-1	Montgomery Street near Jersey Avenue upstream of Chesapeake Boulevard PS	450
FDP-007-4-1	Orange Street near Stephan Court upstream of Chesapeake Boulevard PS	35
FDP-008-D	Chesterfield Boulevard PS - Discharge	440
FDP-008-U	Chesterfield Boulevard PS - Inflow	440
FDP-009-D	City Park PS - Discharge	740
FDP-009-U	City Park PS - Inflow	730
FDP-010-D	Colley Avenue PS - Discharge	3,200
FDP-010-U	Colley Avenue PS - Inflow	3,400
FDP-011-D	Elmhurst Lane PS - Discharge	3,500
FDP-011-U	Elmhurst Lane PS - Inflow	3,600
FDP-012-D	Ferebee Avenue PS - Discharge	3,500
FDP-012-U	Ferebee Avenue PS - Inflow	3,500

Table G-6. Virginia Initiative TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-012-1	Bainbridge Boulevard near Middle Street upstream of Ferebee Avenue PS	2,600
FDP-012-2	Livingston Avenue and Bainbridge Boulevard upstream of Ferebee Avenue PS	2,500
FDP-013-D	Granby Street PS - Discharge	190
FDP-013-U	Granby Street PS - Inflow	180
FDP-014-D	Hanover Avenue PS - Discharge	380
FDP-014-U	Hanover Avenue PS - Inflow	380
FDP-015-D	Ingleside Road PS - Discharge	340
FDP-015-U	Ingleside Road PS - Inflow	330
FDP-016-D	Jamestown Crescent PS - Discharge	560
FDP-016-U	Jamestown Crescent PS - Inflow	560
FDP-017-D	Luxembourg Avenue PS - Discharge	1,100
FDP-017-U	Luxembourg Avenue PS - Inflow	1,000
FDP-017-1-1	Luxembourg Avenue PS North Branch near Versailles Avenue	640
FDP-017-2-1	Blair Avenue upstream of Luxembourg Avenue PS	280
FDP-018-D	Monroe Place PS - Discharge	2,400
FDP-018-U-1	Monroe Place PS - Inflow 2 - Gravity Influent	1,500
FDP-018-U-2	Monroe Place PS - Inflow 1 - Force main Influent	940
FDP-019-D	Norchester Street PS - Discharge	6,900
FDP-019-U-1	Norchester Street PS - Inflow 1 - North (Virginia Boulevard)	4,600
FDP-019-U-2	Norchester Street PS - Inflow 2 - South (Norchester Avenue)	1,900
FDP-019-1-1	Virginia Beach Boulevard near Gondola Road upstream of Norchester Street PS	4,600
FDP-020-D	Norview Avenue PS - Discharge	560
FDP-020-U	Norview Avenue PS - Inflow	580
FDP-021-D	Park Avenue PS - Discharge	6,900
FDP-021-U-1	Park Avenue PS - Inflow 1 - HRSD gravity main	4,200
FDP-021-U-2	Park Avenue PS - Inflow 1 - Chesapeake gravity main	2,700
FDP-022-D	Plume Street PS - Discharge	1,200
FDP-022-U	Plume Street PS - Inflow	1,200
FDP-023-D	Powhatan Avenue PS - Discharge	1,100
FDP-023-U-1	Powhatan Avenue PS - Inflow 1 - South (HRSD gravity main)	240
FDP-023-U-2	Powhatan Avenue PS - Inflow 2 - North (Norfolk gravity main)	860
FDP-024-D	Quail Avenue PS - Discharge	2,000
FDP-024-U	Quail Avenue PS - Inflow	2,000

Table G-6. Virginia Initiative TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-025-D	Richmond Crescent PS - Discharge	930
FDP-025-U	Richmond Crescent PS - Inflow	920
FDP-025-1	Richmond Crescent near Manchester Avenue upstream of Richmond Crescent PS	110
FDP-026-D	Rodman Avenue PS - Discharge	3,800
FDP-026-U	Rodman Avenue PS - Inflow	3,800
FDP-027-D	Seay Avenue PS - Discharge	1,200
FDP-027-U-1	Seay Avenue PS - Inflow 1 - HRSD gravity main	910
FDP-027-U-2	Seay Avenue PS - Inflow 2 - Force main Influent	620
FDP-028-D	State Street PS - Discharge	4,400
FDP-028-U	State Street PS - Inflow	4,200
FDP-028-1-1	Pearl Street near Ligon Street upstream of State Street PS	250
FDP-028-2-1	Mahone Avenue near Craig Street upstream of State Street PS	2,400
FDP-028-2-2	Berkley Avenue near Selden upstream of State Street PS	2,000
FDP-029-D	Steamboat Creek PS - Discharge	910
FDP-029-U	Steamboat Creek PS - Inflow	900
FDP-029-1-1	Springfield Avenue near Ford Drive upstream of Steamboat Creek PS	49
FDP-029-2-1	Arlington Avenue near Waltham Street upstream of Steamboat Creek PS	250
FDP-030-D	Virginia Beach Boulevard PS - Discharge	1,800
FDP-030-U-1	Virginia Beach Boulevard PS - Inflow 1 - HRSD gravity main	1,000
FDP-030-U-2	Virginia Beach Boulevard PS - Inflow 2 - Norfolk gravity main	1,100
FDP-031-D	Willoughby Avenue PS - Discharge	1,400
FDP-031-U	Willoughby Avenue PS - Inflow	1,400
FDP-032-2	West Norcova Drive near East Norcova Drive upstream of Norfolk PS-044	58
FDP-032-U	Norfolk PS-044 Inflow	390
FDP-032-1	East Princess Anne Road near McNeal Avenue upstream of Norfolk PS-044	380
FDP-033	West 41st Street near Hampton Boulevard	8,900
FDP-034	Indian River Road East (Campostella Middle School)	2,200
FDP-035	Bluestone Avenue near West 25th Street (Bluestone)	26,400
FDP-036	Industrial Avenue near Wesley Street (Pinners Point)	29,400

[1] *Simulated passing rate reported as average flow rate over the duration that the storage facility is filling*

[2] *PRS not in operation*

Table G-7. Williamsburg TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-000	Williamsburg TP	34,300
FDP-000-1	Williamsburg TP Influent - 42 Inch (Kingsmill Branch)	18,600
FDP-000-2	Williamsburg TP Influent - 36 Inch (Route 199 Branch)	8,600
FDP-000-3	Williamsburg TP Influent - 24 Inch (Fort Eustis Branch)	6,200
FDP-001-D	Williamsburg Crossing PRS / Storage Facility - Downstream[1]	11,900
FDP-001-U	Williamsburg Crossing PRS / Storage Facility - Upstream	17,200
FDP-002	Longhill PRS	7,400
FDP-003	Route 199 PRS	20,200
FDP-004-D	Colonial Williamsburg PS - Discharge	4,600
FDP-004-U	Colonial Williamsburg PS - Inflow	4,700
FDP-005-D	Fords Colony PS - Discharge	3,300
FDP-005-U	Fords Colony PS - Inflow	3,300
FDP-006-D	Fort Eustis PS - Discharge	2,900
FDP-006-U	Fort Eustis PS - Inflow	2,900
FDP-007-D	Greensprings PS - Discharge	4,700
FDP-007-U	Greensprings PS - Inflow	4,700
FDP-008-D	Kingsmill PS - Discharge	4,600
FDP-008-U	Kingsmill PS - Inflow	4,600
FDP-009-D	Lodge Road PS - Discharge	4,200
FDP-009-U	Lodge Road PS - Inflow	4,000
FDP-010-D	Rolling Hills PS - Discharge	720
FDP-010-U	Rolling Hills PS - Inflow	530
FDP-011-D	Williamsburg PS - Discharge	4,800
FDP-011-U-1	Williamsburg PS - Inflow 1 - Gravity	4,800
FDP-011-U-2	Williamsburg PS - Inflow 2 - Force Main[2]	0.5
FDP-012	Lightfoot Road FM (at Old Mooretown Road)	880
FDP-013	Richmond Road FM (at Lightfoot Road)	2,400
FDP-014	Yorktown Road FM (at Lee Hall)	690

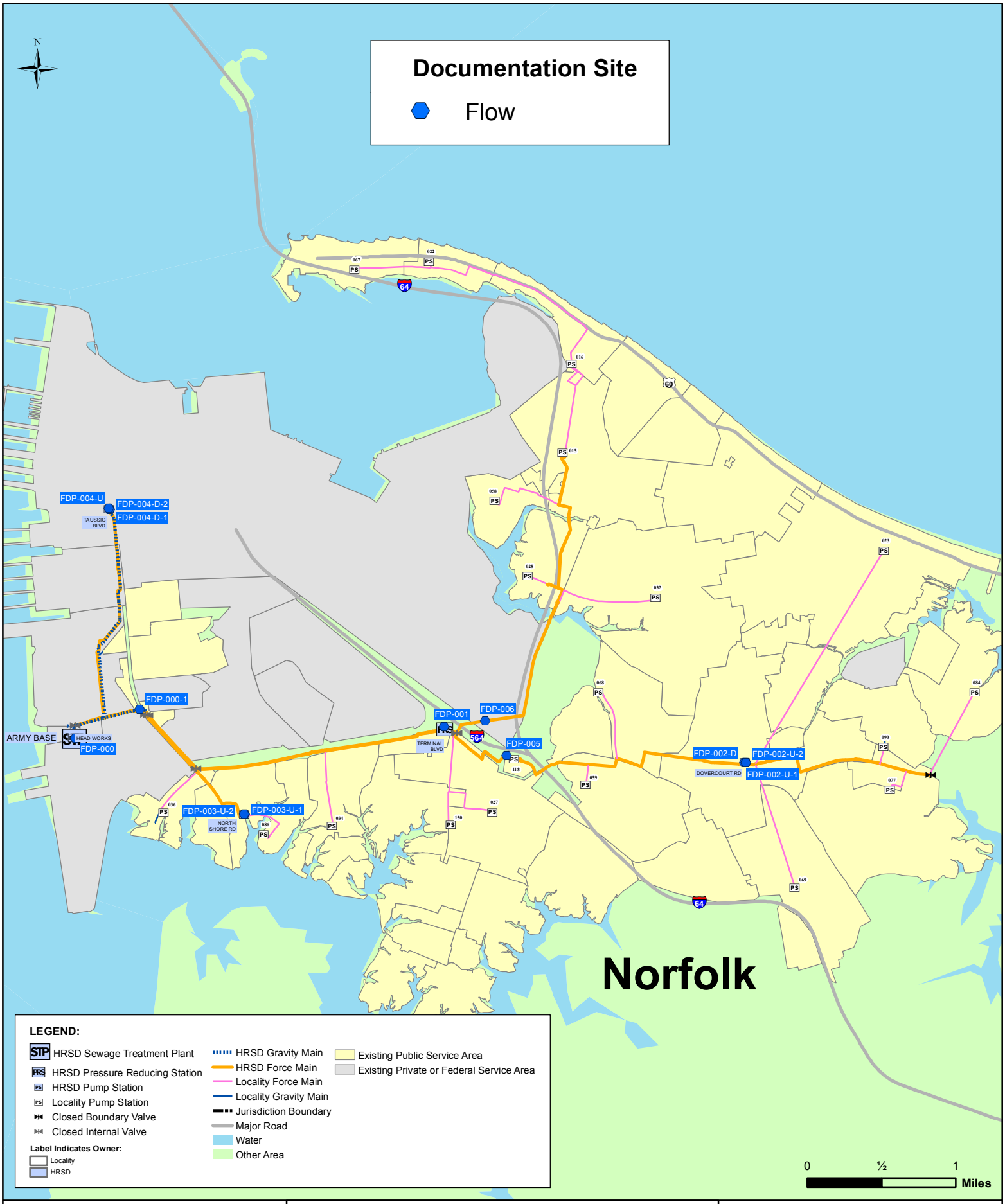
[1] Simulated passing rate reported as average flow rate over the duration that the storage facility is filling

[2] Location with backup flow downstream of closed valve

Table G-8. York River TP 4-Year Wet Weather Event Simulated 1-Hour Average Peak Flow		
Location ID	Location	Peak Flow (gpm)
FDP-000	York River TP	21,500
FDP-001-D	Coliseum PRS / Storage Facility - Downstream[1]	6,700
FDP-001-U	Coliseum PRS / Storage Facility - Upstream	15,100
FDP-002	Big Bethel PRS	10,500
FDP-003	Yorktown PRS	2,300
FDP-004	Beaver Dam Booster Pump Station	270
FDP-005-D	Bay Shore Lane PS - Discharge	2,500
FDP-005-U	Bay Shore Lane PS - Inflow	2,500
FDP-006-D	Bloxoms Corner PS - Discharge	580
FDP-006-U	Bloxoms Corner PS - Inflow	570
FDP-007-D	Freeman Drive PS - Discharge	1,700
FDP-007-U-2	Freeman Drive PS - Inflow	1,700
FDP-008-D	Langley Circle PS - Discharge	10,100
FDP-008-U-1	Langley Circle PS - Inflow North	3,000
FDP-008-U-2	Langley Circle PS - Inflow South	7,200
FDP-009-1	Harris Creek Road near East Little Back River Road upstream of Woodland Road PS	600
FDP-009-D	Woodland Road PS - Discharge	2,000
FDP-009-U	Woodland Road PS - Inflow	1,900
FDP-010	Wolf Trap Road FM (at Chisman Creek Park)	16,700
FDP-011-1	Langley AFB South Branch FM (at Magruder Boulevard)	3,000
FDP-011-2	Langley AFB North Branch FM (at Magruder Boulevard)	720
FDP-011-3	Wythe Creek Road FM (at Magruder Boulevard)	180
FDP-012	Guinea Road FM (Southern Gloucester Branch at York Crossing Drive)	500
FDP-013	Short Lane East FM (Northern Gloucester Branch at George Washington Memorial Highway)	160

[1] *Simulated passing rate reported as average flow rate over the duration that the storage facility is filling*

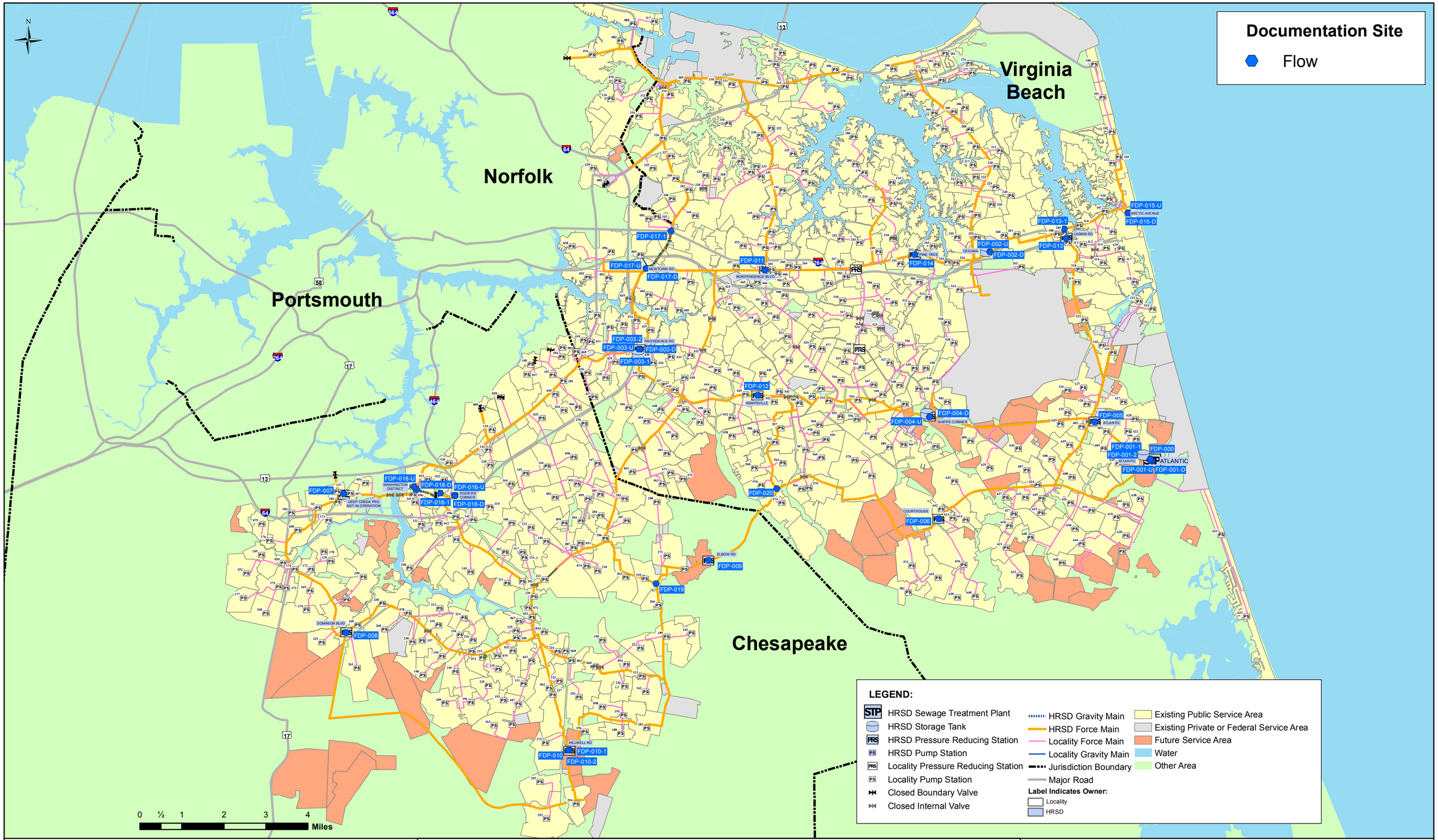
Appendix G: Peak Flow Documentation Sites by Treatment Plant Service Area



Regional Wet Weather Management Plan

Appendix G - Figure 1
Army Base TP
Flow Documentation Sites

9/20/2017



HRSD

Regional Wet Weather Management Plan

Appendix G - Figure 2
Atlantic TP
Flow Documentation Sites

9/20/2017

HRSD

Regional Wet Weather Management Plan

Appendix G - Figure 3
Boat Harbor TP
Flow Documentation Sites

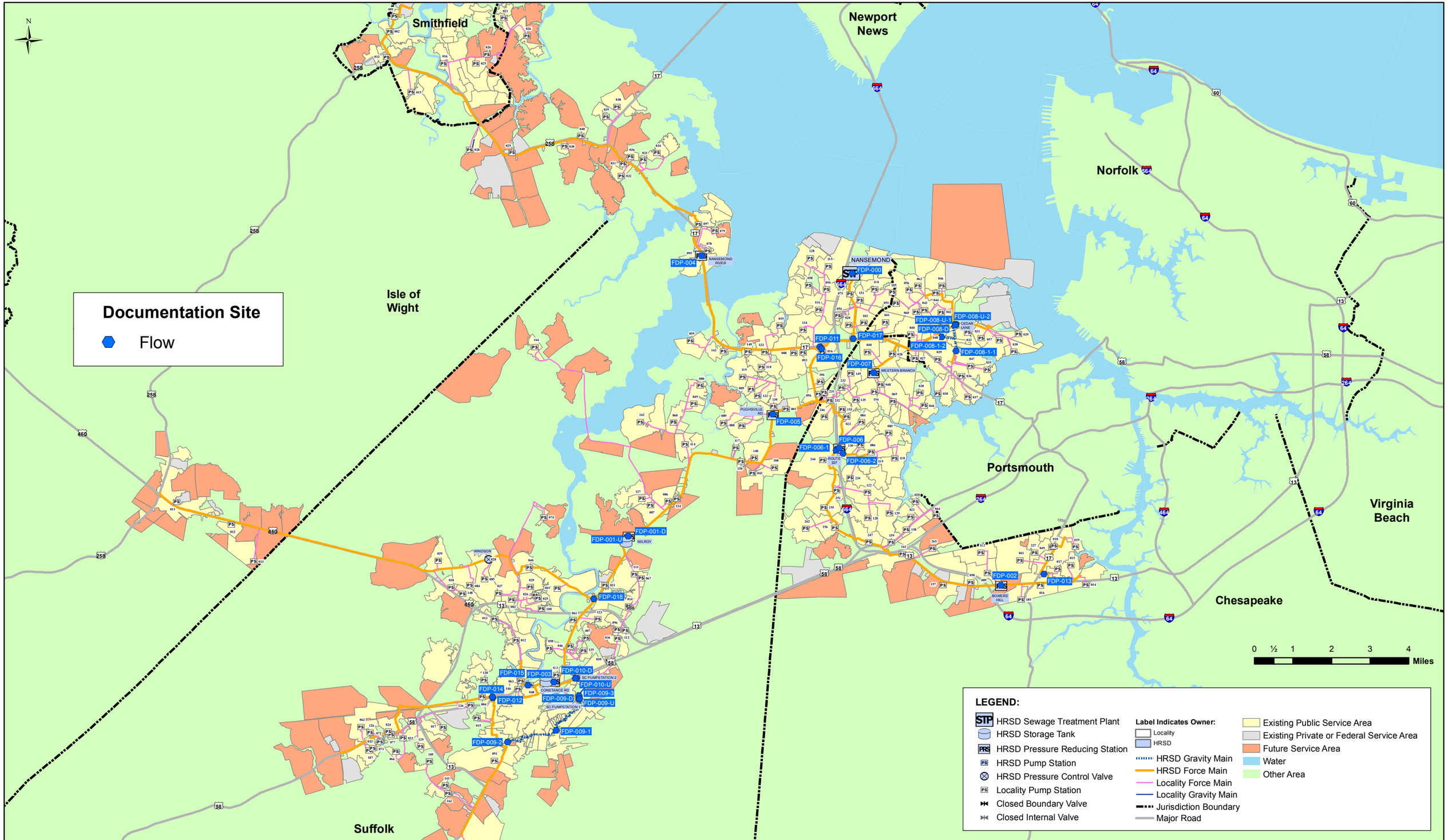
9/21/2017

HRSD

Regional Wet Weather Management Plan

Appendix G - Figure 4
James River TP
Flow Documentation Sites

9/20/2017

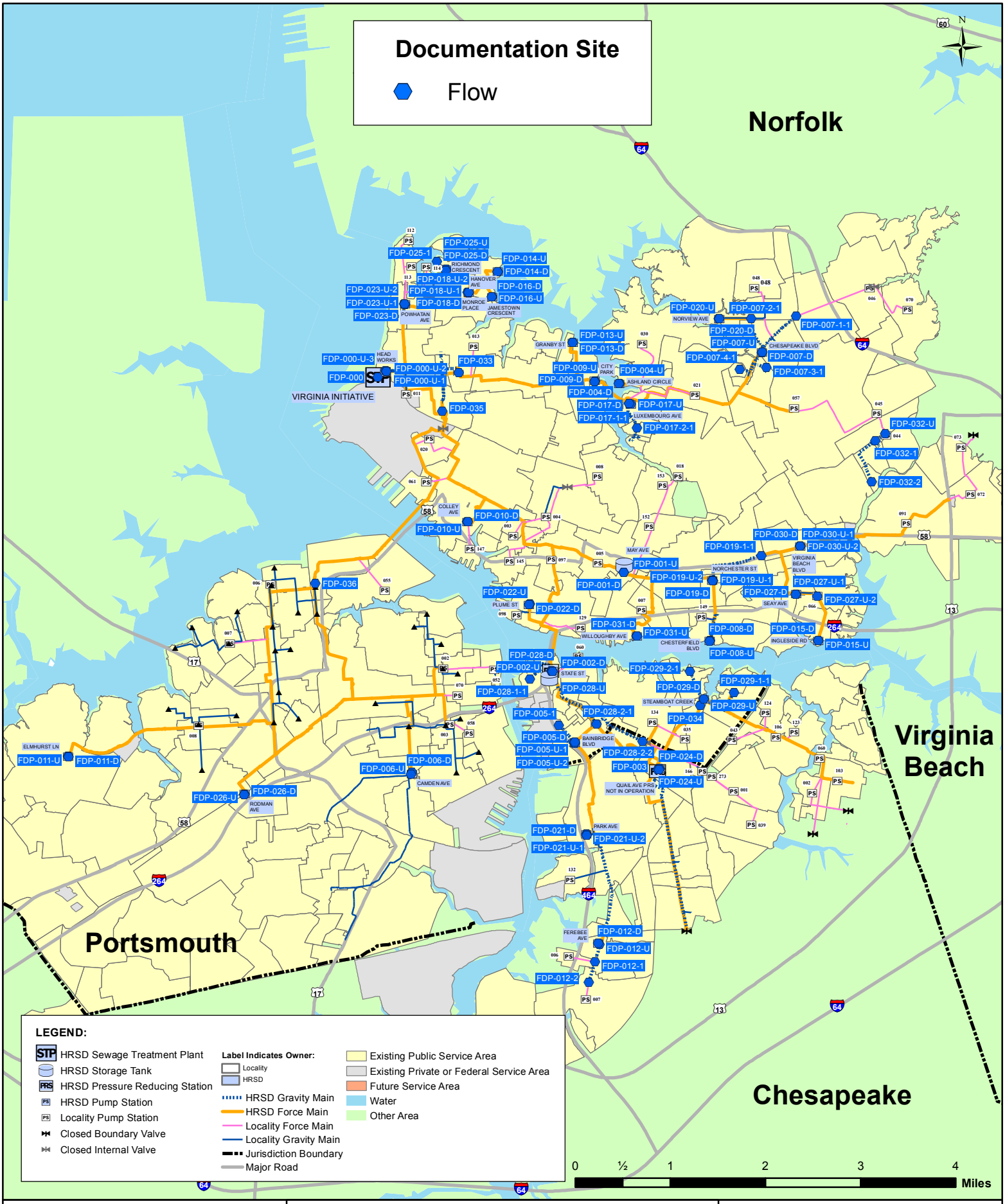


HRSD

Regional Wet Weather Management Plan

Appendix G - Figure 5
Nansemond TP
Flow Documentation Sites

9/20/2017

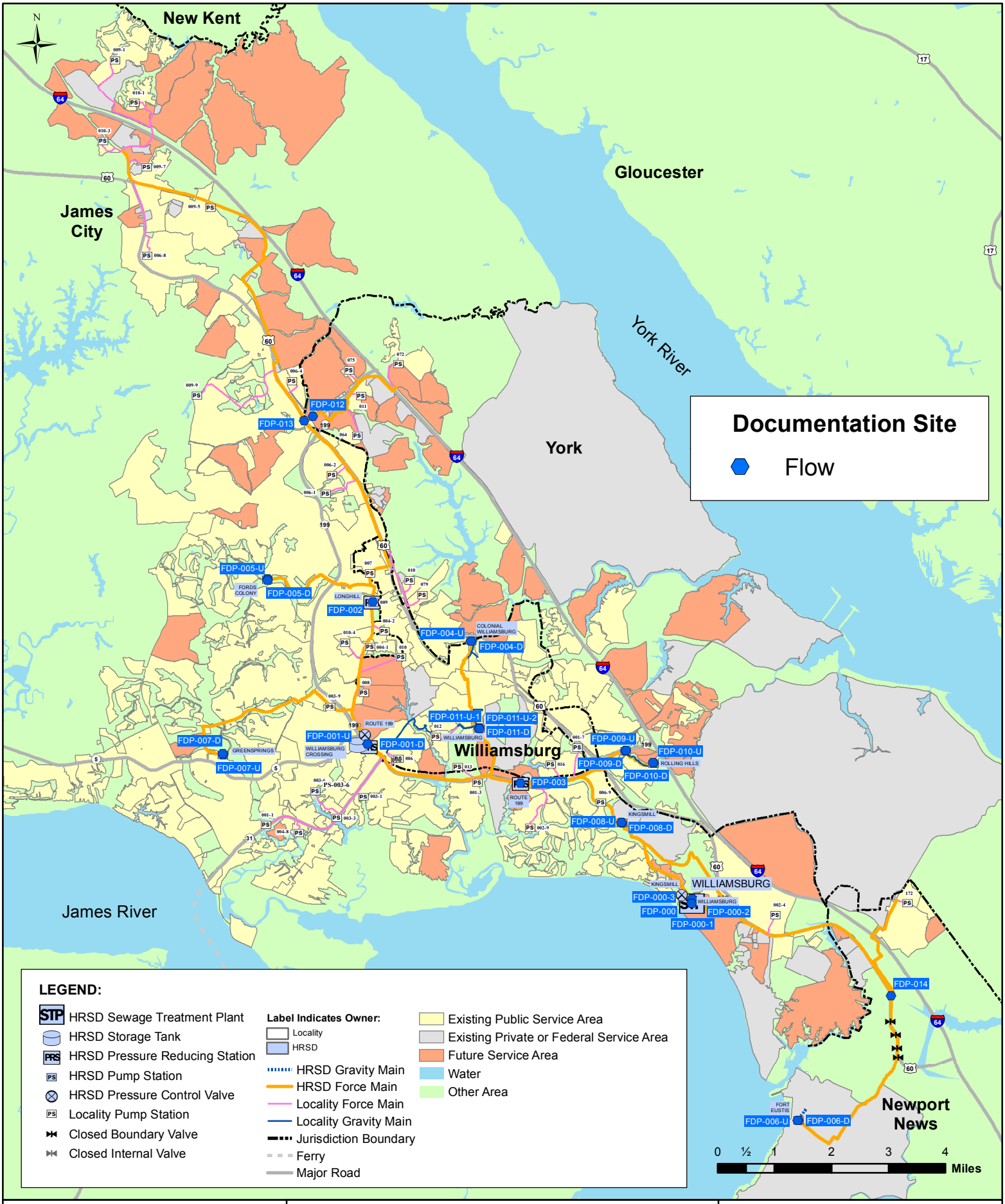


HRSD

Regional Wet Weather Management Plan

Appendix G - Figure 6
Virginia Initiative TP
Flow Documentation Sites

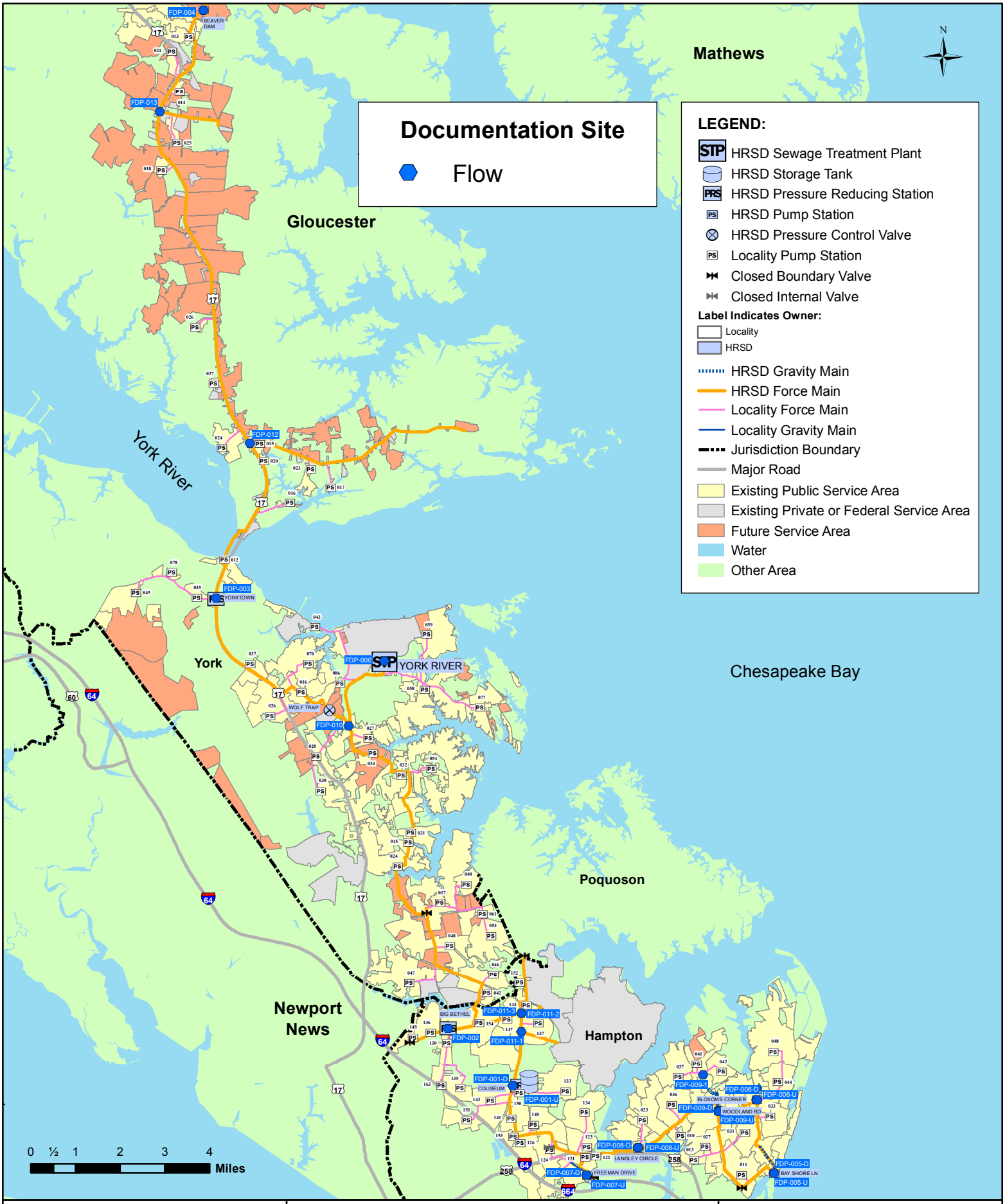
9/20/2017



Regional Wet Weather Management Plan

Appendix G - Figure 7
Williamsburg TP
Flow Documentation Sites

9/5/2017



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Appendix G - Figure 8
York River TP
Flow Documentation Sites

9/20/2017

Cleaning wastewater every day for a better Bay.

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Virginia Beach, VA 23455
(757) 460-2261