



WILLIAM & MARY LAW SCHOOL

VIRGINIA COASTAL POLICY CENTER

Living with the Water – Too Much, and Too Little

POST-CONFERENCE REPORT

The Virginia Coastal Policy Center (VCPC) focuses on providing science-based legal and policy analysis of environmental and land use issues affecting coastal resources, and educates the Virginia policymaking, non-profit, legal, and business communities about these subjects.

The 2016 conference, entitled *Living with the Water – Too Much, and Too Little*, focused on two of our most pressing issues in coastal Virginia - the impacts of rising sea levels and diminishing groundwater resources. The conference was booked beyond capacity with over 200 attendees plus others viewing it remotely via livestream on the internet. Participants in the conference included VCPC students, academics, business leaders, military personnel, representatives of environmental organizations, and more, including federal and local government officials.

Virginia Environmental Endowment, Virginia Sea Grant, Virginia Institute of Marine Science, Middle Peninsula Planning District Commission, and the Muscarelle Museum of Art sponsored the conference.

VCPC graduate research fellows, Chris Antoine and Jamie Huffman, prepared this report, with assistance from VCPC Assistant Director, Angela King.

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Overview

The morning session of the conference was held in collaboration with the second annual Working Waterfronts Summit. The working waterfronts portion of the conference included introduction of the new Virginia Working Waterfront Master Plan (VWWMP) and VCPC student presentations discussing three working waterfront case studies featuring development pressures and conflicting uses faced by working waterfront communities. Also featured were panel discussions involving coastal legislators and representatives of Virginia's coastal regions. The legislative panel, moderated by Tanya Denckla Cobb, Director of the University of Virginia's Institute for Environmental Negotiation, featured Delegate Robert Bloxom, Delegate Keith Hodges, and Senator Lynwood Lewis. This panel discussed potential legislative solutions to some of the issues raised in the Virginia Working Waterfront Master Plan, and provided an important forum for the public to hear elected officials responding to the Plan. The regional panel featured Albert Pollard, former delegate from the Northern Neck; Lewis Lawrence, Middle Peninsula Planning District Commission; Ben McFarlane, Hampton Roads Planning District Commission; and Curtis Smith, Accomack/Norhampton Planning District Commission, discussing development of the VWWMP and challenges faced by working waterfronts within their regions.

Virginia's Lieutenant Governor, The Honorable Ralph Northam, was also on hand to discuss significant challenges to Virginia's coastal environment. Northam, who grew up in Onancock, Virginia, described the importance of the culture surrounding the Chesapeake Bay. "It's a tremendous boon to our economy, literally billions of dollars, so we need to continue to work to restore the health of the Bay," Northam said. "I had that experience growing up, seeing the importance of watermen that made their living on the Bay; and as an adult I've seen the importance of commerce and the military."

The afternoon session of the conference was dedicated to discussing the Hampton Roads Sanitation District's (HRSD) groundwater injection proposal. During lunch, both the General Manager and the Director of Water Technology & Research for HRSD discussed the Sustainable Water Initiative for Tomorrow (SWIFT), HRSD's plan to add advanced wastewater treatment to several facilities to produce high-quality water to inject into the groundwater aquifer. The HRSD SWIFT project has a goal of pumping 120 million gallons per day into the aquifer by 2030, which would not only replenish a depleted source of water supply but also potentially abate and prevent further land subsidence, which contributes to recurrent flooding in the coastal region. Following lunch, VCPC students presented a framework of the science and policy issues surrounding the project, setting the stage for an expert panel to discuss issues raised by the proposal – including Rich Batiuk, Environmental Protection Agency; Michael Markus, Orange County, California Water District (that operates a similar groundwater injection project); Jeff Mosher, Water Environment & Reuse Foundation; Russ Baxter, Virginia Deputy Secretary of Natural Resources; and Peggy Sanner, Chesapeake Bay Foundation. The panel was moderated by Delegate David Bulova.

Capping off the conference was a reception held at the Muscarelle Museum of Art at the College of William & Mary, featuring Virginia oysters and a water-themed art show. Colonel Jason Kelly, Commander of the Norfolk District, U.S. Army Corps of Engineers, provided a dynamic presentation on the Corps' efforts to address sea level rise and recurrent flooding in the region.

I. Opening Remarks and Comments

ELIZABETH ANDREWS, DIRECTOR, VIRGINIA COASTAL POLICY CENTER

Professor Andrews began by saying how excited the Virginia Coastal Policy Center was to have the conference. The VCPC is a partnership between VIMS, the William & Mary Law School, and Virginia Sea Grant.

DREW LUMPKIN, REGIONAL DIRECTOR, OFFICE OF SENATOR MARK R. WARNER

Mr. Lumpkin read the following letter from Senator Warner.

Dear Friends,

I am pleased to extend my warmest greetings to all who are gathered for the Virginia Coastal Policy Center's 2016 Annual Conference: Living with the Water—Too Much, and Too Little.

This event provides an important opportunity to discuss the challenges facing working waterfront communities in the 21st century. Since Virginia's founding, waterfront communities have played an integral role in shaping and driving the Commonwealth's economy. Today, threats such as rising sea levels and beach erosion provide unique challenges to our waterfront communities, and it will take a unified and innovative effort to meet these challenges and forge long-term solutions that ensure the continued success of these communities. I commend all those here who are working to address these critical issues in order to keep our economy strong and our waterfronts prosperous.

On this important occasion, I am very pleased to join with your families, friends, and community in wishing the Virginia Coastal Policy Center the very best for a successful and informative conference.

Sincerely,



MARK R. WARNER
United States Senator

DAVISON DOUGLAS, DEAN, WILLIAM & MARY LAW SCHOOL

Dean Douglas began by saying what an honor it was for William & Mary Law School to host the conference for the fourth time. He noted that the conference was a great opportunity for people who care about the issues to come together and discuss such important issues that affect everyone.

TAYLOR REVELEY, PRESIDENT, COLLEGE OF WILLIAM AND MARY

President Reveley began with a call for continued cooperation by people of all kinds to solve the problems created by climate change and sea level rise. He ended his remarks by stating that he believed the large attendance at the conference was an encouraging sign for the future.

II. Virginia's Working Waterfronts

INTRODUCTION TO THE VIRGINIA WORKING WATERFRONTS MASTER PLAN

BILL PRUITT, FORMER CHAIRMAN OF THE VIRGINIA MARINE RESOURCES COMMISSION

Mr. Pruitt noted that the issue of user conflicts on waterfronts is nothing new. There have always been conflicts in the seafood industry since George Washington fished for shad in the Potomac. What is new, according to Mr. Pruitt, is the aquaculture of clams and oysters. Over the years at VMRC, there have always been disagreements over whether to build or expand marinas and docks and VMRC has done a great job of managing that. But Mr. Pruitt noted that however the issue of people building big houses on the water and not liking the view of the aquaculture is resolved, it is important to remember the industry that has been there and protect that.

Lewie Lawrence had asked Mr. Pruitt to do some field work—talk to citizens, attend boards of supervisors' meetings—and when he did so he was very impressed with their knowledge and understanding of the need to come together to do something about this issue. It is the same with the General Assembly. Virginians are looking to solve problems. The issue of dwindling working waterfronts is all over the coast. It is a matter of coming around the table and working things out. Virginians have always done that.

VCPC DISCUSSION OF WORKING WATERFRONT CASE STUDIES

NOAH TROMBLY (CLASS OF 2018), DEREK VAN DE WALLE (CLASS OF 2017),
AND CHELSEA WILKINS (CLASS OF 2018)

VCPC students presented three case studies that demonstrated some of the issues facing working waterfront communities that are outlined in the Working Waterfront Master Plan: the Lynnhaven River, the Ware River, and the Eastern Shore of Virginia. The Lynnhaven River case study focused on the resurgence of commercial aquaculture on the river that gave rise to a classic use conflict between riparian owners seeking to protect their property rights and commercial watermen lawfully making a living in a booming industry. The Ware River case study provided an example of how conflicts can arise between equally lawful and legitimate uses of waterways and bottomlands. Finally, the Eastern Shore case study looked at the redevelopment of working waterfronts, as well as conflicts between submerged aquatic vegetation and aquaculture.

ISSUES FACED BY OUR WORKING WATERFRONTS TODAY

THE HONORABLE RALPH NORTHAM, LIEUTENANT GOVERNOR OF VIRGINIA

Lt. Gov. Northam gave remarks about his concern for the environment and particularly the Chesapeake Bay. Lt. Gov. Northam noted the continued need to move in a positive direction on this issue. It is important that children are brought to this issue by showing them the importance of being good stewards of our environment.

Lt. Gov. Northam grew up with the Chesapeake Bay as his backyard and reminded the audience that there is a tremendous culture surrounding the Bay and it is a huge boon to Virginia's economy. Watermen's culture is a tremendous asset for Virginia. In the Chesapeake Bay and its estuaries there are so many assets, but there are also liabilities. There are things that threaten the Bay and Virginians need to be aware of them.

Lt. Gov. Northam highlighted two issues that he said Virginians need to continue to address.

On pollution in the bay: “We need to cooperate with our farmers. We knew that to combat algae blooms we had to limit nitrogen and phosphorus so we put in legislation to take nitrogen out of our fertilizers. It is okay to make sure that you have the proper nutrients in your lawns but do not do too much.”

The other issue Lt. Gov. Northam highlighted was sea level rise. Virginia is extremely vulnerable to sea level rise whether there is a debate about what is causing it or not. It is a national security issue and it is something Virginians will have to deal with as they move forward.

Lt. Gov. Northam also voiced his belief in developing alternative sources of energy. In closing, he stated the need to use sound science, use Virginia’s resources responsibly, and work together to promote the good health of the Chesapeake Bay and its estuaries.

PRESSURES FACING WORKING WATERFRONT COMMUNITIES, AND THE NEED FOR PLANNING TO ADDRESS THEM

ALBERT POLLARD (FORMER MEMBER OF VIRGINIA HOUSE OF DELEGATES, NORTHERN NECK)

Mr. Pollard noted that, in the Northern Neck, access to the working waterfront is an issue. It is important to provide public access to the waterfront as the bay bounces back. It is important, however, to also frame working waterfront access as an opportunity, rather than an issue. Additionally, he stated that it would be beneficial to develop a brochure for real estate agents in order to conduct public outreach on the right to wharf out for landowners.

LEWIS LAWRENCE (MIDDLE PENINSULA PLANNING DISTRICT COMMISSION)

Mr. Lawrence observed that working waterfronts is one of the main issue areas at the Middle Peninsula Planning District Commission (MPPDC). The MPPDC has tried to address issues with zoning as uses have changed and shifted over time on the waterfronts. New uses (such as floating buildings and floating houses) were not envisaged under the existing regulatory framework, so as uses have shifted over time, policies and regulatory programs should be modernized as well. It is important to keep people at the table and ensure that they are committed to seeking solutions, particularly at the local level.

BEN MCFARLANE (HAMPTON ROADS PLANNING DISTRICT COMMISSION)

Mr. McFarlane stated that sea level rise is a major issue for Hampton Roads and a preeminent challenge for local governments. Working waterfronts, given the fact that they are on the water, are particularly susceptible to flooding and sea level rise. Land use and water use conflict between competing uses (i.e., aquaculture and recreational use) are also another major issue for our area. One challenge in Hampton Roads is that sometimes working waterfronts are not the highest value uses of the land in question, meaning that local governments have to do a sort of balancing act between competing interests. Zoning ordinances are a very powerful tool for local governments, particularly when it comes to addressing conflicts before they become a real issue.

CURTIS SMITH (ACCOMACK-NORTHAMPTON PLANNING DISTRICT COMMISSION)

Mr. Smith noted that working waterfronts are of crucial importance economically to the Eastern Shore of Virginia. Access is a major issue with waterfronts, particularly considering projected sea level rise and its impact on the roads in the area. It is also important to continue to encourage

innovation for the facilities that are located on the water. Additionally, the fuel tax, dredging, public access, and the cultural heritage components were the top priorities of the Virginia Working Waterfront Master Plan.

ISSUES FACED BY COMMUNITIES WITH WORKING WATERFRONTS AND POTENTIAL LEGISLATIVE MEASURES TO ADDRESS THEM

THE HONORABLE ROBERT BLOXOM (MEMBER, VIRGINIA HOUSE OF DELEGATES)

Delegate Bloxom stated that the biggest challenge faced by the Eastern Shore pertains to dredging. The waterways in the community are technically federal, even though the federal government has abandoned them, and thus the Army Corps of Engineers must permit all shallow water dredging. Additionally, funding requests are often better received in Richmond if localities are willing to match the funds, and this could certainly be applicable to the waterfront context. Localities first need to ascertain how much money they would be willing to provide for working waterfront development themselves. It is also important, when proposing legislation, to make sure that adequate studies have been done.

THE HONORABLE KEITH HODGES (MEMBER, VIRGINIA HOUSE OF DELEGATES)

Delegate Hodges observed that, over the years, working waterfronts have disappeared. One of the major challenges faced in his community is extensive—and often cumbersome—permitting and regulation processes. Instead, simple solutions should be implemented, particularly when inter-agency conflict develops while addressing these issues. He proposed that there are three major means by which to address the issue of working waterfronts in local communities. The first is creating a working waterfront preservation income tax credit (although this would necessitate some other offset in the state budget). Another possibility would be to create a Working Waterfront Preservation Act, and establish a legislative study committee to review the viability of working waterfronts. Finally, it is also important to empower localities and give them the tools necessary to establish working waterfronts themselves. It is also necessary to work together cohesively as a region because rural, coastal Virginia faces its own challenges, unique to the area.

THE HONORABLE LYNWOOD LEWIS, MEMBER, VIRGINIA SENATE

Senator Lewis noted that one major challenge being faced by his community specifically, involves Virginia's Eastern Shore's dredging needs. The redirection of funds is always a difficult issue because such a scenario necessarily creates winners and losers. One possibility to address the issue of working waterfronts is to create a study committee – good studies lead to good legislation. Many of the decisions surrounding the development of working waterfronts are also best made at the local level, thus it is important that Richmond provides localities with the tools to do so.

III. Hampton Roads Sanitation District's Sustainable Water Initiative for Tomorrow Project

HRSD PRESENTATION OF THE SWIFT WASTEWATER INJECTION PROJECT

TED HENEFIN, GENERAL MANAGER, HRSD

Mr. Henefin began with a brief overview of Hampton Roads Sanitation District (HRSD) and the SWIFT project. HRSD is a political subdivision of the Commonwealth, not affiliated with local governments in the region, which is dedicated to providing clean water. The main water challenges in the region are Bay restoration, sea level rise, depletion of groundwater, and wet weather sewage overflows. Mr. Henefin gave statistics showing that about 80% of treated water in the region comes from surface water and the rest from the ground. The need for forward thinking and planning leads HRSD to always consider new ways to treat water effectively. Mr. Henefin noted that the Bay TMDL is one source of regulatory instability; as a result, HRSD has to constantly meet new waste load allocations by investing in new infrastructure. SWIFT is a plan to treat water to drinking water standards in order to provide regulatory stability, reduce discharges into the Chesapeake Bay (discharge could be reduced by up to 90%), reduce land subsidence by pumping the treated water into existing aquifers, provide sustainable sources of groundwater, and protect that groundwater from saltwater intrusion. Mr. Henefin then explained that advanced water treatment is not a new phenomenon and neither is groundwater injection. One important issue to consider for the SWIFT project is how HRSD will match the chemistry of the groundwater before it injects treated water. According to Mr. Henefin, the SWIFT plan has the potential to offset stormwater reductions and may give HRSD the ability to trade with other MS4 localities. By doing that, those localities could save billions of dollars in retrofit costs to their facilities. Why is the SWIFT Project necessary? Our groundwater use is rapidly depleting the Potomac Aquifer. HRSD models show that groundwater injection will increase water pressure throughout the aquifer.

As for how SWIFT can help with sea level rise adaptation, USGS says that up to 50% of sea level rise may be due to land subsidence and 50% percent of land subsidence may be due to aquifer compaction due to over-withdrawal. The greatest aquifer compaction in Hampton Roads is occurring where the greatest amount of water is withdrawn. Lower withdrawal rates lead to around 32 mm of ground level rising near the Franklin paper mill. SWIFT modeling shows that over the next 50 years SWIFT could eliminate a potential 2ft compaction of the land and restore the ground level to where it was in the year 1890.

HRSD is responsible for dealing with wet weather sewer overflows. SWIFT will decrease the amount of water discharged by treatment plants (because it is injected into the ground) and will decrease the water that is present to overflow. Advanced water treatment will also help deal with the bacterial loads of overflowed water.

Mr. Henefin closed by describing the future of the project. HRSD is focused on modeling, defining its water quality targets, and drilling test wells. The two test wells are at the York River Plant and at the Nansemond Plant. HRSD hopes to obtain Underground Injection Control Permits in 2019 after obtaining about a year's worth of data from its test wells.

DR. CHARLES BOTT, DIRECTOR OF WATER TECHNOLOGY & RESEARCH,
HAMPTON ROADS SANITATION DISTRICT

Dr. Bott began by talking about the processes that HRSD is evaluating to treat wastewater prior to injection. The processes that will be added to existing plants in order to complete advanced water treatment are very important and HRSD is testing them now. One approach is a membrane-based

approach and the other is carbon-based. One of the key features of the carbon-based approach is that it may help HRSD match the chemical composition of existing groundwater, which is critically important. Dr. Bott noted that the primary objective of the testing is determining which method produces the best water quality. Secondary objectives include meeting aquifer quality, establishing design parameters and gaining treatment experience for HRSD staff. HRSD is committed to excellent protection of the community with respect to pathogens and organic chemicals in the treated water and that is a major reason for the pilot program. The SWIFT program is complicated and the sampling and analysis may be even more complex, but so far, HRSD's results have been very good according to Dr. Bott. He then gave an update as to how the two testing methods had been performing. For both pilot programs, HRSD is meeting drinking water standards and meeting all primary Maximum Concentration Levels (MCLs). All secondary MCLs are being met by the membrane-based program, but not yet by the carbon-based program.

A big focus for HRSD's treatment is Contaminants of Emerging Concern. HRSD's current plants do an excellent job of protecting against the majority of them and the carbon-based pilot program shows excellent results.

For aquifer compatibility, the carbon-based approach is better according to Dr. Bott. The membrane-based approach requires HRSD to add important components, like salt, back into the water to match the groundwater.

Dr. Bott closed by reminding conference attendees that there are some big questions remaining, like how advanced treatment plants will handle wet weather days.

TED HENEFIN, GENERAL MANAGER, HRSD

Mr. Henefin then returned to discuss the costs of the SWIFT project. The total project will cost in the \$1 billion range for 7 plants with annual operating costs of 21 to 43 million dollars. HRSD believes the benefits more than make up for the costs. As for the timeline of the project, HRSD is working within the timelines of the Consent Degree and the Bay TMDL. HRSD will begin a demonstration pilot in 2018 for two years with full-scale construction set to begin in 2020.

AUDIENCE QUESTIONS

1) I hear a lot about how we are bumping up against the limits of technology as far as removing phosphorus and nitrogen. If the treated water is injected, will it be injected straight out of the pipe or will it have to be treated further to remove even more nutrients?

DR. BOTT: As we go through these advanced treatment processes the ammonia is gone, it is below detection. For organic nitrogen, these methods do an excellent job. When people speak about technology limits, they are not thinking in terms of the advanced treatment processes we are discussing – SWIFT will nearly double our treatment plant infrastructure. From a drinking water standpoint, nitrate has a MCL of 10 and nitrite a MCL of 1, but that is a lot more than we are talking about from a Chesapeake Bay standpoint. Our discussion has been nitrate less than 5 or less than 3. We need to be protective with respect to nitrate going into the advanced treatment facility so we can ensure all the time that nitrate is at appropriate levels. So yes, there is some nitrogen in the finished water we inject, but there is nitrate in drinking water as well.

2) Why inject at all? Why not just release the clean water the same way we do now? And can we move the water through the aquifer efficiently?

MR. HENEFIN: Why inject? We think it is the best use of this water. There are no cost savings for HRSD in implementing the project but we believe we can save money by not having to upgrade

repeatedly in the next few years and by helping to create a better future for the region through providing water that can fuel development. The water doesn't need to move very far in order to re-pressurize the aquifer.

3) Does the increased pressure at local wells make it more difficult to inject in the future?

MR. HENIFIN: The PSI is already pretty low and we believe that withdrawal occurring at the same time will create some equilibrium.

4) Has there been any measuring at other paper mills similar to the Franklin paper mill? Have other mills been considering more water reuse technologies and is the Commonwealth looking at incentives for them to reduce their use?

MR. HENIFIN: They are working with DEQ on solutions to that but we are not the best people to answer that. Many times, we are asked why we do not just pipe our treated wastewater straight to the mills. We have talked about providing water for the paper mills but our big concern is building a pipe to mills that then shut down for other economic reasons and then having a pipe to nowhere. Increasing the water amount in the aquifer is a "wireless" solution; it helps because anyone in the region can withdraw water without needing to be at the end of a pipe.

5) What assurances (financial or otherwise) can you give people in the region in the event of a catastrophic failure of the system?

MR. HENIFIN: There is a series of critical control points throughout the system. We have not abandoned our ability to discharge water and will return to that if necessary in order to fix the problem. For problems under the ground, we just have to stop pumping for a short time and at worst case, pull more water back out of the ground. Programs like this have been done all over the country very safely. As for financial assurances, we probably will have some sort of insurance associated with the project. We are not looking for the easy way out. This is a creative solution to a complex problem that we believe will improve the environment for the Commonwealth and for our children.

6) Any time you deal with complex systems, the variables may be beyond us. What kinds of ongoing research will be done as the system evolves?

MR. HENIFIN: All models are limited and we firmly agree with the need for long-term monitoring of the system. The demonstration facility we are getting ready to build will have research stations built in anticipation of a potential monitoring program.

VCPC DISCUSSION: SCIENCE & POLICY ISSUES SURROUNDING THE PROJECT

EMILY TUCKER (CLASS OF 2018) AND PATRICK HARNER (CLASS OF 2018)

VCPC students presented information regarding the science and policy issues surrounding the projects. This presentation detailed potential benefits of the project, such as reversing the depletion of the aquifer, abating land subsidence, preventing saltwater intrusion into the aquifer near coastal zones, and reducing nutrient discharges to tributaries of the Chesapeake Bay. The presentation also included information regarding the risks of pumping treated wastewater into the aquifer that may not match the chemistry of the existing groundwater, the fiscal impact of the project, and a summary of similar projects in other jurisdictions.

SUSTAINABLE WATER INITIATIVE FOR TOMORROW EXPERT PANEL

RICH BATIUK, ENVIRONMENTAL PROTECTION AGENCY

Mr. Batiuk observed that this is a local and state issue, and despite the fact that the EPA has the permitting authority, they would like to ensure that people's voices are heard. In the TMDL context, EPA's role is to ensure that all states do their equitable fair share, and that water quality standards are attained on the local level. Other than that, the EPA considers the TMDL to be a more state and local issue, to be taken care of at that level. Additionally, the science, technology, and regulatory framework are all present to the extent that the TMDL program could work in reality.

RUSS BAXTER, VIRGINIA DEPUTY SECRETARY OF NATURAL RESOURCES

Economic growth is coming to Virginia and the population is going to increase, so forward thinking perspectives in how we deal with nutrient allocations in the future is essential. The original allocations were made in 2005, but things have changed significantly since then; for example, some facilities that used to discharge nutrients no longer do so at all, so they should no longer have nutrient allocation caps since they no longer need them. These allocations are not necessarily a property right, even though they are traded as such; instead they are a creation of the regulatory process. The reevaluation of the Chesapeake Bay TMDL is currently underway and the political climate is uncertain, so there are a number of potential challenges that could arise in the future.

MICHAEL MARKUS, GENERAL MANAGER, ORANGE COUNTY, CA WATER DISTRICT

Orange County, CA has had to turn to recycled water because of its continued experiences with drought conditions. Orange County uses the groundwater replenishment system (GWRS), which essentially purifies sewer water to near distilled quality, and subsequently recharges this water into the groundwater basin. Thus, wastewater is not seen as waste, but actually as a resource. Reverse osmosis is used to reduce the amount of salts in the water, although that is not as much of a problem for coastal Virginia. The benefits of GWRS include that it creates a new water supply on the local level, makes the water flow much more reliable, and is energy efficient for the Orange County area. Orange County ultimately has proved that this technology does, and will continue to work. Building up a coalition of support for this project and conducting a lot of public outreach in order to explain this project, resulted in no active resistance to the project.

JEFF MOSHER, CHIEF RESEARCH & STRATEGIC PLANNING OFFICER,

WATER ENVIRONMENT & REUSE FOUNDATION

The potential for potable reuse of water (i.e., not for agricultural purposes) is very promising. Water recycling programs are aimed at promoting resiliency and reliability of the water supply. It is also important to start thinking of surface and ground water supplies in an integrated way, rather than as separate and distinct supplies. Indirect potable reuse takes wastewater treated to a higher level and puts it into a groundwater basin. The benefit of the environmental barriers is great and provides a lot of natural filtration and treatment. It is important with these systems to have specified criteria for treatment for pathogens and chemical levels in the water. All communities grapple with potable reuse, but it is always possible to get the public on board with sufficient outreach.

PEGGY SANNER, SENIOR ATTORNEY AND ASSISTANT DIRECTOR,
VIRGINIA OFFICE, CHESAPEAKE BAY FOUNDATION

There will be major changes under SWIFT. If SWIFT is successful, this would ideally permanently end all of HRSD's discharges of nitrogen, phosphorus, sediment, etc., meaning that HRSD could potentially trade credits to other dischargers (although it is unclear if this type of transfer program is lawful under the Clean Water Act). In such a trading program, it is important that water quality is ultimately improved, and pollution is not simply moved or re-directed. There are, however, a variety of regulatory concerns with such a complex scheme.

IV. Reception

Capping off the conference was a reception held at the Muscarelle Museum of Art at the College of William & Mary, featuring Virginia oysters and a water-themed art show. Colonel Jason Kelly, Commander of the Norfolk District, U.S. Army Corps of Engineers, provided a dynamic presentation on the Corps' efforts to address sea level rise and recurrent flooding in the region. Attendees also had the opportunity to mingle with Col. Kelly and speakers from the conference and ask follow-up questions.

V. Appendix: Presentations, VCPC Reports, and Speaker Biographies

PRESENTATIONS

Presentations are available on the VCPC website at:

<http://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/conferences/Living%20with%20the%20Water%20Too%20Much%20and%20Too%20Little/index.php>.

VCPC REPORTS

Reports written by the VCPC students are available on the VCPC website at:

<http://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/reports/index.php>.

SPEAKER BIOGRAPHIES

THE HONORABLE RALPH NORTHAM, LIEUTENANT GOVERNOR, COMMONWEALTH OF VIRGINIA

Born and raised in Onancock on Virginia's Eastern Shore, Ralph Northam grew up working on the Chesapeake Bay before attending Virginia Military Institute, where he graduated with distinction and was President of the Honor Court. After graduating from Eastern Virginia Medical School, Ralph served eight years active duty in the United States Army, rising to the rank of Major. Upon his return from treating soldiers injured in Desert Storm, Ralph began practicing pediatric neurology at Children's Hospital of the King's Daughters in Norfolk where he continues to practice today. Ralph also serves as Assistant Professor of Neurology at Eastern Virginia Medical School and has ten years of volunteer service as Medical Director for the Edmarc Hospice for Children in Portsmouth.

From 2008-2013 Ralph served as a State Senator representing Norfolk, the Eastern Shore, Virginia Beach, and Mathews. In his capacity as a Senator, he worked with colleagues on both sides of the aisle and in both Chambers to successfully pass a number of bills. These legislative initiatives included the prohibition of smoking in restaurants, protecting young athletes who have sustained concussions, improving the health of the Chesapeake Bay, and shielding our first responders from communicable diseases.

As a State Senator, Northam carried the legislation to remove Phosphorus from home fertilizers, brought the legislation to create the Coastal Flooding Working group to study how Virginia's coastal communities can prepare for the effects of climate change, and worked to ban the winter dredging of blue crabs.

Elected Lieutenant Governor on November 5, 2013, Ralph's top priorities are economic development, women's health, early childhood education and development, and meaningful mental health reform. As your Lieutenant Governor, Ralph Northam presides over the Senate of Virginia and serves on a number of the Commonwealth's Boards and Commissions.

Ralph lives in Norfolk with his wife Pam, a long-time Elementary School teacher who currently works for the local conservation organization Lynnhaven River NOW. They have two adult children, Wes and Aubrey.

WILLIAM PRUITT, FORMER DIRECTOR, VIRGINIA MARINE RESOURCES COMMISSION

Bill Pruitt, born and raised on Tangier Island, worked on the water with his father and grandfather during his summers and school vacations. Bill has forty-one years of experience in the public sector and ten years of experience in the private sector. Bill is a decorated/partially disabled Vietnam Veteran, and has held positions as a Law Enforcement Planner, Security Officer for the

Federal Government, and County Administrator. He was the longest serving Commissioner of the Virginia Marine Resources Commission, having served under seven governors. Currently, Bill serves as a member of the VIMS Foundation Board and helps citizens who may be having problems dealing with the government at all levels. As much of his free time as possible is spent with his chocolate lab, MacArthur Baywood Pruitt!

VCPC WORKING WATERFRONTS CASE STUDIES TEAM

This team of VCPC clinical students – consisting of Chelsea Wilkins, Noah Trombly, and Derek Van De Walle - focused on three working waterfront case studies involving three regions: the Lynnhaven River, the Middle Peninsula, and the Eastern Shore. Chelsea Wilkins is a 2L at William & Mary Law School. Chelsea graduated as an Honors Scholar in 2015 from James Madison University with a B.S. in Biological Anthropology and Justice Studies. She conducted research in South Africa for her Honors Thesis and studied in Italy, Japan, and the Dominican Republic. Chelsea intends to pursue international and environmental law and, this summer, she will be working at the United Nations International Criminal Tribunal for the Former Yugoslavia, in The Hague, Netherlands. Noah Trombly received his undergraduate degree from the University Wisconsin-Madison, where he majored in Psychology. He is currently a 2L at William & Mary Law School and is pursuing a career in civil litigation. In his free time, Noah enjoys exploring Virginia's rivers by kayak. Derek Van De Walle attended the University of Michigan where he studied political science and classical civilizations. Derek is currently a 3L at William & Mary Law School and plans to focus on environmental law following graduation.

LEWIS LAWRENCE,

EXECUTIVE DIRECTOR, MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

Lewie Lawrence coordinates and oversees all agency planning activities for the Middle Peninsula Planning District Commission (MPPDC). He is agency lead for research, review and analysis of federal, state and local regulations and policies. He oversees all daily operations of the MPPDC, and directs management of projects, budgeting, and staff and policy initiatives related to coastal community development and coastal zone management, including: marine spatial planning at the locality level, coastal cultural sustainability and community development, public water access, water quality protection, water use conflict management, maritime and coastal economic development, and coordination of fee-simple acquisition of land for conservation and recreation use.

Lewie has served on numerous state level Advisory Groups, including: 2016 DEQ Stormwater Fee Stakeholders Group, 2015 DEQ Eastern Virginia Ground Water Management Area Trading Stakeholders Group, 2015 Bio solids-Industrial Residual Stakeholders Group, 2015 DEQ Stormwater Stakeholders Group, 2011 Aquaculture VMRC-VDACS Stakeholders Group, and 2009 DEQ Eastern Virginia Ground Water Management Area Stakeholders Group.

BEN MCFARLANE,

SENIOR PLANNER, HAMPTON ROADS PLANNING DISTRICT COMMISSION

Ben McFarlane is a Senior Regional Planner for the Hampton Roads Planning District Commission (HRPDC). Located in Chesapeake, Virginia, the HRPDC is the regional planning organization for southeastern Virginia. Mr. McFarlane has worked primarily on the Commission's coastal zone management efforts addressing issues such as climate change, sea level rise, green infrastructure, and local land use policies. He received a B.A. in Economics and a Master's of

Urban and Environmental Planning from the University of Virginia. He is a member of the American Planning Association and the American Institute of Certified Planners.

ALBERT C. POLLARD, JR., FORMER MEMBER, VIRGINIA HOUSE OF DELEGATES

Albert Pollard is non-profit consultant and owner of Lumber Smith Portable Sawmills. As a consultant, he draws on his experience as an entrepreneur, a former Virginia State Legislator, and the former Director of the Virginia Chapter of the Sierra Club. Albert represented the rural and Republican leaning Northern Neck of Virginia for 10 years and, when first elected, was the youngest serving member in the House of Delegates. He had a League of Conservation Voters lifetime legislative scorecard of over 96% and was the 2004 Chesapeake Bay Foundation's Legislator of the Year. In May of 2009, political scientist Bob Holsworth wrote, "Albert has always been the kind of individual who speaks his mind, who is willing to challenge the conventional wisdom, and doesn't worry all that much if he is off-kilter with his own party on occasion." Albert is a former Senior Warden of Trinity Episcopal Church in Lancaster, Virginia and serves on the Executive Committee of the well-respected "sunshine nonprofit," the Virginia Public Access Project.

CURTIS SMITH,

DIRECTOR OF PLANNING, ACCOMACK-NORTHAMPTON PLANNING DISTRICT COMMISSION

Curt Smith was born and raised on the Eastern Shore where his first job was digging clams out of Burtons Bay. He returned home in 2009 where he has since served as the Accomack-Northampton Planning District Commission, Director of Planning. Mr. Smith has a graduate degree in Coastal Geology and Environmental Science from East Carolina University and has vested interest in helping the rural communities of the Eastern Shore.

THE HONORABLE ROBERT BLOXOM, MEMBER, VIRGINIA HOUSE OF DELEGATES

Robert S. Bloxom, Jr. is a native of the Eastern Shore of Virginia and resides in the Parksley area. He was elected to the House of Delegates for the 100th District in February 2014. Rob and his wife, Lou, are the proud parents of three children, Blaire, Madison, and Brant. Rob completed his undergraduate degree at the University of Richmond, then returned to the Eastern Shore to take over the family business. Rob is the owner of Bloxom Auto Supply Co. in Mappsville and Shore Tire & Auto in Onley. He is also the owner and operator of Egret Pointe Seafood Company. Bloxom is a member of Grace United Methodist Church, the Onancock Rotary, and a Director of the Economic Development Authority. As Delegate, Rob has been appointed to the Governor's Aerospace Advisory Council, the Joint Subcommittee to Formulate Recommendations to Address Recurrent Flooding, the House Agriculture, Chesapeake and Natural Resources Committee, House Finance Committee, and the House Science and Technology Committee. Rob was also named the 2015 Legislative Rookie of the year by the Virginia Education Association.

THE HONORABLE KEITH HODGES, MEMBER, VIRGINIA HOUSE OF DELEGATES

Keith Hodges was elected to the Virginia House of Delegates in 2011. He currently represents the 98th district, made up of the Middle Peninsula counties of Essex, Gloucester, King and Queen, Mathews and Middlesex, and part of King William County

Keith serves on the Health Welfare and Institutions, Counties Cities and Towns and General Laws Committees and is the subcommittee chair for the General Laws subcommittee that

deals with multiple issues including professional licensure, economic development, and the state Inspector General.

In addition, he serves on the Virginia Substance Abuse Service Council, Governor's Task Force for Prescription Drug and Heroin Abuse, is the Chair of the Rappahannock River Basin Commission, and Vice Chair of the Rural Caucus.

Keith is a practicing pharmacist and owns Gloucester Pharmacy. He and his wife Shelley reside in Urbanna with their two daughters Chloe and Ella.

THE HONORABLE LYNWOOD LEWIS, VIRGINIA SENATOR (6TH DISTRICT)

Senator Lewis graduated from Hampden-Sydney College in 1984 with a B.A. in History and Political Science and went on to receive his JD from the University of Richmond. Lewis continues the general practice of law in Accomac, Virginia, as a partner of the firm of Custis, Dix, Lewis & Custis, L.L.P.

Lewis was named the 2013 Outstanding Citizen of the Year by the Eastern Shore Chamber of Commerce. He has been named a Legislative Hero or Leader by the League of Conservation Voters numerous times, and in 2012 and 2013 he was awarded the Distinguished Advocate for Virginia Business by the Virginia Chamber of Commerce.

First elected to the House of Delegates in 2003, Lewis served, while in the House, on the Chesapeake Bay Commission, the Governor's Aerospace Advisory Council, and the Speaker of the house appointed him to the Health Insurance Reform Commission.

In January of 2014, he was elected to the Virginia Senate from the 6th District. Senator Lewis sits on the Committees of Agriculture, Conservation and Natural Resources, Local Government, and Education and Health. He serves as Co-Chair of the Tourism Caucus in the General Assembly and has been appointed to both the Joint Subcommittee to Formulate Recommendations to Address Recurrent Flooding and the Modeling and Simulation Advisory Council.

Senator Lewis was named the 2016 Distinguished Friend of Virginia Agribusiness by the Virginia Agribusiness Council, 2015 Chesapeake Bay Foundation Legislator of the Year, and 2016 Virginia Association of Soil & Water Conservation Districts Legislator of the Year.

VCPC SUSTAINABLE WATER INITIATIVE FOR TOMORROW TEAM

This team of VCPC clinical students – consisting of Emily Tucker and Patrick Harner – investigated the scientific and policy implications of the Hampton Roads Sanitation District's Groundwater Injection Proposal. Emily Tucker has an undergraduate degree in Chemical and Biomolecular Engineering from Georgia Tech. Emily is a 2L at William & Mary Law School and intends to practice in the areas of patent prosecution and litigation. This summer, Emily will be splitting her time as a Summer Associate between Crowell & Moring and Wilson, Sonsini, Goodrich & Rosati in Washington, DC. Patrick Harner has a B.A. in History from William & Mary, a M.A. in Earth and Environmental Science from Wesleyan University, and a M.S. in Planetary Science from University of Arizona. Patrick is a 2L at William & Mary Law School.

TED HENIFIN, GENERAL MANAGER, HAMPTON ROADS SANITATION DISTRICT

Ted Henifin joined the Hampton Roads Sanitation District on November 1, 2006, as General Manager. He previously served for nine years as Director of Public Works for the City of Hampton. Henifin holds a bachelor's of science in civil engineering from the University of Virginia. He is a registered professional engineer and is president of the Virginia Association of

Municipal Wastewater Agencies, a member of the board of directors for the National Association of Clean Water Agencies, and serves on the management committee for the US Water Alliance's Value of Water Coalition.

**DR. CHARLES BOTT, DIRECTOR OF WATER TECHNOLOGY & RESEARCH,
HAMPTON ROADS SANITATION DISTRICT**

Dr. Bott is the Director of Water Technology and Research at the Hampton Roads Sanitation District (HRSD) in southeast Virginia, where he currently is managing technology innovation for HRSD's thirteen wastewater treatment plants (249 MGD combined capacity) and collection system. He is also an Adjunct Professor in the Departments of Civil and Environmental Engineering at Virginia Tech and Old Dominion University. He was formerly an Associate Professor in the Department of Civil and Environmental Engineering at the Virginia Military Institute (VMI) and a consulting engineer with Parsons Engineering Science. Charles is a Professional Engineer, a Class 1 Licensed Wastewater Works Operator, and a Board Certified Environmental Engineer.

THE HONORABLE DAVID BULOVA, MEMBER, VIRGINIA HOUSE OF DELEGATES

David Bulova has represented the 37th District of the Virginia House of Delegates since 2006. The 37th District includes the City of Fairfax and portions of Fairfax County. In the House, he serves on the General Laws, Agriculture, Chesapeake, and Natural Resources, and Education committees as well as the State Water Commission, Housing Commission, Joint Commission on Health Care, Chesapeake Bay Commission, Standards of Learning Innovation Committee, and the Virginia War Memorial Board.

David received a B.A. in Government from the College of William and Mary and a Masters in Public Administration and Policy from Virginia Tech. Professionally, David works as a Project Manager for Amec Foster Wheeler Environment & Infrastructure. His primary areas of expertise include municipal and industrial stormwater permit planning and implementation, watershed planning, and stormwater program funding. Prior to his current position, he served as the Director of Environmental Services for the Northern Virginia Regional Commission. David and his wife Gretchen both grew up in Fairfax County. They have three wonderful children.

**RICH BATIUK, ASSOCIATE DIRECTOR FOR SCIENCE, ANALYSIS & IMPLEMENTATION,
CHESAPEAKE BAY PROGRAM, U.S. ENVIRONMENTAL PROTECTION AGENCY**

Rich Batiuk is the Associate Director for Science, Analysis, and Implementation at the United States Environmental Protection Agency's Chesapeake Bay Program Office located in Annapolis, Maryland. In his 32 years with the EPA and the Chesapeake Bay Program partnership, he has led the integration of science into multi-partner policy-making and collaborative decision-making. Rich is now focused on directing the partnership resources towards helping local partners understand their part in the Bay and watershed restoration efforts and getting the job done, restoring water quality to local waterways and the Bay. He received his B.S. in Environmental Science from the University of New Hampshire in 1984 and his M.S. in Environmental Toxicology from American University in Washington D.C. in 1985.

RUSS BAXTER, VIRGINIA DEPUTY SECRETARY OF NATURAL RESOURCES

Russ Baxter is the Deputy Secretary of Natural Resources for the Chesapeake Bay under Secretary of Natural Resources Molly Ward in the office of Governor Terry McAuliffe. Prior to

his appointment, he was the Chesapeake Bay Coordinator for the Virginia Department of Environmental Quality. He has also previously served as Acting Director and Chief Deputy Director of the Department of Conservation and Recreation. From 2002 until 2005, he served as Assistant Secretary of Natural Resources under Secretary W. Tayloe Murphy, Jr. in the office of Governor Mark Warner, and was primarily responsible for the Commonwealth's commitments under the multi-state Chesapeake 2000 Agreement. Prior to his service in the Warner administration, Baxter was the Virginia Director and Senior Policy Analyst for the tri-state Chesapeake Bay Commission and has held positions with the Virginia Conservation Network and the Chesapeake Bay Foundation.

During his professional career he has addressed legislative, policy, and programmatic issues related to point and nonpoint source pollution control, habitat restoration, land conservation, outdoor recreation, nutrient trading, fisheries management, and land use, among others. Baxter holds a master's degree in environmental planning from the University of Virginia and a bachelor's degree in Government from Oberlin College in Oberlin, Ohio. He has also completed the program of study of the Virginia Executive Institute at Virginia Commonwealth University in Richmond. He is a native of Columbus, Ohio and has lived in Virginia for the last 31 years. He resides in Richmond's Museum District with his wife and two sons.

**MICHAEL R. MARKUS, P.E., D.WRE, BCEE, F.ASCE, GENERAL MANAGER,
ORANGE COUNTY, CA WATER DISTRICT**

Mike Markus is the general manager of the Orange County Water District. With more than 38 years of experience, Mike is well known for his expertise in large project implementation and water resource management. He obtained a Bachelor of Science degree in Civil Engineering from California State Polytechnic University at Pomona and a Master of Science degree in Civil Engineering from the University of Southern California. He is also a registered Civil Engineer in the State of California.

During his 28-year career at the District, Mike has been responsible for managing the implementation of the \$480 million Groundwater Replenishment System program and oversight of the \$142 million Groundwater Replenishment System Initial Expansion project. This 100 million gallon per day advanced water purification facility is the largest indirect potable reuse plant in the world and has won many awards including the 2008 Stockholm Industry Water Award, 2009 ASCE Outstanding Civil Engineering Achievement Award, 2014 U.S. Water Prize, and 2014 Lee Kuan Yew Prize.

JEFF MOSHER, CHIEF RESEARCH OFFICER, WATER ENVIRONMENT & REUSE FOUNDATION

Recently, Jeff Mosher joined the Water Environment and Reuse Foundation (WE&RF), a nonprofit research organization located in Alexandria, VA, as their Chief Research Officer. In this capacity he is responsible for guiding WE&RF's research program, which addresses applied research in wastewater, water reuse, resource recovery, and water resources.

Prior to that, he was the Executive Director for 11 years of the National Water Research Institute (NWRI), a nonprofit located in Fountain Valley, CA with water and wastewater agency members.

He works on issues in water supply and water resources, including water reuse with an emphasis on indirect and direct potable reuse. He also has led a number of independent advisory panel efforts for water agencies, wastewater agencies, and state agencies in California, Arizona, Texas, New Mexico, and other states addressing the implementation of water supply projects and

policies. He administers an Expert Panel on evaluating the proposed SWIFT project at Hampton Road Sanitation District.

He is an alumnus of William and Mary. He graduated with a Bachelor of Science in Chemistry in 1985. He also earned a Master of Science degree in Environmental Engineering from the George Washington University.

**MARGARET (PEGGY) SANNER, ESQ., ASSISTANT DIRECTOR AND SENIOR ATTORNEY,
VIRGINIA OFFICE OF THE CHESAPEAKE BAY FOUNDATION**

Peggy Sanner is Virginia Assistant Director and Senior Attorney for the Chesapeake Bay Foundation. She provides legal and policy guidance to the organization on all aspects of environmental law, with particular emphasis on the federal and state laws that affect the restoration and protection of the Chesapeake Bay, local waterways, habitat and fisheries and other natural resources. Peggy practices before state and federal courts, agencies and boards and works with the Virginia General Assembly on numerous policy issues related to CBF's mission of Saving the Bay. Before joining CBF in 2010, Peggy litigated environmental, technical, and other matters in courts across the country, beginning her practice in Philadelphia at Morgan Lewis & Bockius and serving most recently as counsel with Reed Smith in Richmond.

An active member of the Virginia bar, Peggy received her law degree from Rutgers University School of Law and holds graduate and undergraduate degrees from the University of Pennsylvania and Swarthmore College, respectively. She resides in Richmond.

COL. JASON KELLY, COMMANDER, NORFOLK DISTRICT, U.S. ARMY CORPS OF ENGINEERS

Col. Jason E. Kelly assumed duty as the 58th commander of the Norfolk District, U.S. Army Corps of Engineers, on July 16, 2015. As the commander, he oversees the district's civil works, military construction, regulatory and emergency operations missions, and is responsible for more than 350 employees in Norfolk and in resident offices throughout the Commonwealth of Virginia.

A native of Flint, Michigan, Col. Kelly attended the United States Military Academy at West Point, New York and received his commission as an engineer officer upon graduation in 1994. Col. Kelly holds a Bachelor of Science degree in mathematics from West Point, a Master of Science degree in Engineering Management from the Missouri University of Science and Technology, a Master of Science degree in Statistics from the Georgia Institute of Technology, a Master of Science degree in Joint Campaign Planning and Strategy from the National Defense University, and a Master of Science degree in Strategic Studies from the United States Army War College. He is a graduate of the Joint Advanced Warfighter School, Combined Arms Services Staff School, the Sapper Leader Course, as well as the Engineer Officer Basic and Advanced Courses. He is also a certified Project Management Professional.

During more than 21 years of service, Col. Kelly has held leadership positions from platoon to brigade, with duty in Asia, the Middle East, and the United States, including: commander of the 20th Engineer Battalion in Afghanistan; deputy commander of the 36th Engineer Brigade during Operation Iraqi Freedom/Operation New Dawn; commander of the Headquarters and Headquarters Company, 11th Engineer Battalion, 3rd Infantry Division, Assistant Operations Officer for the 10th Engineer Battalion, 3rd Infantry Division, Adjutant for both the 44th Engineer Battalion and the 2nd Infantry Division Engineer Brigade in Korea; Plans Officer for the 4th Infantry Division Engineer Brigade; and Line Platoon Leader, Assault & Obstacle Platoon Leader, and Company Executive Officer in the 588th Engineer Battalion, 2d Armored Division.

Other key assignments include participation in the Army's Advanced Civil Schooling Program, duty as an advanced calculus instructor in the Department of Mathematics at the United States Military Academy, Aide-de-Camp to the Superintendent, United States Military Academy, and service on the Headquarters, Department of the Army Staff at the Pentagon in the Office of the Chief of Engineers.

Col. Kelly's awards and decorations include the Bronze Star with two oak leaf clusters, the Meritorious Service Medal with four oak leaf clusters, the Army Commendation Medal with three oak leaf clusters, the Army Achievement Medal, the Meritorious Unit Award, the National Defense Service Medal, the Kosovo Campaign Medal with Bronze Star Device, the Afghanistan Campaign Medal, the Iraqi Campaign Medal, the NATO Medal, the Combat Action Badge, the Parachutist Badge, and the Sapper Tab. He is also the recipient of the Army Engineer Association's Bronze Order of the Defleury Medal.