CHESAPEAKE BAY FOUNDATION

Using Environmental Impact Bonds to Finance Green Stormwater Infrastructure in the Chesapeake Bay Watershed: A Case Study

Waggonner & Ball Architects

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Saving a National Treasure

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***Lee R. Epstein*[1]**

Introduction

Communities across the country face growing pressure to update aging stormwater infrastructure, meet increasingly stringent water quality standards, and ameliorate the local flooding that is increasing with the advance of climate change. Green infrastructure that mimics nature offers opportunities to address stormwater in a way that restores health to waterways, reduces flooding, revitalizes local communities and economies, and improves urban quality of life. Financing such projects, which often lie outside the bounds of 'business as usual,' can nonetheless pose a challenge to local jurisdictions. A novel financing instrument called an Environmental Impact Bond (EIB) offers a potential solution. In 2017, the Chesapeake Bay Foundation (CBF) launched a three-year project to explore the potential application of EIBs to finance infrastructure in the Chesapeake Bay Watershed which can achieve these objectives. The following paper describes methods and lessons learned from extensive outreach to watershed jurisdictions and the EIB issuance process in two cities—Baltimore, Maryland and Hampton, Virginia—as well as implications for the future use of EIBs to finance water quality improvement and flood minimization efforts.

A Regulatory Imperative

Stormwater runoff from impervious surfaces, such as roadways and buildings, can cause localized flooding, overwhelm sewers and wastewater treatment facilities during large rain events, and carry a range of pollutants into nearby waterways. Such events are increasing in intensity and frequency due to climate change. Many municipalities in the Chesapeake Bay watershed are required to reduce stormwater pollution in accordance with the Bay's Total Maximum Daily Load (TMDL).

The TMDL is a set of science-based pollution limits developed for the Bay by the U.S. Environmental Protection Agency, in cooperation with the six states plus the District of Columbia, which together make up the Chesapeake Bay watershed. Instituted in 2010, the TMDL calculated the reduction of certain pollutants (nitrogen, phosphorus, and sediment) needed to restore ecological function to the Bay and allocated that reduction among the states using sophisticated modeling. Pursuant to the Clean Water Act, the states also

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committed to write and implement detailed plans to achieve the TMDL pollution targets, with all necessary actions and measures in place by 2025.

Together, the TMDL and these enforceable plans are referred to as the Chesapeake Clean Water Blueprint. Meeting the Blueprint goals requires tough environmental regulations and permits, solid enforcement, and money across the board to deploy conservation practices and pollution controls.

The Problem of Financing Stormwater Infrastructure

CBF has been concerned for some time that many local jurisdictions are hard-pressed to come up with the financial wherewithal to pay for the extensive stormwater management practices needed to reduce urban and suburban polluted runoff and localized flooding, pursuant to a certain class of water pollution permits issued to municipalities,[2] as well as effectively address advancing climate change in the watershed.

Stormwater infrastructure is very expensive in urban and suburban settings, especially if it must be retrofitted into already developed landscapes. Among the means of paying for it are traditional municipal bonds, regular municipal budgeting, local stormwater utilities, federal/state water quality-related revolving loan funds, public and private grants, and stormwater utilities or fee systems. However, obtaining substantial new money for these purposes is still difficult, and the more innovative the projects, the harder they are to finance.

EIBs: A New Financial Tool

At a White House conference on environmental finance in the Fall of 2016, several Chesapeake Bay Foundation (CBF) staff heard a presentation on a new kind of financing instrument called an Environmental Impact Bond (EIB). It had been used in the United States for the first time that year by the District of Columbia Water and Sewer Authority (DC Water), and DC Water was assisted by Quantified Ventures (QV), CBF's consulting partner in the projects outlined in this paper, as noted above.

DC Water was under a federal court's Consent Decree to fix its long-standing combined sewer problem—which, like many other old systems across the country, dumped raw sewage into the nearby Potomac River after a heavy rain—and was searching for a cost-effective way to make the fix which might also provide other benefits to the City. It wanted to conduct a pilot project to install about 20 acres of nature-based (or nature-mimicking) green infrastructure for managing stormwater[3] to determine whether another 345 acres of GI might be able to replace the planned installation of a very large, nearly $1 billion tunnel, one of three capable of holding stormwater until the District's combined sewer system could sufficiently process it after each moderate rainstorm. An EIB was chosen to finance the pilot project.

CBF staff were intrigued and began developing a project that could showcase this new technique to cities and counties in Pennsylvania, Maryland, and Virginia—the three states that cover the majority of the 64,000-square-mile Chesapeake Bay watershed. EIBs, we believed, could be another tool in the financial toolbox for localities needing to upgrade their stormwater infrastructure. But we also believed that the instrument needed to be proven more extensively on the ground.

[2] Municipal Separate Storm Sewer System ("MS4") permits, issued pursuant to the Federal Clean Water Act and state delegated Clean Water Act programs.

[3] For our project, such practices could include bioswales, large rain gardens, constructed or enhanced wetlands, pervious pavement, or green roofs, all of which naturally slow and help infiltrate the flow of stormwater from urban landscapes.

What is an EIB and How Does It Work?

An EIB is a designation given to a "green" municipal bond that not only funds environmentally or socially beneficial projects but also commits to a quantitative prediction, post-implementation evaluation, and disclosure to both bond investors and the community, of actual project outcomes. Some EIBs, as will be discussed later, may also feature so-called "Pay for Success" performance-based principles in which financing terms may change with evaluated project outcomes.

Modeled after Social Impact Bonds, which have been in the marketplace for several years, an EIB provides regular bond-type financing, where investors provide capital to municipal entities to create infrastructure. The capital is paid back with interest to the investors over a set schedule, often with maturity between 10 and 30 years. Like Social Impact Bonds, EIBs have a special feature which appeals to a certain category of so-called "impact investors." This new cohort is interested not only in the bond's intended use (some particular social good), but also in the bond's actual *outcome*. They want to know whether, or the extent to which, their investment had the expected impact, and indeed, they want it measured and reported back to them. The evaluation period is determined by which specific metric is being used and by how long the financed projects might take to become fully effective, anywhere from immediately after installation to five years or later.

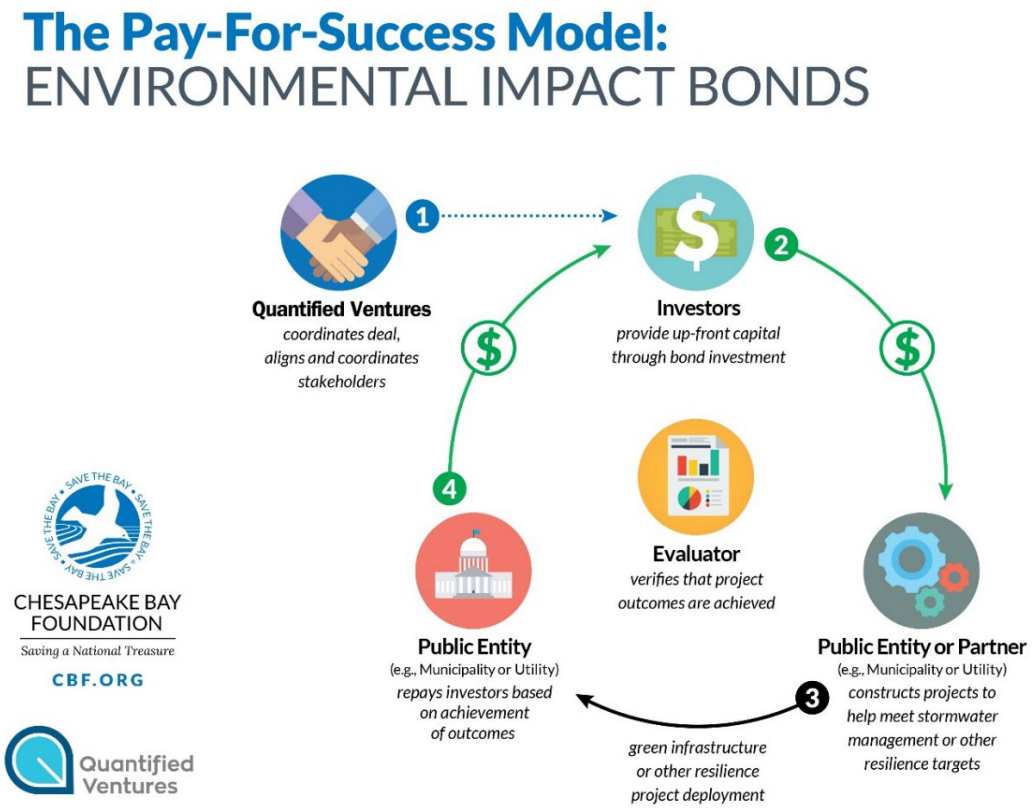
In one model of an EIB, the amount of payback investors receive may hinge on how well the innovative or pilot green infrastructure performs, paying differently based on carefully modeled performance rates that outline the parameters of under-, over-, and as-expected performance.

In the example of the $25 million DC Water EIB, investors' rate of return varies with the overall measured success of the project which in this case relates to the water runoff volume reduced by the green infrastructure put in place. Investors were willing to share the risk with DC Water of a pre-specified, outside expert-validated "under-performance," by making a $3.3 million risk-share payment *back* to DC Water (which money DC Water could then use to mitigate the under-performance with additional stormwater-related projects).

At the same time, investors share the benefit of outside expert-validated "over-performance," with DC Water making a one-time payment to them of $3.3 million. If the GI performs "as expected," there are no additional payments in either direction.

DC Water was willing to engage in this way because, though it might pay investors a bit more for the upside possibility, it would know the infrastructure worked better than expected and would not need to deploy (and pay for) as much of it in the future. The EIB also isolated project performance/financial risk for just this initial GI deployment.[4]

[4] Additional details and a description of the DC Water transaction are available in a 2017 US Environmental Protection Agency white paper, *DC Water's Environmental Impact Bond: A First of its Kind*, available on-line at https://www.epa.gov/sites/production/files/2017-04/documents/dc_waters_environmental_impact_bond_a_first_of_its_kind_final2.pdf, last read on January 5, 2021.



The DC Water EIB, however, is only one model of how such instruments may be structured. A 10-year, $14 million publicly-offered green infrastructure EIB closed in Atlanta, Georgia in January, 2019 (another QV-assisted effort). This EIB uses a two-tiered structure that provides a performance payment of $1 million to the investors if the project over-achieves (i.e. specified as attainment of more than 6.52 million gallons of stormwater capture). There is no downside payment back to the City in the case of underperformance.[5]

The City of Hampton, Virginia's EIB provides yet a third model, described more fully below.

Moving the EIB Project Forward

Extending Outreach and Understanding

CBF reached out to various foundations and grant funders with a detailed proposal for a two-year project that would explore EIB applications in the Chesapeake Bay Watershed. Fortunately, several were willing to invest in our experiment.[6]

The first task was to obtain competent consulting assistance. CBF contracted with the afore-mentioned Quantified Ventures, an outcomes-based capital firm that helps develop financing solutions using outcome-based approaches to social, health, and environmental problems. Next, we hired an internal, CBF EIB Project Coordinator for the multiple EIB projects we expected.

[5] Chris Lewis, "Atlanta Environmental Impact Bond Breaks into Public Market," Conservation Finance Network Monthly News Update, June 24, 2019, available at https://www.conservationfinancenetwork.org/2019/06/24/atlanta-environmental-impact-bond-breaks-into-public-market, last viewed on January 4, 2021.

[6] An Anonymous Donor provided the first large grant, which would need to be matched by others. The Kresge Foundation matched part of it, and smaller matches were provided by two Baltimore-based grant-makers, the Abell Foundation and the Goldseker Foundation.

CBF's project work plan recognized that an extensive phase of outreach to watershed states and municipalities would be required, so that: (1) they could gain an understanding of this new financial instrument; and (2) they were made aware that if towns, cities, counties, or even large university systems were interested in pursuing an EIB project, our team would help them through the process at no cost for that assistance.

CBF made extensive lists of localities by state, including information on demographics, budgets, and other data. With our partner, QV, CBF undertook about 45 in-person presentations to local and state government agencies across Pennsylvania, Maryland, and Virginia, and engaged another 30 jurisdictions through telephone conversations. Each meeting helped us better understand the challenges localities are facing (or not), as well as the jurisdictions' actual needs, readiness, or potential interest in the use of this new financial tool. We also developed, advertised, and ran two one-hour webinars which attracted more than 120 attendees. Finally, CBF created an EIB web landing page on the CBF website, including an application for assistance that could be submitted to us.

Early Lessons Learned

The extensive upfront process proved fruitful, highlighting initial project challenges and lessons, among them:

(1) **A regulatory driver is helpful, but not essential**.
CBF expected that the regulatory environment described earlier in this paper—the demanding Clean Water Blueprint and the MS4 permits issued by the states—would create strong regulatory incentives for new stormwater infrastructure that could meet very high standards. But the special, TMDL-related regulatory framework in the Chesapeake Bay watershed gives credit only for the *completion* of a so-called "Best Management Practice" to reduce stormwater pollution. It does not reward more credit if performance is better than expected. Thus, one incentive for using an EIB was lost.

On the other hand, EIBs may still be attractive to cities which identify and value other green infrastructure co-benefits in addition to meeting permit demands, as well as those interested in determining actual GI performance before widely deploying it.

(2) **Beginning the process early with local government is the best approach**.
By the time infrastructure projects in most municipalities are at the "shovel-ready" stage of design (a requirement we initially created to speed up an otherwise lengthy project timeline), most municipalities' planning and budget cycles require the identification of the financing package, often as part of their Capital Improvement Program process. Thus, in many instances, towns and cities already had a financial plan in place for any new infrastructure planned within the relatively short project term of two years. While larger cities may have a somewhat easier time changing how they finance such projects, smaller cities may not have that luxury.

Engaging municipalities early in their project identification, planning, and budgeting process may therefore increase the use of EIBs.

(3) **EIB's may not work for small towns and cities; sometimes their traditional funding sources are best**.
Small towns and cities may not have the need to raise enough capital, for either single or a group of "bundled" projects, to make developing an EIB cost-efficient for them or attractive to investors. According to QV early on, a price tag of about $3 million appeared to be the smallest amount necessary to make the use of an EIB practicable and cost-efficient.

Since most municipalities in the watershed are relatively small, their traditional means of paying for stormwater infrastructure (described earlier) already made sense for them. Using their general fund, grants, a state revolving fund, or even stormwater fees from a local stormwater utility may be the better option when the project costs are not too high and the wait is not too long.

(4) **Sometimes, on the other hand, traditional funding sources may not be the best way forward**. Traditional stormwater infrastructure financing options might *appear* optimal to local jurisdictions who are already familiar with them, even for larger projects. For example, municipalities may have access to State Revolving Loan Funds ("SRF") for various water infrastructure under the Clean Water Act. These instruments might provide very low-cost capital (0-1%) for their needs.

However, such loan funds are sometimes over-subscribed, the loan application process may be cumbersome, or the wait can be considerable. Also, while SRF loans might be preferred in the short run, they are not tied to performance, which can give EIBs an advantage for municipalities over the long run.

(5) **Don't fixate on just one EIB model, as more can be imagined and are coming on-line**. When CBF began this project, the DC Water EIB was the only model available. Its returns depended upon performance, both on the upside and the downside of risk. It was also of a significant size ($25 million); was related to a combined sewer system problem; and was developed by a sophisticated, big-city sewer and water utility. As a result, the municipalities we engaged were often unable to imagine a model that would apply to *their* specific needs and community profile.

With EIBs now extant in Atlanta, Georgia and Hampton, Virginia, and several others in process, municipalities will soon have a wider variety of models to help envision an EIB that could work for them.

Project Profiles and Case Studies

Within about six months, CBF had accepted applications for two EIB projects, one for Baltimore, Maryland, and one for Hampton, Virginia.

Baltimore, Maryland

Baltimore is the largest city in Maryland, with a population of almost 600,000. This old industrial city is heavily urbanized, with some neighborhoods built in the colonial era, and has a rich history that includes Francis Scott Key writing the "Star Spangled Banner" as he watched the attack on Fort McHenry during the War of 1812. The city was home to other notables like Edgar Allen Poe, Frederick Douglass, Babe Ruth, H.L. Mencken, and Henrietta Lacks. It is also the home of Johns Hopkins University, the Baltimore Ravens, and the Baltimore Orioles. A major Domino Sugar refinery still helps define the Inner Harbor, as do the headquarters of Under Armour and T. Rowe Price, the National Aquarium, and modern downtown office buildings and entertainment venues. It's a gritty city of contrasts. While challenged by big city problems such as historically racist development patterns, drugs and sometimes violent crime, and aging infrastructure, it maintains a reserve of civic pride, substantial private investment and philanthropy, and promise.

Community challenge

As a major city with a Clean Water Act MS4 permit in the Chesapeake Bay watershed, Baltimore faces a significant challenge to reduce pollutants from its urban stormwater. The City must restore more than 4,000 acres of impervious surfaces to pre-development functions, according to its Maryland MS4 permit. The City

Public Works Department (DPW) and, originally, the Department of Planning,[7] expressed interest in working with CBF and QV on an EIB, which could cover at least part of the major expense it would incur from installing new green stormwater management practices in a highly urbanized environment. We accepted the challenge.

Process and GI project selection

CBF and QV first helped DPW staff think through their objectives in a systematic way and narrow down the kinds of projects they wanted to build with the EIB. The idea was to ultimately arrive at a bundle of already planned and mostly designed projects, in this case scattered across the City, that could be "combined" and defined for the purposes of EIB financing. The other goal of early meetings was to determine what benefits Baltimore wished to highlight and to create an outcome or multiple outcomes that could be measured with specific metrics, as is required for social or environmental impact financing.

At the same time, it was important to educate and inform disparate staff from various City agencies, including the Office of Finance and the Treasurer's Office, the City Solicitor's Office, and City political leaders. Finally, it was crucial that the City's outside Independent Financial Advisor, PFM, as well as its outside bond counsel (McKennon, Shelton & Henn) fully understand what this new financial instrument was and how it would work. Regular meetings were instituted, managed by CBF, and attended by representatives of these agencies and actors over the course of two years.

DPW ultimately determined it would use the EIB to partially finance 115 small, neighborhood bioretention facilities, impervious surface removal/green restoration, and a stream restoration project. The bioretention practices would be installed along city streets, on public school grounds, and in neighborhood parks, with the main purpose of reducing pollutants but with significant co-benefits for neighborhood improvement and beautification. Under-resourced neighborhoods constituted a significant proportion of those chosen for GI deployment, but the projects were scattered across the entire City. The package was projected to cost some $17.8 million. The EIB would fund $6.2 million of the overall budget, with the balance coming from the Maryland State Clean Water Revolving Fund.

Developing outcomes and performance metrics

CBF and QV drove discussions over which metric could measure performance of these various projects. Ultimately, the City chose "plant survival," which could be broadly represented across the projects and would be used to determine how much the City would repay its investors. The City reasoned that healthy vegetation was important for gauging how well the bioinfiltration facilities cleansed pollutants from runoff and slowed the outflow of stormwater. The more and better the plants survived, the better the practices' performance. On the other hand, low levels of plant survival would increase the City's ongoing operation and maintenance costs. Learning how best to design and maintain such small-scale infrastructure was important, as the City intended to implement a Green Network city-wide, deploying green infrastructure even more extensively.

Bond structuring and drafting

The City decided on a three-tiered structure, similar to the bond developed for DC Water. The upside payment to investors for *overperformance* of plant survival by a given percentage would be $300,000, while *underperformance* would result in a $300,000 payment back to the City. Plant selection, installation, and regular maintenance would be governed by a strict regime outlined in a document—the Technical Memorandum—prepared largely by QV and CBF with DPW input. The Technical Memorandum is an important part of an EIB package and transaction.

[7] The planning department was interested in building out part of a "Green Network" it was designing. Unfortunately, the key senior planner initially involved retired shortly after the project began, and the department did not participate in the work thereafter.

The next step was to begin drafting the bond transaction documents, and this was undertaken in large part by the City's bond counsel with input from PFM and city agencies. At the same time, the City began discussions with Morgan State University's landscape architecture graduate program to possibly serve as the independent evaluator, which is a required component in an EIB to impartially measure the metric and determine how well the infrastructure performs. The precise blueprint for *how* the evaluation would calculate the metric's performance over time, among a plethora of projects, was detailed in the Technical Memorandum.

The City's cumbersome approval processes for project financing involved approvals of various steps by several City Boards and City Council, including passing a new ordinance to allow the City to use its stormwater utility fees as a source for bond repayment. Progress was not a straight line. There were times when various City officials expressed concern or required additional information. At one point, the entire City government lost all outside communications via email when it suffered a cyber-ransomware attack, putting EIB progress on hold for months. Soon thereafter, because of the ransomware hiatus, a previously approved stormwater fee hike appeared suddenly in bills across the city, and DPW's need to deal with the backlash necessitated a slow-down in EIB work. Additionally, negotiations with DPW's preferred outside validator, Morgan State University, bogged down and the potential contract with them ballooned in cost. While the City's DPW Director was still the project's strongest proponent, he was not a working-group attendee, and his Department's lead for the project was distracted by other work responsibilities. Then the Director of DPW announced his retirement.

Still, the project proceeded through final City approvals. The bond package was privately released to several dozen potentially interested investors (both institutional and philanthropic) in a "Request for Expressions of Interest," and investor proposals with interest rate quotes came in and were reviewed by City staff. A small group of philanthropic investors was finally chosen by the City to be the bondholders. But then, EIB progress suddenly ceased.

Project conclusion

Two months after investors were chosen and a date for closing had been arranged, the City's Director of Finance stepped in and, without discussion, decided to cancel the issuance. He stated that it was too expensive for the City. When directly queried by CBF, he said his concern related in part to the potential Morgan State contract (which admittedly was high). CBF and QV met with the City Council President's office to further explain the project and its broad benefits to the City. We also reviewed Morgan State's proposed scope of work and suggested to DPW modifications which would fulfill the independent evaluation requirements while substantially reducing extraneous work and cost. DPW agreed with our suggested changes and put the revised scope out for bids. The Department received three, all of which were reasonable and substantially lower than the original estimate; Morgan State, one of the three, was able to shave its cost by almost two-thirds.

At that point, communications from the City slowed and then simply ceased. After five more months of inaction, and given the time delay relative to the grants that funded our work, CBF decided that, unfortunately, we could no longer assist Baltimore with an EIB. We eventually found out, many months later, that the Finance Director had still felt the cost to the city was too high, ratifying his earlier cancellation of the EIB. The good news, however, is that DPW was able to proceed with many of the small GI projects on its own accord with other financing in hand.

Lessons learned

While CBF disengaged from the Baltimore EIB project after more than two years of effort, there were several lessons to be learned from the experience.

First, for something as new as an EIB, it is crucial to have the full understanding and support of one, if not more, high municipal officials who can eventually become solid, continuing champions and cheerleaders. This was a new concept for the City and many of the changes in staff and leadership were beyond the City's and our control.

Second, it is important that outside facilitators (such as CBF and QV) completely understand the bureaucratic landscape and all relevant municipal processes, approvals, and timelines necessary for ultimate project success. This way, effective plans can be made and sufficient flexibility can be built into timelines. Finally, while good management of the process from the outside is important, good, ongoing management and a high level of attention from the inside, from start to finish, is also critical.

City of Hampton, Virginia

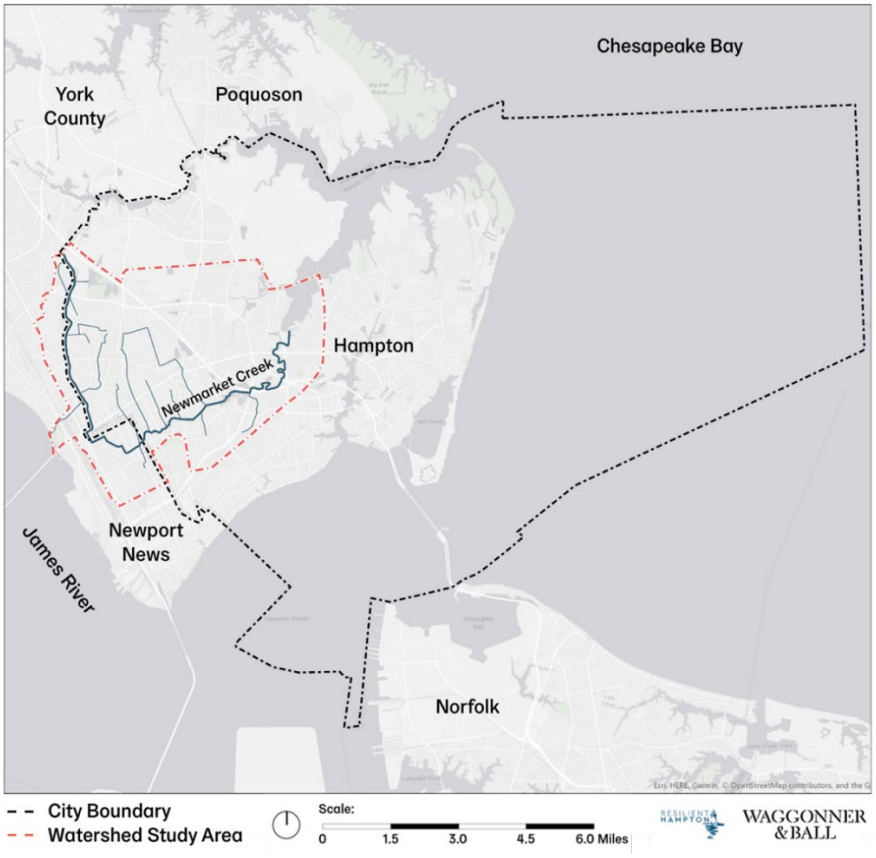
European settlement began in the City of Hampton, Virginia, located in the Commonwealth's Tidewater area, some 400 years ago. Christopher Newport, the Englishman who first brought White settlers to Jamestown, in 1606 identified the site for Old Point Comfort where Ft. Monroe still stands today. Native Americans had, of course, occupied the area centuries prior. Today, the modern city has a population of about 135,000, and is home to historic HBCU Hampton University, on whose campus the famous Emancipation Oak still stands. Hampton is also home to Langley Air Force Base, NASA Langley Research Center, and the Virginia Air and Space Center. Hampton sits next to the cities of Newport News and Norfolk, Virginia.

Community challenge

Hampton holds an MS4 Clean Water Act permit from the Commonwealth of Virginia for its stormwater system, which requires management practices to reduce and manage polluted runoff—in part by implementing retrofitted projects in the City. Since it lies within the Chesapeake Bay watershed, Virginia requires it to reduce a given amount ("Level 2") of modeled pollution loads of nitrogen, phosphorus, and sediment from existing and new sources in three phases: by five percent of the Level 2 during its first permit term, 35 percent during its second permit term, and 60 percent by the end of its third permit term.[8] These are demanding requirements.

Beyond its MS4 permit, Hampton realized it was facing other water-related and equity challenges, not the least of which included regular (and increasing) tidal- and storm-related flooding of numerous residential and commercial areas in the City. Thus was born, in the Community Development Department, Resilient Hampton. The city-wide, inter-departmental sustainability initiative intends to improve residents' quality of life in the face of these kinds of water-related challenges by increasing the City's ability to withstand and recover from them. The effort involved the community in developing a set of values and principles, undertaking a multi-phase land use study, and hiring outside consultants from New Orleans and the Netherlands[9] to help develop resiliency plans for "living with water," resulting in the *Newmarket Creek Water Plan*. Ultimately, a two-phased report produced a concept plan for the Newmarket Creek watershed, which includes diverse residential and commercial neighborhoods in the heart of the City and encompasses a broad cross-section of income and racial groups.

[8] Part I.D.1, Virginia Stormwater Management Permit VA0088633, January 2015. Since these permit terms will extend beyond the Chesapeake Bay TMDL's 2025 goal, the state can adjust this plan and take different approaches to meeting the 2025 deadline.
[9] Bosch Slabbers, a landscape architecture firm headquartered in The Haag, Netherlands, and Waggonner & Ball, an architecture firm headquartered in New Orleans, LA.



Credit: Waggonner & Ball

Process and GI project selection

CBF and QV introduced the City to the idea of using an EIB before Phase II of Resilient Hampton's Water Plan began to take shape. The City, led by the Department of Community Development (DCD) and the Department of Public Works (DPW), decided an EIB could be an appropriate financing tool for deploying the innovative solutions that were still in the early phase of development. Once Hampton's application for CBF assistance was approved, briefings of senior City staff[10] about how an EIB might work began. It soon became a strong working relationship. CBF and QV began participating in a regular meeting schedule for ongoing coordination and consultation with the DCD director, Public Works staff, Waggonner & Ball, and Moffat and Nichol Engineers. These meetings were initially facilitated by Waggonner & Ball, then by CBF, and later by QV once the Waggonner and Ball contract ended.

In order to move its *Newmarket Creek Water Plan* into the next phase of work, begin concept design of various projects under its Resilient Hampton banner, and contemplate which projects might best be financed using an EIB, the City brought its Dutch, New Orleans, and local consultants to Hampton in January 2019 for a multi-day set of site visits, consultations, and a community-engaging charette. CBF and QV, together with more than 120 community members, students from Old Dominion and Hampton Universities, and other local stakeholders participated.

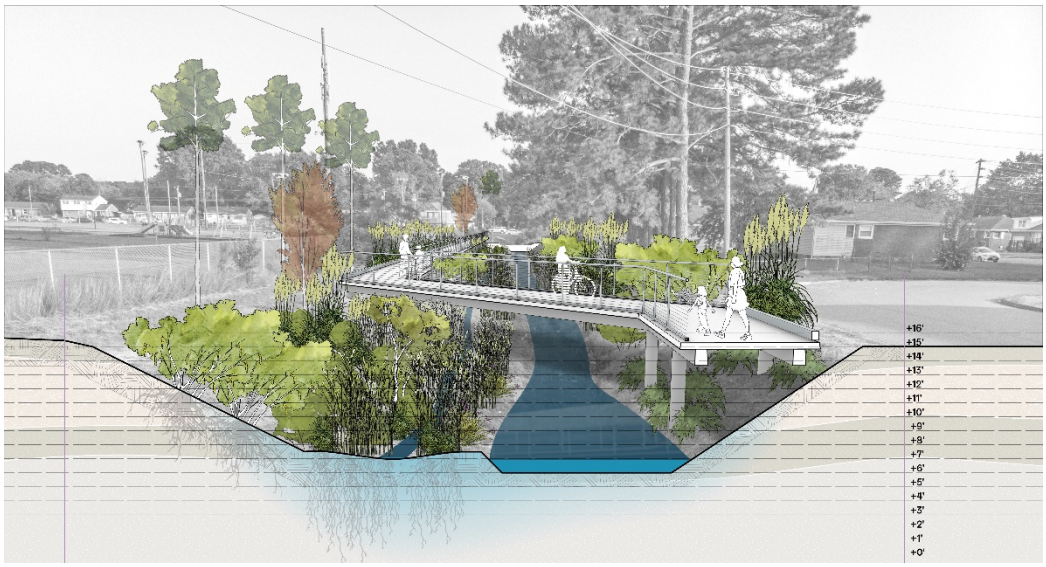
[10] In this case, the Director of DCD became a key champion of the venture, as did his senior planner and his Resiliency Officer. Initial briefings included the City's Director of Finance, the Assistant City Manager in charge of budget matters, and one of the City Engineers in DPW.

The all-day charette and evening community meeting helped narrow down ideas for slowing, storing, and diverting runoff in various neighborhoods and identified a number of conceptual projects across the Newmarket Creek watershed. The months that followed helped to refine and conceptually design several of these projects so that they could move into engineering design—and EIB financing—in the order the City decided was best.

The working group initially decided on three projects from the concept list to begin the engineering design process. A sudden change of direction (and lengthening of the project timeline) became necessary, however, when the City Manager decided to finance this bundle of projects using a traditional municipal bond because rates appeared especially favorable.

The working group scrambled, and after two months of additional research and discussion, developed a substitute group of projects. But project selection, unfortunately, still wasn't done. Among the "new" group of projects were a large parking lot retrofit and extensive work on several old school sites. Other City entities, including the School Board, were not entirely enamored of the choices involving their property, and the parking lot retrofit was complicated by timing issues, so several other possibilities from the Resilient Hampton *Newmarket Creek Water Plan* were examined.

Finally, after six more weeks of work, the working group settled on three large, innovative projects that would move forward into final design by Moffat and Nichol Engineers. A description of each, together with conceptual drawings by City consultant Waggonner & Ball, are included below.



Big Bethel Blueway

This green infrastructure project will store and slow water through the redesign of existing drainage waterways to reduce flooding upstream and downstream in Newmarket Creek. The project creates stormwater storage through the installation of several weirs in the large main drainage channel (which will be expanded), and the addition of bioretention cells to connecting backyard drainage swales. Newly planted vegetation on the channel banks will filter and slow stormwater runoff before it reaches the waterways. Future funding will transform the existing maintenance path into a recreation trail with additional stormwater storage capacity.

North Armistead Road Road-Raising and Green Infrastructure

This road elevation project will eliminate chronic flooding on a major thoroughfare and evacuation route, improving transportation reliability to Joint Base Langley-Eustis and other key economic centers. In connection with the road raising on the south-bound lanes of this major thoroughfare, green infrastructure bioswales will be installed in the median and on the road shoulders to help slow, store, and infiltrate stormwater within the space adjacent to the elevated roadway, redirecting it to the drainage improvements of Lake Hampton, noted below.

Credit all images: Waggonner & Ball

Lake Hampton Stormwater Park

This project involves the transformation of a retention pond into a purpose-built stormwater park, with significantly enhanced stormwater storage capacity. The project will raise the height of the dam and weir to greatly increase potential storage volume, as well as install a series of smaller detention terraces with wetland plantings to form a “treatment train” that will slow, store, and clean runoff from North Armistead Avenue before it enters the lake. Shared-use paths will be built with separate, future funding.

Developing outcomes and performance metrics

The outcomes discussion in Hampton was rich and extensive. The City was potentially interested in applying some of the Resilient Hampton draft evaluation criteria which had earlier been developed, emphasizing not only project effectiveness but also equity and other possible co-benefits. The team collected information on ways to measure some of these, but in the end, for these three projects, decided that simplicity would be favored *for the purpose of the EIB itself*. Thus, given the Resilient Hampton study from which the projects emerged, the outcome would be the capacity of these projects to effectively manage (slow, store, or redirect) stormwater runoff to reduce the effects of climate change (more precipitation, flashy storms, and localized or repetitive flooding).

The environmental metric that seemed most amenable to measurement, and most relevant to all three projects, was *the volume of water to be stored and managed*. Specifically, the metric would measure the volume of water management (storage capacity) projected from the pre-construction designs (8.62 million gallons), as compared to the "as-built" projects[11], to be validated in post-construction surveys by an independent evaluator. Moffat and Nichol, the City's consulting engineers, helped develop the part of the Technical Memorandum containing engineering calculations and a methodology for post-construction validation.

It should be noted that a variety of co-benefits will also accrue to the City from these projects: the road-raising, for example, will eliminate traffic disruptions from a current average of 92 hours of flooding per year, affecting an average of 45,000 vehicle trips annually. Additionally, all three resilience projects and their vegetation will help reduce localized urban heat island effects, improve air quality, provide neighborhood green space, and, with other funding, develop recreational walking or biking trails.

Bond structuring and drafting

While regular team meetings continued to refine the metric methodology and review the designs that were emerging, the financial team began meeting to discuss how best to move the project into EIB financing for a total of $12 million in capital. The net proceeds of the bond, after deduction of issuance costs, will be used by the City to pay the costs of these projects.

Bond counsel (Kutak Rock), the City's independent financial advisor (Davenport), the City's own finance staff, and QV and CBF began creating the regular bond transaction documents. The team decided that this would be a public offering, assisted by an underwriting team of Morgan Stanley (as lead underwriter) and Wells Fargo (as co-manager) after a short competitive process. As a negotiated sale, the underwriters would also assist in highlighting the outcomes-based evaluation and disclosure of project impacts to Environmental, Social and Governance (ESG) and green bond investors in particular.

In the meantime, QV and CBF began developing the Technical Memorandum that would accompany transaction documents, describing the projects in the EIB and how the outcome would be measured. Importantly, a decision was made by the financing team that this EIB, unlike those in Atlanta and the District of Columbia, would be a "disclosure only" EIB, where the measured outcome would be disclosed to the impact investors at the appropriate time, but it would not affect the return on investment or the cost of the bond to the City.

The Technical Memorandum described the projects in detail, including the anticipated water management outcome in gallons (see above), how inspections will proceed during construction, and how the third-party validator will evaluate the projects.

[11] Actual post-construction volumes can vary from those originally designed and modeled due to several factors, including the variability in cost of materials and labor, variability in Contractor bid prices, unforeseen utility lines, availability and width of easements, and even Contractor care in following blueprints. The evaluation provided by a third-party validator will provide the City with direct feedback about the degree to which these three resiliency projects provide the benefits anticipated in engineering designs, allowing for either replication or adjustment in future related projects.

First, the contractor for each project will measure the geometric dimensions of each project through a post-construction, as-built survey (these geometric dimensions were used for the pre-construction design calculations), and submit a survey report to the City; second, the independent, third-party validator will conduct site inspections of each project and both spot-check field measurements and provide photographs, to validate as-built dimensions. These will be assembled using "Civil 3D," an engineering software program, and combined by the validator.

The final report from the validator will discuss its site assessments and calculations, noting any significant design deviations from the total volume storage capacity, and the validator's expert conclusion as to whether the projects as-constructed meet the goals of the original design. The report will be shared with the City no later than 180 days after submission of the Certificate of Completion provided to the City. The City will then post the validator's report and comparison of the relative as-designed and as-built project volume storage capacities on the Electronic Municipal Market Access (EMMA) information website, and on the Resilient Hampton website. This will fulfill the City's obligation to report the outcome to the bond investors.

Project conclusion

After the bond solicitation on the open market was made with the help of the bond underwriting team, bids were received and reviewed by the City's financial team. EIB investors were selected by the City shortly thereafter, with winning bids collectively presenting a very favorable interest rate for the City: less than two percent. As of this writing, the three projects are continuing toward final design, with the objective to begin construction during Fiscal Year 2022.

Lessons learned

As noted with respect to the Baltimore EIB project, it is very important that municipal EIB projects have internal, high-ranking champions who can speak knowledgeably, and do so regularly, with their municipal colleagues and political leadership. Creating a trust relationship between outside EIB project managers/facilitators (in this case CBF and QV) and those leaders is essential, through good communications and capable, sensitive problem-solving as issues arise.

Another imperative is the formation of a strong working team among the outside project managers, the internal City managers and staff who need to move the project forward, and the City's outside consultants—in this case, the departments of Public Works and Community Development, Waggonner & Ball, and Moffat and Nichol Engineers. All must understand the process going forward, participate in regular meetings, and consistently translate planning into action, step by step.

Involving the finance team early in the process to familiarize them with the concept, with a full check-in several months later to share additional information on progress and impending needs, and finally holding regular meetings once structuring of bond financing began, was a way to smooth the transition from outcome, concept, and engineering discussions to developing the transaction process and "paper" for the bond.

Flexibility due to changing circumstances is crucial (for example, in Hampton's case, the loss of projects when some were sidetracked for regular municipal financing). In Hampton, the full team also needed to remain flexible with respect to the types of EIB models available, discussed, and ultimately chosen.

Notably, the "outside" team (CBF and QV) had to be ready to provide whatever assistance might be needed at important project waypoints: for instance, helping refine the scope and type of infrastructure investments to be chosen; developing and "keeping" of project task timelines; creating and moderating an agenda for weekly or biweekly meetings; briefing important city officials and financial consultants along the way; and assisting with press and communications.

Finally, there was overwhelmingly positive attention, initially from underwriters and later from investors when this EIB was marketed, which is unusual for a bond issuer and an issuance of this size – proof that mainstream Wall Street is looking for outcomes-driven investments like this as their own ESG strategies and interests expand. This should be beneficial to municipalities which are willing to think a little outside their comfort zone to take EIBs to market.

Conclusions

The CBF EIB Project was an experiment to determine the general applicability of this new financing concept for addressing certain funding problems encountered in the Chesapeake Bay watershed, often at the municipal level. The EIB project concept sparked several key questions: What conditions are necessary for this concept to work, and for an outside organization to be able to assist in the process of its implementation? What expertise must be marshalled? What are some of the challenges to developing and managing these projects? What are the most notable limitations, and what components are most necessary for a successful conclusion?

This white paper begins to provide at least some initial answers to these important questions.

In sum, EIBs are not suitable for every situation. They are specialized bonds that lie outside the realm of traditional municipal financing. Nonetheless, they provide an additional financing tool for municipalities contemplating innovative but unproven types of infrastructure for which it may be difficult to secure State Revolving Fund loans, marshal other funds, or market to traditional investors. The success of an EIB issuance is largely dependent on early and continuing engagement of the community and city officials—particularly high-ranking officials who can champion the project—as well as strong communication and working relationships among city departments, outside consultants, and the financing team.

Ultimately, EIBs are one more way to help localities meet the *financial* challenges that inevitably underlie the *environmental and climate change* challenges that increasingly confront local governments.