ABSTRACT

The State of Maryland has been steadfast in their commitment to the health and recovery of the Chesapeake Bay. Environmental policy has been a large part of Maryland’s political agenda and development for many years, with recovery efforts dating back to 1983. While progress has been made on improving many of the key indicators of a healthy Bay, the pollution levels of nitrogen and phosphorus have increased over the last year. Effects from nonpoint source pollution, specifically stormwater runoff, have been linked to the increase in these pollutant types. In an effort to address this ongoing problem, this capstone project proposes a newly created grant program that would enable local municipalities and organizations to implement projects aimed to reduce the harmful effects of nonpoint source pollution.

Advisor: Paul J. Weinstein, Jr.
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DECISION MEMORANDUM

TO: Governor Larry Hogan

FROM: Madison Pierson, Student, Johns Hopkins Advanced Academic Programs

SUBJECT: Stormwater Runoff, The Chesapeake Bay

DATE: February 2, 2019

Action Forcing Event

This January, the Chesapeake Bay Foundation (CBF) released their annual State of the Bay report that rated the Chesapeake Bay a score of 33, a one-point drop from last year and an overall rating of a D+¹. Several news journals have reported on this decline, including the Washington Post², CBS Baltimore³ and the Baltimore Sun⁴.

Statement of the Problem

The health and recovery of the Chesapeake Bay has been a conversation of Maryland’s policy agenda and development for many years, with recovery efforts dating back to 1983⁵. The Bay is one of our most priced natural resources in Maryland that not only adds social, environmental and cultural value to our citizens, but also has tremendous


economic benefits. Three of the main economic contributors of the Bay - tourism, job creation, and the seafood industry- provide significant financial value to Maryland.

The recovery programs in place to maintain, preserve and improve the vitality of the Chesapeake Bay have demonstrated positive results for 2 of the 3 main indicators of a healthy bay: habitats and fisheries. However, the CBF reported declines in the third indicator of a healthy bay: pollution. As outlined in figures 1 and 2, there have been score declines for nitrogen (down 5 points), phosphorus (down 9 points) and water clarity (down 4 points) since 2016.

Figure 1: Chesapeake Bay Pollution Scores

<table>
<thead>
<tr>
<th>Type of Pollutant</th>
<th>2018 Score</th>
<th>2016 Score</th>
<th>2014 Score</th>
<th>Change 2016 - 2018</th>
<th>Change 2014 - 2016</th>
<th>2018 Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>12</td>
<td>17</td>
<td>16</td>
<td>-5</td>
<td>1</td>
<td>F</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>19</td>
<td>28</td>
<td>25</td>
<td>-9</td>
<td>3</td>
<td>F</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>42</td>
<td>40</td>
<td>37</td>
<td>2</td>
<td>3</td>
<td>C</td>
</tr>
<tr>
<td>Water Clarity</td>
<td>16</td>
<td>20</td>
<td>18</td>
<td>-4</td>
<td>2</td>
<td>F</td>
</tr>
<tr>
<td>Toxics</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>0</td>
<td>0</td>
<td>D</td>
</tr>
</tbody>
</table>


All three of these indicators—nitrogen, phosphorus, water clarity—had seen progress and positive score changes from 2014 to 2016⁹. Restoration programs were successfully reducing the amount of pollution in the Bay; yet as reported in 2018, the scores for these three pollutants have begun to worsen. The CBF recorded that in 2018 “nitrogen and phosphorus pollution increased significantly because of record rainfall. Water quality was disrupted by sediment runoff and algal blooms fed by the additional nutrients”¹⁰. Many experts suggest that as the effects of climate change intensifies, the record rainfall that Maryland experienced in 2018 is not set to be an outlier when looking ahead in Maryland’s future. According to the Environmental Protection Agency’s (EPA) 2016 report on climate

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change, the annual precipitation in Maryland has “increased about 5% in the last century”\textsuperscript{11} and “average annual precipitation and the frequency of heavy downpours are likely to keep rising”\textsuperscript{11}.

With the increased rainfall becoming Maryland’s new normal, there is also an increased opportunity for polluted waters to enter our waterways. Increased rainfall leaves opportunity for contaminated runoff to enter our waterways and eventually the Chesapeake Bay. This process is referred to as nonpoint source pollution. The Chesapeake Bay Program reports that nutrients like nitrogen and phosphorus enter our waterways “through urban, suburban and agricultural runoff come from a range of sources, including lawn fertilizers, septic systems and livestock manure”\textsuperscript{12}. Rainfall increases the flow of nutrient dense water from runoff, but nutrient dense runoff is in large part due to human activity. And as reported above by the CBF, this is what transpired in 2018 and is why the Bay’s pollution indicators of nitrogen, phosphorus and water clarity were negatively impacted. As described, the increased runoff from rainfall leaves way for more nutrients from human activities entering Maryland’s watershed. The Chesapeake Bay watershed is comprised of more than 100,000 rivers, creeks and streams, spans more than 64,000 square miles and is home to over 18 million people\textsuperscript{13}. This leaves the Chesapeake Bay highly vulnerable to the impacts of nonpoint source pollution and contamination from human activities, as human actions on land have large implications on the health of the Bay.


\textsuperscript{12} “Nutrients,” \textit{Chesapeake Bay Program}, Accessed February 16, 2019: \url{https://www.chesapeakebay.net/issues/nutrients}

\textsuperscript{13} “Watershed,” \textit{Chesapeake Bay Program}, Accessed February 16, 2019: \url{https://www.chesapeakebay.net/discover/watershed}
Not only is this a large threat that Maryland is experiencing, but the increasingly prevalent effects of nonpoint source pollution are being felt by the majority of U.S. states. The EPA reports that the effects of nonpoint source pollution are the leading remaining cause of water quality problems amongst states\textsuperscript{14}.

Nitrogen and phosphorus are naturally occurring nutrients in aquatic ecosystems. Levels of both nutrients will always be detected in and need to be detected to maintain a healthy aquatic ecosystem like the Chesapeake Bay. According to the EPA, both nitrogen and phosphorus “support the growth of algae and aquatic plants, which provide food and habitat for fish, shellfish and smaller organisms that live in water”\textsuperscript{15}. However, while both nutrients have positive benefits, increased levels of these nutrients interfere with oxygen levels that plants and fish need to survive and have grave implications for the economy and the health of Maryland residents\textsuperscript{15}. The Chesapeake Bay’s increased pollutant levels are not just an issue for the Bay, but have widespread impacts for the entire Maryland community.

**History/Background**

a. **Federal Water Pollution Control Act (Clean Water Act)**

Today, in America and across the globe, we continually read about, listen to, debate on and discuss environmental protection, specifically related to water pollution. This has been a conversation in American lives and policy since the 1948 statute of the Federal Water Pollution Control Act which provided government the authorization to establish

\textsuperscript{14} “Polluted Runoff: Nonprofit Source Pollution,” United States Environmental Protection Agency, Accessed April 20, 2019: https://www.epa.gov/nps/basic-information-about-nonpoint-source-nps-pollution

programs that focused on improving the sanitation of surface and underground waters and that aimed to reduce water pollution\textsuperscript{16}. Over the next 71 years, this act has stood as the basis for forthcoming clean water legislation, and has been amended numerous times to broaden and strengthen its original scope.

A pivotal amendment occurred in 1972 when increased public awareness and concern resulted in major policy revisions of the Federal Water Pollution Control Act. The original act of legislation became, as we know it today, the Clean Water Act (CWA)\textsuperscript{17}. This was a monumental point in water pollution policy, as it provided funding and a basis for structure of water regulation and protection. With these amendments, most notably, the CWA “established the basic structure for regulating pollutant discharge into the waters of the United States,” “recognized the need for planning to address the critical problems posted by nonpoint source pollution,” funded construction of sewage treatment plants and continued water quality testing standards and requirements\textsuperscript{18}.

\textbf{b. Chesapeake Bay Agreements and Legal Action}

In 1987, the Chesapeake Bay agreement was signed by representatives of Virginia, Maryland, Pennsylvania, the District of Columbia, the Federal Government and the Chesapeake Bay Commission that acknowledged the commitment of each to protecting and restoring the Bay, and set measurable goals related to recovery and restoration. One of the goals set forth was to “reduce and control point and non-point sources of pollution to

\textsuperscript{16} 33 U.S.C. 1251 - 1376; Chapter 758; P.L. 845, June 30, 1948; 62 Stat. 1155
\textsuperscript{17} 33 U.S.C. 1251 et seq, (1972)
attain the water quality condition necessary to support the living resources of the Bay”19. Within this goal, each state committed to attaining at least a 40% reduction nitrogen and phosphorus entering the Bay by year 200019- an ongoing problem effecting the health of the Chesapeake Bay today.

Again, in 2000, a similar agreement was put forth and signed by representatives of Virginia, Maryland, Pennsylvania, the District of Columbia, the Federal Government and the Chesapeake Bay Commission reaffirming the aforementioned jurisdictions commitment to the Chesapeake Bay. Most notably, within this agreement was a continued goal of increased water quality and a commitment of investing in stormwater management. The agreement stated, “by 2001, develop an Executive Council Directive to address stormwater management to control nutrient, sediment and chemical contaminant runoff from state, federal and District owner land”20. With this directive, the agreement also committed to evaluative measures of stormwater management, stating “by 2004, the jurisdictions will evaluate local implementation of stormwater, erosion control and other locally-implemented water quality protection programs that affect the Bay system and ensure that these programs are being coordinated and applied effectively in order to minimize the impacts of development”20.

Both of these agreements, in 1987 and 2000, have been powerful in acknowledging the commitments of partnership between each jurisdiction and instilling a shared mission of Bay health and protection. There has been criticism, particularly from the CBF, that these agreements are not producing the results each jurisdiction commits to and that
“federal, state, and local governments of the region needed to commit to take dramatic, cooperative action”\textsuperscript{21}. In response to this frustration and lack of outcomes, the CBF filed a lawsuit against the EPA that was rooted in unmet goals, unfilled promised and lack of accountability\textsuperscript{22}. This lawsuit was filed on January 5, 2009 and settlement was reached on May 11, 2010 with a binding agreement. In this historic lawsuit, the EPA acknowledged that “one of the biggest sources of pollution in the Bay region is urban stormwater and that this form of pollution is growing”\textsuperscript{23}. This legally binding settlement, required that the EPA “take specific actions by dates certain to ensure that pollution to local rivers, streams, and the Chesapeake Bay is reduced sufficiently”\textsuperscript{23}.

c. **Maryland Stormwater Utility Fee**

To address the issues of stormwater runoff, Maryland passed House Bill 987 of 2012, an enacted law crafted to address stormwater runoff\textsuperscript{24}. This was one of the first pieces of legislation passed in the United States that imposed a stormwater utility fee to residents. This bill, which applied to 10 jurisdictions in Maryland, required each jurisdiction to adopt laws or ordinances that impose a new residential fee to homeowners. The income generated through the acquired fees was directed towards individual watershed protection and restoration funds for each jurisdiction; specifically, the new funds were used to assist in

\textsuperscript{21}“The History of Chesapeake Bay Cleanup Efforts,” Chesapeake Bay Foundation, Accessed March 1, 2019: https://www.cbf.org/how-we-save-the-bay/chesapeake-clean-water-blueprint/the-history-of-bay-cleanup-efforts.html


\textsuperscript{24}Watershed Protection and Restoration Programs, HB987, Chpt. 151, 2012 Reg. Sess. (MD 2012)
jurisdictions stormwater management efforts. Those jurisdictions included: Anne Arundel, Baltimore City, Baltimore, Carroll, Charles, Frederick, Harford, Howard, Montgomery and Prince George’s. House Bill 987 was later relinquished when the Maryland General Assembly, under your leadership, passed Senate Bill 863 in 2015. This lifted the mandate from the State of Maryland to impose stormwater utility fees. While no longer in legislation, this period of Maryland imposing a stormwater utility fee was one of Maryland’s unsuccessful yet bold attempts at combating the harmful effects of pollution on the Chesapeake Bay.

d. “State of the Bay” Report Card

Although not a policy, the CBF’s annual “State of the Bay” report card has had large effects on public awareness of Bay restoration efforts and public policy. With the first publication beginning in 1998, the “State of the Bay” provides annual updates on the health of the Bay and tracks progress- or lack thereof- of recovery programs and initiatives. The CBF’s annual reports stand as a basis for measuring the effectiveness of environmental policy and provide a firm measure of accountability for Maryland’s, and others, efforts.

Key Stakeholders

Described below are the key stakeholders who have been most active, impacted and/or vested in the effects of stormwater runoff on the Chesapeake Bay. They each play a unique and crucial role in this topic.

- **Maryland General Assembly:** The Maryland General Assembly, with 47 representatives in the Maryland State Senate and 141 representatives in the Maryland House of Delegates, is the governing body of Maryland. These representatives are instrumental in addressing the effects of stormwater runoff on the Chesapeake Bay through public policy, as they are charged with drafting, voting on and implementing policy. Within the Maryland General Assembly, there are varying levels of interest, or lack of, in environmental policy.

- **Local Governments of Maryland:** The health and vitality of the Chesapeake Bay and the effects of stormwater runoff is not just an issue for the State of Maryland, but it is felt by all 23 counties and 157 municipalities. Each local government official, in varying capacity, is engaged in conversation and decisions surrounding the Bay.

- **Chesapeake Bay Program (CBP):** The CBP, a regional partnership that encompasses the Chesapeake Bay Commission, Commonwealth of Pennsylvania, Commonwealth of Virginia, District of Columbia, State of Delaware, State of Maryland, State of New York, State of West Virginia and the EPA, is an influential partnership that has large stay power, authority and credibility the topics of the Bay, including stormwater runoff. Through the CBP, partners have put forth and signed written agreements to address pollution levels in the Bay. The CBP is the main body that is tackling restoration goals and programs in a cohesive, multi-actor, multi-state approach. It is important to highlight that each individual partner of the CBP also has an individual stake in the issue of stormwater runoff.
- **Chesapeake Bay Foundation (CBF):** The CBF is one of the most active and critical players in the health of the Bay. Their annual report, “State of the Bay,” serves as a benchmark and success measure for Maryland’s environmental efforts and policy. Their involvement is critical in any effort related to the Chesapeake Bay.

- **Maryland League of Conservation Voters:** This non-partisan, 501(c)(4) organization is the leading watchdog organization in the state that advocates for environmental conservation laws. In addition to their advocacy, they also produce annual reports of key legislators— including one exclusively on the Governor— that evaluates the environmental votes for the year. They are a large and powerful voice with Maryland who are actively involved in the majority, if not all, environmental legislation pursued by the state.

- **The Maryland Watermen’s Association, Inc.:** It is essential to note the involvement of watermen, those individuals who directly and indirectly make a living on the natural resources of the Bay, and the businesses that depend on the resources of the Bay, as stakeholders in this area. Watermen are greatly impacted by the health of the Bay and have a vested interest in any decision, policy and/or agreement related to the Bay. The Maryland’s Watermen’s Association represents those individuals and groups.

**Policy Proposal**

The purpose of this proposal is to support the prevention, treatment and recovery efforts of the Chesapeake Bay and Maryland’s longstanding priority of maintain the vitality of their natural resources. While there are many factors that affect the health of the Bay, this proposal specifically addresses the negative externalities that stormwater runoff has on
the Bay; specifically, increased levels of nitrogen and phosphorus. The goal of this proposal would be to reduce the nitrogen and phosphorus levels in the Chesapeake Bay by 15% by the end of FY2024.

In order to achieve this goal, the policy proposal would authorize the State of Maryland to establish the *Green the Gray Grant Program*, a state-funded grant program that provides seed-funding to local municipalities, communities and nonprofits for projects aimed at reducing stormwater pollution through the use of green infrastructure.

A fundamental approach in the field of public health is the emphasis on prevention rather than treatment. Instead of treating people who are sick, a public health professional works to prevent people from becoming sick. This proposal applies the aforementioned theory to stormwater runoff. In order to effectively address the problem of increased nutrient levels in the Chesapeake Bay, we need to stop the nutrients from entering the waterways that connect to the Bay. Green infrastructure is defined as “an approach to wet weather management that use natural systems- or engineered systems that mimic natural processes- to enhance overall environmental quality and provide utility services. As a general principal, green infrastructure techniques use soils and vegetation to infiltrate, evapotranspire, and/or recycle stormwater runoff”28. The use of green infrastructure is the tool in which to achieve the goal of this proposal. *Figure 3* outlines the project types and scopes of work that would be considered for this grant. Potential grantees need to incorporate projects that utilize tactics of green infrastructure to reduce stormwater runoff in order to be considered.

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### Figure 3: Green the Gray Grant Program, Potential Project Type

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td><strong>Rain Gardens</strong></td>
<td>Rain gardens manage and treat small volumes of stormwater by filtering runoff through soil and vegetation within a shallow depression.</td>
</tr>
<tr>
<td><strong>Bioretention Areas</strong></td>
<td>Bioretention areas capture and treat stormwater, allowing the water to filter through soil and vegetation.</td>
</tr>
<tr>
<td><strong>Green Roofs</strong></td>
<td>Green roofs are layers of soil and vegetation installed on rooftops that capture runoff. The vegetation allows evaporation and evapotranspiration to reduce the volume and discharge rate of stormwater.</td>
</tr>
<tr>
<td><strong>Street Buffer Restoration</strong></td>
<td>A healthy vegetated buffer helps improve stream health and water quality by filtering and slowing polluted runoff, along with many other benefits.</td>
</tr>
<tr>
<td><strong>Vegetated Swales / Dry Swales</strong></td>
<td>Swales are natural drainage paths or vegetated channels used to transport water instead of underground storm sewers or concrete open channels. They increase the time of concentration, reduce discharge, and provide infiltration.</td>
</tr>
<tr>
<td><strong>Porous Pavement</strong></td>
<td>Pervious types of pavements allow stormwater to infiltrate through the surface, reducing storm water runoff and some pollutants.</td>
</tr>
</tbody>
</table>

All potential grantees will need to submit their scopes of work by 5:00pm on June 30, 2020 to be considered for the *Green the Gray Grant Program*. This grant will be a competitive grant program. The criteria for a successful grantee is based on size of the project, type of the project and ultimately those projects that have articulated the impact of the project on reducing stormwater runoff and the effects of such on the Chesapeake Bay. There will also be an emphasis placed by the review committee on diversity of location, with the goal to have a range of geographic areas impacted by the *Green the Gray Grant*.

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Program. Grants will be awarded in ranges of $50,000-$250,000 and will be made payable over a 5-year period.

a. Policy Authorization Tool

The policy authorization for this proposal will be a new green infrastructure bill that will be introduced and sponsored by you, Governor Larry Hogan in the 2020 Legislative Session. It is proposed that SB 808 be introduced to the Maryland Senate for consideration and once approved, introduced to the Maryland House of Representatives for consideration. Be it enacted by the General Assembly of Maryland, SB 808 will provide Governor Hogan the authorization to allocate $10,000,000 in funding, budgeted over 5 fiscal years: FY2020 through FY2024. The funding will establish the Green the Gray Grant Program.

b. Policy Implementation Tool

This state-funded Green the Gray Grant Program will be administered, maintained and managed by the Maryland Department of Natural Resources and support the goal of reducing the nitrogen and phosphorus levels in the Chesapeake Bay by 15% by 2024. More specifically, within the Department of Natural Resources this grant will be categorized under the Land Acquisition & Planning Unit.

Policy Analysis

Before a recommendation can be made on whether or not to propose SB 808 it is necessary to conduct a thorough cost-benefit analysis that measures the success of the proposed policy in meeting the aforementioned goal of reducing the nitrogen and phosphorus levels in the Chesapeake Bay by 15% by 2024. This rounded analysis will review the impacts of the proposal on various aspects that include: the overall impact of
the proposal on reducing nitrogen and phosphorus levels, a measure of the economic benefits and/or consequences of the proposal, a review of the administrative capabilities needed to execute the proposal and an overall analysis of the grant programs effectiveness and efficiency.

a. **Reduction of Nitrogen and Phosphorus Levels**

   It is vital to review the proposals effectiveness of meeting the overall goal of reducing the nitrogen and phosphorus levels in the Chesapeake Bay by 15% by 2024. As highlighted above, the Chesapeake Bay watershed is comprised of more than 100,000 rivers, creeks and streams, spans more than 64,000 square miles and is home to over 18 million people. To briefly reiterate, the health of the Bay is dependent on the health of those 100,000 rivers, creeks and streams and stormwater runoff and what it carries is a threat to that health. By addressing stormwater runoff at a local-level, this grant gives the opportunity to improve the health of the waterways that feed into the Bay. To analyze the impact of green infrastructure projects on stormwater runoff, local-level case studies will be summarized and discussed.

   One such case study of implemented green infrastructure practices is the *Burnsville Rainwater Gardens* in Minnesota. The purpose of the project was to create a rainwater garden system that was effectively designed to soak up rainwater with a goal of reducing the volume of stormwater runoff and the subsequent increased phosphorous levels being carried with the rainfall. After the project was implemented, a study “determined that the

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30 “Watershed,” Chesapeake Bay Program, Accesssed February 16, 2019: [https://www.chesapeakebay.net/discover/watershed](https://www.chesapeakebay.net/discover/watershed)

rainwater gardens reduced runoff volumes by approximately 90%...and provide high levels of runoff reduction and storm water quality reduction.” Measured in cubic feet per second (CFS), a significant decrease in runoff levels occurred after construction. This is visually expressed in figure 4. While not presented in the figures, the report also attributed the reduction of stormwater runoff with decreased levels of phosphorus. It is important to highlight that while this case study occurred in Minnesota, a Green the Gray Grant Program grant could be awarded for a similar project, pending applicant projects.

Figure 4: Burnsville Rainwater Gardens, Before and After Runoff Analysis

An additional example of successful green infrastructure practices, is the use of green roofs in highly urbanized areas. Urban areas are highly susceptible to large amount of runoff due to the amount of pavement and lack of green space to naturally filter and absorb water. In a case study published in Molecular Diversity Preservation International (MDPI), the use of green roofs as a tool for stormwater management was analyzed. The study specifically looked at Seoul, as Seoul is a highly urbanized city in Korea. The scope of the project including constructing green roofs on various mid to high rise buildings

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throughout the city. The results of their study “indicated that green roof has the ability to hold 10 to 60% of the total rainfall runoff in different rain event”\textsuperscript{33}. Figure 5 further represents the positive measures experienced in Seoul. When comparing green roofs to conventional roofs, green roofs not only reduce the amount of runoff accumulated but also increased the time in which runoff is experienced. Highly urbanized Maryland cities like Baltimore and Silver Spring have the potential to benefit from a similar project, and with the Green the Gray Grant Program, similar projects could be implemented.

\textit{Figure 5: Rainfall Runoff Response of Green Roof and Conventional Roof}\textsuperscript{33}

b. Economic Impacts of Green Infrastructure

The proposal’s approach to tackling the negative effects of stormwater runoff on the Chesapeake Bay - increased nitrogen and phosphorous levels - through green infrastructure has both positive and negative economic impacts on the state of Maryland.

Increased investment in green infrastructure through grant projects has the potential to launch significant economic benefits for Maryland. On a general level, the EPA reports that this green approach to stormwater management of mimicking the environment’s natural filtration system “has been shown to be more cost-effective when compared with traditional gray infrastructure approaches, and green infrastructure offers numerous ancillary benefits”\(^\text{34}\). Standard techniques to manage stormwater, commonly referred to as gray infrastructure approaches, require ongoing maintenance and repair. As expressed by the EPA, this very reason is why green practices are most cost-effective. In addition to reducing stormwater runoff and pollutant levels in waterways that lead to the Chesapeake Bay, the EPA cites those ancillary benefits that result from green infrastructure include increased beautification and overall aesthetics of cities, public education opportunities to teach Maryland’s community on environmental projects, improved air quality caused from increased vegetation, and an overall increase of quality of life\(^\text{35}\).

The EPA continued to cite that “green infrastructure can reduce the cost to implement a stormwater management program because the amount of stormwater to be conveyed and treated is reduced”\(^\text{35}\). In short, the investment in green infrastructure would alleviate funding needs for other stormwater prevention and pollutant cleanup projects that the state and local municipalities of Maryland are currently charged with and potentially defer any future cleanup costs altogether.

While there are economic benefits for Maryland, there are also expressed cost savings opportunities for local business developers and residential communities who

implement green infrastructure tactics and projects. Outlined in figure 6 are case studies of green infrastructure plans that have been implemented in various local, residential areas and the corresponding costs savings values for each individual plan. It is important to highlight that the term low impact development (LID) is expressed in figure 6 and refers to green infrastructure projects that are specific to land development. While these plans were smaller in scale, they each resulted in cost savings and economic benefit for each residential area. These cost saving opportunities provide an economic incentive for grant submissions and business support throughout the grant process.

**Figure 6: Cost Savings from Installing Green Infrastructure Projects in Residential Developments**

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>LID Cost Savings (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodland Reserve* Residential Development, Lexana, KS</td>
<td>Reduced land clearing, reduced impervious surfaces, and added native plantings. (Bezhold 2006)</td>
<td>$118,420</td>
</tr>
<tr>
<td>The Trails* Multi-Family Residential Development, Lexana, KS</td>
<td>Reduced land clearing, reduced impervious surfaces, and added native plantings. (Bezhold 2006)</td>
<td>$89,043</td>
</tr>
<tr>
<td>Medium Density Residential Development, Stafford County, VA</td>
<td>45-acre, 108-lot clustered development, reduced curb and gutter, storm sewer, paving, and stormwater pond size. (Center for Watershed Protection 1999b)</td>
<td>$300,547</td>
</tr>
<tr>
<td>Low Density Residential Development, Wicomico County, MD</td>
<td>24-acre, 8-lot development eliminated curb and gutter, reduced paving, storm drain, and reforestation needs. Eliminated stormwater pond and replaced with bioretention and bioswales. (Center for Watershed Protection 1999b)</td>
<td>$2,140 per lot^b</td>
</tr>
</tbody>
</table>

*Indicates hypothetical or modeled project, not actually constructed.
^b Per-lot cost savings calculated by ECONorthwest.

Despite the policy’s economic benefits, increasing the amount of funding allocated in the FY2020 through FY2024 budgets - an additional $2,000,000 per fiscal year, totaling

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a cost of $10,000,000 - towards environmental priorities would likely result in a decrease of budgeted funding in other priorities areas that may include education, housing and community development, transportation, economic development and others. While variations in budgetary allocations fluctuate year to year, this new allocation of $10,000,000 to establish the *Green the Gray Grant Program* does have potential to reallocate funding from other key issue areas and priorities of Maryland.

c. Administrative Capabilities

A potential cost and/or weakness of the proposal revolves around the administrative needs to implement the grant program. Grant programs require continuous oversight and administrative attention from start to finish; whether that be in finalizing the application process, reviewing potential grantee proposals, overseeing the projects or allocating resources to measure the grants. While the Land Acquisition & Planning Unit within the Department of Natural Resources have experience with managing grant operations, a new grant would require increased administrative time and attention, particularly in the preliminary months and application process. Annually, the Land Acquisition & Planning Unit create a fiscal year grant packet\(^\text{36}\) and with adequate notice, they would be able to budget time and personnel to maintain this new grant within their already ongoing grant projects.

d. Grant Program Effectiveness and Efficiency

In addition to grant programs requiring significant administrative oversight, there has also been criticism of federal and state-level grant programs in general. The Society for Nonprofits summarizes the shared criticisms of government grants. These would

include: there is often time-consuming research needed to prepare grant applications, there are often strings attached when money is received and limited flexibility with the funding, and most notably, the failure rate for applicants is significant, citing that “one the average day, roughly 2,700 grant proposals are submitted; fewer than 200 will receive funding”37.

Political Analysis

In addition to conducting an analysis of the policy put forth in this memorandum, it is essential to thoroughly analyze the potential political implications of recommending this proposal.

This past November 2018, the State of Maryland overwhelming voted Larry Hogan, you, for a second four-year term as Governor of Maryland. Maryland, traditional classified as a very blue-state, once again voted in favor of a republican governor, with you earning 55.4% of the votes38. As you are currently serving in your second term, there is no need to consider reelection for Governor when recommending, supporting or developing policy. However, while not up for gubernatorial reelection, there are still important political implications—both positive and negative—to consider, especially if higher political aspirations are desired.

Putting forth and passing new legislation in Maryland does not come without its set of unique challenges, time constraints and political implications. And with this proposed legislation having implications for all local governments in Maryland and various environmental organizations, the interest—whether positive or negative—is anticipated to be widespread.

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The Democratic Party currently holds the majority within the Maryland State Senate, with 32 seats of 47. Because of previous voting on environmental policy, with most democratic state senators voting favorable 90%+\textsuperscript{39} of the time on environmental legislation, there is strong evidence that SB 808 would be received positively amongst democratic members and pass through the Senate with ease. However, moving forward with this proposal has potential negative implications amongst your own Republican Party members, as this is not a traditional policy that aligns with their agenda. There are currently 10 returning republican state senators within the Maryland General Assembly. When looking at their lifetime and 2018 environmental scorecard, as outlined in \textit{figure 7}, it is evident that this group are not always in support of environmental-focused policy. With introducing SB808 to establish the \textit{Green the Gray Grant Program}, has implication of separating yourself from your peer party members.

In addition to Maryland General Assembly legislators, it is necessary to acknowledge voters in this analysis. Throughout the United States political history, environmental issues have been polarized and heavily debated amongst Americans. Republicans tend to be less favorable towards environmental spending; democrats tend to be more in favor of environmental spending. What is different than other polarized issues are that amongst Americans the opinions or interest of environmental issues tend to fluctuate. As reported in a recent study published by Social Forces, “Americans reduce their support for additional federal environmental spending during Democratic presidencies and during difficult economic times, and increase their support during

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Republican presidential administrations and during better economic times. Because of this polarization coupled with fluctuating perspectives, there is often difficulty in gauging the public’s opinion on proposing an increase in environmental spending due to the ever changing political landscape.

In our present day economic and political state, American citizens are becoming more invested in protecting the environment and are expressing increased concern for our environmental health. From a political perspective, this resurgence of wanting the government to do more for the environment demonstrates favorable belief that Americans would support a proposal for increasing environmental spending – similar to SB 808 proposed in this memorandum. More citizens, and the majority of, want Government to do more for the environment and believe that currently not enough is done for the environment. This is demonstrated in figure 8, affirming that since 2015 the public perception that Government has been doing too little to protect the environment has significantly increased.

Even more so in Maryland, a prominently democratic state, are environmental issues at the forefront of conversation and political attention. Environmental policy is not as bipartisan as an issue as it is seen in other states- there is a common ethos of protecting the Bay amongst residents. Your environmental secretary, Ben Grumbles, speaks to this in a 2018 interview with WYPR- “I would say, number one, would be the strong, bipartisan support for Chesapeake Bay restoration”\textsuperscript{43}. With this rationale that Marylanders want increased government action towards protecting the environment, there is reason to believe that Maryland constituents would be in favor of this proposal and would strengthen your overall approval ratings as Governor.

Although there is reason to believe that there is a shared ethos amongst Marylanders to protect the Bay, it is still important to acknowledge that this proposal would not likely be supported by far right individuals and political leaders of Maryland. In the 2019 federal


budget proposed by President Donald Trump, there are plans to significantly cut funding to the EPA\textsuperscript{44}. With 33.9\% of Marylanders voting for President Trump in the 2016 election\textsuperscript{45}, there is potential to lose support amongst this group when proposing policy that does not align with the President’s agenda. SB808 could be viewed as an objection towards President Trump’s agenda and proposed budget cuts toward environmental efforts.

While there are political challenges with introducing SB808 and creating this new grant program within your base party, this proposal has potential to strengthen your relationship with numerous environmental organizations and advocacy groups focused on Chesapeake Bay health. These would include: The Chesapeake Bay Program, The Chesapeake Bay Foundation, Maryland League of Conservation Voters, amongst others. While you have supported numerous environmental bills over the years, introducing SB 808 will set a new narrative surrounding your environmental goals for the state. You have faced numerous criticisms of your efforts to enact and enforce environmental protection policy. Karl Raettig, executive director of the Maryland League of Conservation Voters, stated “but he’s [Governor Hogan] really not showing the kind of leadership we need in any of the areas. And really does not do the environment work that we need without a lot of prodding, and he won’t take bold leadership”\textsuperscript{46}. Pushing forward and proposing this policy would be a strong stance that you are committed to the health of the Chesapeake and the overall environmental health of Maryland.


\textsuperscript{45} “Presidential Election in Maryland, 2016,” \textit{Politico}. Accessed on April 10, 2019: \url{https://ballotpedia.org/Presidential_election_in_Maryland,_2016}

**Recommendation**

Nonpoint source pollution, specifically stormwater runoff, are increasing the flow of pollutants levels into our Chesapeake Bay. As outlined throughout this proposal, there are grave consequences for increased pollutant levels. The policy proposal put forth in this memorandum has verified measures of success that it would meet the aforementioned goal of reducing nitrogen and phosphorus levels in the Chesapeake Bay by 15% by 2024. Under your leadership, Governor Hogan, measures need to be taken to address this problem. Therefore, after throughout analysis and careful consideration, introducing SB808 and authorizing the state to establish the *Green the Gray Grant Program*, is the needed action you need to pursue.

Despite its weaknesses, this outlined proposal is the most cost-effective approach to addressing the problem and reaching the proposals’ expressed goal. Gray infrastructure approaches (i.e. water treatment facilities, storage basins, upgraded sewer systems and others) require significant long-term funding to establish, implement and maintain. While these approaches to would be effective in reducing the effects of stormwater runoff in Maryland, the financial costs of implementing gray infrastructure are too astronomical, especially given the other key policy priorities of your administration. Green infrastructure is the most cost-effective approach and leaves funding available for other priorities like education, healthcare and drug overdose prevention. Not only is it cost-effective, but there are proven case studies and research that investment in green infrastructure is an effective approach in reducing the amount of runoff and polluted waters entering Maryland’s watershed, and eventually, the Chesapeake Bay.
In addition to the proposals goal of reducing pollutant levels in the Bay, there is also strong political advantages with pushing forward with this bill. With recent policy developments and actions pursued by our President and his administration, there is amplified public concern on our federal government’s commitment to the environment. Federal funding is slated to significantly decrease, our country has pulled out of many environmental programs and alliances, and the effects of climate change are worsening. The time to take a firm stance that Maryland is committed to the environment is now. While there is strong reason to believe that this proposal will be enacted into law if pursued, simply introducing it to the Maryland General Assembly will demonstrate your strong leadership on environmental policy that the Maryland residents have desired during your time in office. Bold leadership will not only highlight your strength and power as a leader, but will also prove to Maryland residents that you are committed to the health of the Chesapeake Bay. Additionally, authorizing the state to create the Green the Gray Grant Program will empower local organizations and municipalities with the financial resources to utilize their knowledge, innovation and community to address stormwater runoff issues from a local lens.

There is no better time to introduce this legislation than now. Organizations like the Chesapeake Bay Foundation and the Maryland League of Conservation Voters are pushing hard for legislators to act now and commit to Chesapeake Bay recovery, and Maryland residents are now more than ever energized and invested in environmental policy. The fact that you are not up for reelection as Governor coupled with the desire that local organizations and residents have, fosters the perfect time for strong political action to be taken.
Curriculum Vitae

While attending the University of Delaware, Madison developed a passion for fundraising after being exposed to the impact of philanthropy on her own educational path. Madison pursued this passion for fundraising during her undergraduate work through involvement in senior class giving and alumni fundraising. She graduated from the University of Delaware in 2016 with a Bachelor of Arts in Public Policy and minors in Spanish and Organizational and Community Leadership.

Recognizing that philanthropy is her way to make a sustainable impact in the nonprofit sector, upon graduation Madison launched into a career of medical fundraising at Johns Hopkins University.

In her current role, Madison is the Senior Development Coordinator for The James Buchanan Brady Urological Institute at Johns Hopkins, in which she is responsible for departmental events, the stewardship of major donors, engagement of advisory board members and overall office management. With completion of her degree in Public Management, Madison hopes to advance in her role and become a front-line fundraiser with the responsibilities of raising philanthropic funds, primarily from grateful patients and families.