



December 11, 2019



Millbrook, Submerged Gravel Wetland

# The Clean Water Partnership

 A 30-year partnership between Prince George's County, Maryland and Corvias to identify, design, build, finance, operate and maintain stormwater assets.



- Based on the Community-Based Public Private Partnership (CBP3) model as developed by the USEPA Region III.
- Intentionally developed to provide multiple, overlying benefits (socioeconomic, environmental, implementation efficiency, local uplift, compliance surety)



# **Partnership Goals**

#### <u>Scalable</u>

Implementation strategy for distributed stormwater infrastructure across public and private properties

#### **Affordable**

Implementation strategy to achieve County's cost of compliance

#### **Maintainable**

Long term compliance and operability of distributed stormwater infrastructure

#### **Community Benefit and Uplift**

Incorporation of broader policy performance objectives inclusive of investment in local, small and disadvantaged businesses, community outreach and public engagement



# **Integrated Delivery Partner**

 HDR is responsible for the management of design, procurement, and construction toward the completion of projects with a view towards impervious acre credits in support of the County MS4 Permit and TMDL requirements

# Agenda

- **1.Program Introduction**
- 2.Performance Summary
- 3. Phase 1: Breakdown by Class
- 4. Phase 1: Device Performance Breakdown

**5.Next Steps** 



# PROGRAM INTRODUCTION

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Accokeek Library, Wet Pond

### The Chesapeake Bay Program

#### **Goal:** Restore water quality to meet recreation and aquatic uses

- Started with 1983 Chesapeake Bay Agreement
- TMDL established in 2010, to be met by 2025
- Chesapeake Bay characteristics
  - 6 states and the District of Columbia
  - 64,000-square-mile watershed
  - 18.2 million residents





### TMDL Requirements for Prince George's County MS4





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# Clean Water Partnership CBP3 Goals



### **TMDL Strategy**

- Capital improvement projects
- Alternative BMPs
- Urban stormwater retrofit programs

Schools 4

Stream restoration

Faith-based and other †**†**† private nonprofit community land

Municipal and county **AA**A sites

1 Existing pond retrofits



Scotchtown Elementary School, Swales



### **General Overview of Retrofit Program**





# PERFORMANCE SUMMARY

C. Vale

Accokeek Library, Wet Pond

### Key Achievements in Phase 1

#### **Nutrient Removal:**

- 。 Total Nitrogen (TN): 34,000 lb
- Total Phosphorous (TP): 3,500 lb
- Total Suspended Solids (TSS): 1,990,000 lb

**Total Projects Completed: 96** 

Total Devices Constructed: 246

#### Total Impervious Area Treated Credits (IATs):

• 2,142 acre credit

#### Drainage Area Treated:

- Total: 7,442 acres
- Impervious: 2,147 acres



# **Total Design and Construction Cost:** \$63.4 million

St. Michael's Truth, Micro-Bioretention



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# PHASE 1: BREAKDOW BY PROJECT CLASS

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Gwynn Park High School, Sand Filter

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# Data Breakdown - Class

| <ul> <li>ACP</li> <li>83 devices, \$24,000/device</li> <li>59.7 lb TN removed, \$34,000/lb TN removed</li> <li>5.51 IAT credits, \$369,000/IAT credit</li> </ul>       | <ul> <li>MUN</li> <li>66 devices, \$165,000/device</li> <li>1,960.2 lb TN removed, \$6,000/lb TN removed</li> <li>138.1 IAT credits, \$79,000/IAT credit</li> </ul>    |
|--|--|
| <ul> <li>School</li> <li>65 devices, \$129,000/device</li> <li>376.2 lb TN removed, \$22,000/lb TN removed</li> <li>31.39 IAT credits, \$266,000/IAT credit</li> </ul> | <ul> <li>Ponds</li> <li>27 devices, \$1,560,000/device</li> <li>31,751 lb TN removed, \$1,000/lb TN removed</li> <li>1,965 IAT credits, \$21,000/IAT credit</li> </ul> |

Costs do not include program management



# PHASE 1: DEVICE PERFORMANCE BREAKDOWN

Potomac High School, Micro-Bioretention

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# **BMP** Types

Nine (9) BMP types were built in the program

#### Examples of Micro-Scale Practice:

- Micro-Bio Retention (MMBR)
- Rooftop Disconnection (NDNR)
- Impervious Area to Pervious (IMPP)

# Examples of Small-Scale Practice:

- Bioretention Filter (FBIO)
- Sand/Organic Filter (FSND)
- Regenerative Step Pool Storm Conveyance (SPSC)
- Grass Swale (MSWG)



Rhode Island Ave, Step Pool

Wet Ponds (PWET) can be implemented on a large or small scale, depending on site conditions.



### Phase 1 Data Breakdown – Micro to Small Scale

| ВМР Туре                                    | Number<br>of<br>Devices<br>built | TN<br>Removed<br>(lb/yr) | TP<br>Removed<br>(lb/yr) | TSS<br>Removed<br>(Ib/yr) | Impervious<br>Area Credits<br>(IATs)<br>Received | Total Design<br>&<br>Construction<br>Spent* | \$\$/IAT  | \$\$/Device | \$\$/TN<br>Removed | \$\$/TP<br>Removed | \$\$/TSS<br>Removed |
|---|----------------------------------|--------------------------|--------------------------|---------------------------|--|---|-----------|-------------|--------------------|--------------------|---------------------|
| Micro-Bio<br>Retention<br>(MMBR)            | 49                               | 155.70                   | 16.82                    | 9,007                     | 13.1   | \$4,612,049                                 | \$353,000 | \$94,000    | \$30,000           | \$274,000          | \$512               |
| Sand Filter<br>(FSND)                       | 18                               | 313.09                   | 35.83                    | 21,232                    | 28.1   | \$5,568,014                                 | \$198,000 | \$309,000   | \$18,000           | \$155,000          | \$262               |
| Bio-Retention<br>(FBIO)                     | 6                                | 81.27                    | 7.91                     | 4,131                     | 6.12   | \$1,775,002                                 | \$290,000 | \$296,000   | \$22,000           | \$225,000          | \$430               |
| Rooftop Runoff<br>Disconnect<br>(NDRR+NDNR) | 100                              | 11.47                    | 1.47                     | 813                       | 1.50   | \$616,943                                   | \$412,000 | \$6,000     | \$54,000           | \$420,000          | \$759               |
| Impervious Area<br>to Pervious<br>(IMPP)    | 17                               | 5.81                     | 1.49                     | 873                       | 0.97   | \$468,503                                   | \$483,000 | \$28,000    | \$81,000           | \$315,000          | \$537               |
| Grass Swales<br>(MSWB)                      | 6                                | 52.39                    | 5.21                     | 2,802                     | 3.61   | \$660,389                                   | \$183,000 | \$110,000   | \$13,000           | \$127,000          | \$236               |
| Infiltration<br>Trench (ITRN)               | 1                                | 1.49                     | 0.18                     | 101                       | 0.16   | \$75,396                                    | \$471,000 | \$75,000    | \$51,000           | \$417,000          | \$746               |
| Step Pool Storm<br>Conveyance<br>(SPSC)     | 1                                | 42.12                    | 5.39                     | 2,975                     | 0.91   | \$40,297                                    | \$44,000  | \$40,000    | \$1,000            | \$7,000            | \$14                |
| Outfall<br>Stabilization                    | 1                                | N/A                      | N/A                      | N/A                       | 0.94   | \$40,297                                    | \$43,000  | \$40,000    | N/A                | N/A                | N/A                 |

Costs do not include program management

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# Nutrient Reduction: TN – Micro to Small Scale







# Nutrient Reduction: TP – Micro to Small Scale

#### **Cost vs. Phosphorus Reduction**



**Construction Cost** 



## Nutrient Reduction: TSS – Micro to Small Scale







# IAT Credits – Micro to Small Scale





# **BMP Type Performance Breakdown**

#### **MMBR**

- 49 devices, \$94,000/device
- 155.7 lb TN removed, \$30,000/lb TN removed
- 13.1 IAT credits, \$353,000/IAT credit

#### **FSND**

- 18 devices, \$309,000/device
- 313.1 lb TN removed, \$18,000/lb TN removed
- 28.1 IAT credits, \$198,000/IAT credit

#### FBIO

- 6 devices, \$296,000/device
- 81.27 lb TN removed, \$22,000/lb TN removed
- 6.12 IAT credits, \$290,000/IAT credit

#### Costs do not include project management

#### NDNR

- 100 devices, \$6,000/device
- 54,000 lb TN removed, \$1,000/lb TN removed
- 1.50 IAT credits, \$412,000/IAT credit





# **Nitrogen Reduction - Ponds**

Small Ponds (zoomed in)



**Construction Cost** 

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# Data Breakdown - Ponds



- Smaller ponds: Nutrient reduction highly correlated with construction cost, lower cost per device, higher per pound nutrient reduction.
  - $_{\circ}~$  8 devices, \$501,000/device
  - 485 lb TN removed, \$8,000/lb TN removed
  - $_{\circ}~$  37.5 IAT credits, \$107,000/IAT credit



- Large ponds: Site specific, was able to perform minimal retrofit at large ponds to maximize return, outliers make statistic correlation very weak.
  - 34 devices, \$1,329,000/device
  - 33,049 lb TN removed, \$1,000/lb TN removed
  - 2,054 IAT credits, \$22,000/IAT credit
  - $_{\circ}$  Should see more correlation in Phase 2

Costs do not include project management



# Comparison of Projects – One Device vs. Multiple Devices

Overall projects with multiple devices see lower cost per lb of nutrients removed

• Projects with multiple devices are approximately 2/3 of unit cost of projects with 1 device because of shared mobilization/demobilization and other construction costs





# NEXT STEPS

# Phase 2 Underway





90+ Projects

Performance-based Design Contracts

Collaboration with General Contractors

Three years until June 2021







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# Questions or Comments?

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# For Additional Information about the Clean Water Partnership

Visit the website at <u>https://thecleanwaterpartnership.com</u>



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