

Total Maximum Daily Load Restoration Plan for Bacteria

2020 Annual Bacteria TMDL Assessment

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INTRODUCTION

1.1 BACKGROUND

Anne Arundel County (the County) currently has 19 waterways with U.S. Environmental Protection Agency (EPA)-approved Total Maximum Daily Loads (TMDLs) associated with bacteria impairments. Fecal coliform is identified as the cause of impairment in the TMDLs for 15 of the 19 waterways. E. coli and Enterococci are identified as the impairments for two TMDLs each. The County is required by its National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit (11-DP-3316, MD0068306) to develop a TMDL Restoration Plan to address the Stormwater Waste Load Allocations (SW-WLAs) identified in the TMDL reports developed by the Maryland Department of the Environment (MDE). The Anne Arundel County Department of Public Works (DPW) Bureau of Watershed Protection and Restoration (BWPR) developed a combined Draft Bacteria TMDL Restoration Plan to address the 19 bacteria TMDLs. The restoration plan was submitted to MDE on February 12, 2015. The County received comments from the MDE on May 19, 2015, and comments were addressed in the February 2016 submittal. The revised Bacteria TMDL Restoration Plan was made available for public review and comments for 30 days from June 15 to July 14, 2016. The Restoration Plan was finalized and submitted in January 2017 (Anne Arundel County, 2017a).

1.2 OVERVIEW OF PROGRESS REPORT

The County implemented multiple restoration strategies within the first year of submitting the Draft Bacteria TMDL Restoration Plan in February, 2015. Several additional restoration strategies are currently in the planning stages and are included as part of the Capital Improvement Program (CIP) projects. These include restoration strategies that address human sources of bacteria (Tier A) as well restoration strategies that address non-human sources of bacteria (Tier B).

This report documents the progress made during fiscal year (FY) 20, July 1, 2019 – June 30, 2020, by the County towards achieving the bacteria TMDL goals. This report was prepared in consultation with several County departments, including the Department of Health and the DPW's BWPR and Bureau of Engineering - Technical Engineering division, using existing County data and other reports.

1.3 TIER A STRATEGIES

Tier A strategies are those that address potential human sources of bacteria, such as septic system effluent from poorly maintained septic systems, sanitary sewage overflows, and illicit connections that discharge household human wastewater into the MS4. The progress in implementing Tier A strategies during the past year is described below.

1.3.1 Elimination of Household Illicit Connections

Restoration Plan Goal

Under the household illicit connection program, the Restoration Plan states that approximately 150 outfalls are evaluated each year, resulting in detection and elimination of 2 percent of the outfalls that have illicit connections.

Progress

The County currently conducts field screening of outfalls to identify illicit connections from residences and businesses. This process of illicit discharge detection and elimination (IDDE) is required to meet the County's NPDES MS4 permit requirement. As a part of this program, approximately 150 outfalls are sampled every year, and all identified illicit connections are investigated and eliminated immediately.

During the 2020 reporting period, the County conducted targeted outfall sampling in the southern portion of the County (south of the intersection of I-97 and Route 3) and areas within the Upper Patuxent River watershed along the southwestern edge of the County. In addition, the County revisited all locations that had shown documented evidence of illicit discharge dating back to the 2013 screening year. In 2020, the County evaluated 155 outfalls and confirmed that 5 outfalls had illicit connections. From FY2005 through FY2020, 61 illicit connections were detected out of 2,423 outfalls surveyed, as documented in the County's Annual NPDES MS4 reports. Based on this, the countywide illicit discharge detection and elimination (IDDE) program has resulted in the elimination of illicit dischargers at a rate of 2.52 percent, up from 2.00 percent as identified in the plan, and up slightly from the FY 2019 rate of 2.47 percent. Table 1 shows the IDDE rate and associated estimation of bacteria load reductions for each bacterial TMDL watershed.

Table 1. IDDE Rate per TMDL Watershed and Estimated Bacteria Load Reductions.

TMDL Watershed	IDDE Rate (%)	Bacteria Load Reduction (%)
Tracy and Rockhold Creeks	0.012%	0.30%
Magothy River/Forked Creek	0.006%	1.43%
Magothy River/Magothy River Mainstem	0.096%	11.02%
Magothy River/Tar Cove	0.010%	0.84%
Patapsco Lower North Branch	0.130%	14.17%
Patapsco River/Furnace Creek	0.095%	10.49%
Patapsco River/Marley Creek	0.078%	13.53%
Severn River/Mill Creek	0.015%	1.94%
Severn River/Severn River Mainstem	0.230%	22.67%
Severn River/Whitehall/Meredith Creeks	0.011%	1.20%
South River/Duvall Creek	0.004%	0.83%
South River/Ramsey Lake	0.003%	0.14%
South River/Selby Bay	0.002%	0.20%
South River/South River Mainstem	0.127%	13.79%
Patuxent River Upper	0.019%	1.43%
West River and Rhode River/Bear Neck Creek	0.005%	0.67%
West River and Rhode River/Cadle Creek	0.002%	0.33%
West River and Rhode River/Parish Creek	0.002%	0.24%
West River and Rhode River/West River Mainstem	0.012%	1.76%

1.3.2 Abatement of Sanitary Sewer Overflows

Restoration Plan Goal

This strategy proposes to reduce the number of sanitary sewer overflows (SSO), and thereby reduce the discharge of human bacteria to surface water, through wastewater projects that are designed to improve the reliability of the sanitary system. Table 4-2 in the Restoration Plan listed the active sewage pump stations (SPS) upgrade projects.

Progress

The number of SPS upgrade projects in each TMDL watershed included in the Center for Watershed Protection’s (CWP) Watershed Treatment Model (WTM; Caraco 2013) and the estimated percent bacteria load reductions are provided in Table 2. Progress modeling for the abatement of SSOs was conducted in two ways. First, SSO abatement progress was forecasted out to the compliance year, 2025, using the anticipated number of SPS upgrades in each watershed that will be completed by that compliance year. Second, FY 2020 progress was modeled using the actual number of SPS upgrades completed through FY 2020. In both cases, these data were entered

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into the WTM future management practices under the “SSO Repair/Abatement” option to estimate the load reductions. The number of SPS projects in each TMDL watershed included in the WTM projected out through FY25, as well as the estimated percent bacteria load reductions through FY 20 and FY25 are provided in Table 2.

Table 2. SPS Upgrade Projects in TMDL Watersheds through FY25 and load reductions through FY20 (actual) and through FY20 (projected).

TMDL Watershed	Number of SPS Upgrades through FY20	Bacteria Load Reductions through FY20 (%)	Projected Number of SPS Upgrades through FY25	Projected FY25 Bacteria Load Reductions (%)
Tracy and Rockhold Creeks	0	0.00%	5	1.15%
Magothy River/Forked Creek	0	0.00%	1	6.19%
Magothy River/Magothy River Mainstem	3	0.36%	11	1.32%
Magothy River/Tar Cove	No SPSs	0.00%	No SPSs	0.00%
Patapsco Lower North Branch	0	0.00%	2	1.39%
Patapsco River/Furnace Creek	0	0.00%	4	2.50%
Patapsco River/Marley Creek	0	0.00%	5	4.04%
Severn River/Mill Creek	0	0.00%	0	0.00%
Severn River/Severn River Mainstem	2	0.12%	30	1.94%
Severn River/Whitehall/Meredith Creeks	0	0.00%	0	0.00%
South River/Duvall Creek	0	0.00%	1	2.56%
South River/Ramsey Lake	0	0.00%	0	0.00%
South River/Selby Bay	0	0.00%	0	0.00%
South River/South River Mainstem	3	0.27%	9	0.83%
Patuxent River Upper	No SPSs	0.00%	No SPSs	0.00%
West River and Rhode River/Bear Neck Creek	0	0.00%	2	3.49%
West River and Rhode River/Cadle Creek	0	0.00%	18	17.04%
West River and Rhode River/Parish Creek	0	0.00%	1	6.47%
West River and Rhode River/West River Mainstem	0	0.00%	5	8.00%

The status of specific wastewater projects that are considered sewage pumping station (SPS) upgrades or otherwise designed to improve the reliability of the sanitary system was provided by the Technical Engineering Division (G. Heiner, pers. Communication August 18, 2020) and is listed in Table 3. In addition to including the updated status and budget of the SPS projects listed in Table 4-2 of the Restoration Plan, Table 3 also includes new sanitary system improvement projects as identified by DPW. One project was completed in FY 2020, however, this was a sewer line extension project and not an SPS upgrade. Consequently, no additional SPS upgrade projects were identified compared to the FY 2019 data.

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Table 3. Discrete Sewage Pumping Station Upgrade Projects (Active or Completed) in FY20 in Bacteria TMDL Watersheds.

Project	Project Title	Current Status	Description	TMDL Watershed	Qty. of Pump Stations Being Upgraded	Total Budgeted Costs ³	Expended and/or Encumbered as of 8/15/2020
S797800	Furnace Barn Sewer Replacement ²	Active	Construct a new sewer line under Sawmill Creek	Patapsco River / Furnace Creek	0	\$1,216,500	\$62,016
S799200	Mayo Collection Sys Upgrade ²	Active	Expansion of Mayo Wastewater Collection and Conveyance System to accommodate planned growth within Mayo Sewer service area	Rhode River/Cadle Creek	18	\$12,222,829	\$6,349,150
S804300	Jennifer Road SPS Upgrade ²	Active	Upgrades to Jennifer Rd sewage pump station; pump station force main replacement	Severn River Mainstem	1	\$7,546,935	\$9,072,241
S805300	Cinder Cove SPS Mods ²	Active	Pump station reliability improvements necessary to minimize risks of sanitary sewer overflows	Patapsco River / Furnace Creek	1	\$8,454,000	\$7,825,937
S805400	Marley SPS Improvements ²	Active	Various upgrades to Marley SPS	Patapsco River/Marley Creek	1	\$217,689	\$4,234,856
S806203	SPS Fac Gen Replacement ²	Active	Generator replacement (Design 1 and Phase 6 contracts)	Patapsco River LNB*	2	\$53,011,268 ⁴	\$2,650,851
S806204	SPS Fac Gen Replace ²	Active	Generator replacement (Design 2 and Phase 7 contracts)	West River Mainstem	5	\$53,011,268 ⁴	\$1,451,197
S806205	SPS Fac Gen Replace ²	Active	Design of replacement and installation of generators at SPS throughout the County (Design 1 contract)	Countywide	-	\$53,011,268 ⁴	\$2,992,134

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Project	Project Title	Current Status	Description	TMDL Watershed	Qty. of Pump Stations Being Upgraded	Total Budgeted Costs ³	Expended and/or Encumbered as of 8/15/2020
S806206	SPS Fac Gen Replace ²	Active	Design of replacement and installation of generators at SPS throughout the County (Design 2 contract)	Countywide	-	\$53,011,268 ⁴	\$3,000,563
S806208	SPS Fac Gen Replacement ²	Active	Generator Replacement (Phase 8 contract)	Severn Mainstem	7	\$53,011,268 ⁴	\$688,697
S806209	SPS Fac Gen Replacement ²	Active	Generator Replacement and Installation (Phase 9 contract)	Severn River Mainstem	5	\$53,011,268 ⁴	\$2,156,160
S806210	SPS Fac Gen Replacement ²	Active	Generator Replacement and Installation (Phase 10 contract)	Severn Mainstem, Parish Creek, Tracy/Rockhold	4	\$53,011,268 ⁴	\$1,711,314
S806211	SPS Fac Gen Replacement ²	Active	Generator Replacement and Installation (Phase 11 contract)	Magothy River Mainstem, Severn River Mainstem	3	\$53,011,268 ⁴	\$1,818,713
S806212	SPS Fac Gen Replacement ²	Active	Generator Replacement and Installation (Phase 12 contract)	Severn River Mainstem, Marley/Furnace Creeks	5	\$53,011,268 ⁴	\$3,939,855
S806213	SPS Fac Gen Replacement ²	Active	Generator Replacement and Installation (Phase 13 contract)	Severn River Mainstem, Marley/Furnace Creeks	6	\$53,011,268 ⁴	\$1,397,244
S806214	SPS Fac Gen Replacement ²	Active	Generator Evaluation, Replacement, Installation (Phase 14 contract)	Marley/Furnace Creeks, Bear Neck Creek	3	\$53,011,268 ⁴	\$2,602,452
S806215	SPS Fac Gen Replacement ²	Active	Installation of electrical feeders for back-up power	Severn River Mainstem	4	\$53,011,268 ⁴	\$908,597
S806216	SPS Fac Gen Replacement ²	Active	Installation of portable generators at select pump stations (Phase 15 contract)	Severn River Mainstem	5	\$53,011,268 ⁴	\$1,186,844
S806217	SPS Fac Gen Replacement ²	Active	Design of replacement and installation of generators at SPS throughout the County (Design 2 contract)	Countywide	-	\$53,011,268 ⁴	\$45,762

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Project	Project Title	Current Status	Description	TMDL Watershed	Qty. of Pump Stations Being Upgraded	Total Budgeted Costs ³	Expended and/or Encumbered as of 8/26/2019
S806700	Cinder Cove FM Rehab ²	Active	Construction of 10,000 linear feet of 30" force main	Patapsco River / Furnace Creek	0	\$12,499,000	\$10,196,904
S806900	Rolling Knolls ES Sewer Extension ²	COMPLETE	Design and construction of sanitary sewer extension to accommodate new elementary school	South River Mainstem/Severn River Mainstem	0	\$3,081,700 ⁶	\$ 3,029,603 ⁶
S808100	CATTAIL CREEK FM REPLACEMENT ²	Active	Construction of the replacement of 17,000 lf of 24" and greater force main (FM) beginning at the Cattail Creek SPS and ending at a gravity manhole in College Parkway. This project will replace aging, at-risk infrastructure to increase the reliability of the conveyance system and reduce risks for spills resulting from infrastructure failures	Magothy River Mainstem	0	\$17,322,729	\$241,223
S808200	GRINDER PUMP REPL/UPGRD PRGM	Active	Multi-year sewer infrastructure investigation, rehabilitation and replacement program to ensure the adequacy of the County's Wastewater Collection System	Countywide	0	\$3,500,000 ⁴	\$7,384
X7388000	Sewer Main Replace/Recon ²	Active	Maintenance and replacement of sewer main lines countywide	Countywide	0	\$111,755,738 ⁴	\$59,208,046
				Total	—	\$736,348,108	\$123,748,140

¹ Indicates new project.

² Data have been updated since being listed in Table 1 of the Total Maximum Daily Load Restoration Plan for Bacteria 2016 Annual Report (Anne Arundel County, 2017b).

³ Total Budgeted Cost derived from FY2016 Anne Arundel County Approved Capital Budget and Program and includes current and prior appropriation and approved program totals through FY 24

⁴ Total Budgeted Cost for this project includes completed and active SPS upgrades countywide; however, the total budget is not broken down at the level of individual projects. Some individual projects may be outside of bacteria TMDL watersheds. Therefore, only the total project cost is listed.

⁵ Total budgeted costs for all projects includes only one count of the Countywide upgrades active and completed with a total budget of \$52,559,000.

⁶ Since this project is not specifically an SPS project, the associated dollar values are not included in the totals.

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In FY20, there were seven (7) SSOs reported in the County's Bacteria TMDL watersheds, the lowest figure in 19 years of reporting (Figure 1). The net volume of spilled material in Bacteria TMDL watersheds in FY20 was 26,450 gallons (Figure 2). Sanitary sewer line blockages due to roots, rags, grease, and debris resulted in spills totaling 22,600 gallons. In June 2019, Anne Arundel County Department of Public Works (DPW) Bureau of Utility Operations launched a mapping application to track SSOs in the County. The interactive geographic information system (GIS) plots known overflows over the last two years from sanitary sewer collection systems owned and maintained by DPW. The map can be found here:

<http://annearundelmd.maps.arcgis.com/apps/webappviewer/index.html?id=118c2cc77748459590f57b41cb8fda5a>

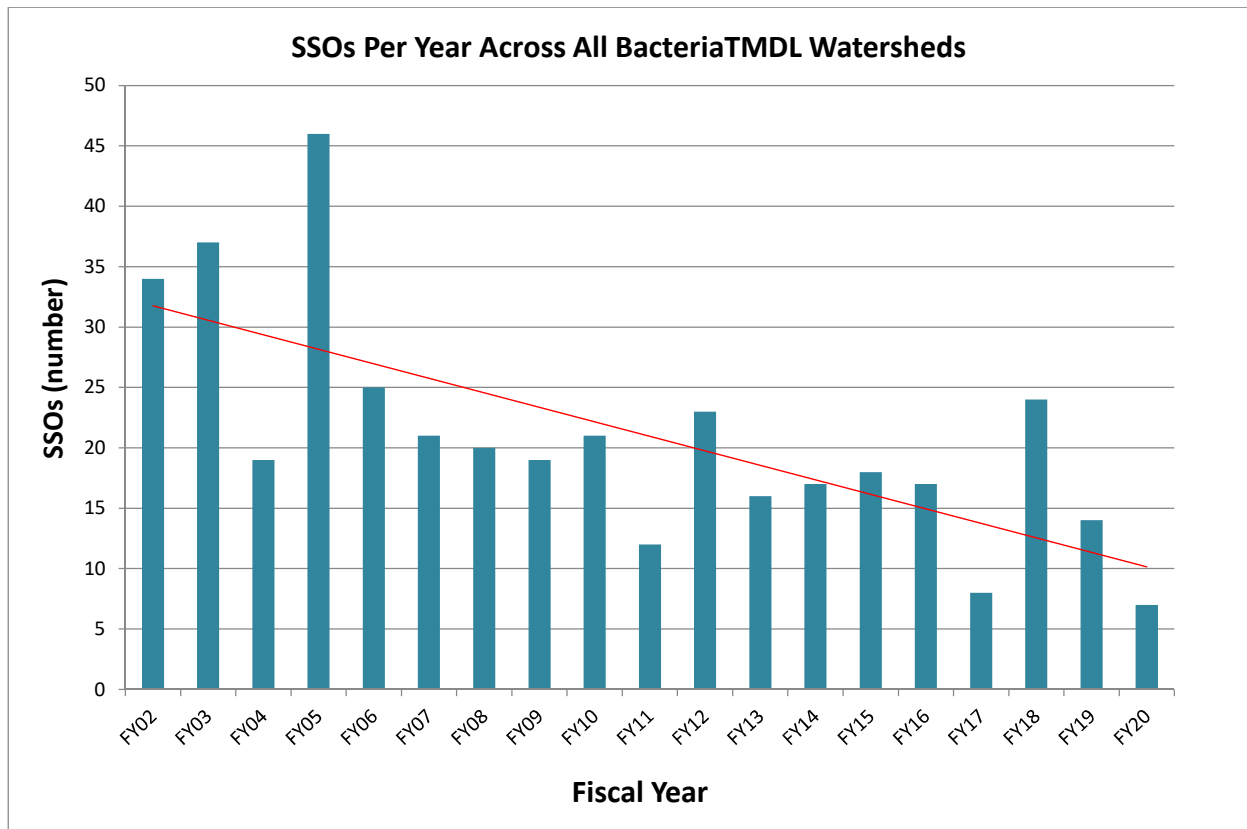


Figure 1. Number of SSOs per year across all Bacteria TMDL watersheds, FY02 – FY20.

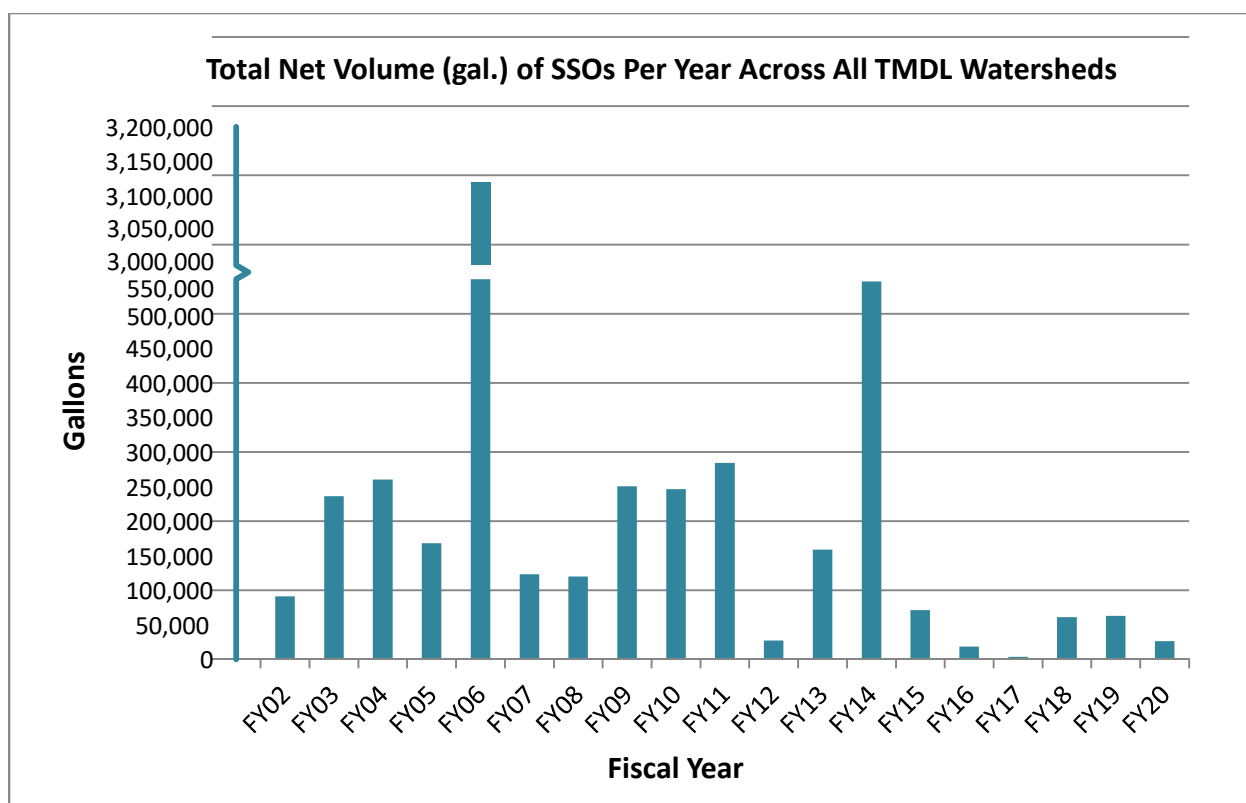


Figure 2. Total Volume (gallons) of SSOs per year across all Bacteria TMDL watersheds, FY02 – FY20.

1.3.3 Retirement of County Septic Systems

Restoration Plan Goal

The Restoration Plan presents the retirement of septic systems at a rate of 20-40 systems per year.

Progress

The County has undertaken the initiative to reduce the number of onsite sewage disposal systems (OSDS). The Bureau of Engineering initiated development of conceptual layouts for large and smaller projects, identifying approximately 20,000 OSDS with the potential to be connected of which 16,000 are located in the bacteria impaired watersheds (Anne Arundel County, 2008). According to the Department of Health, approximately 5,000 of these potential connections are located within Health Department Problem Areas (HDPAs) – areas with poor soils, steep slopes, high groundwater tables, and well set-backs (Table 4). The cost – approximately \$52,000 per connection – along with homeowner participation are identified as the primary constraints for retiring OSDSs and connecting to the public sanitary sewer system.

Septic systems that are “retired” are connected to the County’s sanitary sewer system that has the capacity to handle the increased load. Within TMDL watersheds, the County retired 16 On-Site

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Disposal Systems (OSDS) in FY20, 21 in FY19, eight (8) in FY18, 20 in FY17, and nine (9) in FY16. From FY16 through FY20, the County has retired an average of 15 OSDS per year within TMDL watersheds. An additional five (5) OSDS were retired in non-TMDL watersheds in FY20.

Table 4. Health Department Priority Areas (HDPAs) within bacteria TMDLs watersheds (Anne Arundel County, 2017c)

HDPAs	TMDL Watershed
Clearview Village	Magothy Mainstem
Huntsmore, Pasadena	Magothy Mainstem
Gingerville Manor	South River Mainstem
Edgewater Beach (North)	South River Mainstem
Laurel Acres	Magothy Mainstem
Edgewater Beach (South)	South River Mainstem
Palisades on the Severn/Herald Harbor	Severn Mainstem
Chelsea Beach	Magothy Mainstem
Amberly	Whitehall & Meredith Creeks
Long Point on the Magothy	Tar Cove

Progress modeling for OSDS retirement was conducted in two ways. First, the progress was forecasted out to the compliance year, 2025, using the average annual rate of OSDS retirement and their connection to WWTPs. Based on the data from the County, the historical rate of OSDS retirement and their connection to WWTPs is 20 to 40 per year. Consequently, an OSDS conversion rate of 40 per year was used as the estimate of the number of septic systems that would be retired by 2025 in each TMDL watershed. For this scenario, failure rates of connected systems was based on averages from previous estimates by Anne Arundel County.

For the second scenario, actual achieved progress through FY20 was modeled using the number of OSDS retirements through June 30, 2020. Per discussions with the EAE Unit in BWPR, it was assumed for this scenario that 50% of retired and connected OSDSs were failing systems, which more accurately reflects current failure rates of retired systems. These data were entered into the WTM’s future management practices under the “Septic System Retirement (Convert to WWTP)” option to calculate the load reductions that would be achieved from this strategy.

Table 5 provides both the estimated number of OSDS that would be retired by 2025, the actual number of OSDS retired between FY 2016 and FY 2020 in each TMDL watershed, and percent bacteria load reductions that have been achieved from this strategy.

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Table 5. Projected Number of OSDS to Be Retired by 2025 in Each TMDL Watershed and Estimated Bacteria Load Reductions.

TMDL Watershed	Projected Septic Systems Retired FY 2016 -2025	Projected FY 2025 Bacteria Reductions (%)	Septic Systems Retired FY 2016-2020	FY 2020 Bacteria Reductions (%) ¹
Tracy and Rockhold Creeks	0	0.00%	22	2.41%
Magothy River/Forked Creek	2	0.11%	1	0.20%
Magothy River/Magothy River Mainstem	88	0.25%	44	0.43%
Magothy River/Tar Cove	31	0.46%	0	0.00%
Patapsco Lower North Branch	3	0.09%	2	0.07%
Patapsco River/Furnace Creek	5	0.07%	3	0.04%
Patapsco River/Marley Creek	0	0.00%	20	0.28%
Severn River/Mill Creek	21	0.62%	0	0.00%
Severn River/Severn River Mainstem	100	0.18%	42	0.11%
Severn River/Whitehall/Meredith Creeks	6	0.42%	1	0.08%
South River/Duvall Creek	0	0.00%	1	0.24%
South River/Ramsey Lake	0	0.00%	0	0.00%
South River/Selby Bay	0	0.00%	0	0.00%
South River/South River Mainstem	31	0.28%	3	0.02%
Patuxent River Upper	5	0.38%	0	0.00%
West River and Rhode River/Bear Neck Creek	0	0.00%	1	0.23%
West River and Rhode River/Cadle Creek	0	0.00%	0	0.00%
West River and Rhode River/Parish Creek	0	0.00%	2	1.50%
West River and Rhode River/West River Mainstem	0	0.00%	2	0.16%

¹Because the failure rates were updated for the FY20 progress model, in some watersheds the actual modeled progress resulted in higher bacterial reductions compared to the reductions forecasted through FY 2025, despite having fewer OSDS connections implemented.

In February 2017, a Septic Task Force was created, consisting of staff from relevant County departments as well as representatives from the local business and environmental communities. The Septic Task Force’s stated goals included developing recommendations that will inform decision making, and identifying short term strategies and long term approaches to reducing septic system loads. Key questions discussed by the group include where and how residents could connect to public sewer systems, how will septic conversion projects be financed, and what policies are required to develop a successful conversion program. The task force met monthly from February to July in 2017, with a close-out meeting held in March 2018. A 2018 Final Report was produced in June 2018 and a 2019 Final Report was produced in April 2020.

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In September 2018 a private consulting firm was hired to serve as a Conversion Program Manager, and from July 2019 through October 2019 the Septic Task Force reconvened, holding meetings on a bi-weekly basis to develop the framework for a new septic connection program. In August 2019, a customer survey was distributed to County residents to gauge citizens' attitudes towards water quality and willingness to pay for a septic-to-sewer conversion program. Nearly 1,500 residents responded to the survey. The 2018 and 2019 Septic Task Force Final Reports, as well as Septic Task Force meeting minutes can be found at <https://www.aacounty.org/departments/public-works/septic-task-force/>

Following upon the efforts of the Septic Task Force, DPW developed and requested new legislation to allow septic system connections in eligible areas to be provided with a subsidy, and an option to defer a portion of their assessment. Eligible areas were defined to include areas in the Health Department's Onsite Wastewater Management Problem Areas, and locations within the Critical Area. Four separate pieces of legislation were passed between the end of 2019 and during 2020 to put the elements of the program into place.

In conjunction with the legislative changes, DPW has been developing the "Our wAAter" initiative to educate the public on strategies and efforts underway to reduce nutrient loads to Anne Arundel County waterways and the Chesapeake Bay. The new initiative will incorporate five core elements: septic connections, small system upgrades, stormwater, groundwater resiliency, and wastewater treatment enhancements. Within the Our wAAter initiative, a goal of connecting 200 homes per year over a 20-year period has been set. The program will be voluntary, so specific locations will be dependent upon community interest. A map of the eligible areas can be found on the Our wAAter program site at https://www.aacounty.org/departments/public-works/ourwaater/images/ProposedEligibleAreas_Basemap.pdf.

DPW intends to broadly introduce the program to the public in 2021, including community meetings, to provide information and encourage communities to consider applying for the program.

In 2017, the County also applied for and received a grant to evaluate the feasibility of County take-over of select private minor wastewater treatment facilities to either convey to existing County facilities or to construct new advanced treatment package plants utilizing the same discharge location. Five feasible projects were identified, two of which are located in watersheds with bacteria-related TMDLs (South River Mainstem and Patapsco River Lower North Branch). The study, which assessed cost-benefit aspects and policy outcome impacts of the individual projects, was completed in March 2018. A more detailed evaluation was completed in 2020 as part of the Our wAAter program, which confirmed the feasibility of the proposed consolidation of treatment facilities in the vicinity of Wayson's Corner (not within a bacteria TMDL watershed). Discussions with private facility owners and MDE are in the preliminary stages.

1.4 TIER B STRATEGIES

Tier B strategies are those that address non-human sources of bacteria, such as pet waste, wildlife waste, and livestock waste. The progress of implementation of Tier B strategies is described below.

1.4.1 Implementing New Stormwater Management Projects and Retrofitting Pre-2002 Stormwater Management Facilities to Meet Current MDE Criteria

Restoration Plan Goal

In FY20, the County completed restoration of 20 percent of currently unmanaged impervious areas through implementing new stormwater management projects and retrofitting existing stormwater management facilities to meet current MDE requirements

Progress

118 projects have been completed within the watersheds with bacteria impairment between 2015 and 2020, with nine of those projects being completed in FY2020. Projects included Step Pool Storm Conveyance (SPSC), stream restoration, wet ponds, and retention ponds. Furthermore, the County refined data for the impervious area to be treated on previously retrofitted stormwater management facilities. New projects, project status, and updated data are shown in Appendix A. This information was entered into the proposed conditions in the WTM to estimate the bacteria load reductions that would be attained from implementing this strategy. The load reductions were further adjusted based on the assumptions that:

- The proposed practices would capture 90 percent of the rainfall depth they are designed for,
- The County requires location-based and performance-enhancing standards for design of stormwater features that will result in high pollutant-removal efficiencies, and
- Regular maintenance of the practices will be enforced and conducted by the County.

In addition to including the updated drainage area and treated impervious area of the stormwater management projects listed in Table 4-5 of the Restoration Plan, Appendix A also includes new stormwater management projects planned by the County in the bacteria impaired watersheds. Table 6 lists the number of urban BMP CIP projects completed and planned in the TMDL watersheds, and the estimated percent bacteria load reductions from these projects based on actual implementation through FY 2020 and projected implementation through FY 2025. The detailed list of projects is provided in Appendix A of this report.

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Table 6. Completed and Proposed Urban Stormwater Projects in Bacteria TMDL Watersheds.

TMDL Watershed ID	Number of Urban Retrofit Projects Proposed	Drainage Area Proposed to Be Treated (acres)	Impervious Area Proposed to Be Treated (acres)	Actual Bacteria Load Reductions Through FY20 (%)	Projected Bacteria Load Reductions Through FY25 (%)
Tracy and Rockhold Creeks	0	0	0	0.00%	0.00%
Magothy River/Forked Creek	4	65.66	5.65	0.00%	11.03%
Magothy River/Magothy River Mainstem	43	989.04	302.52	8.44%	12.41%
Magothy River/Tar Cove	1	3.70	0.68	0.11%	0.11%
Patapsco Lower North Branch	28	884.49	435.67	3.20%	5.05%
Patapsco River/Furnace Creek	14	309.69	125.98	1.71%	7.60%
Patapsco River/Marley Creek	11	207.94	74.46	1.30%	1.41%
Severn River/Mill Creek	7	119.91	15.23	1.11%	6.96%
Severn River/Severn River Mainstem	29	1209.32	274.90	2.94%	3.00%
Severn River/Whitehall/Meredith Creeks	3	60.44	8.85	0.92%	0.92%
South River/Duvall Creek	3	12.67	3.75	3.08%	3.08%
South River/Ramsey Lake	0	0	0	0.00%	0.00%
South River/Selby Bay	0	0	0	0.00%	0.00%
South River/South River Mainstem	32	644.30	275.14	9.25%	9.81%
Patuxent River Upper	0	0	0	0.00%	0.00%
West River and Rhode River/Bear Neck Creek	5	18.87	5.31	0.63%	0.63%
West River and Rhode River/Cadle Creek	0	0	0	0.00%	0.00%
West River and Rhode River/Parish Creek	0	0	0	0.00%	0.00%
West River and Rhode River/West River Mainstem	1	1.37	0.86	0.08%	0.08%

1.4.2 Riparian Buffer Education

Restoration Plan Goal

The Restoration Plan recommends that a riparian buffer education program be implemented in areas where the buffer is reduced, altered, or where private property abuts the waterway.

Progress

Anne Arundel County and the Maryland Department of Natural Resources (MDNR) continue to provide support to the Anne Arundel County Watershed Stewards Academy (WSA), which trains and certifies Master Watershed Stewards to engage in educational outreach and implement water quality improvement projects throughout their community. One such program WSA manages is

the Backyard Buffers program, which provides landowners with free native trees and shrubs. The County has also partnered with WSA on a new tree planting initiative called “Replant Anne Arundel” in an effort to combat forest canopy loss. WSA programs resulted in the planting of 2,014 native trees and shrubs in FY20. Both of these programs will continue in 2021. Information on the Backyard Buffers and Replant Anne Arundel programs can be found on the WSA site at <http://aawsa.org/>

1.4.3 Expanded Pet Waste Education Program

Restoration Plan Goal

The Restoration Plan recommends pet waste education programs such as increasing pet waste stations, increasing signage, developing public service announcements, improving management of pet waste at public parks and providing grants to communities to install pet waste stations.

Progress

Master Watershed Stewards trained through the WSA are given the knowledge and resources needed to teach their communities about the importance of cleaning up pet waste and provide pet waste stations where needed.

In FY20, the community of Parkers Creek (Tracy and Rockhold Creeks bacteria TMDL watershed) requested seven pet waste stations from the County, with installation to occur in FY 21. While pet waste stations are installed in all County parks that have specific dog park areas, there are several local County parks that do not have pet waste stations installed. Research on new potential pet waste station installations will be conducted in FY21.

In 2020, the County hired a private consultant to develop pet waste outreach messaging to effect behavior change in regards to pet waste disposal. A pilot campaign targeting two communities in bacteria TMDL watersheds is currently in the planning stages; the two communities are Avalon Shores, in the West River Mainstem watershed, and Manhattan Beach, in the Magothy River Mainstem watershed. In conjunction with the pilot outreach campaign, the County is conducting pre- and post- outreach surface water bacteria monitoring within the target communities. Pre-outreach surface water monitoring began in October 2020, while community outreach is slated to begin in Spring 2021

1.4.4 Live Stock Fencing (Two TMDL Watersheds Only)

Restoration Plan Goal

The Restoration Plan recommends installation of livestock fencing along streams in pasture areas in Patuxent River Upper and West River Mainstem watersheds.

Progress

Livestock fencing was identified as a low priority restoration strategy as it has limited applicability in only two of the watersheds. No exclusion fencing was installed during FY20. A total of 54,520 linear feet of livestock exclusion fencing has been installed in the West River and Patuxent River watersheds combined since 2002. According to the Anne Arundel County Soil Conservation

District, no additional exclusion fencing is expected to be installed within the County (J. Czajkowski, pers. Communication January 2, 2020).

1.4.5 Canada Goose Management (Site-Specific)

Restoration Plan Goal

The Restoration Plan recommends adoption of various techniques for the management of Canada goose population including implementation of exclusion methods, habitat alteration and bird dispersal method.

Progress

Although this strategy was given a low priority at the time of the previous annual update, the County continues to research methods of goose management and possible locations where management would be applicable.

1.4.6 Additional Outreach Opportunities

Restoration Plan Goal

The Restoration Plan recommends additional outreach programs for homeless population, stray animals and expanded outreach programs for marinas.

Progress

Outreach programs for homeless population and stray animals are currently identified as low priority strategies for the County to meet the bacteria TMDL goals; however the County continued to perform outreach via social media targeting boaters as a follow-up to informational brochures covering proper boat sewage disposal practices and pumpout locations produced during the last reporting period. Arundel Rivers Federation offers a pump-out boat service operating in the West, Rhode, and South Rivers. The pumpout boat operates on Thursday, Friday, Saturday, Sunday and Holidays from Memorial Day weekend through October 1st. The pump-out boat can be hailed by boaters via phone, text, or VHS radio (Arundel Rivers Federation, 2019).

The Maryland Clean Marinas program recognizes marinas that meet standards of pollution prevention established by Maryland Department of Natural Resources and the Maryland Clean Marina Committee, including standards of sewage handling, waste containment and disposal, and stormwater management. Certified Clean Marinas are re-inspected every three years to ensure continued compliance. Currently, 41 marinas in Anne Arundel County are certified Clean Marinas or Clean Marina Partners (Maryland DNR, 2020).

Although the Restoration Plan did not identify the creation of a “No Discharge Zone” as a strategy, the County - in conjunction with the City of Annapolis and the Severn River Association – pursued the establishment of a No Discharge Zone (Severn River Association, 2021). In 2018 a resolution supporting a No Discharge Zone for all waters in Anne Arundel County was introduced to the Anne Arundel County Council. The resolution, which was passed by both the Anne Arundel County Council as well as the City of Annapolis Council in fall 2018, would prohibit the discharge

of marine vessel sewage into waters of the County, whether treated or not. The resolution, which is currently awaiting state and federal approval, would require marine vessel sewage to be disposed at designated pump-out stations if approved. Violations would be punishable by civil penalties not to exceed \$10,000 per violation. Three meetings were held during August 2019 to solicit public feedback prior to submitting the application for the No Discharge Zone to MDNR and MDE for review in October 2019. In December 2019 the MDNR and MDE jointly submitted the Anne Arundel County No Discharge Zone application to EPA. In January 2020, EPA staff responded with comments and questions, which have been addressed in the final version of the pump out application. The final version of the application was resubmitted to EPA on May 12, 2020. An additional public comment period is anticipated. MDNR has tentatively approved the NDZ and a public comment period was in place through October 23, 2020.

1.5 POLLUTANT LOAD REDUCTIONS

Bacteria load reductions that would be achieved from the implementation of the proposed restoration strategies were quantified using the Center for Watershed Protection's spreadsheet based Watershed Treatment Model and existing literature review.

All Tier A strategies and two Tier B strategies (Implementing New Stormwater Management Projects and Retrofitting Pre-2002 Stormwater Management Facilities to Meet Current MDE Criteria, Riparian Buffer Education Program) were modeled using CWP's Watershed Treatment Model to estimate the potential bacteria load reductions from them.

Potential bacteria load reductions from remaining Tier B strategies (Expanded Pet Waste Education Program, Canada Goose Management and Livestock Fencing) were estimated using existing literature review.

Based on the FY20 County information, the following restoration strategies were modeled using CWP's Watershed Treatment Model to update the bacteria load reductions. Data sources for the FY 2020 model include:

- Restoration of 20 percent of the untreated impervious area through urban stormwater management retrofits based on updated County data through FY20.
- Elimination of household connections based on 2,259 sampled outfalls under the Illicit Discharge Detection and Elimination program from 2005 to 2020.
- Abatement of sanitary sewer overflows (SSOs) based on the new sewage pump station projects identified by the Department of Public Works.
- Retirement of OSDs and subsequent connection to the County's sanitary sewer system.

The percentage of bacteria load reductions estimated from the above-mentioned Tier A and Tier B strategies for FY20 were compared with the percent bacteria load reductions estimated for FY19.

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The FY19 progress reported in the previous year was the modeled progress through the compliance year, 2025. Due to a change in personnel combined with the availability of more granular data, the FY20 progress was the actual progress through FY20, rather than projections through FY25. Consequently, there have been some reductions in progress compared to previous years reporting. However, as seen in sections 2 through 4, the projected progress through FY25 is in most cases greater than the modeled FY20 progress. Observations regarding the modeling results are provided below.

- There was a net increase in the bacterial load reduction related to the retirement of County septic systems; however, many watersheds saw an increase in load reduction, while others saw a decrease compared to previous years reporting. The greatest increase was observed in Tracy and Rockhold Creeks, where the reductions from OSDS retirement increased 2.4 percent. Conversely, the greatest decrease was observed in Mill Creek, where the reductions from OSDS retirement decreased 0.63 percent. It is important to reiterate that the difference in reductions is due the FY19 modeling using forecasted disconnections through FY25, whereas the FY20 modeling used actual implemented disconnections through FY20.
- The increase in the IDDE rate resulted in a slight increase in percent bacteria load reductions across all watersheds. The Severn River Mainstem watershed showed the greatest change with a 0.3 percent increase in bacteria load reductions.
- The percent bacteria load reductions in South River Mainstem watershed resulting from the implementation of urban stormwater management retrofits was slightly reduced in FY20 and FY25 compared to previous years reporting, because the drainage area and impervious treated data for a large BMP project were revised. For bacterial reductions forecasted through FY25, several watersheds also saw a reduced percent bacteria load reduction due to a slight increase in the baseline load resulting from the IDDE survey. Magothy River/Forked Creek had the greatest change in percent bacteria load reduction resulting from urban stormwater management, with an increase of 2.19 percent. Tracy and Rockhold Creeks, South River/Ramsey Lake, South River/Selby Bay, West River and Rhode River/Cadle Creek, and West River and Rhode River/Parish Creek have no planned or completed urban stormwater management retrofits. For bacterial load reductions achieved through FY20, several watersheds saw large decreases compared to FY19 reporting, due to pending BMP implementation. The watersheds with the largest differences, were Forked Creek, Furnace Creek, and Mill Creek, which have few or no projects implemented, but several awaiting construction.
- No new planned pump station upgrades were implemented in FY20. A sewer line extension to connect a pump station was completed in the Severn River/Severn River Mainstem watershed in FY20, but this was a planned project and was accounted for in the FY19 progress modeling. However, due to the differences in modeling approaches, all watersheds saw a decrease in progress between the FY19 and FY20 modeling results.

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Table 7 provides a comparison of estimated bacteria load reductions quantified for the four above mentioned strategies in each bacteria TMDL watershed as modelled between reporting years FY19 and FY20.

Table 7. Estimated Load Reductions for Proposed Strategies in Bacteria TMDL Watershed FY2018-FY2019.

Watershed	Urban SW BMP Projects (new and retrofits) (%)		Elimination of Illicit Household Connections (%)		Abatement of SSOs (%)		Retirement of OSDS (%)		Total Cumulative Reduction ¹ (%)	
	FY19	FY20	FY19	FY20	FY19	FY20	FY19	FY20	FY15-FY19	FY15-FY20
Magothy River Mainstem	12.47	8.44	10.81	11.02	1.82	0.36	0.26	0.43	26.18	21.06
Forked Creek	8.84	0.00	1.39	1.43	6.20	0.00	0.11	0.20	18.28	3.36
Tar Cove	0.00	0.11	0.83	0.84	0.00	0.00	0.46	0.00	2.20	1.86
Furnace Creek	5.11	1.71	13.92	10.49	2.54	0.00	0.10	0.04	21.63	13.59
Marley Creek	7.63	1.30	10.29	13.53	2.29	0.00	0.07	0.28	19.09	16.56
Patapsco Lower North Branch	1.42	3.20	13.28	14.17	2.93	0.00	0.00	0.07	24.28	20.03
Upper Patuxent River	0.00	0.00	1.40	1.43	0.00	0.00	0.38	0.00	22.26	21.90
Bear Neck Creek	0.63	0.63	0.65	0.67	4.60	0.00	0.00	0.23	5.99	1.63
Cadle Creek	0.00	0.00	0.33	0.33	17.04	0.00	0.00	0.00	18.05	1.02
Severn River Mainstem	2.94	2.94	22.36	22.67	1.11	0.12	0.20	0.11	27.93	27.16
Mill Creek (Severn River)	6.84	1.11	1.90	1.94	0.00	0.00	0.00	0.00	11.83	5.53
Whitehall & Meredith Creeks	1.03	0.92	1.17	1.20	0.00	0.00	0.08	0.08	4.74	4.32
South River Mainstem	3.08	9.25	0.81	13.79	6.40	0.27	6.40	0.02	31.47	30.31
Duvall Creek	10.27	3.08	13.50	0.83	0.40	0.00	0.40	0.24	10.28	4.15
Ramsey Lake	0.00	0.00	0.14	0.14	0.00	0.00	0.00	0.00	0.26	0.27
Selby Bay	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.26	0.26
Tracy & Rockhold Creeks	0.00	0.00	0.30	0.30	0.22	0.00	0.22	2.41	8.19	10.38
West River Mainstem	0.08	0.08	1.71	1.76	2.00	0.00	2.00	0.16	15.63	13.82
Parish Creek	0.00	0.00	0.24	0.24	12.90	0.00	12.90	1.50	13.59	2.16

Monitoring in the pet waste outreach focus areas would be needed to evaluate the progress and quantify the bacteria load reductions from of this strategy. The County has not initiated the low priority strategies of Canada Goose Management and Livestock Fencing, therefore the progress from these strategies are not quantified as well.

Overall, a decrease in percent bacteria load reductions was observed in most watersheds compared to the FY19 annual progress modeling results. This is due to a revised modelling approach used in FY20, and the use of more accurate annual data as opposed to projected data through FY25. A comparison of percent bacteria load reductions modeled in FY20 to the percent bacteria load reductions modeled in FY19 for the Bacteria TMDL Restoration Plan is provided in Table 7.

SECTION TWO MONITORING

As noted in the Restoration Plan, there are six different monitoring programs operating in the County including the County's ongoing NPDES MS4 Assessment of Controls monitoring at the Parole Plaza outfall and Church Creek; MDE's shellfish harvesting area monitoring; the County Department of Health's bacteria monitoring of public bathing beaches; the community-sponsored Operation Clearwater, which is (as of summer 2020) monitoring water quality at select locations along the Magothy River, Rock Creek and Severn River; the County's Stream Restoration Project Monitoring; bacteria trend monitoring in the Marley and Furnace Creek watersheds; and pre-outreach bacteria monitoring in two communities in conjunction with a pilot pet waste outreach campaign, all of which monitor bacteria concentration.

2.1 ASSESSMENT OF CONTROLS MONITORING

In compliance with County NPDES MS4 permit requirements, the County samples stormwater runoff in the Church Creek watershed. A variety of parameters are measured, including bacteria (*E. coli*). Church Creek is located in Annapolis, MD within the South River Mainstem subwatershed, which is listed as impaired for Fecal Coliform. Church Creek MS4 stormwater sampling is conducted by private consultant at two different monitoring stations – the upstream Parole Plaza station and the downstream Church Creek station. During summer 2015, significant discrepancies were observed in *E.coli* counts between samples taken at the upstream Parole Plaza monitoring station and the downstream Church Creek monitoring station on the same date throughout the hydrograph.

Upon County review of these data and in response to these discrepancies, the County began conducting synoptic bacteria sampling at the two MS4 monitoring stations as well as four other locations along Church Creek. Limited data collection occurred in 2016, and in 2017 a more robust growing season synoptic sampling program was developed, entailing collection of samples at the two MS4 monitoring stations as well as four other locations along Church Creek. Synoptic studies allow for detailed investigations of the geographic distribution of particular water quality characteristics at a given time, as all samples are synchronized to be taken at the same time. The

County continued to conduct synoptic sampling at Church Creek during summer 2018. At this time there are no plans to continue further monitoring.

The impetus behind the synoptic study was to determine what, if any, unidentified source of bacteria is contributing to the disparity in results observed between the Church Creek and Parole Plaza monitoring stations. The average median *E. coli* concentrations for sites along the tributary branch originating at Parole Plaza were 242.9 in 2017 and 221.7 in 2018. *E. coli* concentrations for sites along the tributary originating north of Harbour Center were 519.8 in 2017 and 201.7 in 2018. Potential sources of *E. coli* identified during this study include sediments mobilized during the retrofit of the stormwater pond at Harbour center and wildlife. Additionally, IDDE efforts during 2019 revealed and addressed an illicit discharge associated with power washing at a parking garage directly across the street from the Parole Plaza monitoring station, which may have contributed to bacteria inputs.

2.2 BACTERIA TREND MONITORING

In July 2019, the County began trend monitoring for bacteria (enterococcus) in the Furnace Creek and Marley Creek bacteria TMDL watersheds. The County identified 12 monitoring stations – six in each TMDL watershed – to be monitored monthly for surface water bacteria (Figure 3). The County’s Bacteria Sampling Plan and QA/QC Protocols document can be found in Appendix B of this report, while results from the first 12 months of monitoring (July 2019 – June 2020) can be found in Appendix C of this report.

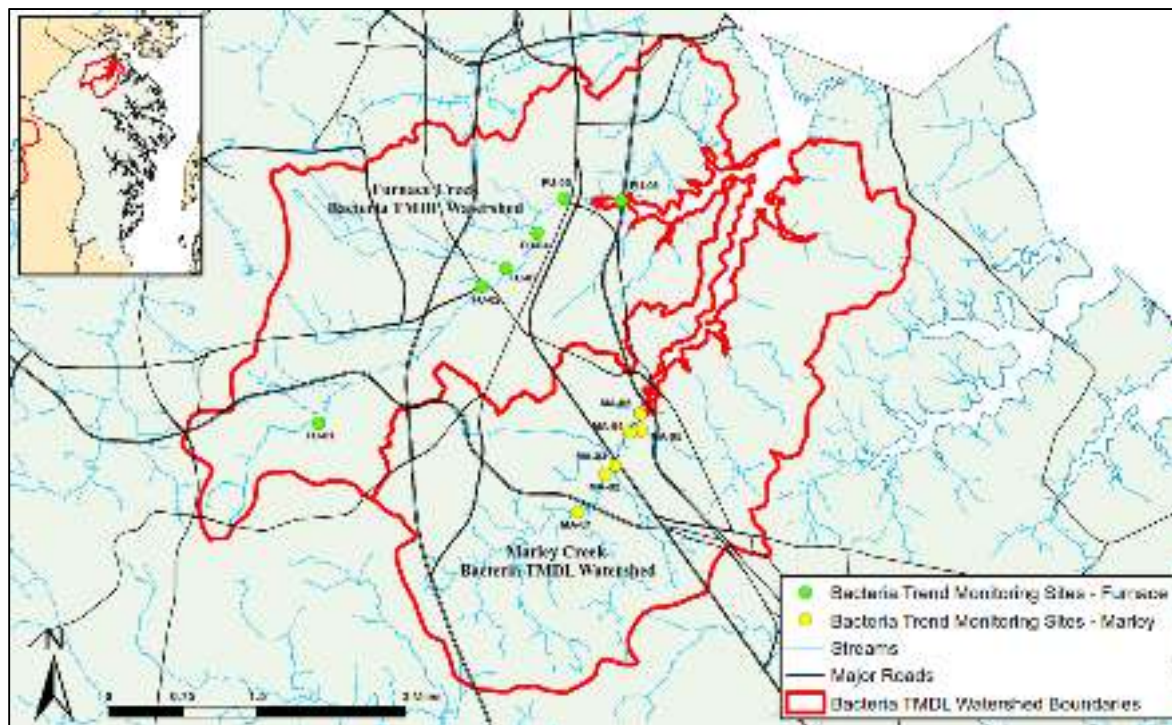


Figure 3. Bacteria trend monitoring sampling locations in the Furnace and Marley Creek TMDL watersheds.

2.3 SHELLFISH HARVESTING MONITORING STATIONS

MDE uses the monitoring data from the shellfish harvesting area monitoring stations to prepare the Integrated Report for Surface Water Quality which includes a surface water quality assessment of the State waters, and for the development of TMDLs. In order to demonstrate support of the shellfish harvesting designated use, the measured level of fecal coliform in water (expressed as MPN/100 ml) must have a median of less than the MDE criterion level of 14 and a 90th percentile of less than 49, calculated from a minimum of 30 samples taken over a three year period.

Annual (fiscal year) median bacteria concentrations based on historical monitoring data for 41 monitoring stations in 15 applicable Bacteria TMDL watersheds (as presented in Appendix C of the Restoration Plan) can be found in Appendix D of this report. A comparison of MDE’s monitoring data for FY19 and FY20 is provided in Table 8.

In FY20, annual median bacteria concentrations were below the MDE criterion level at 38 monitoring stations and above the MDE criterion level at 3 stations. Median bacteria concentrations decreased at 19 stations from FY19 to FY20, increased at 7 stations and remained the same at 15 stations. Analysis of the historical data shows an overall downward trend in yearly median bacteria concentrations at 31 of the 42 monitoring stations. Effective February 10, 2020 portions of the West and Rhode Rivers previously restricted to shellfish harvesting were classified to “approved for shellfish harvesting” based on water quality monitoring results. The County will continue to review the monitoring data as well as the Integrated Report for Surface Water Quality Assessment to assess whether the bacteria TMDLs are meeting MDE’s water quality criterion for bacteria.

Table 8. Comparison of MDE Shellfish Harvesting Area Monitoring Data

Bacteria TMDL Watershed	Monitoring Data Source	Monitoring Station	Median (MPN/100ml) ¹	
			FY19	FY20
Magothy Mainstem	MDE	0301001	9.1	3.6
Magothy Mainstem	MDE	0301001A	3.6	15.0
Magothy Mainstem	MDE	0301001C	1.0	1.0
Magothy Mainstem	MDE	0301800	3.6	3.6
Magothy River/Forked Creek	MDE	0301011	9.1	39.0
Magothy River/Tar Cove	MDE	0301005C	3.6	3.6
Magothy River/Tar Cove	MDE	0301006B	12.1	9.1
Magothy River/Tar Cove	MDE	0301801	1.0	1.0
Magothy River/Tar Cove	MDE	0301802	1.0	1.0
Rhode River/Bear Neck Creek	MDE	0307120A	23.0	23.0
Rhode River/Cadle Creek	MDE	0307019	23.0	4.0
Severn River Mainstem	MDE	0304152	43.0	3.6

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Bacteria TMDL Watershed	Monitoring Data Source	Monitoring Station	Median (MPN/100ml) ¹	
			FY19	FY20
Severn River Mainstem	MDE	0304150	3.6	3.6
Severn River Mainstem	MDE	0304002A	1.0	3.0
Severn River Mainstem	MDE	0304005	2.3	3.6
Severn River Mainstem	MDE	0304008	2.3	1.0
Severn River Mainstem	MDE	0304011	3.3	1.0
Severn River Mainstem	MDE	0304016	3.6	3.6
Severn River Mainstem	MDE	0304020	3.6	3.0
Severn River Mainstem	MDE	0304028	2.3	1.0
Severn River Mainstem	MDE	0304029	3.6	3.6
Severn River Mainstem	MDE	0303200	1.0	1.0
Severn River Mainstem	MDE	0303202	1.0	1.0
Severn River Mainstem	MDE	0303204	3.3	1.0
Severn River/Mill Creek	MDE	0303006	12.1	9.1
Severn River/Whitehall and Meredith Creek	MDE	0303005	3.6	3.6
Severn River/Whitehall and Meredith Creek	MDE	0303005A	16.1	7.3
South River/Duvall Creek	MDE	0306104	9.3	3.6
South River/Duvall Creek	MDE	0306013A	4.2	3.6
South River Mainstem	MDE	0306110	3.6	2.3
South River Mainstem	MDE	0306211	3.6	2.3
South River Mainstem	MDE	0306002	2.3	9.1
South River Mainstem	MDE	0306205	1.0	1.0
South River Mainstem	MDE	0306111	2.3	3.6
South River Mainstem	MDE	0306208A	3.6	12.1
South River/Ramsey Lake	MDE	0306115A	3.6	3.6
South River/Selby Bay	MDE	0306801	6.4	3.6
South River/Selby Bay	MDE	0306115	3.6	2.3
W. Chesapeake Bay/Tracy and Rockhold Creeks	MDE	0501004	19.0	6.4
West River Mainstem	MDE	0307205	3.6	3.6
West River/Parish Creek	MDE	0307011	9.1	7.3

¹ The MDE Criterion for Median Sample (MPN/100ml) is 14

² The MDE Criterion for 90th Percentile Sample (MPN/100ml) is 43.

2.4 HEALTH DEPT. MONITORING OF BATHING BEACHES

The Anne Arundel County Department of Health, under State of Maryland regulations, conducts water quality sampling at 81 community bathing beach sites along area creeks and rivers from Memorial Day to Labor Day either weekly or biweekly. The water bodies are tested for levels of enterococci bacteria. If enterococci counts exceed the acceptable level or when a sewage spill impacts a waterway the Department of Health will issue an advisory against swimming and other direct water contact activities. The advisory remains in effect until test results show enterococci counts are within acceptable levels. The acceptable level for bodies of water sampled is 104 MPN (Most Probable Number) of colonies of organisms per 100 milliliters of water. Recreational water quality reports are available from the County's Department of Health website at <https://www.aahealth.org/recreational-water-quality-report/>

2.5 OPERATION CLEARWATER AND NGO MONITORING

Several NGOs also conduct water quality monitoring for bacteria within the County's TMDL watersheds. Operation Clearwater has provided regular bacteria monitoring at waterfront recreational areas for 44 years. In FY20, Operation Clearwater conducted weekly monitoring of microbial (Enterococci) water quality at 63 sites throughout the County from Memorial Day through Labor Day. Further information about Operation Clearwater, including monitoring data, can be found online at <https://sites.google.com/view/aaccecoperationclearwater> and <http://ola2.aacc.edu/tldomanski/>

Arundel Rivers Federation (ARF) also conducted weekly water quality monitoring for Enterococci bacteria from Memorial Day through Labor Day in FY20 at 22 sites. Additionally, ARF has collaborated with the Smithsonian Environmental Research Center (SERC) in DNA source tracking analysis to determine the source of chronic bacteria pollution in areas of high concern. Further information about ARF's bacteria monitoring program, including monitoring data, can be found online at <http://www.arundelrivers.org/water-quality-monitoring/programs/bacteria-monitoring/>. ARF's 2019 Report Card for the South, West, and Rhode Rivers showed improvement from 2018, with all three rivers receiving an "A-" or better in the bacteria category. ARF's 2019 Report Card can be found at https://www.arundelrivers.org/water-quality-monitoring/report_card/. Similar report cards for the Severn and Magothy Rivers can be found at <https://severnriver.org/wp-content/uploads/SRA-2019-State-Of-Severn-Written-Report-Final.pdf> and <http://www.magothyriver.org/wp/wp-content/uploads/2020/03/magothy-river-index-2019.pdf>, respectively.

Partners at the Anne Arundel Community College monitored enterococci weekly at six locations along the Rhode River and its tributaries from May through August 2017 as part of an effort to characterize water quality in the Rhode River prior to the conversion of the Mayo Water Reclamation Facility from a treatment plant to a pumping station (Domanski, 2017). The conversion was completed in October 2017 and the first full season of post-conversion monitoring was accomplished from May through August 2018. A second year of monitoring was

accomplished from May-August 2019; A full report on this second year of monitoring can be found in Appendix E of this annual report.

2.6 CIP RESTORATION PROJECT MONITORING

In August 2018, the County broke ground on a stream restoration project at Furnace Branch located in Glen Burnie. The project includes the removal of an existing concrete floodway and restoring a natural stream channel and floodplain. Furnace Branch lies within the highly impaired Furnace Branch subwatershed, which is listed as impaired for Enterococci. As part of this project, a water quality monitoring program has been established to determine what water quality benefits occur due to restoration activity. During the pre-restoration monitoring work occasional elevated bacteria (*E. coli*) counts and observation of an overflowing sewer manhole (subsequently repaired), prompted a more thorough investigation of conditions along the channelized portion of the stream, upstream of the monitoring station, between Kent Rd and 7th Avenue. In summer 2017, the County began collecting additional bacteria samples under baseflow conditions from locations along the main stem that bracket known sewer crossings, as well as from storm drain outfalls discharging to the reach of interest. Bacteria sampling was suspended with the initiation of construction in August 2018 and will resume after restoration work is completed.

2.7 COUNTYWIDE BIOMONITORING

The County has performed biological monitoring in accordance with Maryland Biological Stream Sampling protocols at targeted CIP sites within bacteria TMDL watersheds since 2015, with benthic sampling occurring annually and fish sampling occurring biennially. In 2020, monitoring at two sites (FB-01 and FB-02) has been temporarily suspended until restoration work has been completed. Post-restoration biological monitoring at sites HB-01 and HB-02 has been deemed completed, thus these sites were not sampled in 2020. One site (CY-01) was deemed unsampleable in 2020 due to beaver dam impoundment. Five sites (CB-01, CB-02, CB-03, CB-04, and CB-05) were added in 2020 as new restoration projects were completed. Table 10 shows the Benthic Index of Biotic Integrity (BIBI) scores for each of these sites for years 2016 through 2020. Additionally, biological monitoring has also been performed as a component of a separate study at 15 sites along Sawmill Creek and its tributaries within the Furnace Creek bacteria TMDL watershed since 2017, and is expected to continue at least until 2021.

Table 9. Benthic Index of Biotic Integrity (BIBI) scores at Targeted CIP Sites in Bacteria TMDL Watersheds, 2016-2019

Site ID	Bacteria TMDL Watershed	BIBI Score 2016	BIBI Score 2017	BIBI Score 2018	BIBI Score 2019	BIBI Score 2020
FB-01	Furnace Creek	1.86 (Very Poor)	2.14 (Poor)	1.00 (Very Poor)	n/a ¹	n/a ¹
FB-02	Furnace Creek	1.86 (Very Poor)	1.57 (Very Poor)	1.57 (Very Poor)	n/a ¹	n/a ¹
CY-01	Magothy Mainstem	1.86 (Very Poor)	1.86 (Very Poor)	1.57 (Very Poor)	2.43 (Poor)	n/a ²
CY-02	Magothy Mainstem	1.57 (Very Poor)	2.43 (Poor)	2.43 (Poor)	2.14 (Poor)	2.71 (Poor)
DC-01	Magothy Mainstem	2.14 (Poor)	2.14 (Poor)	2.43 (Poor)	1.00 (Very Poor)	2.14 (Poor)
DC-02	Magothy Mainstem	1.86 (Very Poor)	1.86 (Very Poor)	1.49 (Very Poor)	2.43 (Poor)	2.71 (Poor)
MC-01	Magothy Mainstem	2.71 (Poor)	2.71 (Poor)	2.71 (Poor)	2.43 (Poor)	3.00 (Fair)
MC-02	Magothy Mainstem	1.57 (Very Poor)	3.00 (Fair)	1.00 (Very Poor)	2.14 (Poor)	2.14 (Poor)
MC-03	Magothy Mainstem	2.71 (Poor)	2.71 (Poor)	1.00 (Very Poor)	2.14 (Poor)	2.71 (Poor)
MC-04	Magothy Mainstem	2.71 (Poor)	2.71 (Poor)	3.00 (Fair)	2.71 (Poor)	2.43 (Poor)
HB-01	Severn Mainstem	3.00 (Fair)	3.29 (Fair)	2.43 (Poor)	2.71 (Poor)	n/a ³
HB-02	Severn Mainstem	3.29 (Fair)	1.00 (Very Poor)	2.14 (Poor)	1.86 (Very Poor)	n/a ³
SR-01	Severn Mainstem	3.86 (Fair)	3.86 (Fair)	3.29 (Fair)	3.57 (Fair)	4.43 (Good)
CB-01 ⁴	Severn Mainstem	n/a	n/a	n/a	n/a	2.43 (Poor)
CB-02 ⁴	Severn Mainstem	n/a	n/a	n/a	n/a	1.29 (Very Poor)
CB-03 ⁴	Severn Mainstem	n/a	n/a	n/a	n/a	1.00 (Very Poor)
CB-04 ⁴	Severn Mainstem	n/a	n/a	n/a	n/a	1.86 (Very Poor)
CB-05 ⁴	Severn Mainstem	n/a	n/a	n/a	n/a	1.86 (Very Poor)

¹ Not sampled in 2020 due to ongoing restoration project construction.

² Not sampled in 2020 due to beaver dam impoundment.

³ Not sampled in 2020 due to completion of post-restoration monitoring.

⁴New monitoring site in 2020.

SECTION THREE SUMMARY AND FUTURE ACTIONS

Table 10 presents a summary of the County’s progress toward achieving the SW-WLAs for Bacteria TMDLs. Reductions in bacteria loads were quantified using the Watershed Treatment Model; based on the modelling results, the County has met the required reduction percentages in 5 of 19 TMDL watersheds. In Section 7 (Implementation Schedule and Milestone) of the Bacteria TMDL Restoration Plan, programmatic milestone criteria were identified to be achieved by the end of the 2021 milestone year. Table 11 provides the County’s progress towards achieving these programmatic milestones as of the end of FY20.

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Table 10. Bacteria TMDL SW-WLAs Implementation Progress for Anne Arundel County

Watershed	SW-WLA		Percent Reduction	
	Baseline	Target	Required	Reduction through FY20 ¹
Magothy River Mainstem	4.97x10 ¹²	4.33x10 ¹²	12.8%	21.06%
Forked Creek	1.83x10 ¹¹	1.35x10 ¹¹	26.3%	3.36%
Tar Cove	9.82x10 ¹¹	2.07x10 ¹²	0.0%	1.86%
Furnace Creek	3.66x10 ¹²	8.14x10 ¹¹	77.7%	13.59%
Marley Creek	6.19x10 ¹²	1.50x10 ¹²	75.7%	16.56%
Patapsco Lower North Branch	2.37x10 ¹⁵	1.99x10 ¹⁵	20.7%	20.03%
Upper Patuxent River	1.20x10 ¹⁶	6.01x10 ¹⁵	22.3%	21.90%
Bear Neck Creek	3.55x10 ¹¹	2.01x10 ¹¹	43.3%	1.63%
Cadle Creek	3.54x10 ¹¹	9.85x10 ¹⁰	72.2%	1.02%
Severn River Mainstem	6.07x10 ¹²	4.92x10 ¹²	19.0%	27.16%
Mill Creek (Severn River)	1.78x10 ¹²	2.49x10 ¹¹	86.0%	5.53%
Whitehall & Meredith Creeks	4.92x10 ¹¹	4.92x10 ¹⁰	90.0%	4.32%
South River Mainstem	1.32x10 ¹³	9.31x10 ¹²	29.5%	30.31%
Duvall Creek	1.52x10 ¹¹	8.27x10 ¹⁰	45.6%	4.15%
Ramsey Lake	5.57x10 ¹¹	2.27x10 ¹¹	59.3%	0.27%
Selby Bay	3.27x10 ¹¹	3.57x10 ¹¹	0.0%	0.26%
Tracy & Rockhold Creeks	1.67x10 ¹²	3.06x10 ¹¹	81.6%	10.38%
West River Mainstem	1.77x10 ¹²	1.15x10 ¹²	35.3%	13.82%
Parish Creek	2.56x10 ¹¹	1.20x10 ¹¹	53.1%	2.16%

Table 11. End of NPDES MS4 permit cycle Milestone Programmatic Criteria Status (as of the end of FY20).

Programmatic Criteria	Progress
20% of impervious area managed with SPSC or other high-performing BMP (meet NPDES MS4 Permit/WIP goal).	The County continues to make progress towards completing new and retrofit stormwater management facilities projects in accordance with County goals. For the amount of impervious acres managed within bacteria TMDL watersheds, refer to the geodatabase submitted as part of the County's FY20 NPDES MS4 Annual Report.
Continued triennial inspection and maintenance of constructed BMPs.	During the FY20 reporting period the County continued triennial inspection and maintenance of constructed BMPs to verify functionality.
Pet waste education program continues; implement additional television PSAs, videos, social media, etc. as funds allow.	Throughout FY20 the County highlighted proper pet waste management practices through its social media outlets, and at community events and presentations. The County has hired a private consultant to develop a pilot pet waste outreach campaign in two target communities. In conjunction with the outreach campaign, the County is conducting pre- and post-outreach bacteria monitoring in the target communities. Pre-outreach monitoring began in October 2020. Community outreach is scheduled to begin in Spring 2021. In FY20 BWPR continued to make pet waste stations available for interested communities; seven stations were reserved in FY20 for installation in FY21. WPRP will further investigate the number and locations of pet waste stations at County parks.

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<p>50% of planned septic systems connected to sewers, if funding allows.</p>	<p>292 OSDS in bacteria TMDL watersheds have been projected to be retired by FY25. Currently, 143 OSDS have been retired – 49% of the projected total.</p> <p>The County successfully secured Chesapeake Bay Trust Funding to advance the County’s efforts to connect septic systems to public sewer. This funding enabled the County to prioritize watersheds for septic conversion. The County has developed conceptual layouts and cost estimates for approximately 140 separate projects. Individual tasks have been completed through the use of consultants.</p> <p>In February 2017, a Septic Task Force was created, consisting of representatives from the County, local business, and environmental organizations. The Septic Task Force’s stated goals included developing recommendations that will inform decision making, and identifying short term strategies and long term approaches to reducing septic system loads. In September 2018 a private consulting firm was hired to serve as a Conversion Program Manager, and in 2019 the Septic Task Force worked to develop the framework for a new septic connection program. In August 2019, a customer survey was distributed to County residents to gauge citizens’ attitudes towards water quality and willingness to pay for a septic-to-sewer conversion program. Nearly 1,500 residents responded to the survey.</p> <p>Following upon the efforts of the Septic Task Force, DPW proposed new legislation to allow septic system connections in eligible areas to be provided with a subsidy, with an option to defer a portion of their assessment. Eligible areas were defined to include areas in the Health Department’s Onsite Wastewater Management Problem Areas, and locations within the Critical Area. Four separate pieces of legislation were passed between the end of 2019 and during 2020 to put the elements of the program into place.</p> <p>In conjunction with the legislative changes, DPW has been developing the “Our wAater” initiative to educate the public on strategies and efforts underway to reduce nutrient loads to Anne Arundel County waterways and the Chesapeake Bay. Within the Our wAater initiative, a goal of connecting 200 residential systems per year over a 20-year period has been set. DPW intends to broadly introduce the program to the public in 2021, including community meetings, to provide information and encourage communities to consider applying for the program.</p>
<p>Streamside livestock fencing completed.</p>	<p>No livestock fencing projects were implemented in the Bacteria TMDL watersheds during FY20. Maryland Department of Agriculture does not foresee any additional exclusion fencing being installed in the County.</p>

Implementation of a multi-media expanded pet waste outreach program was identified as a strategy that would provide the highest bacteria load reductions among 9 of the 19 TMDL watersheds. The County has continued the development of a robust pet waste outreach program by hiring a consultant to develop a pet waste outreach campaign. A pilot campaign in two communities within bacteria TMDL watersheds will be rolled out in Spring 2021. In conjunction with the pilot outreach campaign, the County is conducting pre-and post-outreach bacteria monitoring at each community’s public water access area. Pre-outreach monitoring began in October 2020.

In July 2019, the County began long-term bacteria trend monitoring at twelve (12) sites within the Marley and Furnace Creek bacteria TMDL watersheds. The first year of data from this effort is available in Appendix C of this report.

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The County remains committed to preventing SSOs by upgrading sewer pump stations and sewer infrastructure; there are currently 39 active pump station upgrade projects in bacteria TMDL watersheds.

The County continues to make progress towards the retirement of OSDS, passing new legislation designed to reduce the financial burden of private septic system connections in eligible areas. The County's draft General Development Plan (GDP) states that the County intends to implement the recommendations from the Septic Task Force final report to address onsite wastewater management problem areas. Additionally, the GDP has also set forth goals for the development of a program to ensure individual septic systems are properly maintained, and for the evaluation of the impact of increasing precipitation events and sea-level rise on septic system function (more information on the General Development Plan can be found at <https://www.aacounty.org/departments/planning-and-zoning/long-range-planning/general-development-plan/index.html>).

Restoration strategies such as Canada Goose Management, and outreach opportunities for management of homeless population and stray animals have not been initiated by the County as these were given a low priority. Evaluation of their effectiveness needs to be conducted if these strategies are to be implemented. The installment of any additional livestock fencing in the County is not anticipated.

Continual monitoring of the effectiveness of implemented strategies is recommended. This is because most restoration techniques require time to produce quantifiable benefits at the watershed level from their implementation time. Data collected by MDE from shellfish harvesting monitoring stations, as well as the Integrated Report for Surface Water Quality, will continue to be reviewed to determine the effectiveness of the implemented restoration strategies as well as to determine if any of the bacteria TMDL water bodies become eligible for removal from the TMDL list through the achievement of water quality standards for bacteria.

Moving forward, the County intends to focus future bacteria reduction efforts in TMDL watersheds in which WLAs have not yet been met, to the greatest extent possible. The County will also continue to collaborate with MDE and other jurisdictions to investigate the effectiveness of BMPs to reduce bacteria where such opportunities exist.

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Appendix A

**County CIP Urban Stormwater Retrofit Projects Completed and
Proposed in Bacteria TMDL Watersheds, 2015 - 2025**

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA18RST000001	Severn River Mainstem	Jabez SWM BMP 33 Retrofit	Shallow Marsh	Shallow Marsh	119.0	12.6	1.0	2018	2018
AA16RST000008	South River Mainstem	Historic London Town Step Pools and Rain Garden	-	Rain Garden	0.7	0.5	1.0	2013	2013
AA16RST000009	Severn River Mainstem	Annapolis Mall Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	-	-	-	-	2016
AA16RST000011	Patapsco River Lower North Branch	Jerome Avenue Pond Retrofit	Extended Detention Structure	Infiltration Basin	4.6	1.5	1.6	2016	2016
AA16RST000012	Severn River Mainstem	1275 Odenton Road Pond Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	3.4	1.1	0.9	2016	2016
AA16RST000013	South River Mainstem	St Andrews Pond Retrofit	Extended Detention Structure	Multiple Pond System	8.0	2.5	2.6	2017	2017
AA16RST000014	Furnace Creek	Lochaber Court Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	14.6	3.4	0.9	2016	2016
AA16RST000016	Marley Creek	Hospital Drive Pond #3 SWM Retrofit SPSC	Extended Detention Structure	Regenerative Step Pool Conveyance	31.7	15.8	0.9	2016	2016
AA16RST000017	Magothy River Mainstem	8013 Tick Neck Road Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	52.7	23.1	0.1	2016	2016
AA16RST000018	Magothy River Mainstem	603 Deering Road Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	50.1	23.1	0.5	2016	2016
AA16RST000019	Mill Creek	Comanche Rd Retrofit	Infiltration Basin	Retention Pond (Wet Pond)	13.0	2.6	0.6	2017	2017
AA16RST000020	Patapsco River Lower North Branch	Musical Way Pond Retrofit	Extended Detention Structure	Infiltration Basin	16.8	3.8	0.6	2016	2016
AA16RST000021	Mill Creek	Old Sturbridge Rd Retrofit	Infiltration Basin	Retention Pond (Wet Pond)	7.7	1.5	0.8	2017	2017
AA16RST000022	Mill Creek	Nickerson Way Retrofit	Infiltration Basin	Retention Pond (Wet Pond)	3.7	0.8	1.1	2017	2017
AA16RST000024	Patapsco River Lower North Bran	Severn Road / Carriage Drive Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	11.2	4.8	0.8	2016	2016
AA16RST000025	Furnace Creek	McNeil Court Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	8.2	3.1	1.2	2016	2016
AA16RST000027	Magothy River Mainstem	725 Bridge Drive Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	3.9	1.1	1.5	2016	2016
AA16RST000028	South River Mainstem	Loch Haven Manor Pond	Extended Detention Structure	Retention Pond (Wet Pond)	8.3	2.2	1.6	2016	2016
AA16RST000030	Patapsco River Lower North Bran	806 Central Ave (Linthicum) Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	1.5	1.0	0.4	2017	2017

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA16RST000031	Magothy River Mainstem	Dividing Creek AACC Pond Retrofit #1	Extended Detention Structure	Retention Pond (Wet Pond)	15.1	12.8	1.0	2016	2016
AA16RST000032	Magothy River Mainstem	Dividing Creek AACC Pond Retrofit #2	Infiltration Trench	Bioretention	7.7	6.6	0.4	2016	2016
AA16RST000033	Magothy River Mainstem	Grosvenor Lane Bioretention	-	Bioretention	4.1	0.6	0.3	2016	2016
AA16RST000034	Marley Creek	Sun Valley Condos Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	5.5	1.8	0.4	2017	2017
AA16RST000035	South River Mainstem	Wordsworth Dr Retrofit	Retention Pond (Wet Pond)	Retention Pond (Wet Pond)	69.7	27.1	2.5	2017	2017
AA16RST000038	South River Mainstem	Sharpsburg Dr Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	33.0	4.0	1.3	2016	2016
AA16RST000039	South River Mainstem	Annapolis Harbour Center Pond Retrofit	Retention Pond (Wet Pond)	Extended Detention Structure	36.3	27.1	1.9	2017	2017
AA16RST000040	Severn River Mainstem	Valentine Creek SWM Retrofit	Detention Structure (Dry Pond)	Extended Detention - Wetland	34.9	3.3	1.7	2017	2017
AA16RST000041	Furnace Creek	Chalmers Ave Pond Retrofit	Detention Structure (Dry Pond)	Infiltration Basin	19.0	5.3	2.5	2017	2017
AA16RST000044	Furnace Creek	Towering Oaks Court Pond Retrofit	Detention Structure (Dry Pond)	Extended Detention Structure	8.0	3.2	2.6	2018	2018
AA16RST000045	Furnace Creek	Baby Baer Court Pond Retrofit	Detention Structure (Dry Pond)	Infiltration Basin	11.4	3.2	2.5	2016	2016
AA16RST000047	Patapsco River Lower North Bran	Groveland Road Pond Retrofit	Detention Structure (Dry Pond)	Infiltration Basin	12.4	3.8	1.0	2019	2019
AA16RST000054	Marley Creek	Hospital Drive / Foxwell Bend Road Pond Retrofit	Extended Detention Structure	Extended Detention Structure	30.1	11.3	1.8	2017	2017
AA16RST000055	Marley Creek	Fox Cub Court Pond Retrofit	Extended Detention Structure	Extended Detention Structure	16.2	6.7	2.4	2017	2017
AA16RST000058	Whitehall and Meredith Creeks	Pennington Ln South Retrofit	Extended Detention Structure	Regenerative Step Pool Conveyance	24.2	4.7	1.0	2017	2017
AA16RST000060	Patapsco River Lower North Bran	Gesna Dr Retrofit	Detention Structure (Dry Pond)	Shallow Marsh	30.5	11.8	0.8	2020	-
AA16RST000061	Patapsco River Lower North Bran	Tuckerman Dr Retrofit	Detention Structure (Dry Pond)	Extended Detention - Wetland	92.6	22.2	1.8	2019	2019
AA16RST000062	Patapsco River Lower North Bran	Fairbanks Dr Retrofit	Detention Structure (Dry Pond)	Shallow Marsh	14.4	6.4	0.7	2019	2019
AA16RST000064	Patapsco River Lower North Bran	Green Moss Glen Retrofit	Detention Structure (Dry Pond)	Sand Filter	23.4	7.2	0.7	2021	-
AA16RST000066	Patapsco River Lower North Bran	Ridge Commons Blvd Retrofit	Extended Detention Structure	Extended Detention Structure	24.1	10.6	2.6	2019	2019

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA16RST000067	Severn River Mainstem	Pasture Brook Rd Retrofit	Detention Structure (Dry Pond)	Extended Detention - Wetland	49.4	13.0	1.0	2017	2017
AA16RST000069	South River Mainstem	2662 Riva Rd Retrofit	Detention Structure (Dry Pond)	Regenerative Step Pool Conveyance	7.9	4.2	1.4	2020	-
AA16RST000072	Furnace Creek	Juneberry Way Pond Retrofit - SPSC	Detention Structure (Dry Pond)	Regenerative Step Pool Conveyance	5.4	3.1	1.0	2016	2016
AA16RST000073	Severn River Mainstem	Maryland Therapeutic Riding Center SPSC	-	Regenerative Step Pool Conveyance	26.6	2.4	2.5	2015	2015
AA16RST000075	Patapsco River Lower North Bran	Northrup Grumman Bioswale 1	-	Bio-Swale	0.6	0.6	0.7	2016	2016
AA16RST000078	Patapsco River Lower North Bran	Northrup Grumman Pervious Pavement 1	-	Permeable Pavements	1.0	0.8	1.4	2016	2016
AA16RST000079	Patapsco River Lower North Bran	Northrup Grumman Pervious Pavement 3A-2	-	Permeable Pavements	1.5	1.2	1.2	2016	2016
AA16RST000080	Patapsco River Lower North Bran	Northrup Grumman Pervious Pavement 3B	-	Permeable Pavements	1.3	1.2	1.5	2016	2016
AA16RST000081	Patapsco River Lower North Bran	Northrup Grumman Pervious Pavement 2	-	Permeable Pavements	0.5	0.5	0.7	2016	2016
AA16RST000082	Marley Creek	Hospital Drive Pond 2 Retrofit SPSC	Extended Detention Structure	Regenerative Step Pool Conveyance	13.0	5.8	0.7	2017	2017
AA15RST000085	Magothy River Mainstem	Earleigh Heights Rd at B&A Trail Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	12.9	3.7	2.6	2015	2015
AA15RST000086	Magothy River Mainstem	Evon Ct Pond Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	8.9	2.8	2.6	2015	2015
AA15RST000087	Magothy River Mainstem	Colleen Garden/Severndale GST Pond Retrofit	Infiltration Trench	Retention Pond (Wet Pond)	21.1	5.6	0.2	2015	2015
AA15RST000088	Magothy River Mainstem	Colleen Garden Ln Pond Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	3.0	1.1	0.6	2015	2015
AA15RST000089	Magothy River Mainstem	Waycross Way Pond Retrofit	Wet Pond - Wetland	Retention Pond (Wet Pond)	45.5	12.8	0.5	2015	2015
AA15RST000090	Duval Creek	Old Annapolis Neck Road	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	3.0	0.9	2.6	2016	2016
AA15RST000091	Magothy River Mainstem	244 Kennedy Drive Pond Retrofit	Infiltration Basin	Retention Pond (Wet Pond)	2.3	0.9	1.3	2016	2016
AA15RST000092	Severn River Mainstem	Knollwood Road Outfall	-	Regenerative Step Pool Conveyance	9.5	2.6	1.0	2016	2016
AA15RST000093	Severn River Mainstem	Western District Police Station	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	2.3	1.3	1.7	2016	2016

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA15RST000094	Magothy River Mainstem	109 Chelsea Grove Ct Pond Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	13.1	2.8	0.4	2016	2016
AA15RST000095	South River Mainstem	Dillon Court Pond Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	15.2	2.8	1.3	2016	2016
AA15RST000096	Magothy River Mainstem	Finnegan Dr Pond Retrofit	Infiltration Basin	Retention Pond (Wet Pond)	7.2	2.2	1.5	2015	2015
AA15RST000097	Severn River Mainstem	Wetherfield Pond SWM Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	16.5	4.8	1.0	2014	2014
AA14RST000098	Magothy River Mainstem	Longfellow Drive Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	17.6	4.4	0.4	2014	2014
AA14RST000099	Magothy River Mainstem	Copperwood Ct Pond Retrofit #2	-	Regenerative Step Pool Conveyance	7.6	2.9	0.0	2014	2014
AA14RST000100	Magothy River Mainstem	Copperwood Ct Pond Retrofit	Retention Pond (Wet Pond)	Retention Pond (Wet Pond)	7.6	2.9	0.4	2014	2014
AA14RST000101	Magothy River Mainstem	Sylvan Ave Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	10.4	4.7	0.5	2014	2014
AA14RST000102	Magothy River Mainstem	Lahinch Dr SWM Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	35.0	7.7	0.5	2014	2014
AA14RST000103	Magothy River Mainstem	Tarks Lane Pond Retrofit	Wet Pond - Wetland	Retention Pond (Wet Pond)	25.9	5.5	0.6	2014	2014
AA14RST000105	Magothy River Mainstem	Collington Court Pond Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	37.4	6.8	0.3	2014	2014
AA14RST000106	Magothy River Mainstem	Mayfield Rd and Gladnor Rd Pond Retrofit	Detention Structure (Dry Pond)	Retention Pond (Wet Pond)	6.2	2.7	1.2	2014	2014
AA14RST000107	Magothy River Mainstem	Amesbury Ct. Pond Retrofit	Wet Pond - Wetland	Retention Pond (Wet Pond)	35.5	4.9	0.5	2014	2014
AA14RST000108	Magothy River Mainstem	Longfellow Drive Pond Retrofit #2	-	Regenerative Step Pool Conveyance	17.6	4.4	0.0	2014	2014
AA16RST000001	South River Mainstem	Preserve at Broad Creek Pond Retrofit - SPSC	Extended Detention Structure	Regenerative Step Pool Conveyance	11.0	4.6	0.7	2015	2015
AA16RST000007	Duval Creek	Hillsmere Beach Road Kayak Area CPO / Bioretention	-	Bioretention	9.0	2.5	0.2	2015	2015
AA17RST000001	Patapsco River Lower North Bran	Riverside Park Stormwater Management Retrofit	-	Regenerative Step Pool Conveyance	8.7	4.8	1.0	2021	-
AA17RST000002	Patapsco River Lower North Bran	Chesapeake Arts Center Stormwater Management Retro	-	Infiltration Trench	4.1	2.6	1.0	2021	-
AA17RST000003	Patapsco River Lower North Bran	Brooklyn Park Stormwater Management Retrofit	-	Infiltration Trench	7.0	2.7	1.0	2021	-

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA17RST000004	Magothy River Mainstem	Old Mill RD Outfall Stabilization	-	Regenerative Step Pool Conveyance	15.1	1.8	0.8	2021	-
AA17RST000005	Furnace Creek	Heritage Hills Back Creek Phase 2 Retrofits	Detention Structure (Dry Pond)	Regenerative Step Pool Conveyance	9.5	4.1	1.4	2020	-
AA17RST000007	Furnace Creek	Heritage Hills Back Creek Phase 2 Retrofits	-	Infiltration Berm	4.1	2.4	2.6	2020	-
AA17RST000010	Marley Creek	Mill Race Pond Retrofit	Detention Structure (Dry Pond)	Wet Pond - Wetland	46.8	14.5	2.1	2019	2019
AA17RST000011	Severn River Mainstem	Lakeland Road Outfall Stabilization	Dry Swale	Regenerative Step Pool Conveyance	44.9	13.1	2.2	2021	-
AA17RST000012	Marley Creek	Empowering Believers Church Rain Garden 6	-	Rain Garden	0.2	0.2	2.2	2016	2016
AA17RST000013	Marley Creek	Empowering Believers Church Rain Garden 2	-	Rain Garden	0.5	0.5	1.1	2016	2016
AA17RST000014	Marley Creek	Empowering Believers Church Rain Garden 1	-	Rain Garden	0.3	0.3	0.9	2016	2016
AA17RST000015	Magothy River Mainstem	Randell Road Bioretention (Round Bay Community)	-	Rain Garden	1.5	0.4	0.5	2014	2014
AA17RST000016	Severn River Mainstem	Coventry Court Dry Channel RSC- Category 2	-	Regenerative Step Pool Conveyance	2.4	1.5	0.3	2017	2017
AA17RST000017	Severn River Mainstem	Herald Harbor Bonaparte RD #2 CPO	-	Regenerative Step Pool Conveyance	17.6	4.9	0.1	2017	2017
AA17RST000018	Severn River Mainstem	Winchester on the Severn Dry Channel RSC	-	Regenerative Step Pool Conveyance	18.7	5.1	0.3	2017	2017
AA17RST000019	Duval Creek	St. Anne School of Annapolis Rain Garden	-	Rain Garden	0.6	0.4	1.5	2017	2017
AA17RST000020	West River Mainstem	Avalon Shores Fire Dept Stormwater Wetland	-	Bio-Swale	1.4	0.9	0.7	2016	2016
AA16RST000085	Magothy River Mainstem	Will O Brooke Drive Outfall Stabilization	-	Regenerative Step Pool Conveyance	4.7	1.5	2.6	2017	2017
AA17RST000022	Patapsco River Lower North Bran	Maritime Institute (Maritime Blvd) Pond Retrofit	Detention Structure (Dry Pond)	Regenerative Step Pool Conveyance	17.5	9.2	0.9	2021	-
AA17RST000023	Furnace Creek	Sawmill Hollins Ferry RD Pond Retrofit BMP 190	Detention Structure (Dry Pond)	Infiltration Basin	32.1	19.4	2.6	2018	2018
AA17RST000024	Magothy River Mainstem	Upper Mill Creek Stream Restoration BMP 824	Detention Structure (Dry Pond)	Regenerative Step Pool Conveyance	22.6	4.5	0.6	2023	-
AA17RST000025	Severn River Mainstem	Sappington Hill Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	15.3	3.7	1.8	2016	2016
AA17RST000026	Severn River Mainstem	Fairfield Drive Pond Retrofit	Retention Pond (Wet Pond)	Extended Detention Structure	25.3	7.6	0.4	2016	2016

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA17RST000027	Severn River Mainstem	Dellwood Court Outfall Sand Filter	-	Sand Filter	1.3	0.3	1.6	2017	2017
AA17RST000028	Severn River Mainstem	Dellwood Court Outfall Bioretention	-	Bioretention	3.9	0.5	0.4	2016	2016
AA17RST000029	Severn River Mainstem	Dellwood Court Infiltration Trench	-	Infiltration Trench	0.6	0.3	0.7	2017	2017
AA17RST000030	Patapsco River Lower North Bran	Northrop Grumman ESD Pervious Pavement 3A-1	-	Permeable Pavements	1.5	1.2	2.1	2016	2016
AA17RST000031	Patapsco River Lower North Bran	Northrop Grumman ESD Raingarden	-	Rain Garden	0.0	0.0	2.5	2016	2016
AA16RST000086	Magothy River Mainstem	Pinewood Road Storm Drain SPSC	-	Regenerative Step Pool Conveyance	26.7	7.8	1.4	2017	2017
AA17RST000033	Magothy River Mainstem	Cypress Creek Recreation Bioretention	-	Bioretention	0.8	0.5	1.1	2012	2012
AA17RST000034	Magothy River Mainstem	Cypress Creek Park and Ride Bioretention	-	Bioretention	6.5	3.8	1.0	2012	2012
AA17RST000035	Patapsco River Lower North Bran	Peach Orchard SWM Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	43.7	10.9	1.0	2013	2013
AA15RST000098	Severn River Mainstem	Denington Lane Outfall	-	Regenerative Step Pool Conveyance	122.4	38.2	0.5	2016	2016
AA16RST000088	Severn River Mainstem	Buttonwood Trail Outfall Repair SPSC	-	Regenerative Step Pool Conveyance	8.5	3.3	0.5	2015	2015
AA16RST000089	South River Mainstem	Cinnamon Lane Outfall Rehabilitation	-	Regenerative Step Pool Conveyance	20.9	4.9	0.5	2016	2016
AA16RST000090	Severn River Mainstem	Picture Spring Branch Outfall Restoration	-	Regenerative Step Pool Conveyance	24.3	1.7	0.5	2016	2016
AA16RST000091	South River Mainstem	Annapolis Corporate Park SPSC #1	-	Regenerative Step Pool Conveyance	18.8	8.7	0.1	2015	2015
AA16RST000092	South River Mainstem	Annapolis Corporate Park SPSC #2	-	Regenerative Step Pool Conveyance	15.8	4.4	0.5	2015	2015
AA16RST000093	South River Mainstem	Camp Woodlands Pre-Treatment	-	Regenerative Step Pool Conveyance	7.8	2.1	0.5	2015	2015
AA16RST000094	South River Mainstem	Annapolis Harbour Center SPSC	-	Regenerative Step Pool Conveyance	50.3	31.4	0.3	2016	2016
AA15RST000101	Severn River Mainstem	Old Bay Ridge Rd/Abandoned RR Embankment Sinkhole	-	Regenerative Step Pool Conveyance	126.6	20.1	0.0	2015	2015
AA15RST000102	Severn River Mainstem	Olde Severna Park Outfall Retrofit Birch Court	-	Regenerative Step Pool Conveyance	37.8	15.9	0.5	2015	2015
AA17RST000049	Magothy River Mainstem	Dunkeld Manor SWM Retrofit	Infiltration Basin	Regenerative Step Pool Conveyance	18.3	7.6	0.5	2013	2013

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA17RST000050	Marley Creek	Grays Luck SWMP Retrofit	Detention Structure (Dry Pond)	Regenerative Step Pool Conveyance	41.9	8.4	0.5	2017	2017
AA17RST000051	Severn River Mainstem	Windswept Estates Pond Retrofit	Infiltration Basin	Regenerative Step Pool Conveyance	15.5	6.0	0.5	2014	2014
AA18RST000005	Patapsco River Lower North Bran	Walmart Arundel Mills Pond Opti Retrofit	Retention Pond (Wet Pond)	Retention Pond (Wet Pond)	33.8	26.8	2.1	2018	2018
AA18RST000010	Patapsco River Lower North Bran	Arundel Mills Limited Partnership CMAC Pond Retrofit	Retention Pond (Wet Pond)	Retention Pond (Wet Pond)	198.9	137.4	1.6	2018	2018
AA18RST000017	Patapsco River Lower North Bran	Hock Business Park (Corporate Blvd) Pond Retrofit	Detention Structure (Dry Pond)	Sand Filter	89.2	52.6	1.4	2021	-
AA18RST000018	Patapsco River Lower North Bran	International Drive Pond Retrofit	Detention Structure (Dry Pond)	Wet Pond - Wetland	137.3	74.3	0.2	2023	-
AA18RST000019	Severn River Mainstem	Sappington Hill BMP 1280 Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	31.3	7.9	1.1	2019	2019
AA18RST000021	South River Mainstem	Broad Creek Headwaters Phase I Dept of Health SPSC	-	Regenerative Step Pool Conveyance	7.0	1.1	0.5	2018	2018
AA18RST000022	Patapsco River Lower North Bran	Concorde Circle Dry Pond Retrofit	Detention Structure (Dry Pond)	Regenerative Step Pool Conveyance	63.3	15.1	2.2	2021	-
AA18RST000023	Forked Creek	Forked Creek Outfall Retrofit - U15O002	-	Regenerative Step Pool Conveyance	65.1	5.1	2.1	2021	-
AA18RST000024	South River Mainstem	Killarney House and Neighbors Beards Creek Community BMPs	-	Regenerative Step Pool Conveyance	20.6	3.8	2.6	2018	2018
AA18RST000025	South River Mainstem	Sylvan Shores Stormwater Infrastructure Upgrade Bioretention #1	-	Bioretention	0.3	0.2	0.4	2016	2016
AA18RST000026	South River Mainstem	Sylvan Shores Stormwater Infrastructure Upgrade Bioretention #2	-	Bioretention	0.8	0.3	0.5	2016	2016
AA18RST000027	South River Mainstem	Sylvan Shores Stormwater Infrastructure Upgrade Bioretention #3	-	Bioretention	0.8	0.2	1.0	2016	2016
AA18RST000031	South River Mainstem	Edgewater Beach Grass Swale	-	Grass Swale	0.8	0.2	0.4	2017	2017
AA18RST000032	South River Mainstem	Edgewater Beach Bioswale	-	Bio-Swale	0.8	0.2	0.1	2017	2017
AA18RST000033	South River Mainstem	Broad Creek Health Department StormTech BMP	-	Other	1.1	1.1	0.9	2018	2018
AA18RST000035	Magothy River Mainstem	Wee Lad and Lassie Bioretention	-	Bioretention	1.2	0.3	1.3	2017	2017
AA18RST000036	South River Mainstem	United Church of Christ Pond Retrofit	Extended Detention Structure	Retention Pond (Wet Pond)	0.6	0.3	1.0	2018	2018

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA18RST000037	Bear Neck Creek	Holly Hill Harbor Community Park Constructed Wetland A	-	Extended Detention - Wetland	1.1	0.4	0.3	2018	2018
AA18RST000038	Bear Neck Creek	Holly Hill Harbor Community Park Constructed Wetland B	-	Extended Detention - Wetland	1.1	0.4	0.3	2018	2018
AA18RST000039	Bear Neck Creek	Holly Hill Harbor Community Park Constructed Wetland C	-	Extended Detention - Wetland	2.1	0.5	0.5	2018	2018
AA18RST000040	Bear Neck Creek	Holly Hill Harbor Community Park Constructed Wetland D	-	Extended Detention - Wetland	7.2	2.0	0.0	2018	2018
AA18RST000041	Bear Neck Creek	Holly Hill Harbor Community Park Constructed Wetland E	-	Extended Detention - Wetland	7.3	2.1	0.1	2018	2018
AA18RST000042	Magothy River Mainstem	Berrywood Community Bioretention and Swale	-	Bio-Swale	3.5	1.0	2.1	2019	2019
AA18RST000043	South River Mainstem	Center for Applied Technology South - Bioretention	-	Submerged Gravel Wetland	1.9	0.8	0.2	2018	2018
AA18RST000044	Whitehall and Meredith Creeks	Asbury Broadneck United Methodist Church - SPSC	-	Regenerative Step Pool Conveyance	21.2	3.6	0.1	2019	2019
AA18RST000028	Furnace Creek	Sawmill Creek - Cromwell Elementary School Bioretention #1	-	Bioretention	10.0	3.8	1.0	2020	-
AA18RST000029	Furnace Creek	Sawmill Creek - Cromwell Elementary School Bioretention #2	-	Bioretention	3.6	1.7	1.0	2020	-
AA18RST000030	Furnace Creek	Sawmill Creek - Cromwell Elementary School Vortechs Unit #1	-	Other	9.2	3.6	0.0	2020	-
AA18RST000047	Magothy River Mainstem	Harting Farm Pond 1 Retrofit	Retention Pond (Wet Pond)	Extended Detention Structure	59.0	18.6	0.6	2024	-
AA18RST000048	Magothy River Mainstem	Harting Farm Pond 2 Retrofit	Retention Pond (Wet Pond)	Extended Detention Structure	82.0	22.5	2.6	2024	-
AA18RST000049	Magothy River Mainstem	Harting Farm Pond 3 Retrofit	Retention Pond (Wet Pond)	Extended Detention Structure	1.9	0.2	2.6	2024	-
AA19RST000001	Furnace Creek	Sawmill Creek Stream Restoration Phase I Muddy Bridge Branch SPSC	-	Regenerative Step Pool Conveyance	112.4	37.0	0.2	2022	-
AA19RST000002	Magothy River Mainstem	Barrensdale Outfall Restoration - SPSC	Detention Structure (Dry Pond)	Regenerative Step Pool Conveyance	22.5	7.9	2.6	2019	2019
AA19RST000003	South River Mainstem	Broad Creek Outfall Retrofit - SPSC at Camp Woodlands	-	Regenerative Step Pool Conveyance	14.4	1.5	0.6	2020	-
AA19RST000005	South River Mainstem	Broad Creek Headwaters Phase II Dept of Health SPSC	-	Regenerative Step Pool Conveyance	6.6	2.7	0.6	2019	2019
AA19RST000006	South River Mainstem	Broad Creek Headwaters Phase II Dept of Health Infiltration Trench	-	Infiltration Trench	0.8	0.7	1.0	2019	2019

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA18RST000051	South River Mainstem	32 Wilelinor Drive SPSC	-	Regenerative Step Pool Conveyance	1.7	0.6	0.4	2014	2014
AA18RST000052	South River Mainstem	Edgewater Beach Pervious Concrete	-	Permeable Pavements	0.3	0.1	1.4	2017	2017
AA18RST000053	Severn River Mainstem	Seven Oaks BMP 341	Extended Detention Structure	Extended Detention Structure	437.9	99.5	0.5	2018	2018
AA19RST000007	Mill Creek	Kingsberry Drive SPSC 1	-	Regenerative Step Pool Conveyance	32.1	4.9	0.2	2021	-
AA19RST000008	Mill Creek	Kingsberry Drive SPSC 2	-	Regenerative Step Pool Conveyance	14.1	0.7	2.6	2021	-
AA19RST000010	Furnace Creek	Cromwell Fountain Pond Repair	Extended Detention Structure	Extended Detention Structure	62.4	32.6	2.6	2021	-
AA19RST000012	Marley Creek	Mill Pond Stormwater Management Retrofit	Detention Structure (Dry Pond)	Extended Detention - Wetland	21.8	9.1	1.1	2021	-
AA19RST000019	Severn River Mainstem	Epping Forest Stormwater BMPs - Gravel Wetland 2	-	Submerged Gravel Wetland	3.8	1.6	0.4	2020	-
AA19RST000018	Severn River Mainstem	Epping Forest Stormwater BMPs - Gravel Wetland 1	-	Submerged Gravel Wetland	0.5	0.3	0.9	2020	-
AA19RST000025	South River Mainstem	Central Services Garage Pond 4098 Opti Upgrade	Extended Detention Structure	Extended Detention Structure	13.6	7.3	2.0	2019	2019
AA19RST000026	South River Mainstem	South River Colony Pond 4063 Opti Upgrade	Extended Detention Structure	Extended Detention Structure	267.4	127.2	2.6	2019	2019
AA19RST000009	Mill Creek	Kingsberry Drive Wetlands	-	Extended Detention - Wetland	46.0	4.0	0.7	2021	-
AA19RST000011	Patapsco River Lower North Bran	601-611 Hammonds Ferry Road North Pond Retrofit	Detention Structure (Dry Pond)	Sand Filter	43.2	20.7	1.1	2021	-
AA19RST000013	Magothy River Mainstem	Farmington Village at Schramms Crossing Pond Retrofit	Extended Detention Structure	Extended Detention Structure	59.1	19.6	2.5	2020	-
AA19RST000014	Magothy River Mainstem	North Star Drive Pond Retrofit	Extended Detention Structure	Extended Detention Structure	192.3	43.4	1.8	2020	-
AA19RST000015	Magothy River Mainstem	Walmart Pond Retrofit - Ritchie Hwy	Detention Structure (Dry Pond)	Extended Detention Structure	19.1	14.2	1.1	2021	-
AA20RST000004	Severn River Mainstem	Circle Drive Dry Channel RSC	-	Regenerative Step Pool Conveyance	9.1	2.3	1.0	2020	2020
AA20RST000005	South River Mainstem	Beechnut Kennels BMP	-	Bioretention	1.2	0.5	1.1	2020	2020
AA20RST000007	Whitehall and Meredith Creeks	St Dixon Farm SPSC	-	Regenerative Step Pool Conveyance	15.1	0.6	2.6	2021	-

Restoration BMP ID	TMDL Watershed	Project Description	Existing Project Type	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Rainfall Depth (Inches)	Projected Year of Completion	Year of Completion
AA20RST000006	Mill Creek	Burley Creek Community Rain Garden	-	Rain Garden	3.3	0.8	0.0	2016	2016
AA20RST000008	Forked Creek	Ulmstead Community Park Rain Garden A	-	Rain Garden	0.2	0.2	0.7	2021	-
AA20RST000009	Forked Creek	Ulmstead Community Park Rain Garden B	-	Rain Garden	0.2	0.2	0.5	2021	-
AA20RST000010	Forked Creek	Ulmstead Community Park Rain Garden C	-	Rain Garden	0.2	0.2	1.0	2021	-
AA20RST000011	Magothy River Mainstem	14 Linda Lane Infiltration Trench	-	Infiltration Trench	0.3	0.1	2.6	2018	2018
AA20RST000012	Tar Cove	Heilman Property SPSC	-	Regenerative Step Pool Conveyance	3.7	0.7	0.1	2019	2019
AA18RST000020	Magothy River Mainstem	Twin Harbors HOA Bioretention	-	Bioretention	3.6	1.0	0.9	2018	2018

Appendix B

**Bacteria Trend Monitoring Sampling Plan and Quality
Assurance/Quality Control Protocols**

FINAL



Bacteria Sampling Plan and Quality Assurance/Quality Control Protocols

Prepared for:

Anne Arundel County Department of Public Works
Watershed Protection & Restoration Program
2664 Riva Road
Annapolis, Maryland 21401

Task Order 02: Bacterial TMDL Trend Monitoring – Marley and Furnace Creek Watersheds
Contract No. 10478, Category 14

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July 1, 2019 (FINAL-REVISED)

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Appendices

Appendix A: Monitoring Locations Map and Photos

Appendix B: Field Forms

Acronyms

COC – Chain of Custody

MBSS – Maryland Biological Stream Survey

MDE – Maryland Department of the Environment

MS4 – Municipal Separate Storm Sewer System

NPDES – National Pollutant Discharge Elimination System

NOAA – National Oceanic and Atmospheric Administration

NWS – National Weather Service

PFD – Personal floatation device

PPE – Personal protective equipment

QA/QC – Quality Assurance/Quality Control

RFP – Request for Proposal

SOW – Scope of Work

TMDL – Total Maximum Daily Load

USCG – United States Coast Guard

USGS – United States Geological Survey

WLA – Waste Load Allocations

1. Background

Anne Arundel County's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit (11-DP-3316 MD0068306) requires the County to develop Restoration Plans to address the stormwater Waste Load Allocations (WLAs) for various impairments with Maryland Department of the Environment (MDE) approved TMDLs. The Marley and Furnace Creek Bacteria TMDL Restoration Plan requires that the County evaluate the effectiveness of the restoration plan in the Marley and Furnace Creek watersheds through sampling and analysis.

This Bacteria Sampling Plan and Quality Assurance/Quality Control (QA/QC) Protocol has been developed as part of the Bacteria TMDL Trend Monitoring Program for the Marley and Furnace Creek Watersheds in Anne Arundel County (herein referred to as "the County"). This sampling plan and protocols have been developed in accordance with AECOM's proposal dated April 15, 2019 and the Marley/Furnace Creek Bacteria TMDL Trend Monitoring Scope of Work/Request for Proposal (SOW/RFP) provided by the County dated March 2019. Sampling procedures and methodologies in this Plan are based on guidance provided in the following documents:

- *Standard Methods for the Examination of Water and Wastewater* (American Public Health Association, 2012).
- *Guidance for County Recreational Water Quality Monitoring and Notification Programs* (Maryland Department of the Environment, 2003).

The County identified 12 monitoring stations within the project area to be sampled monthly: six each in the Marley Creek and Furnace Creek Watersheds. The monitoring stations are in shallow depth surface waters, streams, and tidal waters, and are accessible by foot. The original location proposed by the County for site FU-06 was deemed inaccessible for sample collection. An alternative location was proposed by AECOM and approved by the County in emails dated April 12, 2019. Table 1 provides the site identification numbers and geographic coordinates for each of the sampling locations.

A map and photographs depicting the locations of the 12 monitoring stations are provided in **Appendix A**.

Table 1: Bacteria Sampling Site IDs and Locations

Site ID	Latitude	Longitude
FU-01	39.15013	-76.66172
FU-02	39.16994	-76.63152
FU-03	39.17249	-76.62697
FU-04	39.17774	-76.62109
FU-05	39.18275	-76.61593
FU-06	39.18178	-76.60710
MA-01	39.13699	-76.61351
MA-02	39.14241	-76.60825
MA-03	39.14371	-76.60648
MA-04	39.14852	-76.60388
MA-05	39.14882	-76.60143
MA-06	39.15116	-76.60172

2. Project Schedule

2.1 Schedule of Project Activities/Deliverables

The proposed schedule for key project activities and deliverables is provided below:

- Draft Bacterial Sampling Plan and QA/QC Protocols submitted to the County: June 12, 2019
- Kickoff meeting: June 14, 2019
- Final Bacterial Sampling Plan QA/QC Protocols submitted to the County: June 24, 2019
- Field Sampling Activities: First sampling event to occur July 10, 2019
- Submit laboratory and field data to County: Monthly upon receipt of laboratory data
- Submit Draft Annual Monitoring Report and MS Access database to the County: October 1, 2020
- Receive Comments on Draft Report from the County: October 15, 2020
- Submit Final Annual Monitoring Report and MS Access database incorporating comments from the County: November 1, 2020

2.2 Detailed Schedule of Field Sampling Activities

AECOM will mobilize for field sampling monthly, on the same days and time of each month, regardless of weather conditions. Sampling will occur on two consecutive days each month: one day for each watershed. If the scheduled day for sampling falls on a holiday, sampling will instead occur on the day before or day after the scheduled sampling event. In the event of unsafe conditions that cause the sampling team to abandon sampling before it is completed, sampling will be resumed the following day if conditions allow. Unsafe conditions may include high winds, electrical storm activity, deteriorating road conditions due to snow and ice, high water/flooding at sampling sites that presents dangerous access conditions.

The schedule for completing monthly field sampling activities is as follows:

- Sampling Events: Every second Wednesday and Thursday of each month starting July 10th, 2019 and ending June 11th, 2020
- Submit samples to laboratory for analysis: Within 6 hours after the first sample is collected during each sampling event
- Receive analytical results from laboratory: routine turnaround time (5-7 business days)
- Analytical results and field note package submitted to the County Project Manager: Next business day following receipt of analytical results for each sampling event

3. Bacteria Trend Monitoring Sampling Methodology

AECOM will perform bacteria trend monitoring sampling activities for the 12-month sampling period beginning in July 2019. AECOM will provide a two-person sampling team to perform the bacteria trend monitoring sampling activities in the project area, in accordance with this sampling plan and protocols.

3.1 Field Sampling Preparation

At least one day prior to a scheduled sampling event, field equipment will be assembled and prepared for use. Two days prior to a sampling event, the multi-parameter sonde will be checked to confirm it is functioning properly. If necessary, a replacement sonde will be obtained. The following equipment will be used for field activities:

Field Equipment:

- Multi-parameter sonde
- Sonde calibration fluid and container
- Handheld GPS Unit
- Telescopic dipper and pre-sterilized ladles
- Sterilized sample containers for water quality water samples
- Laboratory-supplied sample containers for bacteria monitoring water samples
- Chain-of-custody (COC) forms and seals
- Insulated cooler
- Ice (to be purchased on morning of field sampling activities)
- Field data forms, clip board, pens
- Wading pole
- Field test kit for residual chlorine
- Alcohol wipes, non-phosphate detergent, Virkon® Aquatic solution, salt solution
- Bottled water, deionized water, buckets, sprayer, brush, or similar materials for decontamination
- Paper towels
- Waterproof storage bags
- Sealable waste container (for used PPE and decontamination materials)
- Camera/cameral phone

Personal Protective Equipment (PPE)

- Nitrile gloves
- Eye protection
- Type III Personal Floatation Device (PFD)
- Type IV PFD with rescue line
- Chest-high waders
- Knee-high rubber safety-toe boots
- Insect repellent
- First aid kit

3.2 Sample Collection and Field Measurements

The sampling team will consist of one team member collecting the sample (the sampler) and one team member recording data in the field log. The field team will mobilize to the sites on two

consecutive days (one day per watershed) and will conduct sampling at each watershed starting with the most downstream location as follows:

Monitoring stations in the Furnace Creek Watershed will be sampled the second Wednesday of every month in the following order:

- FU-06 (tidal site)
- FU-05
- FU-04
- FU-03
- FU-02
- FU-01

Monitoring stations in the Marley Creek Watershed will be sampled the second Thursday of every month in the following order:

- MA-06 (tidal site)
- MA-05
- MA-04
- MA-03
- MA-02
- MA-01

The general procedures to be conducted at each location during each sampling event are as follows:

- Calibrate the multi-parameter sonde (first location each day at a minimum)
- Note conditions of the site and record field observations in the field log.
- Take GPS reading and record coordinates (first sampling event only at each site).
- Take photograph(s) to document field conditions.
- Identify point of entry to the monitoring station and sample collection (collection point).
- Note conditions that may affect quality of sample (e.g. shallow depth and soft stream bed that prevent sampling without water fouling).
- Collect a stream sample and test for residual chlorine (first sampling event only at each site).
- Collect bacteria monitoring sample.
- Use a multi-parameter sonde to collect field measurements and record the results on the field data collection sheet.
- Enter date and time of collection on sample container and COC, and place sample in cooler with ice.
- Decontaminate equipment.

Detailed field procedures are provided in the following sections.

3.2.1 Bacteria Sampling

A grab sample will be collected at each monitoring site for bacteria analysis. Prior to collecting the sample, the team member handling the sampling container will don a clean pair of nitrile gloves. Whenever possible, the sample will be collected directly into the laboratory-supplied sterile sample container. If flow conditions or water depth prevent direct collection, a clean long-handled dipper with a properly decontaminated sample ladle will be used to collect the sample.

Collecting Samples

If the sample will be collected directly into the laboratory-supplied container:

- Enter the stream from a downstream location and wade slowly to the collection point, taking care not to disturb the stream bed or to foul the collection point. When ready to collect the sample, remove lid and take care not to contaminate the inner surface or underside of the cap, or the neck of the bottle.
- Collect samples facing upstream. The person collecting the samples shall be positioned downstream of any water current and collect from the incoming flow.
- Hold the sample container at its base and angle the neck and mouth towards the water.
- Carefully plunge the container neck-down into the water, avoiding any debris or surface scum.
- Position the container into the current until the neck faces slightly upward and the mouth of the container is facing the current, to allow air to escape the container to fill up. If there is no current, one may be created by moving the bottle forward horizontally away from the sampler.
- Samples should be collected from a point representative of the site; the sampler shall not take a sample too near the bank or too far from the point of drawoff, or at a depth above or below the point of drawoff. For the tidal sites, FU-06 and MA-06, the sample shall be taken at a location roughly 0.5 meters deep (knee-depth water), taking the sample from approximately 0.1 meter (4 inches) below the surface.
- Allow the container to fill but leave approximately 1-2 cm of air space to allow mixing by shaking before examination. Carefully replace cap and tighten.

If a sample must be collected using sampling equipment (e.g. telescopic dipper) before being transferred to the sterile laboratory-supplied sample container;

- Remove a pre-cleaned dipper ladle and bracket from the sealed bag and securely attach the ladle bracket to the dipper handle being careful not to contaminate the ladle and bracket. Submerge the dipper ladle in the sample water downstream of the collection point, swirl its contents, and then dump the contents downstream of the collection point. Ensure this process does not disturb sediments or otherwise impact sample results.
- Carefully move to within range of the collection point and submerge the dipper ladle once more to collect the water sample. Avoid collecting sediment, mud, scum, or debris.
- When ready to transfer the sample from the equipment to a sterile container, remove the sterile container lid and take care not to contaminate the inner surface or underside of the cap, or the neck of the bottle.
- Using aseptic techniques, fill the sterile container with sample water but leave approximately 1-2 cm of air space to allow for proper mixing later in the lab and seal tightly.

Logging Samples

Once the sample is collected, seal the container and label appropriately with sample ID, date, and time and enter sample information on the COC form. Place the sample in an insulated cooler for transportation to the analytical laboratory. Samples shall be put on ice and maintained at 1-10 °C during transit (average ~4 °C). To keep sample containers dry, they shall be placed in a waterproof storage bag prior to being placed in the cooler. All hold times shall be adhered to. Hold times for enterococci are 8 hours.

3.2.1 Field Measurements and Observations

Field observations and conditions, including equipment information, field measurements, high/low flow determination, tidal characteristics, and other observations of the site and surrounding area will be recorded in a field log consisting of field data sheets, calibration sheets, and daily field observation log. Field observations and other pertinent anecdotal information to be recorded includes but is not limited to:

- Date and time of sample collection
- Depth of sample collection
- Ambient air temperature
- Extreme conditions (weather, flooding, extreme temperatures, high winds)
- Unusual sampling/environmental conditions (possible sources of contamination, unusual inflow/outflow, algal blooms, significant changes to historical field results, etc.)
- Presence of transient encampments, congregations or evidence of avian or other wildlife, accumulated debris, etc.)
- Presence of invasive species (snakeheads, phragmites, etc.)
- Precipitation amount for 3-days prior to sampling and at the time of sampling
- Tide characteristics (high/low or ebb/flood/slack) obtained from NOAA's Ft. McHenry tidal monitoring station [8574680](#)
- Water characteristics
- Water color
- Visual turbidity
- Odor
- Flow characteristics (still, fast, dam, etc.)

Photographs will be taken to document field conditions. Sample field data collection and equipment calibration sheets are provided in **Appendix B**.

At each site, sampling team members will don PPE and prepare sampling equipment. A multi-parameter sonde will be used to collect the following physical water quality data for each sample:

- Temperature (°C)
- Dissolved Oxygen (mg/l)
- Specific Conductivity (µS/cm)
- Turbidity (NTUs)
- pH

When possible, the sampling team will submerge the sonde probe in the stream flow and read results directly from the stream. If the stream depth is too shallow to allow proper submersion of the sonde probe, a sample will be collected in a clean sample container and the results read from the sample container.

If directly reading from the stream:

- Ensure that any antifouling components or probe protective attachments are equipped and probe is securely attached to cable.
- Face upstream and submerge the sonde probe into the current to a depth where the probe sensors are submerged at least 0.1 meter (4 inches) below the water surface and are fully in contact with the flow. The reading should be taken from approximately the same depth as the bacteria sample.
- Wait at most thirty seconds for readings to stabilize and read aloud the sample results from the sonde readout so that they may be recorded in the field log.

If reading from a sample container:

- Ensure that the sample container has been sufficiently rinsed in the sample water prior to collecting.
- Face upstream, and, gripping from the base and pointing the container towards the water, submerge the container and then angle into the current at the desired depth to collect a sample.
- Retrieve the sample container and place the sonde probe into the sample.
- Wait at most thirty seconds for readings to stabilize and read aloud the sample results from the sonde readout so that they may be recorded in the field log.

3.3 Cleanup and Decontamination

Proper decontamination procedures must be followed after sampling at each location to prevent bacteria and nuisance organism/pathogen cross-contamination. To prevent the introduction and spread of nuisance organisms and pathogens, the Maryland Biological Stream Survey (MBSS) *Decontamination Procedures for Boots and Equipment* (provided as Appendix C) will be followed.

Set up a decontamination area that is located at least 50 yards from the from the stream. After samples have been collected from a station, wash hands and arms with disinfectant wipes or lotion, or use soap and water, and dry to reduce exposure to potentially harmful bacteria or other microorganisms.

Decontaminate multiparameter sonde probe and sample collection container (if used) as follows:

- Don a clean pair of nitrile gloves.
- Clean sonde, exposed cable, and sample container by removing visible contamination with a brush or wipes and rinse with distilled/deionized water.
- Submerge Sonde, exposed cable, and sample collection container (if used) in a 5% salt solution for at least 10 minutes.
- Thoroughly dry with paper towels

Decontaminate dip sampler as follows:

- Don clean pair of nitrile gloves.
- Scrub the sampler to remove visible contamination, using appropriate brush(es), bottled water, and, if needed, non-phosphate detergent.
- Rinse sampler with distilled/deionized water, collecting rinse water in bucket.
- Submerge dipper bucket and bracket in 1% Virkon Aquatic solution for at least 10 minutes.
- Place dipper handle on clean plastic sheeting or plastic bag and spray with 1% Virkon Aquatic solution; allow to remain for at least 10 minutes before drying.
- Thoroughly dry all parts with paper towels.
- Place in dipper ladle and bracket in clean zippered plastic bag and seal bag; wrap dipper handle in large plastic bag.

Decontaminate boots and waders as follows:

- Remove boots/waders
- Using sprayer filled with 1% Virkon Aquatic solution, thoroughly spray any area of boots/waders that came into contact with stream water.
- Place boots/waders in clean plastic trash bag for transportation to next sampling location.

Dispose of all wash water, rinse water, rinsates, and other sampling wastes (disposable PPE, plastic sheeting, paper towels, etc.) in properly marked, sealable containers or bags.

3.4 Data Collection /Recordkeeping Procedures

Information provided by the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) for [Baltimore-National-Airport](#) (BWI) will be used to collect precipitation data for 72 hours prior to the sampling event and on the date of sampling. Outside temperature at time of collection, and weather at time of collection will be recorded.

AECOM will use data from United States Geological Survey (USGS) Gauge Station [01589500](#) (Sawmill Creek, Glen Burnie, MD) to determine the cutoff flow rates for high/low flows and make a high/low flow determination for each sample collected from monitoring sites. For the two tidal sites, FU-06 and MA-06, AECOM will use data from NOAA Tidal Monitoring Station [8574680](#) (Fort McHenry). Prior to sampling, the sampling team will record field observations and other details pertinent to site characterization in the field log and on field data sheets.

The sampling team will record field observations and other pertinent anecdotal information for each monitoring station in the field log as described in Section 3.2.1. Field observations and conditions, including equipment information, water quality data, high/low flow determination, tidal characteristics, and other observations of the site and surrounding area will be recorded in a field log consisting of field data sheets, calibration sheets, and daily field observations. Field forms will be scanned for recordkeeping purposes.

3.5 Laboratory Analysis

A Maryland State-certified Water Quality Laboratory will analyze the water samples using IDEXX Enterolert (ASTM Method #D6503-99) for the presence of enterococci bacteria. The sampling team will deliver bacteria monitoring samples to the laboratory no later than six (6) hours after the initial collection. The hold time for enterococci is 8-hours. Delivering the samples

to the lab within 6 hours of collection will ensure enough time for pre-processing to occur, without risking the analysis of the samples due to their hold times expiring. Results will be reported in Most Probable Number (MPN) per 100 ml. Dilutions may be done for samples that are taken during or immediately following heavy precipitation, or at sites with chronically high levels of bacteria, so that sample readings are within detection limits.

3.6 Field Note Package

Upon receipt of laboratory analytical results after each sampling event, AECOM will deliver to the County Project Manager via email a singular PDF file summarizing field activities and results. The file will include the following:

- Calibration logs for Sonde
- Water Quality Data Field Data Sheets
- Sampling Event Field Notes
- Laboratory Analytical Results
- Chain of Custody forms

4. Quality Assurance / Quality Control Protocols

4.1 Field Sampling QA/QC

Samples collected will be done so at approximately the same time and day each month, to provide consistently gathered data.

A field test will be performed during the initial sampling event at each monitoring site to confirm the presence or absence of residual halogens (free chlorine) that could affect analytical results. It is not expected that the streams in Marley and Furnace Creek watersheds will be affected by chlorination sources. Should the presence of residual halogens be detected at a monitoring station in concentrations that could affect results, the sampling plan and protocol will be altered to accommodate that monitoring station for subsequent sampling events and the County Project Manager notified.

The sampling team will exercise aseptic sample techniques to avoid the potential for contamination during routine sampling. Sample equipment will remain sealed and sterile until ready to be used. To the extent possible, samples for laboratory analysis will be collected directly into the sterile, laboratory-supplied container. The sampling team will utilize, but is not limited to, the following aseptic practices:

- The sampling team will utilize laboratory-supplied, pre-sterilized containers composed of nonreactive borosilicate glass or plastic for bacteria sample collection.
- Sampling equipment will be cleaned/decontaminated after each use.
- Sampling containers will remain closed until ready to collect.
- When possible, sample will be collected directly into its appropriate sampling container.
- If a field blank is to be prepared during the sample event, it will be the first sample collected.

All sampling activities will be conducted in order of the most downstream point to most upstream to prevent initial sampling activities from impacting results of subsequent samples. Samples will be collected facing upstream, away from the sampler and into the current, to prevent contamination from the sampler. If no current is present, one may be generated artificially by sampling in a forward motion.

The sampler will enter the stream downstream of the sample collection point. If wading, the sampler will carefully move to avoid significant fouling of the water.

After all samples are collected from a monitoring station, the sampling team will use soap and water, alcohol wipes, a disinfectant lotion, or similar, to wash and dry their hands and any reusable PPE, to reduce exposure to harmful bacteria and to prevent cross-contamination of sites. Field equipment will be cleaned/decontaminated according to the procedures specified in Section 3.3.

The field team will collect one (1) field blank sample per every third sampling event. The field blank will be collected first and will be done so by pouring a sample of analyte-free water into a sterile sample container in the field.

The field team will collect one (1) duplicate sample per sampling event. The duplicate sample will be collected following the same procedures as regular sample collection.

Samples will be transferred upon collection to a cooler maintained at 4 °C until they can be delivered to the laboratory for analysis. To keep containers dry, samples will be placed in a sealable waterproof storage bag prior to being placed in the cooler.

Sampling team will deliver samples to the laboratory no later than six (6) hours after initial collection time. This will allow for 2 hours of processing time between when samples are delivered and when they are analyzed.

4.2 Database QA/QC

An MS Access database compiling the monthly sample collection data from the water quality field data sheets and laboratory analytical results for the 12 sites will be developed. The database schema will include the following fields:

- Site ID
- Location
- Date and time of sample collection
- Tide characteristics
- Field measurements
 - Temperature (°C)
 - Dissolved Oxygen (mg/l)
 - Specific Conductivity (µS/cm)
 - Turbidity (NTUs)
 - pH
 - Depth of sample collection
- Laboratory Analysis Results
 - Enterococcus (MPN/100ml)
- Notes

To maintain quality control and verify that the data entered in the database accurately represents the results obtained from the lab analysis and parameters measured at the monitoring site, all database entries will be checked by a second AECOM staff member. Additionally, a histogram of each field will be visually inspected to detect any outliers. Outliers will be investigated to determine the cause and documented in the Annual Monitoring Report.

5. References

American Public Health Association. 2012. Standard Methods for the Examination of Water and Wastewater, 22nd edition. American Public Health Association, Washington, D.C.

Maryland Department of Environment. 2003. Guidance for County Recreational Water Quality Monitoring and Notification Programs. Maryland Department of the Environment Water and Science Administration, Baltimore, MD.

Maryland Department of Natural Resources. Decontamination Procedures for Boots and Equipment. Maryland Department of Natural Resources Non-Tidal Assessment Division, Resource Assessment Service, Baltimore, MD.

*Marley/Furnace Creek Watersheds
Bacteria Sampling Plan and QA/QC Protocols*

APPENDIX A
MONITORING LOCATION MAP AND PHOTOS

*Marley/Furnace Creek Watersheds
Bacteria Sampling Plan and QA/QC Protocols*



FU-01



FU-02



FU-03



FU-04



FU-05



FU-06



MA-01



MA-02



MA-03



MA-04



MA-05



MA-06

APPENDIX B
FIELD DATA FORMS

*Marley/Furnace Creek Watersheds
Bacteria Sampling Plan and QA/QC Protocols*

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: _____

Date: _____ **Time:** _____

Field Personnel: _____

Weather Conditions:

Temperature: _____ °F Weather: _____

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: _____ inches Type: ___ Rain ___ Snow ___ Mix

Day of Sampling: _____ inches Type: ___ Rain ___ Snow ___ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): _____ cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): ___ High ___ Low ___ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to table on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (µS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)

BACTERIA SAMPLE COLLECTION

Sample ID: _____

QA/QC samples: Duplicate Sample (Yes/No) _____ Sample ID _____ Trip Blank (Yes/No) _____

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Cutoff Flow Rates	
Site ID	Low Flow Cutoff (cfs)
FU-01	
FU-02	
FU-03	
FU-04	
FU-05	
FU-06	
MA-01	
MA-02	
MA-03	
MA-04	
MA-05	
MA-06	

MARTEL *CHAIN OF CUSTODY / SAMPLE INFORMATION FORM*

Martel Laboratories *JDS* Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 Email: vk@martellabs.com

MARTEL Log # _____ Client Code _____	Sampler _____
Client Name/Phone/FAX _____	Project Name/# _____
Client Address _____	Contract/P.O Number _____
Invoice Address _____	Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/ Preservation Status	Potentially Hazardous?	# of Containers	Date	Time	Analyses Required/Comments

Transferred by: _____	Received by: _____	Date	Time	Cooler Receipt Information (LAB USE ONLY) Sufficient ice? - Yes/No If No, temp.= _____ Sample containers pres'd? - Yes/No If No, explain Custody Seal present/intact? - Yes/No Initials: _____ Date: _____
Transferred by: _____	Received by: _____	Date	Time	
Transferred by: _____	Received by: _____	Date	Time	

APPENDIX C

MD-DNR DECONTAMINATION PROCEDURES FOR BOOTS AND EQUIPMENT

*Marley/Furnace Creek Watersheds
Bacteria Sampling Plan and QA/QC Protocols*

MBSS Decontamination Procedures for Boots and Equipment



Monitoring and Non-Tidal Assessment Division

Resource Assessment Service

Maryland Department of Natural Resources



Why decontaminate?

Helps prevent the introduction and spread of nuisance organisms and pathogens



Didymo



Chytrid fungus



Whirling disease



Box turtle with ranavirus by: Scott Farnsworth

Ranavirus



Largemouth bass virus



Avian influenza



Viral hemorrhagic septicemia

**Statewide ban
on felt-soled
waders went
into effect
March 21,
2011, in
Maryland.**



**Felt can retain
and transfer
organisms and
pathogens at a
higher rate than
rubber.***

* Gates, K.K., C.S. Guy and A.V. Zale. 2008. Adherence of *Myxobolus cerebralis* myxospores to waders: Implications for disease dissemination. *North American Journal of Fisheries Management* 28: 1453-1458.

Decontaminate all boots and equipment that have come into contact with stream water

-Virkon Aquatic

- 2% solution = 2 scoops per gallon of water
- virucide/herbicide
- designed for use in aquaculture facilities
- 10 lb. tub is ~\$100
- powder is corrosive (eye and skin burns)



-10% Bleach solution (1 part bleach per 9 parts water)

- disinfect equipment at least 50 yards from water body

-Dry to touch, then dry for another 48+ hours

Other alternative solutions that are effective...

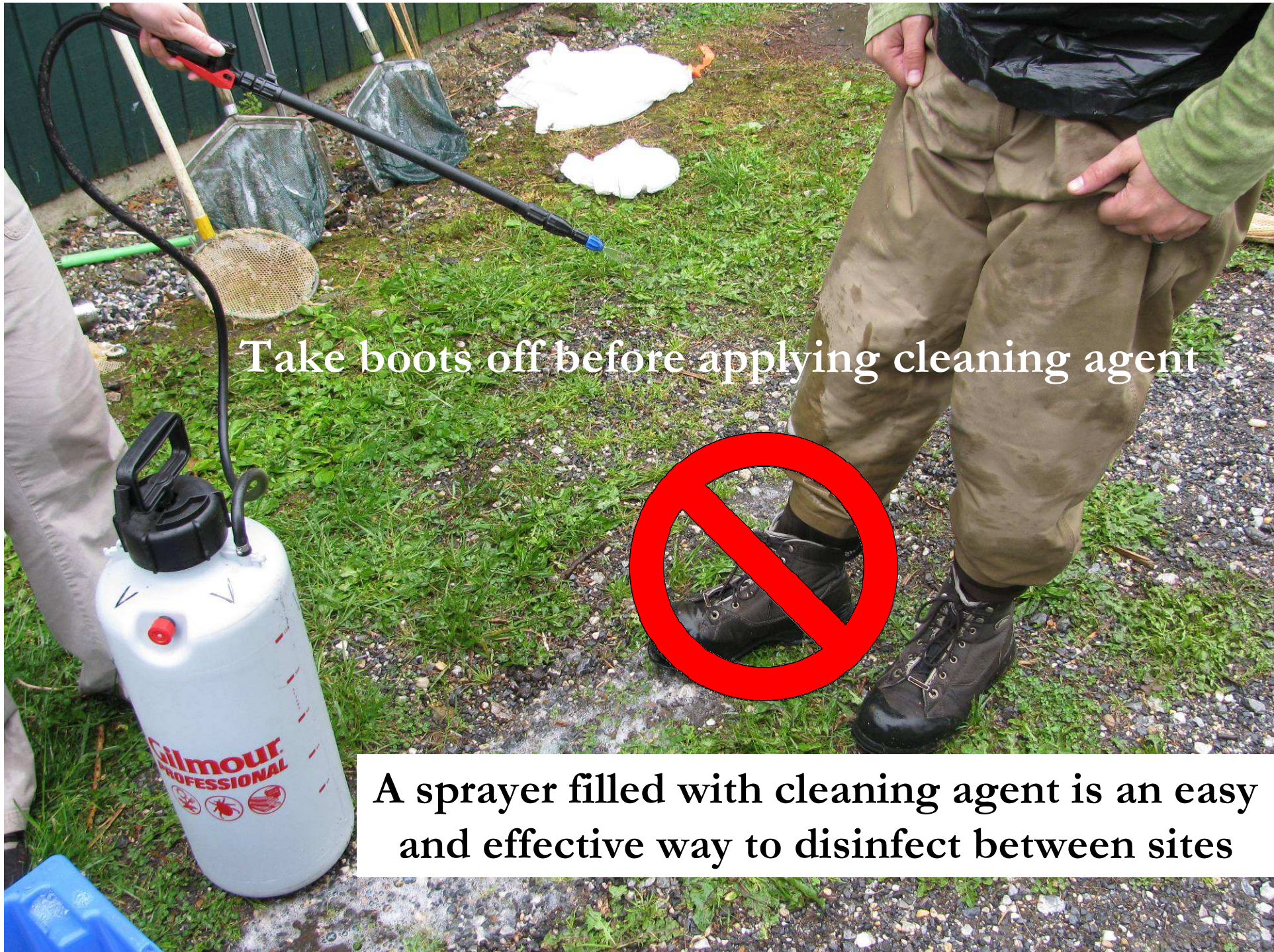
Disinfection Solution	Recommended Concentration	Dilution Formula	Minimum Exposure (Minutes)
Virkon® Aquatic Solution	1 % solution	10g per liter of water 1.3 oz./ gal (packets) 2.6 oz./ 2 gal (sprayer)	10
Chlorine Bleach	10% solution	100ml per liter of water 377 ml. / gal. 12.6 fl. oz. / gal. 1.6 cups / gal.	10
Lysol (or phenol-based product)	Full Strength	----	> 3
Salt	5 %, 50 ppt., 71,323 μS/cm	0.6 cups / gal. 1.2 cups / 2 gal.	10-30
Ethanol	50%	959 ml per liter of water (for 95% grade)	> 2
Hot Water	>140°F (60°C)		3-10



Soak equipment in disinfectant



Clean water rinse after soak



Take boots off before applying cleaning agent

A sprayer filled with cleaning agent is an easy and effective way to disinfect between sites



- **Take boots off before applying cleaning agent**
- **Disinfect any area that came into contact with water from a stream, lake, etc.**



Didymo

Didymosphenia geminata

- Occurs in the Gunpowder River, Savage River, Big Hunting Creek and North Branch Potomac River
- Spreads rapidly
- Covers substrate when in bloom
- Feels like wet wool (not slimy like most algae)



Microscopic image of didymo cells



Didymo in the Gunpowder River

If you think you see Didymo...

- In a zip-top bag, place:
 - A sample from the center of the colony/mat with a small amount of stream water
 - A paper label with sample location & collection date in pencil
- Store on ice or in the refrigerator
- Call or email:

Katherine Hanna

Maryland DNR

katherine.hanna@maryland.gov

410-260-8609

Sample **must** be received by DNR no more than 36 hours after collection

Appendix C
Bacteria Trend Monitoring, Marley and Furnace Creek Watersheds -
Year One Report

Bacteria Total Maximum Daily Load Trend Monitoring Annual Report (FINAL)

Marley Creek and Furnace Creek Watersheds, Anne Arundel County

Year 1 Progress (July 2019 - June 2020)

Task Order 02: Bacteria TMDL Trend Monitoring – Marley and Furnace Creek
Watersheds

Contract No. 10478, Category 14

October 2020

Prepared for:

Anne Arundel County Department of Public Works
Bureau of Watershed Protection and Restoration

2664 Riva Road
Annapolis, Maryland 21401

Task Order 02: Bacteria TMDL Trend Monitoring – Marley and Furnace Creek Watersheds
Contract No. 10478, Category 14

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October 2020 (FINAL)

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Acronyms

°C – degrees Celsius

BWI – Baltimore/Washington Thurgood Marshall International Airport

cfs – cubic feet per second

cfu/mL – Colony-forming units per milliliter

COC – Chain of Custody

CWA – Clean Water Act

DO – dissolved oxygen

EPA – U.S. Environmental Protection Agency

FU – Furnace Creek

GIS – geographic information system

MA – Marley Creek

MBSS – Maryland Biological Stream Survey

MDE – Maryland Department of the Environment

mg/L – Milligrams per liter

mL – milliliters

MPN – Most probable number

mS/cm – Mllisiemens per centimeter

MS4 – Municipal Separate Storm Sewer System

NOAA – National Oceanic and Atmospheric Administration

NPDES – National Pollutant Discharge Elimination System

NTU – Nephelometric turbidity units

NWS – National Weather Service

OSDS – Onsite Sewage Disposal System

PFD – Personal Floatation Device

PPE – Personal Protective Equipment

QA/QC – Quality Assurance/Quality Control

TMDL – Total Maximum Daily Load

USGS – United States Geological Survey

WLA – Waste Load Allocation

1. Introduction

Anne Arundel County’s National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit (11-DP-3316 MD0068306) requires the County to develop restoration plans to address the stormwater Waste Load Allocations (WLAs) for various water quality impairments with Maryland Department of the Environment (MDE)-issued and U.S. Environmental Protection Agency (EPA)-approved Total Maximum Daily Loads (TMDLs). A TMDL is the calculated maximum pollutant amount a waterbody can receive and continue to meet water quality standards for that pollutant. Both Marley Creek and Furnace Creek watersheds were listed as impaired for bacteria according to the Maryland Final 2010 Integrated Report of Surface Water Quality (MDE 2010a). The federal Clean Water Act (CWA) requires MDE to develop a TMDL for improving the water quality of impaired water bodies by establishing pollutant goals and control targets.

Marley and Furnace Creeks are MDE-designated Use Class I waters with designated uses that include water contact recreation and protection of nontidal warmwater aquatic life. A TMDL for enterococci was issued in 2010 for Marley Creek and Furnace Creek as a method of reducing the amount of bacterial pollutants entering the water bodies. Enterococci is used as a bacteria water quality indicator for Maryland Use Class I waters. The enterococci TMDL allocations developed for Marley Creek and Furnace Creek watersheds for enterococci are shown below in **Table 1-1**.

Table 1-1: Enterococci TMDLs per Watershed (MDE, 2010b)

Waterbody	Enterococci TMDL (counts per day)
Furnace Creek	8.14×10^{11}
Marley Creek	1.50×10^{12}

In compliance with MDE and EPA regulatory guidelines, Anne Arundel County developed a County-wide TMDL Restoration Plan for Bacteria (January 2017) that included restoration strategies for Marley Creek and Furnace Creek watersheds along with other bacteria-impaired watersheds. To measure progress toward achieving the enterococci TMDLs for the Marley Creek and Furnace Creek watersheds, the County initiated a Bacteria TMDL Trend Monitoring Program. This report presents the results from the first year (Fiscal Year 2020) of the monitoring program.

The County identified 12 monitoring stations to be sampled monthly, six each in the Marley Creek and Furnace Creek watersheds. Each station was sampled once per month, on the second Wednesday and Thursday of the month, by AECOM scientists. During the July 2019 – June 2020 sampling period, samples were successfully collected monthly at each monitoring station. In addition to the monitoring program, the contributing drainage areas to each of the 12 monitoring stations were delineated and a field reconnaissance was conducted to observe land use conditions in the drainage areas to the monitoring stations.

This report presents an analysis of the sample data collected from the 12 monitoring stations for the 12-month sampling period to identify any trends, correlations with potential sources (sanitary sewer overflows, established transient encampments, avian congregation locations, etc.), and seasonal variations. Along with the quantitative data, anecdotal observations of each sampling location are included in the report.

2. Monitoring Locations

The County identified 12 monitoring stations within the project area to be sampled monthly; six each in the Furnace Creek (FU) and Marley Creek (MA) watersheds. The sampling areas are in shallow surface waters, streams, and tidal waters, and are accessible by foot. Based on an initial field reconnaissance, the original location proposed by the County for site FU-06 was deemed inaccessible for sample collection. Therefore, an alternative location for FU-06 was proposed by AECOM and approved by the County in emails dated April 12, 2019.

To evaluate the existing land use conditions and identify the drainage areas to each monitoring station, AECOM obtained the geographic information system (GIS) data of watershed boundaries for Furnace Creek and Marley Creek watersheds from MDE's TMDL Data Center. The drainage area to each monitoring point was delineated using the 2-foot topographic GIS data downloaded from the County's open data website (<https://opendata.aacounty.org/>). The 2017 land use data GIS data obtained from the County's open data website was used to evaluate overall land use conditions in the Marley and Furnace Creek watersheds as well as the land use conditions within the drainage area to each monitoring point. Additionally, GIS data for onsite sewage disposal systems (OSDS) obtained from the County as a part of Total Maximum Daily Load Restoration Plan for Bacteria Final Plan (January 2017) and sanitary sewer system and pump station GIS data also obtained from the County's open data website was used for conducting a spatial analysis to identify proximity of OSDS, sewer infrastructure, pumping stations to the monitoring stations.

Table 2-1 provides the site identification numbers, geographic coordinates, and drainage areas for each of the sampling locations. A map and photographs depicting the locations of the 12 monitoring stations, and a map with delineated drainage areas to monitoring stations are provided in **Appendix A**.

Table 2-1: Bacteria Sampling Site IDs and Locations

Site ID	Latitude	Longitude	Drainage Area (acres)
FU-01	39.15013	-76.66172	606
FU-02	39.16994	-76.63152	2,148
FU-03	39.17252	-76.62697	1,007
FU-04	39.1777	-76.62106	628
FU-05	39.18275	-76.61593	978
FU-06	39.18181	-76.607	255
MA-01	39.13693	-76.61356	2,106
MA-02	39.14233	-76.60846	675
MA-03	39.14378	-76.60640	519
MA-04	39.14841	-76.60388	1,358
MA-05	39.148820	-76.60143	311
MA-06	39.15116	-76.60172	39

2.1 Furnace Creek

The drainage area for Furnace Creek is 13.41 square miles, and is composed primarily of residential (34%), commercial (12%), industrial (6%), and undeveloped or open areas (34%). A portion of Baltimore/Washington International Thurgood Marshall (BWI) Airport and the surrounding open space is also part of this watershed. Based on review of County's GIS data, there are approximately 710 OSDS located primarily in the upstream portion of the watershed. A map of the land use in Furnace Creek is included below in **Figure 2-1** and a map of OSDS and sanitary sewer system in Furnace Creek is included in **Figure 2-2**.

AECOM conducted field reconnaissance of Furnace Creek watershed on August 13, 2020, to observe watershed conditions and identify any potential bacteria-contributing sources. The sections below describe the monitoring locations, land use conditions within the drainage area to the monitoring location, and any notable observations identified from the field reconnaissance. **Table 2-2** displays the land use distribution in the drainage area of each monitoring point within Furnace Creek based on the 2017 GIS land use data obtained from the County.

Table 2-2: Land Use Distribution in Furnace Creek Watershed Monitoring Location Drainage Areas

	FU-01	FU-02	FU-03	FU-04	FU-05	FU-06
Commercial (%)	3	6	6	22	6	35
Industrial (%)	1	6	10	9	3	4
Open Space (%)	16	17	20	18	5	7
Pasture and Row Crops (%)	6	-	-	-	-	-
Transportation and Utilities (%)	4	9	4	9	8	12
Water (%)	-	1	0	0	0	1
Airport (%)	-	5	37	5	-	-
Wetland (%)	1	1	2	2	0	2
Residential (%)	36	26	14	21	68	32
Woods (%)	33	29	7	14	10	7
Total	100	100	100	100	100	100

AECOM calculated the proximity of nearby pump stations to each sampling location within the Furnace Creek Watershed. **Table 2-3** displays the distance between each Furnace Creek Monitoring Point to the nearest pump station and also identifies if the pump station is located upstream or downstream of the monitoring station.

Table 2-3: Distance Between Furnace Creek Watershed Monitoring Location and Nearest Pump Station

Monitoring Point	Nearest Pump Station	Distance
FU-01	Quarterfield Crossing	3,029 ft (0.57 mi) downstream from FU-01
FU-02	Quarterfield Crossing	8,395 ft (1.59 mi) upstream from FU-02
FU-03	Cinder Cove	7,234 ft (1.37 mi) downstream from FU-03
FU-04	Holsum Way (Private)	5,109 ft (0.97 mi) downstream from FU-04
	Cinder Cover	5,171 ft (0.97 mi) downstream from FU-04

Monitoring Point	Nearest Pump Station	Distance
FU-05	Holsum Way (Private)	2,743 ft (0.51 mi) downstream from FU-05
	Cinder Cover	3,899 ft (0.74 mi) downstream from FU-05
FU-06	Cinder Cove	1,451 ft (0.27 mi) downstream from FU-06

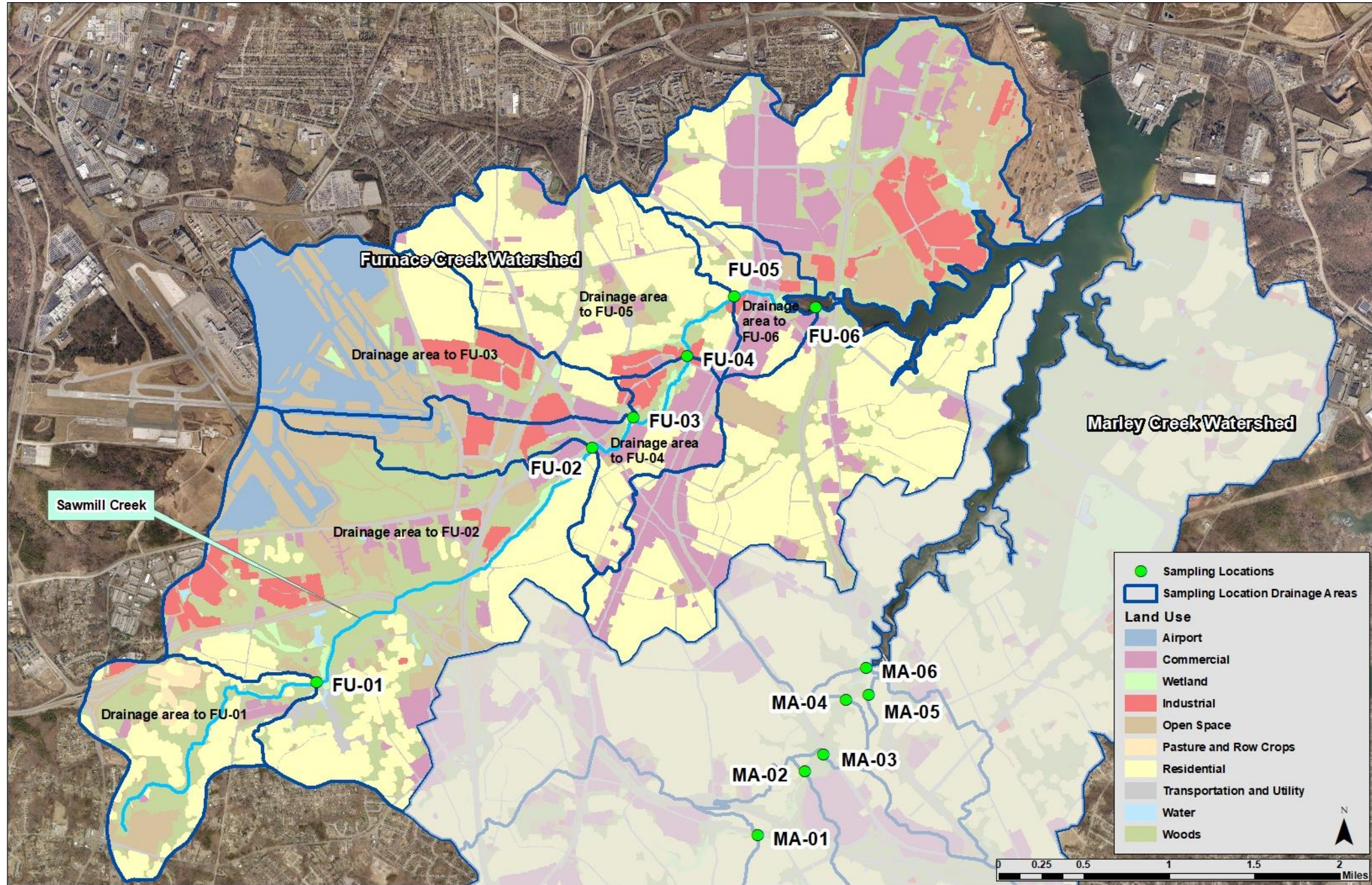


Figure 2-1: Land Use Distribution in Furnace Creek Watershed

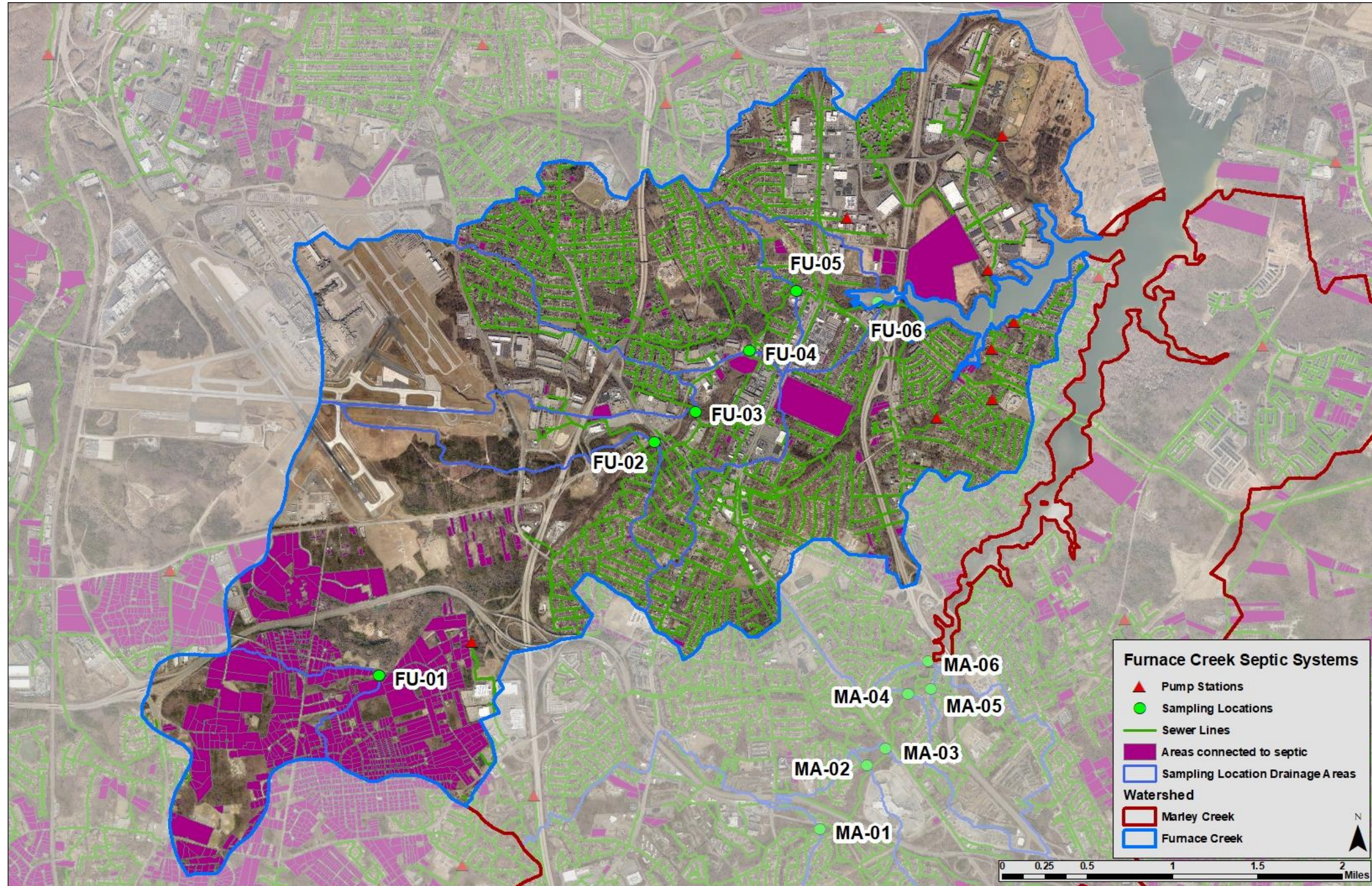


Figure 2-2 : Location of OSDS and Sewer System in Furnace Creek

2.1.1 FU-01

FU-01 is located across from Queenstown Park, along a driveway off Queenstown Road. The stream is fed by the headwaters of Sawmill Creek, originating in the Severn Danza Park area of Severn, MD. The sampling area resembles a wetland, with saturated ground and aquatic plants in the area.

Within the drainage area to FU-01, there are mainly residential, wooded, or open areas, comprising 36%, 33%, and 16% of the drainage area, respectively. The few commercial areas (3%) appear to be automobile or large-scale storage related. There is also pastureland (6%) along Sandy Farm Road, though no livestock or other animals were seen at the time of field reconnaissance. Other land uses in the drainage area include transportation and utilities (4%), industrial (1%) and wetland (1%). Most areas that drain to this monitoring location are connected to septic sewer systems.

2.1.2 FU-02

FU-02 is located along Dorsey Road in Glen Burnie, MD, across the street from the Maryland Military Department First Regiment Armory, next to the Baltimore & Annapolis Trail. The sampling area itself is part of Sawmill Creek; the collection point is located after the junction with Irving Branch. The streambank growth consists mostly of cattails, and the streambed is rocky and sandy. The sampling location is near a busy intersection with heavy automobile and pedestrian traffic.

Within the drainage area to this sampling point, residential areas comprise 26% of the total land use. The non-residential developed areas include BWI airport (5%), industrial areas south of BWI airport (6%), and commercial areas (6%) that are largely construction and automobile related. One notable business in this area is United Site Services on Glenbrook Road, which is a supplier of portable toilets. This business backs up to Sawmill Creek. The rest of the drainage area is primarily wooded (29%) or open space (17%). Other minor land uses include transportation and utilities (9%), water (1%) and wetland (1%). FU-02 also receives drainage from FU-01. Several areas in the south and southwest of this drainage area are connected to septic systems.

2.1.3 FU-03

FU-03 is located off 8th Avenue NW, at the location of the old 8th Avenue Flea Market. The sampling area is part of Sawmill Creek and has transient encampments present year-round. The streambed is sandy and often has sunken debris. There is a sewer line that runs adjacent to the upstream branch of the stream.

The drainage area to the monitoring point partially consists of residential neighborhoods, which comprise 14% of the drainage area. The non-residential land use is largely open space (20%), industrial (10%), and commercial (6%). These areas contain automobile and construction related businesses, as well as a retail area adjacent to the monitoring location. The northeast portion of BWI Airport also occupies 37% of this drainage area. Other minor land uses include transportation and utilities (4%), wetland (2%) and woods (7%). Two small industrial and commercial areas in this watershed are connected to septic systems.

2.1.4 FU-04

FU-04 is located off 8th Avenue NW, adjacent to Maisel Brothers, a commercial landscaping facility and is surrounded by commercial areas on all sides. The sampling area is before Ferndale Branch, in the leg of Sawmill Creek running alongside the west fence of Maisel Brothers. The sampling area has remnants of transient encampments, including abandoned bedding, clothing, shopping carts, and debris in the path leading to the sampling location. The stream is part of Sawmill Creek, and the sampling location captures the drainage from FU-01 through 03.

Drainage to this location comes from a portion of BWI airport (5% of the drainage area), wooded and residential areas (14% and 21% of the drainage area, respectively), and developed commercial and industrial areas (22% and 9% of the drainage area, respectively). The commercial and industrial areas appeared to be largely automobile and construction related. The area directly adjacent in the south of the monitoring location is connected to a septic system. There are a few other small residential areas in the central part of the watershed that are also connected to

septic. Other land uses in the drainage area include open space (18%), transportation and utilities (9%) and wetland (2%). FU-04 receives drainage from upstream drainage areas to monitoring locations FU-01 through FU-03.

2.1.5 FU-05

FU-05 is near the intersection of Crain Highway and E Furnace Branch Road, adjacent to Dave’s Trim Shop. The sampling area is adjacent to commercial businesses and multiple parking lots. The stream is part of Sawmill Creek, and is fed by the main trunk as well as tributaries originating from neighborhoods located around North Glen Park in Glen Burnie, MD. This sampling location receives the downstream drainage from FU-01 through 04.

The drainage area to this sampling location is primarily residential (68%), with a few areas comprising commercial (6%), industrial (3%), and wooded (10%) land use. During field reconnaissance, it was noted that many of the homes had boats parked nearby. There are a few residential areas in this drainage area that are connected to septic systems. Other land uses in the watershed include open space (5%) and transportation and utilities (8%). FU-05 receives drainage from drainage areas of upstream monitoring locations FU-01 through FU-04.

2.1.6 FU-06

FU-06 is the tidal site for Furnace Creek, fed primarily by Sawmill Creek. It is located off E Furnace Branch Road, adjacent to 120 N Langley Road. The sampling location is surrounded by commercial businesses and is adjacent to transient encampments year-round. This sampling location experiences substantial variation in tide level compared to other monitoring sites which can lead to the streambed being exposed during routine sampling activities.

The drainage area to this location is primarily occupied by commercial and residential land use types. Residential areas comprise 32% of the drainage area. The commercial areas, which comprise 35% of the drainage area, are mostly automobile related, though the area immediately around the monitoring location is an industrial supply warehouse. Other land uses in the drainage area include industrial (4%), open space (7%), transportation and utilities (12%), water (1%), wetland (2%) and woods (7%). Since this location is the terminal sampling point for Furnace Creek, it receives drainage from all upstream areas, including drainage that reaches FU-01 through FU-05. There are two small residential areas in the drainage area that are connected to septic systems.

2.2 Marley Creek

The drainage area of Marley Creek is 13.65 square miles, and is primarily composed of residential (51%), commercial (10%), and undeveloped or open areas (31%). Based on review of County’s GIS data, Marley Creek watershed has approximately 420 OSDS that are located throughout the watershed. A map of the land use in Marley Creek is included below in **Figure 2-3** and a map of OSDS and sanitary sewer system in Marley Creek is included in **Figure 2-3**.

AECOM conducted field reconnaissance of Marley Creek watershed on August 13, 2020, to observe watershed conditions and to identify any potential bacteria-contributing sources. The sections below describe the monitoring locations, land use conditions within the drainage area to the monitoring location, and any notable observations identified from the field reconnaissance. **Table 2-4** displays the land use distribution in the drainage area of each monitoring point within Marley Creek based on the 2017 GIS land use data obtained from the County

Table 2-4: Land Use Distribution in Marley Creek Watershed Monitoring Location Drainage Areas

	MA-01	MA-02	MA-03	MA-04	MA-05	MA-06
Commercial (%)	14	5	27	15	14	-
Industrial (%)	0	-	0	0	-	-
Open Space (%)	6	8	3	5	5	-
Pasture and Row Crops (%)	2	2	-	-	-	-

	MA-01	MA-02	MA-03	MA-04	MA-05	MA-06
Transportation and Utilities (%)	9	6	12	9	13	-
Water (%)	0	0	0	0	0	3
Airport (%)	-	-	-	-	-	-
Wetland (%)	1	2	0	1	0	4
Residential (%)	56	53	33	62	58	64
Woods (%)	12	24	25	8	10	29
Total	100	100	100	100	100	100

AECOM also calculated the proximity of nearby pump stations to each sampling location within the Marley Creek Watershed. **Table 2-5** displays the distance between each Marley Creek Monitoring Point to the nearest pump station also identifies if the pump station is located upstream or downstream of the monitoring station.

Table 2-5: Distance Between Marley Creek Watershed Monitoring Locations and Nearest Pump Station

Monitoring Point	Nearest Pump Station	Distance
MA-01	Marley	8,976 ft (1.17 mi) downstream from MA-01
MA-02	Marley	3,740 ft (0.70 mi) downstream from MA-02
MA-03	Marley	3,076 ft (0.58 mi) downstream from MA-03
MA-04	Marley	1,204 ft (0.22 mi) downstream from MA-04
MA-05	Marley	839 ft (0.15 mi) downstream from MA-05
MA-06	Marley	135 ft (0.02 mi) upstream from MA-06

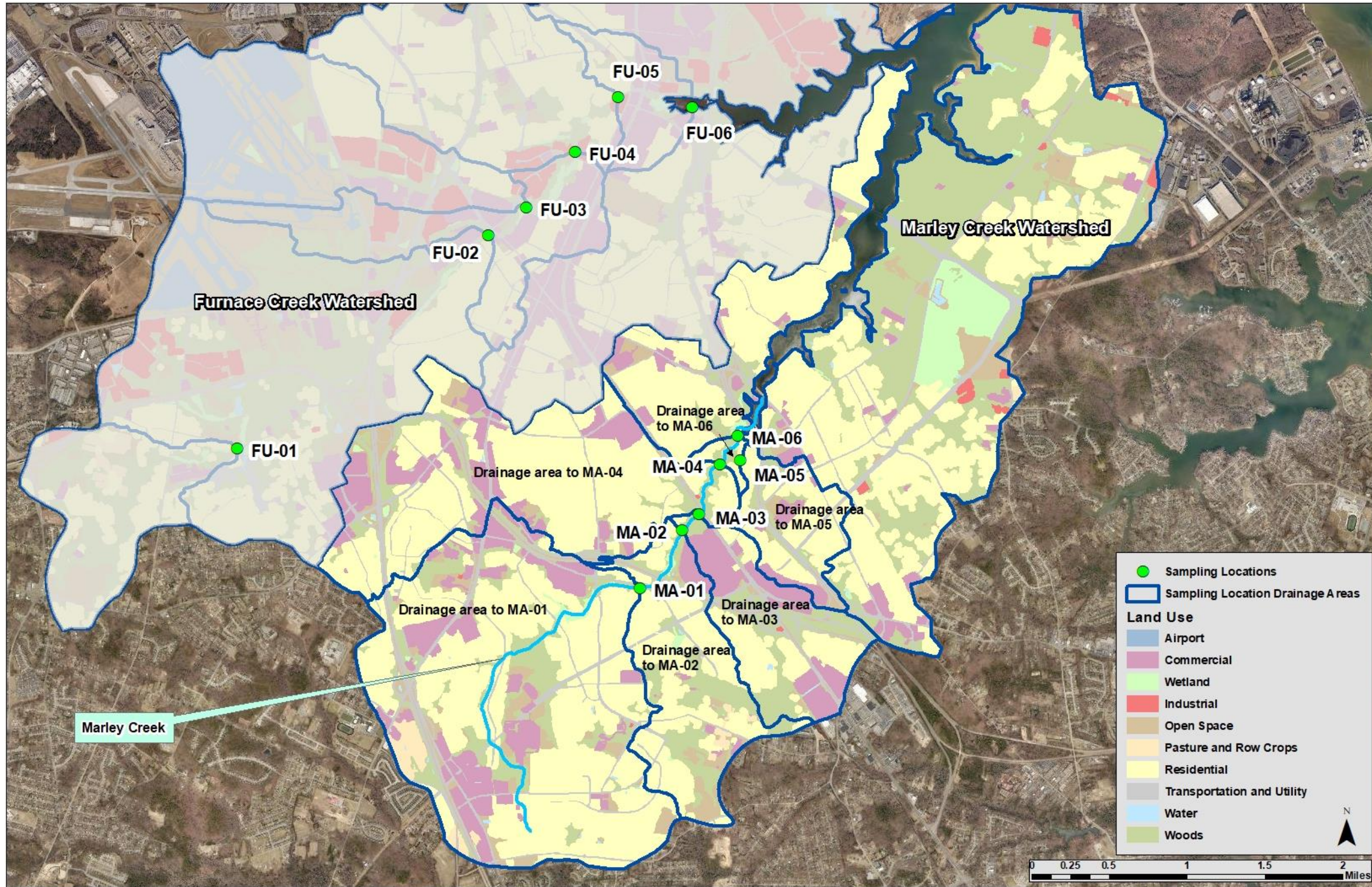


Figure 2-3: Land Use Distribution in Marley Creek Watershed

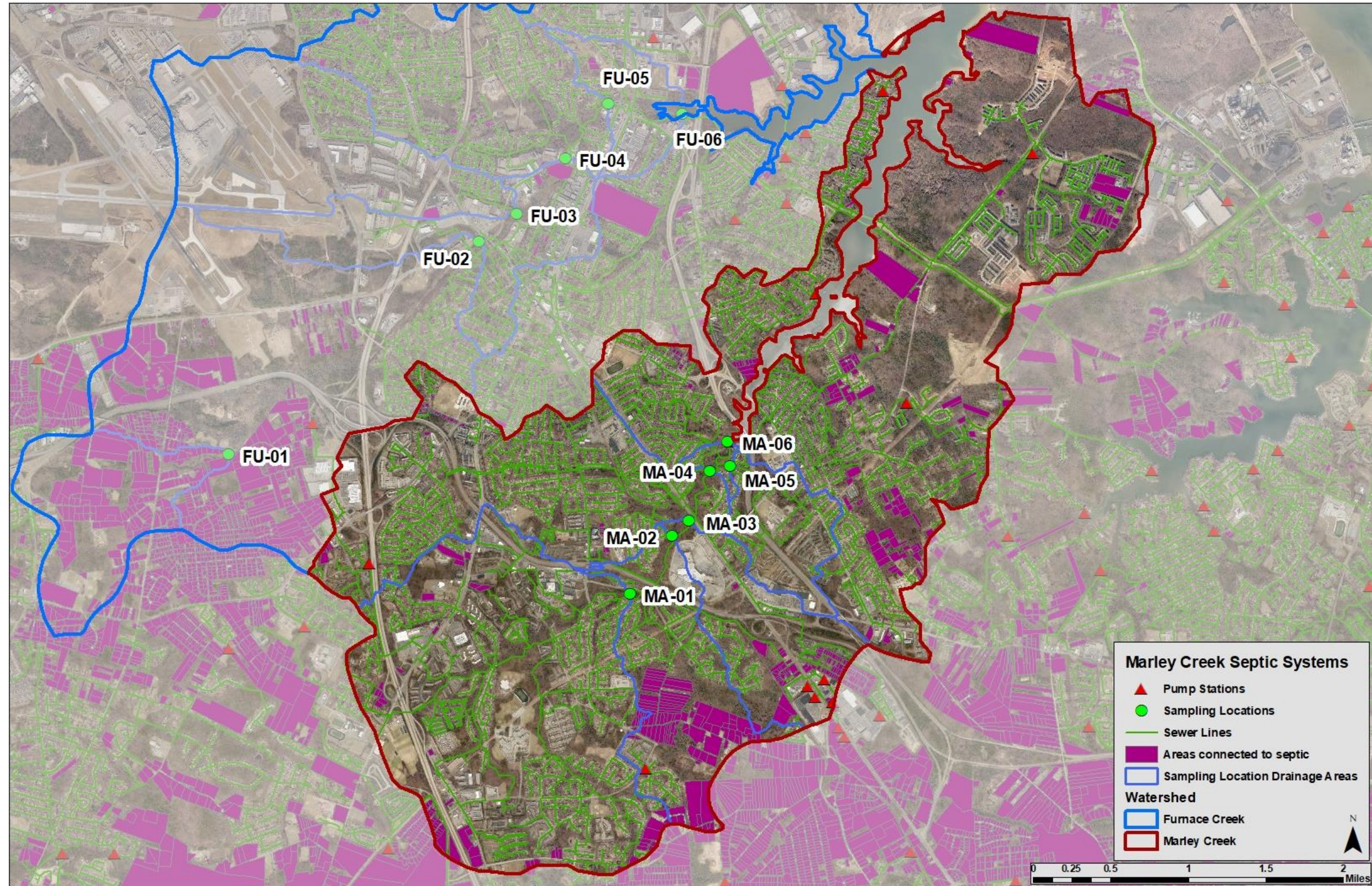


Figure 2-4: Location of OSDS and Sewer System in Marley Creek

2.2.1 MA-01

MA-01 is located between Cross Creek Drive and Hospital Drive in Glen Burnie, MD. The stream is fed by the headwaters of Marley Creek, originating in the west part of the South Gate area in Glen Burnie, MD. The sampling area is generally overgrown but otherwise healthy. A sewer line runs adjacent to much of the upstream portion of Marley Creek.

The drainage area to this sampling point is composed of primarily residential communities (56% of the drainage area), interspersed with several larger commercial areas, which comprise 14% of the drainage area. Northwest of the monitoring location is the University of Baltimore Washington Medical Center. The other commercial areas beyond the hospital are also largely medical and healthcare related. To the east and southeast of MA-01 are several shopping centers with mainly retail businesses. A few residential and commercial areas to the southwest and west of the monitoring location are connected to septic sewer systems. Other land uses in the drainage area include woods (12%), open space (6%), pasture and row crops (2%), transportation and utilities (9%), and wetland (1%).

2.2.2 MA-02

MA-02 is located underneath the Marley Creek Trussle Bridge, which is located along the Baltimore & Annapolis Trail next to Marley Station Mall. The sampling location is wooded and is adjacent to both a large residential neighborhood and the Marley Station shopping mall.

The monitoring location captures the upstream portions of Marley Creek that run through MA-01 as well as additional headwaters that originate in the neighborhoods off Foxwell Road in Glen Burnie and Elvaton Road in Pasadena. Areas in the immediate vicinity of the monitoring station are served by public sewer system. Neighborhoods in upper reaches of the drainage area are primarily connected to septic systems. Residential areas comprise 53% of the drainage area. During field reconnaissance, it was noted that the neighborhood to the southwest had a lot of loose trash. Some houses had boats parked nearby. The majority of the remaining drainage area is largely wooded (24% of the drainage area). Other land uses in the drainage area include commercial (5%), open space (8%), pasture and row crops (2%), transportation and utilities (6%), and wetland (2%).

2.2.3 MA-03

MA-03 is located approximately 250 yards downstream from MA-02. It can be accessed from Governor Ritchie Highway near the Marley Station shopping mall. The sampling location is located after Marley Creek is intersected by outfalls that flow from Marley Station Mall. These outfalls appear to be connected to tributaries that originate in the Woodholme neighborhood of Pasadena, MD. This neighborhood, in the southern part of the drainage area, is primarily connected to septic systems.

This sampling location captures drainage from the upstream areas that reach MA-01 and 02, as well as the Marley Station Mall and adjacent retail center, another retail center to the southeast, residential areas, and wooded areas. The southeast retail center includes PPT Porta Potty Rentals off Jumpers Hole Road. Commercial, residential, and wooded areas comprise 27%, 33%, and 25% of the drainage area to MA-03, respectively. Open space and transportation and utilities occupy 3% and 12% of the drainage area, respectively.

2.2.4 MA-04

MA-04 is located in the wooded area between Tower Road and Dixon Drive in Glen Burnie. The monitoring location captures the main trunk of Marley Creek, including drainage to the upstream monitoring locations MA-01 through MA-03, as well as additional flow from sources in adjacent neighborhoods along Ritchie Highway and nearby commercial areas. A sewer line runs adjacent to the upstream length of the stream.

Residential areas cover 62% of the land use draining to MA-04. Commercial areas, which comprise 15% of the drainage area, are primarily medical, retail, and automobile industry businesses. One notable business in the drainage area is Premier Porta Potty Rental off Landmark Drive. Other land uses in the drainage area include open space (5%), transportation and utilities (9%), and woods (8%). Only one small area at the upstream point of the drainage area appears to be connected to septic sewer systems.

2.2.5 MA-05

MA-05 is located off Norman Avenue between Phelps Avenue and Mueller Drive in Glen Burnie. The sampling location captures flow from tributaries originating near Marley Elementary School and several neighborhoods and apartment buildings before connecting to the main trunk of Marley Creek. During field reconnaissance, it was noted that the neighborhoods in this drainage area had very little trash and debris lying around. Yards are large and grassy, with boats parked at many homes.

Residential communities make up 58% of the land use, while commercial areas comprise 14% of the drainage area. Other land uses in the drainage include transportation and utilities (13%), open space (5%), and woods (10%). A sewer line runs adjacent to the stream, and a pumping station is located less than 1,000 feet from the sampling location. No areas within the drainage area to MA-05 appear to be connected to septic systems.

2.2.6 MA-06

MA-06 is the tidal site for Marley Creek. It is found behind the sewer transfer station located at 521 Norman Avenue in Glen Burnie. It is fed primarily by Marley Creek tributaries, including all tributaries captured by upstream Marley Creek monitoring locations. MA-06 does not capture Marley Creek tributaries north and east of Maryland Route 10 (Arundel Expressway). The sampling location is generally silty with heavy cattail growth in the shallow waters. A sewage-like odor is generally evident that could be related to the nearby Marley Pump Station and /or marshy conditions at the sampling location.;

The drainage area to this monitoring station is largely residential (64%) and wooded (29%). Other land uses in the drainage area include water (3%) and wetlands (4%). No areas within the drainage area to MA-06 appear to be connected to septic systems.

3. Sampling Methodology

AECOM performed bacteria trend monitoring sampling activities for the 12-month sampling period beginning in July 2019 and ending in June 2020. Sampling was conducted on the second Wednesday and Thursday of each month. AECOM provided a two-person sampling team to perform the bacteria trend monitoring sampling activities in the project area, in accordance with the Bacteria Sampling Plan and Quality Assurance/Quality Control Protocols (July 2019), and EPA sampling protocols.

3.1 Field Sampling Preparation

One week before a scheduled sampling event, bottles and an insulated cooler were ordered. Two days prior to a sampling event, the multi-parameter sonde was checked to confirm it was functioning properly, and if necessary, a replacement sonde or parts were obtained. At least one day prior to a scheduled sampling event, field equipment was assembled and prepared for use.

3.2 Sample Collection and Field Measurements

The sampling team consisted of one team member collecting the sample (the sampler) and one team member recording data using the field form. The field team mobilized to the site on two consecutive days: Furnace Creek on the second Wednesday of each month and Marley Creek on the second Thursday of each month. The team conducted sampling at each watershed starting with the most downstream location as follows:

Monitoring stations in Furnace Creek watershed were sampled on the second Wednesday of every month in the following order:

- FU-06 (tidal site)
- FU-05
- FU-04
- FU-03
- FU-02
- FU-01

Monitoring stations in the Marley Creek watershed were sampled on the second Thursday of every month in the following order:

- MA-06 (tidal site)
- MA-05
- MA-04
- MA-03
- MA-02
- MA-01

3.2.1 Bacteria Sampling

A grab sample was collected at each monitoring site for bacteria analysis. Prior to collecting the sample, the team member handling the sampling container donned a clean pair of nitrile gloves and collected the sample directly into the laboratory-supplied sterile sample container.

Collecting Samples

The sampler entered the stream from a downstream location and waded slowly to the collection point, taking care not to disturb the stream bed or to foul the collection point. In order to collect the sample, the sampler removed the sample container lid and removed the preservative tablet, taking care not to contaminate the inner surface or underside of the cap or the neck of the bottle. The person collecting the samples was positioned facing upstream, and the sample was collected from the incoming flow by holding the container at the base and angling the neck and

mouth of the bottle toward the water. The bottle was then plunged neck-down into the water, avoiding any debris or surface scum, and positioned into the current until the neck faced slightly upward and the mouth of the container was facing the current, in order to allow air to escape and the container to fill up. If there was no current, one was created by moving the bottle forward horizontally away from the sampler.

Samples were collected from a point that is representative of the site, with the sampler taking care not to collect the sample too near the bank or too far from the point of drawoff, or at a depth above or below the drawoff. For tidal sites FU-06 and MA-06, the sample was taken at a location approximately 0.5-meter-deep, and for all other sites, the sample was taken at a location of approximately 0.1 meter below the surface. The sampler allowed the container to fill but left approximately 1 to 2 centimeters of air space to allow mixing by shaking before examination. The sampler then carefully placed the preservative tablet back into the container before replacing the cap and locking the lid in place.

During the 2019–2020 sampling year, all samples were collected directly in the sampling containers, and none required a piece of sampling equipment (e.g., telescopic dipper) to collect the sample.

Logging Samples

Once the sample was collected, the container was sealed and labeled appropriately with sample ID, date, and time, then the same information entered onto the Chain-of-Custody (COC) form. The sample was then placed in an insulated cooler for transportation to the analysis laboratory. Samples were put on ice and maintained between 1 and 10 degrees Celsius (°C) during transit. In order to keep the samples dry, they were placed in a waterproof storage bag prior to being placed in the cooler. The 8-hour hold time for enterococci analysis was not exceeded for any of the sampling events.

3.2.2 Field Measurements and Observations

The field team member responsible for collecting data noted field observations and conditions, including equipment information, field measurements, high/low flow determination, tidal characteristics, and other observations of the site and surrounding area in a field log. The field log consists of field data sheets and calibration sheets. Field observations and other pertinent anecdotal information that was recorded include:

- Date and time of sample collection
- Depth of sample collection
- Ambient air temperature
- Extreme conditions (weather, flooding, extreme temperatures, high winds)
- Unusual sampling/environment (possible sources of contamination, unusual inflow/outflow, algal blooms, significant changes to historical field results, etc.)
- Presence of transient encampments, congregations of evidence of avian or other wildlife, accumulated debris, etc.
- Presence of invasive species (snakeheads, phragmites, etc.)
- Precipitation amount for 3 days prior to sampling and at the time of sampling
- Tide characteristics (high/low or ebb/flood/slack) obtained from the National Oceanic and Atmospheric Administration's (NOAA's) Ft. McHenry tidal monitoring station 8574680
- Water characteristics
- Water color
- Visual turbidity
- Odor
- Flow characteristics (still, fast, dam, etc.)

At each site, sampling team members donned personal protective equipment (PPE) and prepared the sampling equipment. A multi-parameter sonde was used to collect the following physical water quality data for each sample:

- Temperature (°C)
- Dissolved Oxygen (milligrams per liter [mg/L])
- Specific Conductivity (millisiemens per centimeter [mS/cm])
- Turbidity (Nephelometric turbidity units [NTUs])
- pH

Prior to use, the multi-parameter sonde probe was examined to ensure that any antifouling components or probe protective attachments were equipped and the probe was securely attached to the cable. The sampling team member submerged the sonde probe in the stream flow and read results directly from the probe. The probe was placed in the

stream with the sampler facing upstream and was submerged at least 0.1 meter below the water surface and in full contact with the flow. The reading was taken from approximately the same depth as the bacteria sample. The probe was held in place for at least 30 seconds to allow readings to stabilize before results were recorded in the field log.

Field data sheets and calibration logs are provided as **Appendix B**.

3.2.3 Cleanup and Decontamination

Proper decontamination procedures were followed while sampling at each location to prevent bacteria and nuisance organism/pathogen cross-contamination and to prevent the introduction and spread of nuisance organisms and pathogens to other locations. The sampling team followed the Maryland Biological Stream Survey (MBSS) *Decontamination Procedures for Boots and Equipment* (MDNR n.d.).

The decontamination area was set up at least 50 yards from the stream. After samples were collected from a station, the field members wiped their hands with disinfectant wipes or lotion, or washed with soap and water to reduce exposure to potentially harmful bacteria or other microorganisms. The sample team then followed the following protocols to decontaminate the field equipment:

For the multiparameter sonde:

- Don a clean pair of nitrile gloves
- Clean sonde, exposed cable, and sample container by removing visible contamination with a brush or wipes and rinse with distilled/deionized water
- Submerge sonde, exposed cable, and sample collection container (if used) in a 5% salt solution for at least 10 minutes
- Thoroughly dry with paper towels

For the boots and waders:

- Remove boots/waders
- Using sprayer filled with 1% Virkon Aquatic solution, thoroughly spray any area of boots/waders that came into contact with stream water
- Place boots/waders in a clean plastic trash bag for transportation to next sampling location

Dispose of all wash water, rinse water, rinsates, and other sampling wastes (disposable PPE, plastic sheeting, paper towels, etc.) in properly marked, sealable containers or bags.

3.2.4 Data Collection/Recordkeeping Procedures

Information provided by NOAA's National Weather Service (NWS) for BWI was used to collect precipitation data for 72 hours prior to the sampling event and on the date of sampling. Outside temperature and weather were recorded at the time of sample collection.

AECOM used data from United States Geological Survey (USGS) Gauge Station 01589500 (Sawmill Creek, Glen Burnie, MD) to determine the cutoff flow rates for high/low flows and make a high/low flow determination for each sample collected from monitoring sites. For the two tidal sites, FU-06 and MA-06, AECOM used data from NOAA tidal monitoring station 8574680 (Fort McHenry). Prior to sampling, the sampling team recorded field observations and other details pertinent to site characterization in the field data sheets.

The sampling team recorded field observations and other pertinent anecdotal information for each monitoring station in the field data sheets as described in Section 3.2.2. Field observations and conditions, including equipment information, water quality data, high/low flow determination, tidal characteristics, and other observations of the site and surrounding area were recorded in the field data sheets.

3.3 Laboratory Analysis

Martel Laboratories JDS, Inc., a Maryland State-certified water quality laboratory, analyzed the water samples using IDEXX Enterolert (ASTM Method #D6503-99) for the presence of enterococci bacteria. The sampling team delivered the bacteria monitoring samples to the laboratory no later than 6 hours after the initial collection. The hold time for enterococci is 8 hours. Delivering the samples to the lab within 6 hours of collection ensured adequate time for pre-processing and analysis of the samples within the hold time limit. Results were reported in Most Probable Number (MPN) per 100 milliliters (mL). Laboratory reports are provided in **Appendix C**.

3.4 Field Note Package

Upon receiving laboratory analytical results after each sampling event, AECOM sent the County Project Manager an email with a PDF file summarizing field activities and results. The file included the calibration logs for the sonde, water quality data field data sheets, sampling event field notes, laboratory analytical results, and COC forms.

3.5 Quality Assurance/Quality Control (QA/QC) Protocols

3.5.1 Field Sampling QA/QC

Samples were collected at approximately the same time and day each month to provide consistently gathered data. A field test was performed during the initial sampling event at each monitoring site to confirm the presence or absence of residual halogens (free chlorine) that could affect analytical results. The results showed that the Marley Creek and Furnace Creek monitoring locations were not affected by chlorination sources.

The sampling team exercised aseptic sample techniques to avoid the potential for contamination during routine sampling. Sample equipment remained sealed and sterile until ready for use. Samples for laboratory analysis were collected directly into the sterile, laboratory-supplied container.

All sampling activities were conducted from the most downstream point to the most upstream to prevent initial sampling activities from impacting results of subsequent samples. Samples were collected facing upstream, away from the sampler and into the current, to prevent contamination from the sampler. If no current was present, one was generated artificially by sampling in a forward motion. The sampler entered the stream downstream of the sample collection point. If wading, the sampler moved carefully to avoid significant fouling of the water.

After all of the samples were collected from a monitoring station, the sampling team used soap and water, alcohol wipes, or a disinfectant lotion to wash and dry their hands and any reusable PPE to reduce exposure to harmful bacteria and to prevent cross-contamination of sites. Field equipment was cleaned/decontaminated according to the procedures specified in Section 3.2.3.

The field team collected one field blank sample per every third sampling event. The field blank was collected first by pouring a sample of analyte-free water into a sterile sample container in the field.

The field team collected one duplicate sample per sampling event. The duplicate sample was collected following the same procedures as regular sample collection.

Samples were transferred upon collection to a cooler maintained at 1°C to 10°C until delivered to the laboratory for analysis. To keep containers dry, the samples were placed in a sealable waterproof storage bag prior to being placed in the cooler.

The sampling team delivered samples to the laboratory no later than 6 hours after initial collection time. This allowed for 2 hours of processing time from when samples were delivered to when they were analyzed.

3.5.2 Database QA/QC

A Microsoft Access database was developed in which to compile the monthly sample collection data from the water quality field data sheets and laboratory analytical results for the 12 sites. The database schema includes the following fields:

- Site ID
- Location
- Date and time of sample collection
- Tide characteristics
- Field measurements
 - Temperature (°C)
 - Dissolved Oxygen (mg/L)
 - Specific Conductivity (mS/cm)
 - Turbidity (NTUs)
 - pH
 - Depth of sample collection
- Laboratory analysis results
 - Enterococcus (MPN/100 mL)
- Notes

In order to maintain quality control and verify that the data entered in the database accurately represent the results obtained from the lab analysis and parameters measured at the monitoring site, all database entries were checked by a second AECOM staff member. Additionally, a histogram of each collected data was visually inspected to detect any outliers. Outliers were investigated to determine the cause and are documented in the Section 4. This database is attached in **Appendix D**.

4. Monitoring Results

The TMDLs established by MDE require a reduction of enterococci bacteria by 75.75% for Marley Creek and 77.79% for Furnace Creek. The water quality criterion for Marley Creek and Furnace Creek watersheds states that the mean density of enterococci shall not exceed 35 colony-forming units per 100 milliliters (cfu/100 mL). The water quality criterion is designed to protect the Use I waters of Marley Creek and Furnace Creek. MDE's *Guidance for County Recreational Water Quality Monitoring and Notification Programs 2003* uses Beach Action Values for Indicator Organism Densities adapted from US EPA 2002 *EPA-823-B-02-004*. The Beach Action Value is not being met if the geometric mean of a sampling event's results for enterococci exceeds 104 cfu/100 mL. The data collected for this report are reported in most probable number per 100 mL (MPN/100 mL) and are directly comparable to the water quality standards presented in cfu/100 mL. In addition, the data provided below was compared to the single sample water quality criterion of 61 MPN/100 mL for freshwater and single sample water quality criterion of 104 MPN/100 mL for estuarine waters. The single sample water quality criterion for fresh water is applicable to all sites except FU-06 and MA-06. The single sample estuarine water quality criterion is applicable to tidal sites FU-06 and MA-06.

4.1 Furnace Creek

The data collected for Furnace Creek show bacteria trends to be higher during the summer months and lower during the winter months. The highest values were seen at FU-06 (the tidal site), FU-04, FU-03, and FU-02. From January 2020 through March 2020 all sites met the Beach Action Value (104 MPN/100 mL). FU-01 met the single sample water quality criterion for fresh water of 61 MPN/100 mL for November through May; FU-02 met the criterion for January through April; FU-03 met the criterion for September and November through March; FU-04 met the criterion for January through March and in May; FU-05 met the criterion in November, January through March, and May. FU-06 met the single sample water quality criterion for estuarine waters of 104 MPN/100 mL December through May. **Figure 4-1** shows the data for all sites. The sections below discuss results for each sampling site.

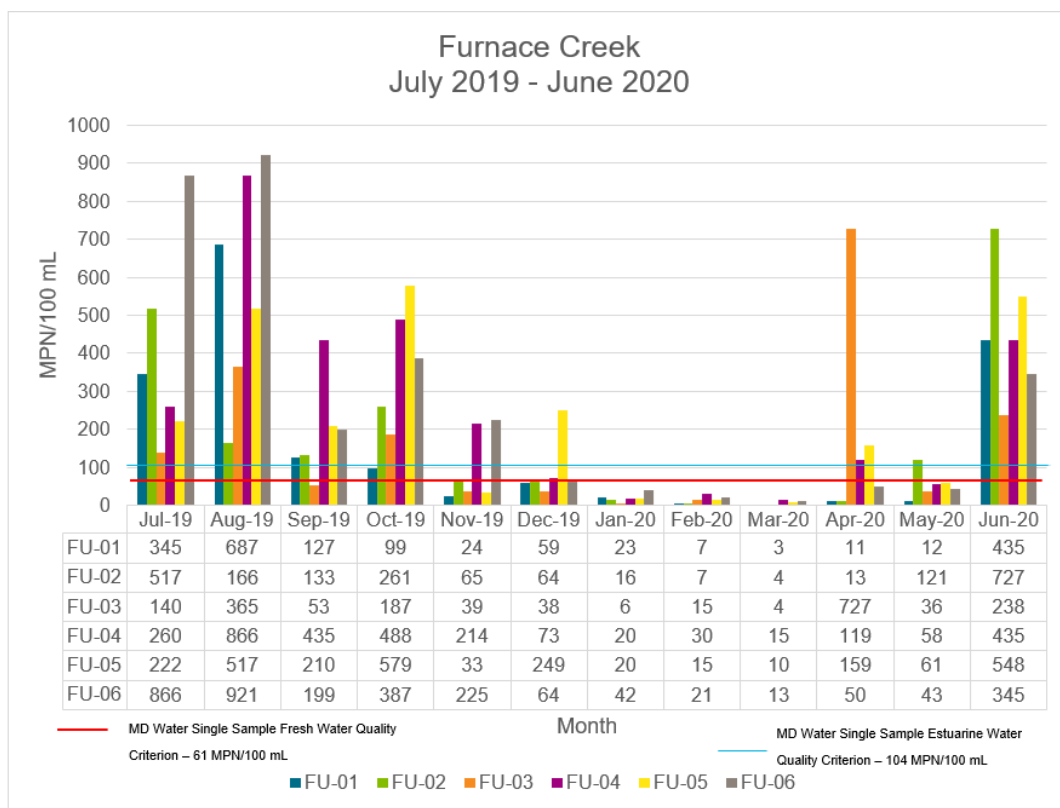


Figure 4-1: Furnace Creek Enterococci Data from July 2019 to June 2020

4.1.1 FU-01

FU-01 experienced its highest enterococcus concentration of 687 MPN/100 mL in August, as shown in **Figure 4-2**. Enterococcus levels remained below the Beach Action Value (< 104 MPN/100 mL) from October through May 2020. Levels met the single sample fresh water quality criterion (61 MPN/100 mL) in November through May. Elevated concentrations ranging from 345 MPN/100 mL to 687 MPN/100 mL occurred in July, August, and June.

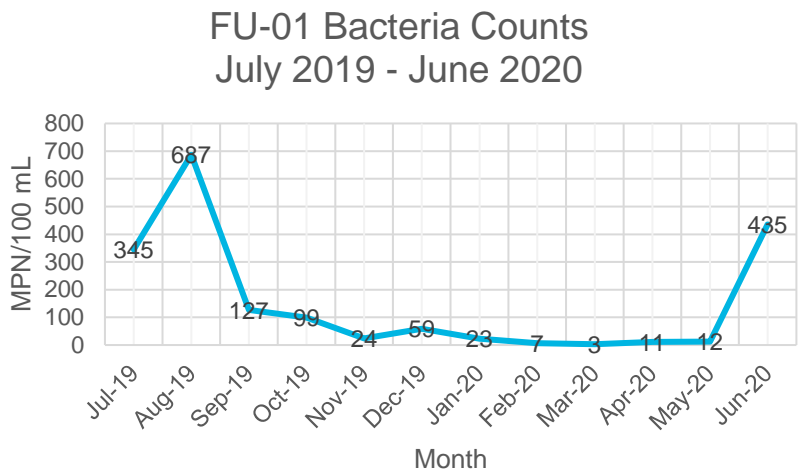


Figure 4-2: FU-01 Bacteria Trend

4.1.2 FU-02

FU-02 experienced its highest enterococcus concentrations of 727 MPN/100 mL in June, shown in **Figure 4-3**. Bacteria levels were below the Beach Action Value (<104 MPN/100 mL) from November through April. Levels met the single sample fresh water quality criterion (61 MPN/100 mL) from January through April. Elevated concentrations ranging from 261 MPN/100 mL to 727 MPN/100 mL occurred in July, October, and June.

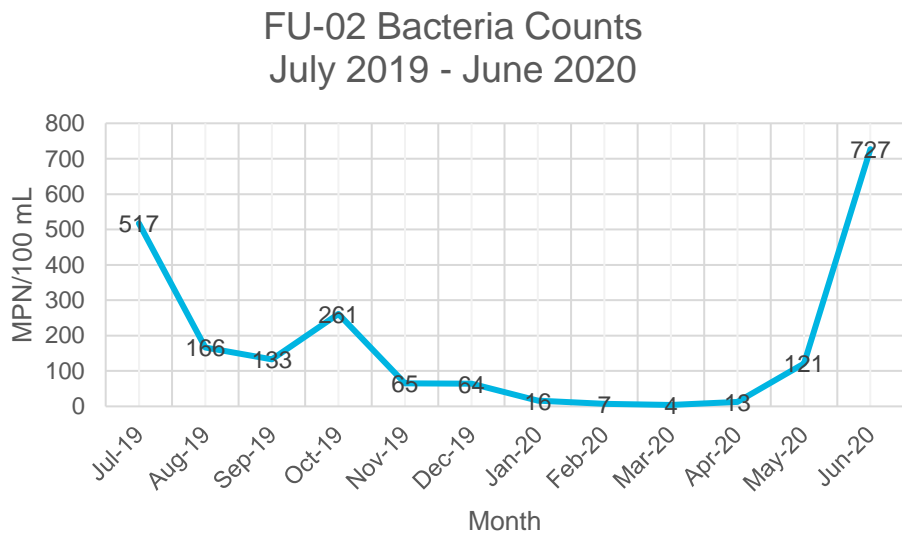


Figure 4-3: FU-02 Bacteria Trend

4.1.3 FU-03

FU-03 experienced its highest enterococcus level of 727 MPN/100 mL in April, shown in **Figure 4-4**. Bacteria levels were below the Beach Action Value (< 104 MPN/100 mL) in September and from November through March, and in May. Levels met the single sample fresh water quality criterion (61 MPN/100 mL) in September and May and from November through March. Elevated concentrations ranging from 140 MPN/100 mL to 727 MPN/100 mL occurred in July, August, October, April, and June.

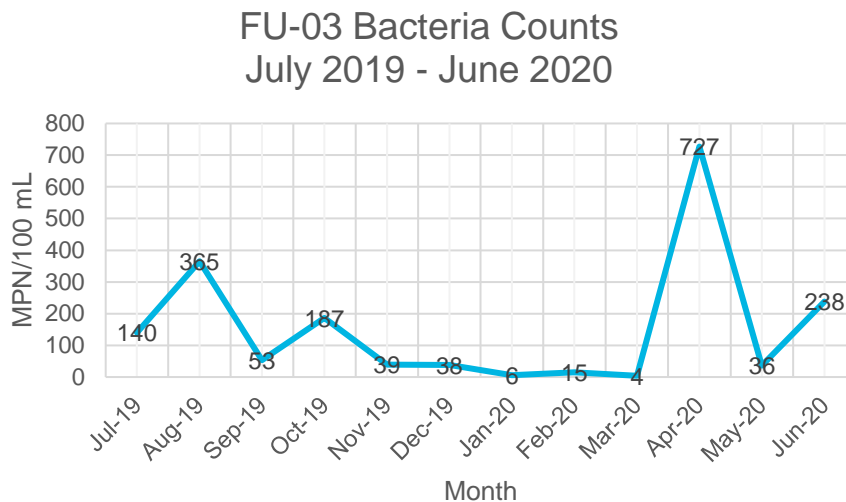


Figure 4-4: FU-03 Bacteria Trend

4.1.4 FU-04

FU-04 experienced its highest enterococcus concentration of 866 MPN/100 mL in August, shown in **Figure 4-5**. Bacteria levels were below the Beach Action Value (<104 MPN/100 mL) from December through March, and in May. Levels met the single sample fresh water quality criterion (61 MPN/100 mL) from January through March and in May. Elevated concentrations ranging from 119 MPN/100 mL to 866 MPN/100 mL occurred in July, August, September, October, November, April and June.

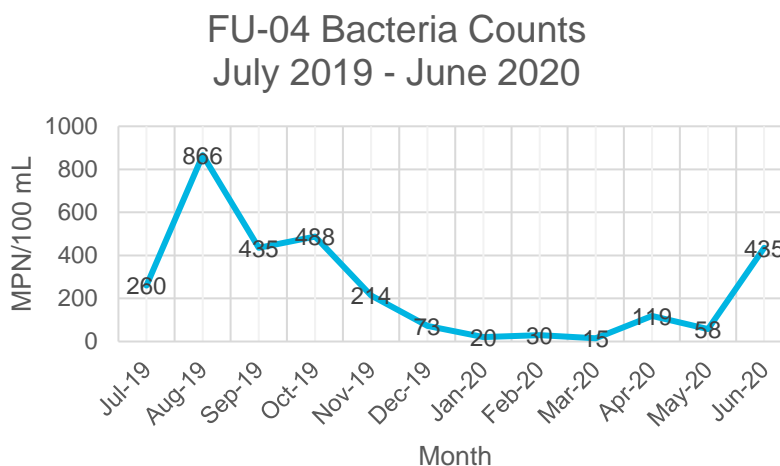


Figure 4-5: FU-04 Bacteria Trend

4.1.5 FU-05

FU-05 experienced its highest enterococcus concentration of 579 MPN/100 mL in October, shown in **Figure 4-6**. Bacteria levels were below the Beach Action Value (< 104 MPN/100 mL) in November, from January through March, and in May. Levels met the single sample fresh water quality criterion (61 MPN/100 mL) in November and May, and from January through March. Elevated concentrations ranging from 159 MPN/100 mL to 579 MPN/100 mL occurred in July-October, December, April and June.

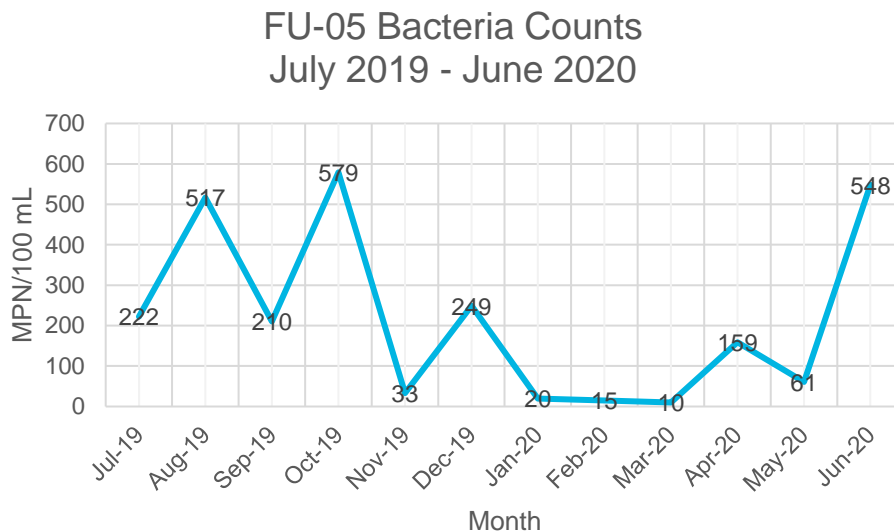


Figure 4-6: FU-05 Bacteria Trend

4.1.6 FU-06

FU-06 experienced its highest enterococcus concentration of 921 MPN/100 mL in August, shown in **Figure 4-7**. Bacteria levels were below the Beach Action Value (< 104 MPN/100 mL) from December through May. Levels met the single sample estuarine water quality criterion (104 MPN/100 mL) in December through May. Elevated concentrations ranging from 199 MPN/100 mL to 921 MPN/100 mL occurred in July through November and June.

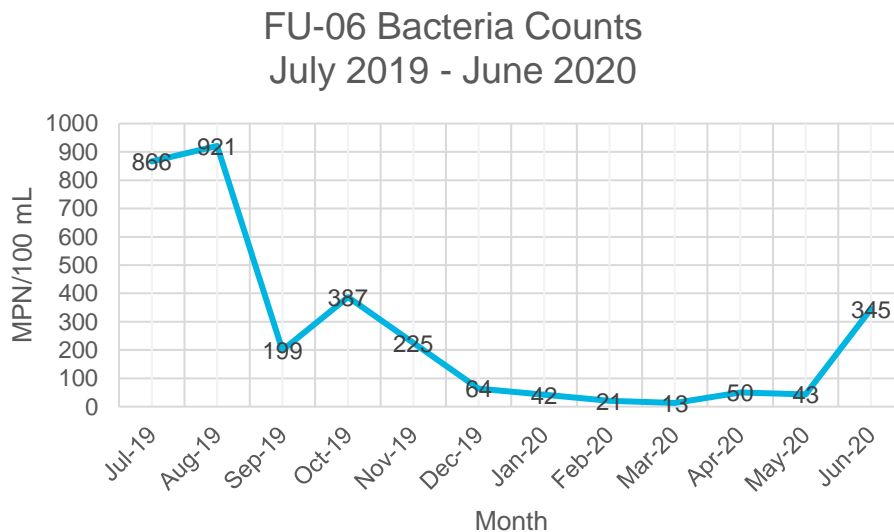


Figure 4-7: FU-06 Bacteria Trend

4.2 Marley Creek

Marley Creek results show bacteria trends for all sites to be highest on average during June. However, stations MA-02, MA-03, and MA-06 tended to experience extremely elevated concentrations continuously from November through June. MA-06 exceeded Beach Action Value (104 MPN/mL) during every month of the sampling period. Additionally, at least two-thirds of all sites (MA-02, MA-03, MA-04 and MA-06) did not meet the Beach Action Value nine months out of the 12-month sampling period. No sites met the Beach Action Value during the months of July, August, February, or June. Two sites met the single sample water fresh quality criterion for fresh water of 61 MPN/100 mL during the months of October (MA-01 and MA-02) and November (MA-01 and MA-05); three sites met the fresh water criterion in January (MA-01, MA-04, and MA-05); and MA-01 met this criterion in April. No sites met the water quality criterion from July through September, or in December, February, May, or June. Monitoring station MA-03 never met the water quality criterion during the entire sampling period. MA-06 exceeded the single sample water quality criterion for estuarine waters of 104 MPN/mL every month. **Figure 4-8** shows the data for all sites. The sections below discuss results for each sampling site.

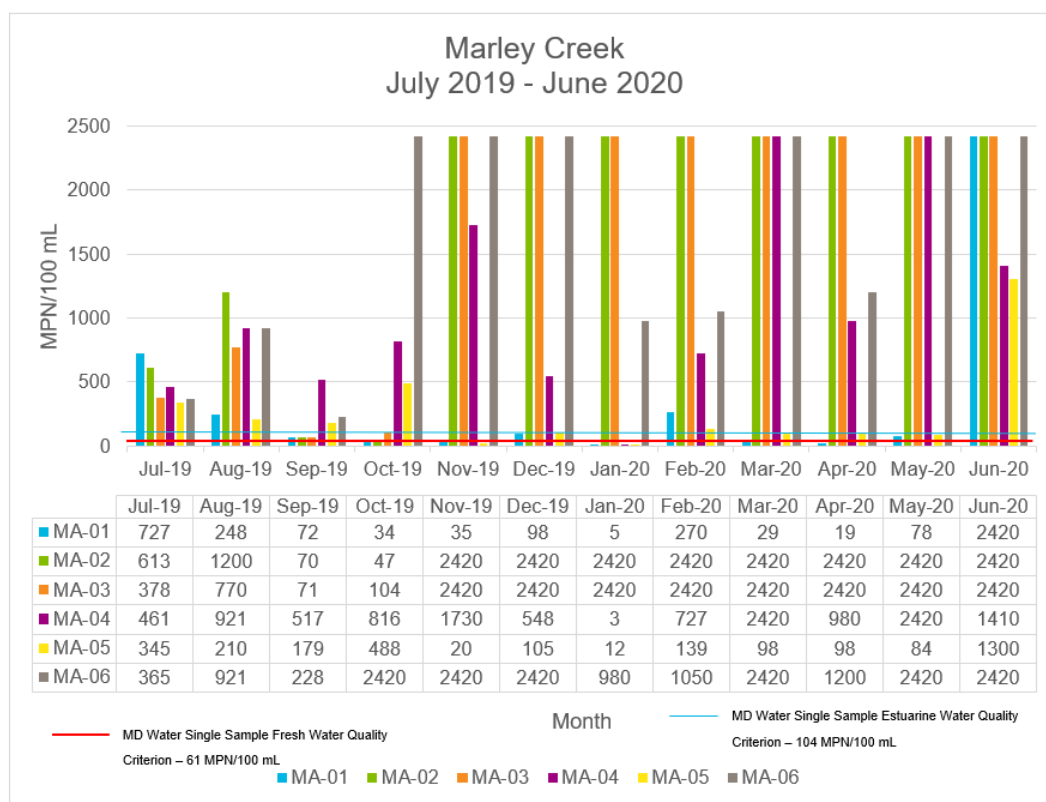


Figure 4-8: Marley Creek Bacteria Data from July 2019 to June 2020

4.2.1 MA-01

MA-01 experienced its highest concentration of enterococci greater than or equal to 2,420 MPN/100 mL in June, shown in **Figure 4-9**. Bacteria levels were below the Beach Action Value (< 104 MPN/100 mL) from September through January, and from March through May. Levels met the single sample fresh water quality criterion (61 MPN/100 mL) in October, November, January, March, and April. An elevated concentrations of 727 MPN/100 mL

and 207 MPN/100 mL occurred in July and February respectively. A significant elevated concentration of $\geq 2,420$ MPN/mL occurred in June.

MA-01 Bacteria Counts July 2019 - June 2020

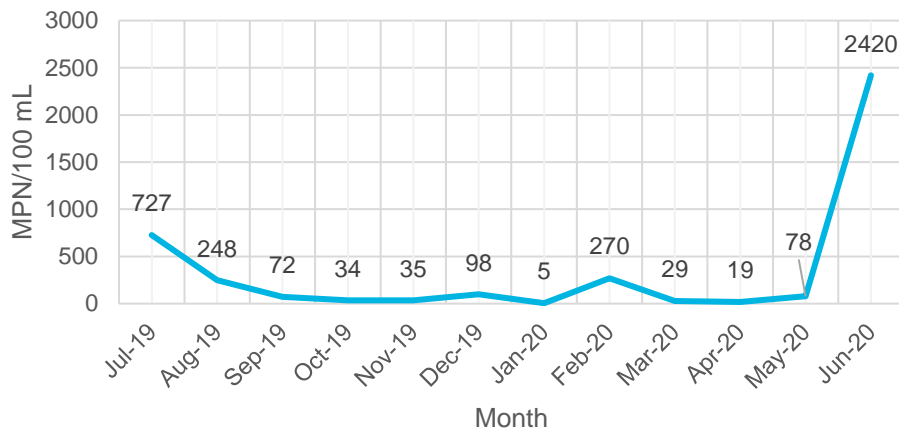


Figure 4-9: MA-01 Bacteria Trend

4.2.2 MA-02

MA-02 experienced its highest enterococcus concentration of greater than or equal to 2,420 MPN/100 mL from November through June, shown in **Figure 4-10**. Bacteria levels were below the Beach Action Value (< 104 MPN/100 mL) in September and October. Levels met the single sample fresh water quality criterion (61 MPN/100 mL) in October. An elevated concentration of 1,200 MPN/100 mL occurred in August, before continuously spiking at $\geq 2,420$ MPN/100 mL from November through the end of the sampling period (June).

MA-02 Bacteria Counts July 2019 - June 2020

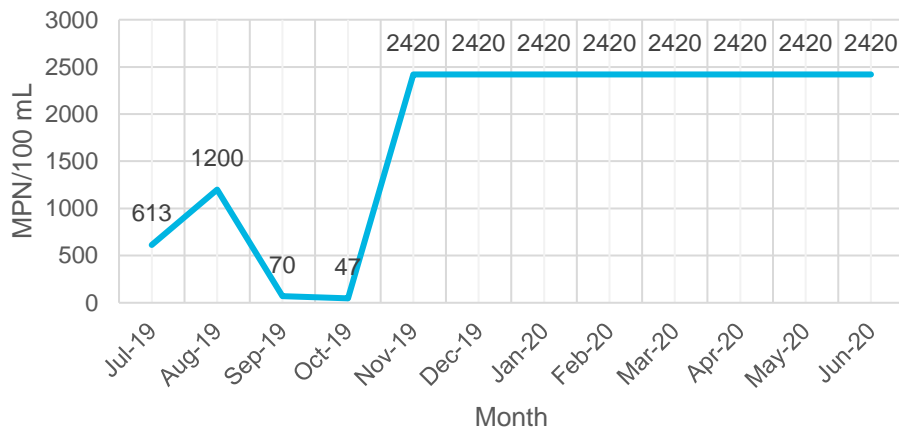


Figure 4-10: MA-02 Bacteria Trend

4.2.3 MA-03

MA-03 experienced its highest enterococcus concentration of $\geq 2,420$ MPN/100 mL from November through June, shown in **Figure 4-11**. Bacteria levels were below the Beach Action Value (< 104 MPN/100 mL) only in September. Levels never met the single sample fresh water quality criterion (61 MPN/100 mL). An elevated concentration of 770 MPN/100 mL occurred in August, before continuously spiking $\geq 2,420$ MPN/100 mL from November through the end of the sampling period (June).

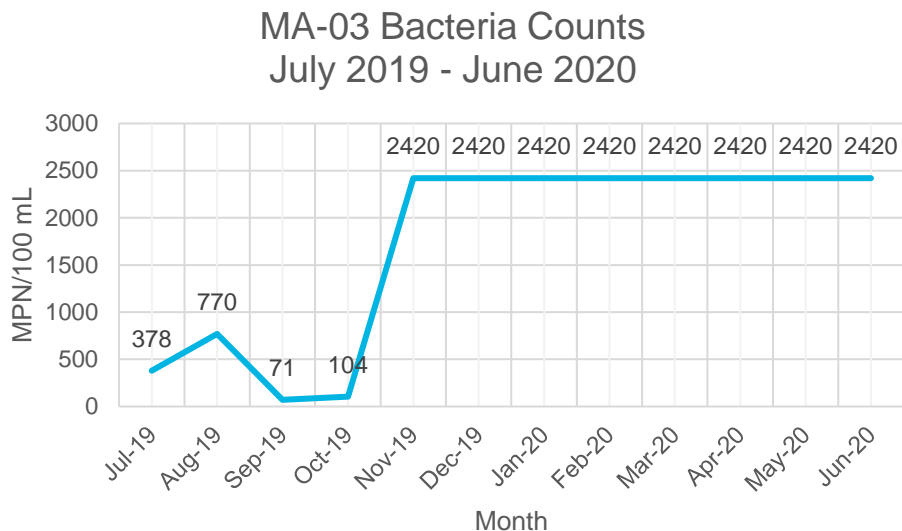


Figure 4-11: MA-03 Bacteria Trend

4.2.4 MA-04

MA-04 experienced its highest enterococcus concentration of greater than or equal to 2,420 MPN/100 mL in March and May, shown in **Figure 4-12**. Bacteria levels were below the Beach Action Value (< 104 MPN/100 mL) only in January. Levels also met the single sample fresh water quality criterion (61 MPN/mL) in January. Elevated concentrations ranging from 461 MPN/100 mL to $\geq 2,420$ MPN/100 mL occurred from July through December, and February through June.

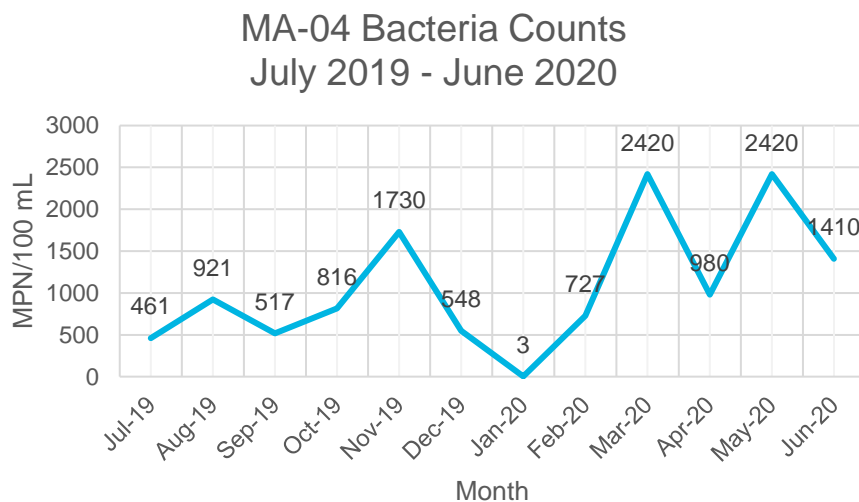


Figure 4-12: MA-04 Bacteria Trend

4.2.5 MA-05

MA-05 experienced its highest enterococcus concentration of 1,300 MPN/100 mL in June, shown in **Figure 4-13**. Bacteria levels were below the Beach Action Value (< 104 MPN/100 mL) in November, January, and from March through May. Levels met the single sample fresh water quality criterion (61 MPN/100 mL) in November and January. Elevated concentration from 139 - 1,300 MPN/100 mL occurred in July through October, in February and in June.

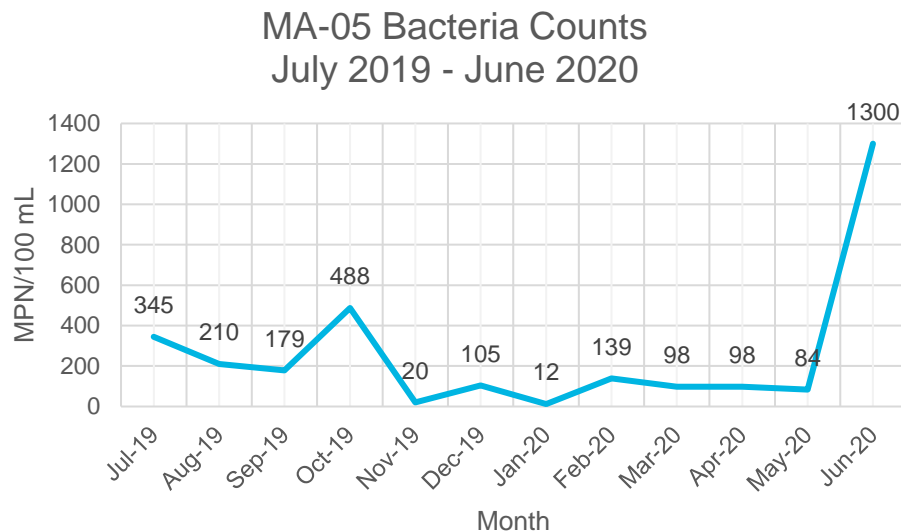


Figure 4-13: MA-05 Bacteria Trend

4.2.6 MA-06

MA-06 experienced its highest enterococcus concentration of greater than or equal to 2,420 MPN/100 mL from October through December, in March, and in May and June, shown in **Figure 4-14**. Bacteria levels were never below the Beach Action Value (< 104 MPN/100 mL) for the tidal site at MA-06, and the levels never met the single sample estuarine water quality criterion (104 MPN/100 mL). Elevated concentrations ranging from 921 MPN/100 mL to $\geq 2,420$ MPN/100 mL occurred in August and from October through the end of the sampling period (June).

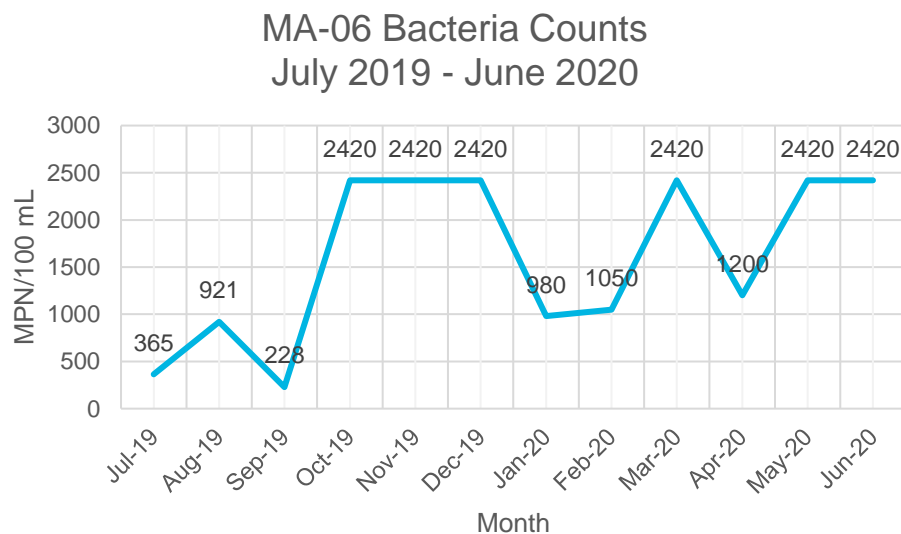


Figure 4-14: MA-06 Bacteria Trend

5. Data Correlation and Statistical Analysis

5.1 Data Correlation

The tidal sites (FU-06 and MA-06) generally experienced heightened levels of enterococci concurrently with other upstream monitoring sites. As a part of this project, county-wide sanitary sewer overflows and force main breaks data for FY 2019 and FY2020 was obtained from the County to identify any correlation between sewer overflows in the drainage areas to the monitoring stations with elevated bacteria concentrations. Any sewer overflows will likely result in elevated enterococci counts at downstream monitoring stations except for tidal areas where sewer contamination can travel upstream via tidal flows. No overflows were reported at any of the pump stations in the watersheds. One sanitary sewer overflow of 150 gallons was recorded on January 6, 2020 at 1320 Tarrant Road in Marley Creek watershed, upstream of monitoring station MA-06. Monitoring for the month of January was conducted on January 9th, 2020, 3 days after the recorded sewer overflow and enterococci concentration of 980 MPN/100mL was observed at MA-06; this concentration is still less than the enterococci concentrations of 2420 MPN/100mL observed for half of the sampling months at this station indicating that the sewer overflow at 1320 Tarrant Road may not be a contributor. No sanitary sewer overflows or force main breaks were recorded by the County in Furnace Creek during the monitoring period.

Marley Creek stations experienced highly elevated levels of enterococci starting in October for station MA-06 and in November for stations MA-02 and MA-03. These elevated levels continued through the end of the sampling period. MA-06 is a tidal site and the most downstream site, and it is not unexpected for it to have elevated levels while other stations experience elevated levels.

Stations MA-02 and MA-03 are located further upstream in the watershed than half the monitoring locations. These locations are located more than 3,000 feet from the nearest pump station (Marley Pump Station). They are the only two monitoring points fed directly by tributaries around the Marley Station Mall and surrounding neighborhoods. There are several conditions present in the drainage areas for these monitoring stations that could potentially be related to the elevated bacteria results:

- Neighborhoods in the upper reaches of the drainage areas for MA-02 and MA-03 are primarily connected to septic systems. Failing septic systems and their associated drain fields have been identified as one of the sources of bacteria in the watersheds by MDE (MDE 2010b).
- As shown on Figure 2-4, there is a sewer line running south to north that crosses in close proximity to MA-02 and MA-03; AECOM field teams noticed raised sewer manholes near both sampling locations.
- Pet waste may be a factor influencing the elevated enterococci levels because the drainage areas to these monitoring locations are primarily residential.

Furnace Creek generally had increased levels of enterococci from July 2019 through October 2019. Two outlier enterococci counts of 727 occurred during the months of April and June at monitoring stations FU-03 and FU-02, respectively. FU-02 is located next to the Baltimore & Annapolis Trail; heightened pedestrian and animal traffic during the months of April and June could potentially have contributed to the outlier enterococci counts during these months. Many residential areas in Furnace Creek are connected to septic systems and as discussed above, failing septic systems and their associated drain fields could be a potential cause for elevated enterococci concentrations. The highest enterococci counts at monitoring location FU-06 were observed during July and August. This tidal area of the stream likely experiences recreational boating use, which would be expected to be highest in the summer months. Raw and poorly managed sewage from boats contain bacteria and could be one of the contributors of elevated bacteria concentrations in tidal areas. None of the monitoring sites associated with transient encampments (FU-03, FU-04, and FU-06) exhibited significantly higher levels of enterococci than their counterparts during the same sampling period.

5.2 Statistical Analysis

Temperature, dissolved oxygen, specific conductivity, turbidity, and pH data were collected at each monitoring location during bacteria sampling, and a Pearson Correlation Coefficient (r) was estimated for a combination of enterococci counts with each parameter. A correlation coefficient was also estimated for the combination of enterococci counts with air temperature, USGS gage flow, and tide levels. In general, correlation coefficients range between "-1" and "+1," with "-1" indicating strong negative correlation and "+1" indicating strong positive correlation. A value for "r" close to "0" indicates no correlation. **Figure 5-1** shows the correlation coefficient heat map developed for the parameters and the enterococci counts. Dissolved oxygen generally ranged between 0 and 21 mg/L, though a few samples had dissolved oxygen values of 70 to 170 mg/L. These outliers have been excluded when estimating the "r" value for dissolved oxygen and enterococci combination.

	Temperature (°C)	Dissolved Oxygen (mg/L)	Specific Conductivity (mS/cm)	Turbidity (NTU)	pH	Enterococci (MPN/100 mL)	Air Temperature (°F)	USGS Gage Flow (cfs)	Tide Level (ft)	Precipitation (in)
Temperature (°C)	1.000									
Dissolved Oxygen (mg/L)	-0.631	1.000								
Specific Conductivity (mS/cm)	0.017	-0.163	1.000							
Turbidity (NTU)	0.224	-0.194	0.101	1.000						
pH	0.202	0.107	-0.159	-0.016	1.000					
Enterococci (MPN/100 mL)	-0.043	-0.107	0.089	-0.001	-0.037	1.000				
Air Temperature (°F)	0.940	-0.592	-0.059	0.183	0.208	-0.059	1.000			
USGS Gage Flow (cfs)	0.277	-0.262	-0.141	0.059	-0.236	0.021	0.324	1.000		
Tide Level (ft)	0.745	-0.369	-0.097	0.186	0.134	0.099	0.767	0.164	1.000	
Precipitation (in)	-0.083	0.040	-0.141	-0.023	-0.343	-0.059	-0.049	0.810	-0.029	1.000

Figure 5-1: Correlation Map for Enterococci Count vs. Sample Parameters

The bolded blue row and column in this map show the correlation coefficient (r) for each of the sampling parameters against the enterococci count. Based on the data shown in **Figure 5-1**, none of the parameters stand out as having a strong correlation, though tide level, dissolved oxygen appears to have minimal correlation to enterococci count, with an "r" value of approximately 0.1 and -0.1 respectively.

Each sampling parameter along with air temperature, USGS gage flow rate, and tide levels were also plotted against enterococci count individually to determine a graphical relationship with the parameters. A coefficient of determination (R^2) value was also calculated to determine the strength of the relationship.

Given the dataset includes only one year of sampling data with 144 sampling events, it is a comparatively small dataset to identify the strength of parameters as predictors for enterococci count. With more sampling, it is possible that trends will emerge as the sample size increases.

Sample Temperature

The sample temperature from July 2019 to June 2020 ranged between 2.2°C and 23.8°C. No apparent trend appears as temperature changes, shown by the high enterococci counts at temperatures as low as 4.2°C and as high as 22.8°C. An exponential function fit to this dataset produced the highest R² value at 0.06. **Figure 5-2** shows a scatter plot of sample temperature and Enterococci counts.

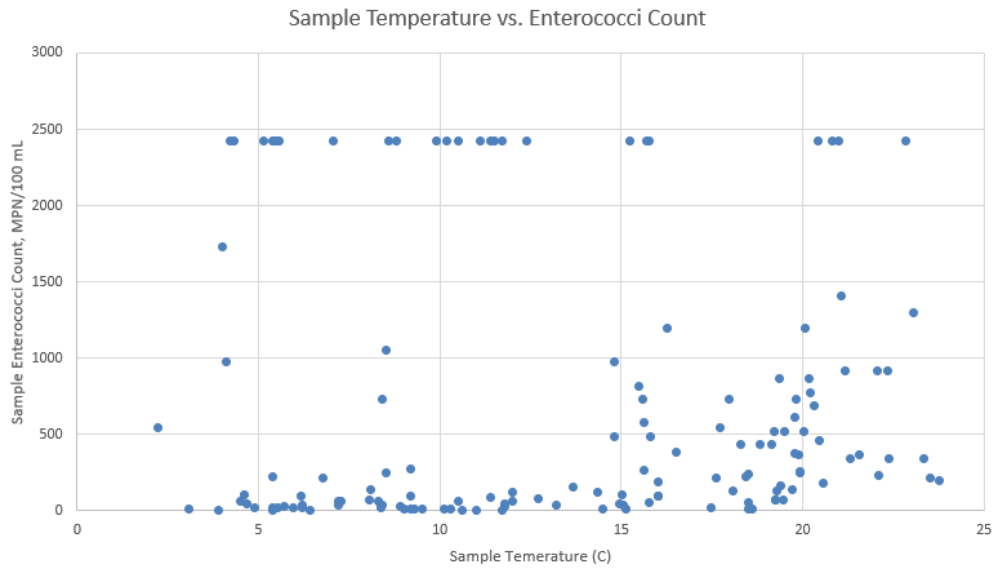


Figure 5-2: Plot of Sample Temperature vs. Bacteria Count

Dissolved Oxygen

Dissolved oxygen (DO) generally ranged between 0 and 21 mg/L, though a few samples had DO of 70 to 170 mg/L. These outliers have been excluded from the analysis, as they likely represent inaccurate readings. However, excluding these outliers did not appear to significantly strengthen the relationship between DO and enterococci count. An exponential function fit to these data produced the highest R² value of 0.09, which does not indicate a strong correlation between this parameter and enterococci count. **Figure 5-3** shows a plot of DO vs. enterococci counts.

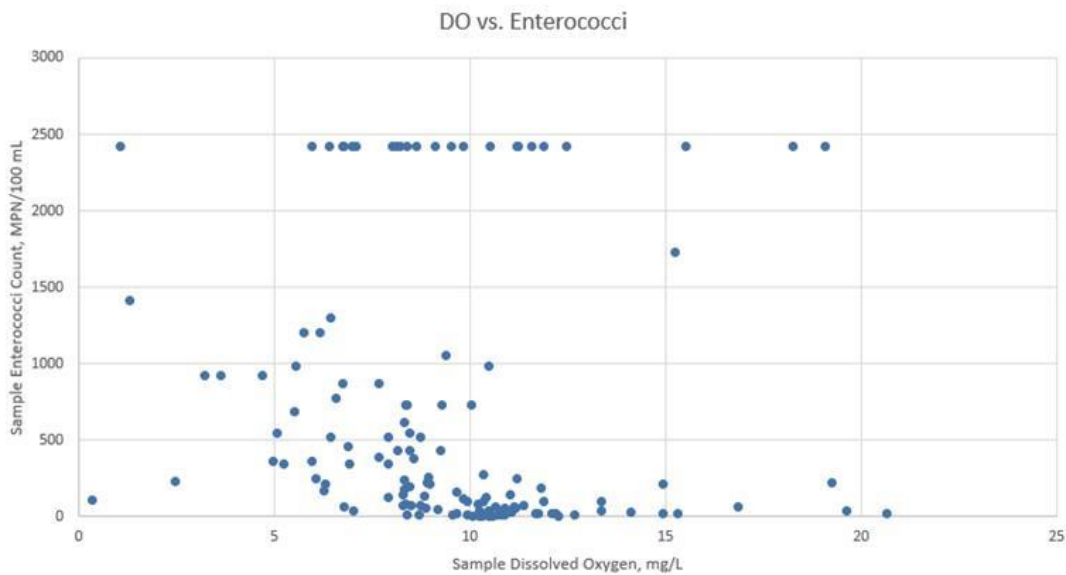


Figure 5-3: Plot of Sample DO vs. Bacteria Count

Specific Conductivity

Most samples collected between July 2019 and June 2020 had specific conductivities between 0 and 2 mS/cm, with some readings as high as 13.3 mS/cm. These data best fit a logarithmic function, producing an R^2 value of 0.01. This low value indicates that specific conductivity is not a strong predictor for enterococci count. Samples with both high and low values of specific conductivity had high counts of bacteria. **Figure 5-4** shows a plot of these data.

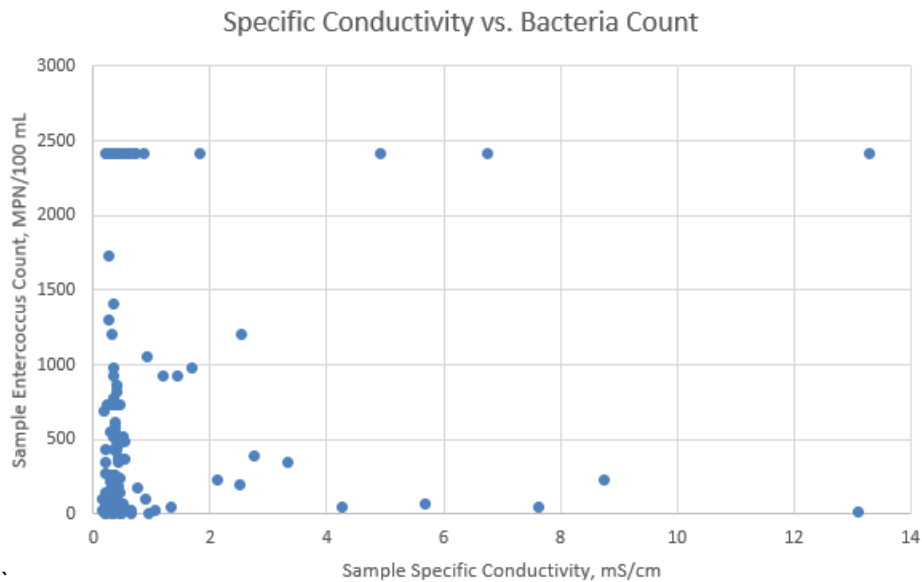


Figure 5-4: Plot of Sample Specific Conductivity vs. Bacteria Count

Turbidity

Turbidity of samples generally fell between -2 and 50 NTU, though one sample had a turbidity as high as 213 NTU. Excluding this outlier, an exponential function best fits this dataset with an R^2 value of 0.03, indicating a very weak relationship between the two variables. **Figure 5-5** shows the plot of this turbidity vs. enterococci counts.

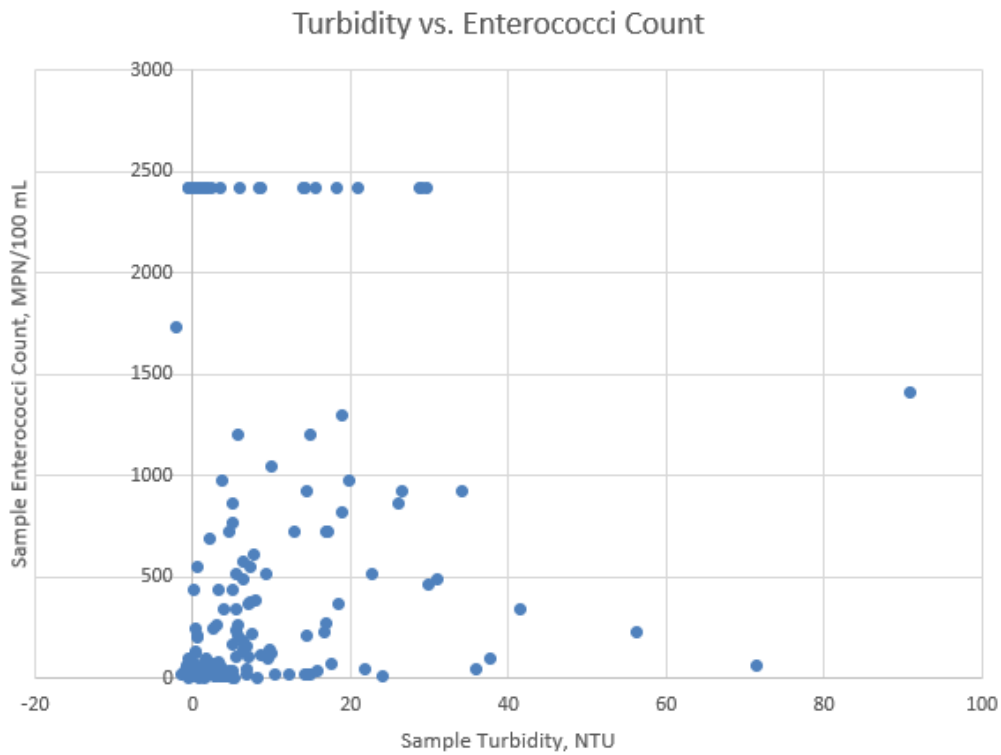


Figure 5-5: Plot of Sample Turbidity vs. Bacteria Count

pH

The pH values of samples ranged from 5.7 to 8.8, with most samples falling between 6.5 and 8. A power function best fit these data with an R^2 value of 0.003. No trends emerged from these data, shown by the extremely low R^2 and the fact that both samples with lower and higher pH values had high enterococci counts. **Figure 5-6** shows the plot of this dataset.

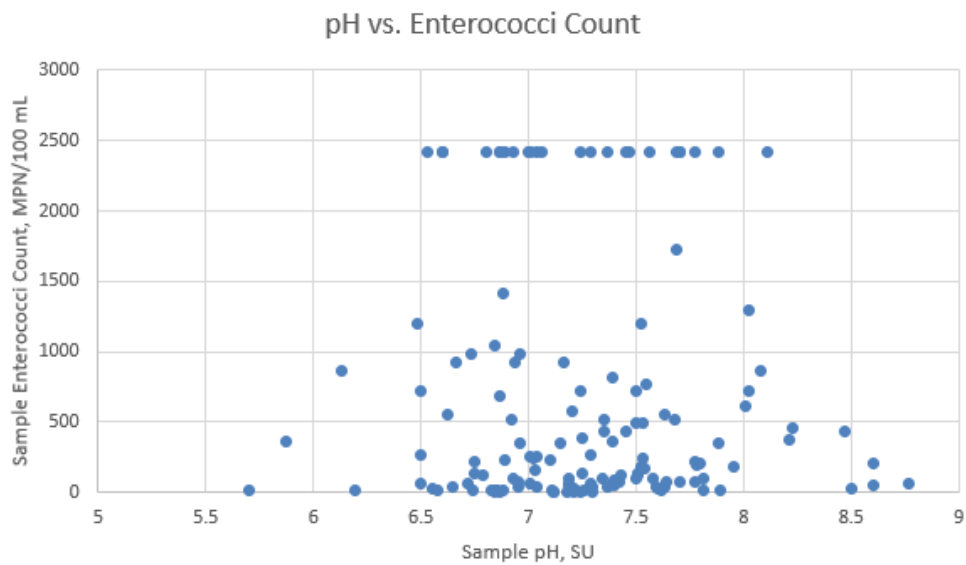


Figure 5-6: Plot of Sample pH vs. Bacteria Count

Air Temperature

The air temperature at the time of sample collection ranged from 27°F to 92°F. Samples with high enterococci counts were found year-round, indicating that this parameter is not strongly correlated with bacteria count. An exponential function best fit this dataset with an R^2 value of 0.06. **Figure 5-7** shows a plot of this dataset.

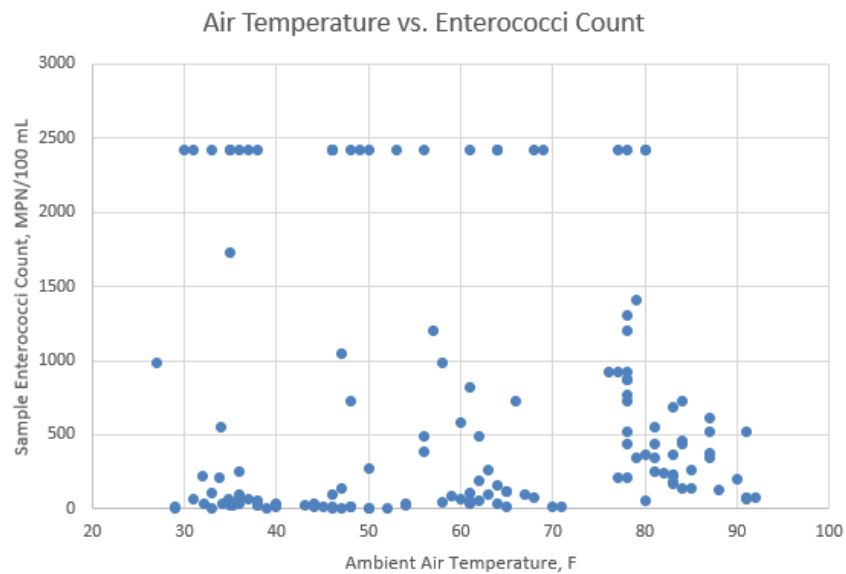


Figure 5-7: Plot of Air Temperature vs. Bacteria Count

USGS Gage Flow Rate

The USGS flow gages at each of the 12 sampling locations displayed values between 4 and 10 cubic feet per second (cfs), with most values falling between 4.5 and 6 cfs. Fit to an exponential function, this dataset produced an R^2 value of 0.03, which indicates a very weak relation between flow rate and enterococci count in the sample. **Figure 5-8** shows a plot of these data.

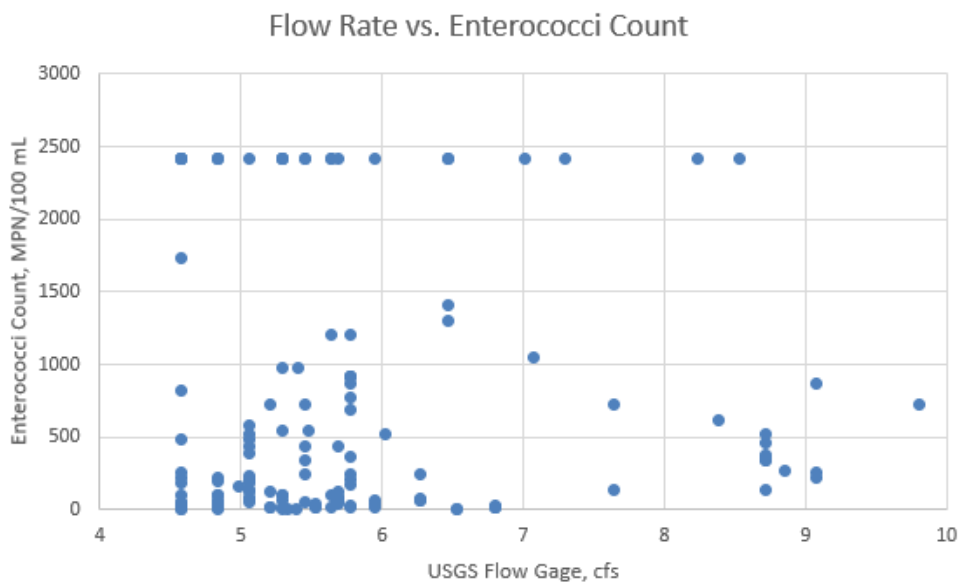


Figure 5-8: Plot of Flow Rate vs. Bacteria Count

Tide Level

The tide levels at the time of sampling fell between -2 and 3 feet, with most sampling events -0.5 feet or greater. The most variability in enterococci count appears to be between 1 and 2.75 feet of tide. Fitting these data to an exponential function yielded the highest R^2 value of 0.1, which indicates a weak correlation between tide level and enterococci count. However, this parameter appears to have the strongest relation with enterococci among all parameters. **Figure 5-9** shows a plot of these data.

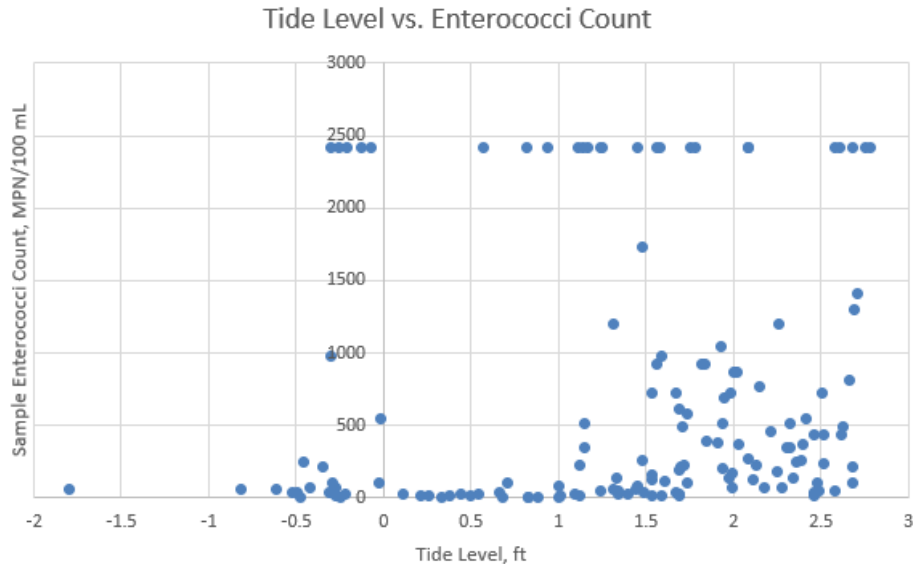
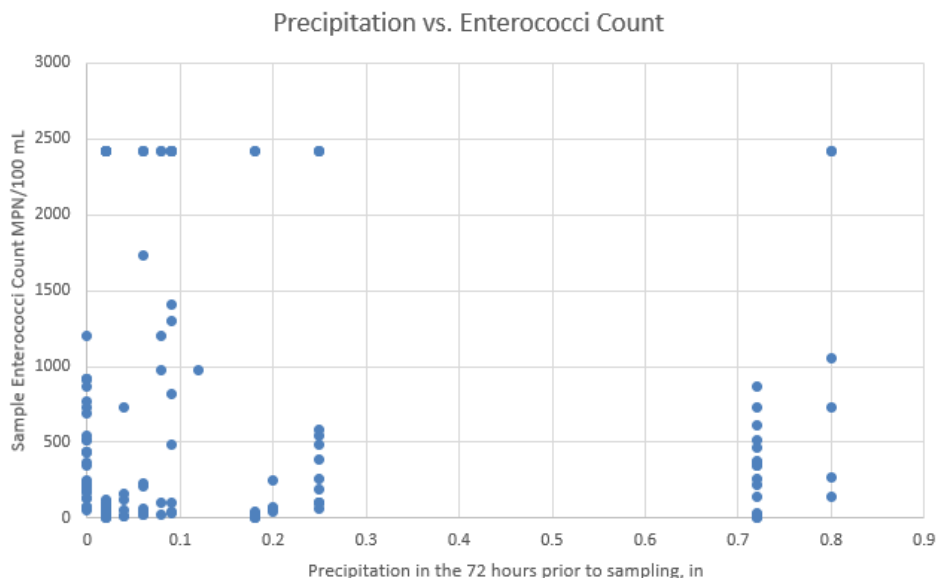


Figure 5-9: Plot of Tide Level vs. Bacteria Count

Precipitation

Precipitation within 72 hours prior to sampling ranged from 0 inch – 0.8 inches, with most events producing less than 0.3 inch of precipitation. For sampling days with precipitation in the prior 72 hours, the precipitation type was rainfall on all but one day. The sampling event in January 2020 experienced mixed snowfall, which was converted to equivalent snowmelt. Fitting these data to a polynomial function yielded the highest R^2 value of 0.004, which indicates a weak correlation between precipitation and enterococci count. **Figure 5-10** shows a plot of these data.



6. Summary and Conclusions

Because sampling has been conducted for only one year, elevated values of the indicator enterococci that were observed may or may not be indicative of impairment in the watershed. It will be necessary to evaluate the results from indicator organisms from multiple sampling events over time to adequately quantify water quality conditions. One year of sampling data will show changes in trends on a monthly scale, but seasonal trends will not be verifiable until more data are collected. Still, some trends are apparent after one year of sampling.

Results of the Year 1 sampling in Furnace Creek have shown a general upward trend in bacteria levels during warmer months, and a downward trend during colder months. Results for Marley Creek have shown somewhat of the same trends for areas of the watershed, but other areas are exhibiting levels of bacteria that exceed seasonal patterns.

Enterococci count does not appear to be statistically correlated with any of the sampling parameters (sample temperature, dissolved oxygen, specific conductivity, turbidity, pH, air temperature, flow rate, tide level, and precipitation), though the dataset is too small to draw conclusions at this time. Tide level appears to be the parameter with the strongest statistical correlation with enterococci count, though the coefficient of determination is only 0.1, indicating a weak correlation. There is insufficient data at this point to statistically correlate any potential sources of bacteria with the elevated enterococci counts that have been observed. As more sampling occurs and the dataset increases in size, trends may emerge to indicate relationships between sampling parameters and enterococci counts. Any future trends can be used to identify the source of the bacteria impairment and improve the quality of the water in the Furnace Creek and Marley Creek watersheds.

7. References

- American Public Health Association. 2012. Standard Methods for the Examination of Water and Wastewater, 22nd edition. American Public Health Association, Washington, D.C.
- Anne Arundel County. 2017. Total Maximum Daily Load Restoration Plan for Bacteria. January 2017.
- Anne Arundel County. 2019. Bacteria Sampling Plan and Quality Assurance/Quality Control Protocols. July 1st, 2019
- Maryland Department of the Environment (MDE). 2003. Guidance for County Recreational Water Quality Monitoring and Notification Programs. Maryland Department of the Environment Water and Science Administration, Baltimore, MD.
- MDE. 2010a. Maryland's Final 2010 Integrated Report of Surface Water Quality. Maryland Department of the Environment, Environmental Assessment & Standards Program, Water and Science Administration, Baltimore, MD. Approved by EPA March 18, 2011.
- MDE. 2010b. Total Maximum Daily Loads of Bacteria for Impaired Recreational Areas in Marley Creek and Furnace Creek of Baltimore Harbor Basin in Anne Arundel County, Maryland. July 2010.
- Maryland Department of Natural Resources (MDNR). n.d. Maryland Biological Stream Survey (MBSS) *Decontamination Procedures for Boots and Equipment*. Maryland Department of Natural Resources Non-Tidal Assessment Division, Resource Assessment Service, Baltimore, MD.
- MDNR. 2010. Total Maximum Daily Loads of Bacteria Impaired Recreational Areas in Marley Creek and Furnace Creek of Baltimore Harbor Basin in Anne Arundel County, Maryland. Approved by EPA March 10, 2011.

Appendix A

Site Maps and Monitoring Station Photographs

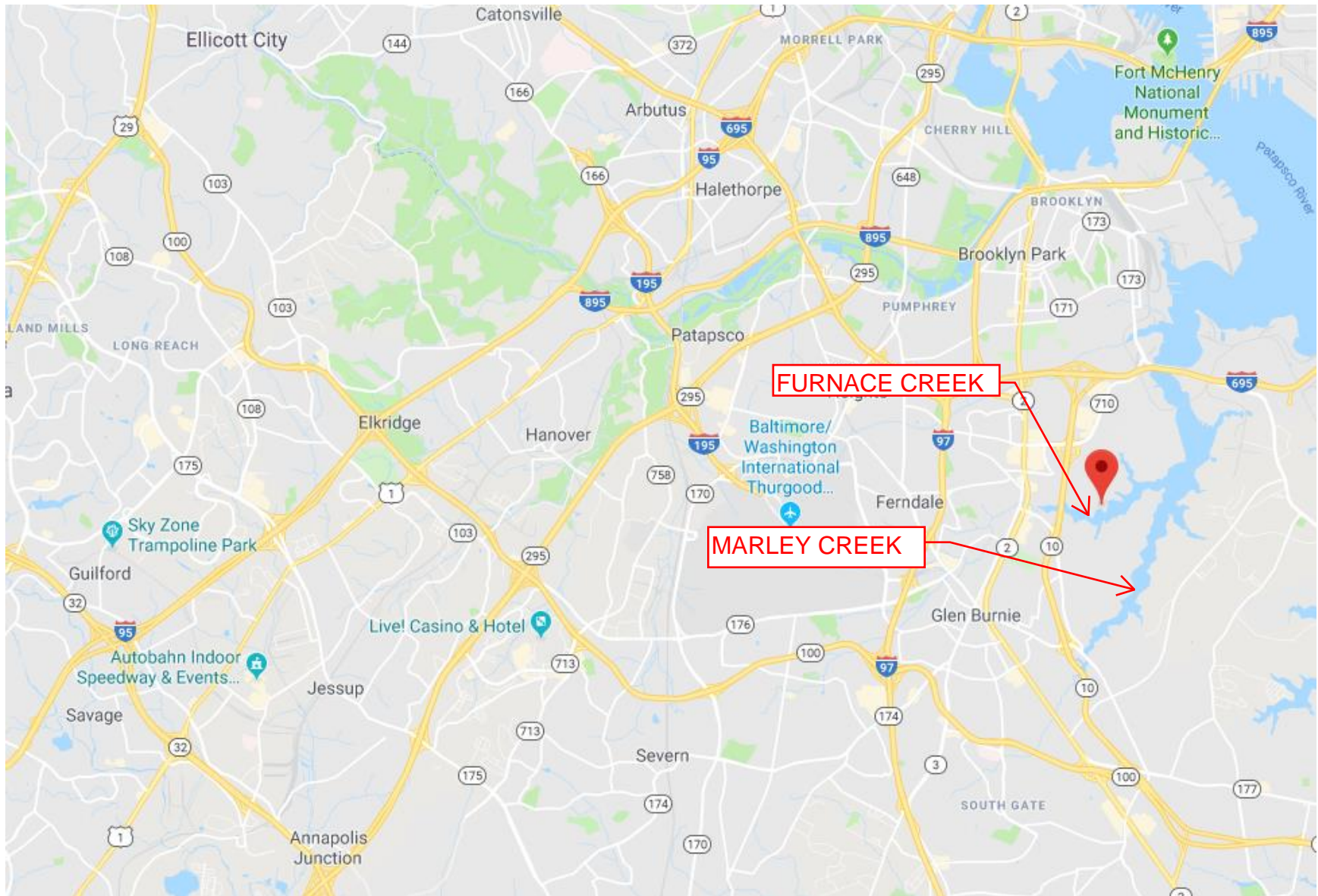


Figure A-1: General Location Map - Marley and Furnace Creeks, Anne Arundel County, MD

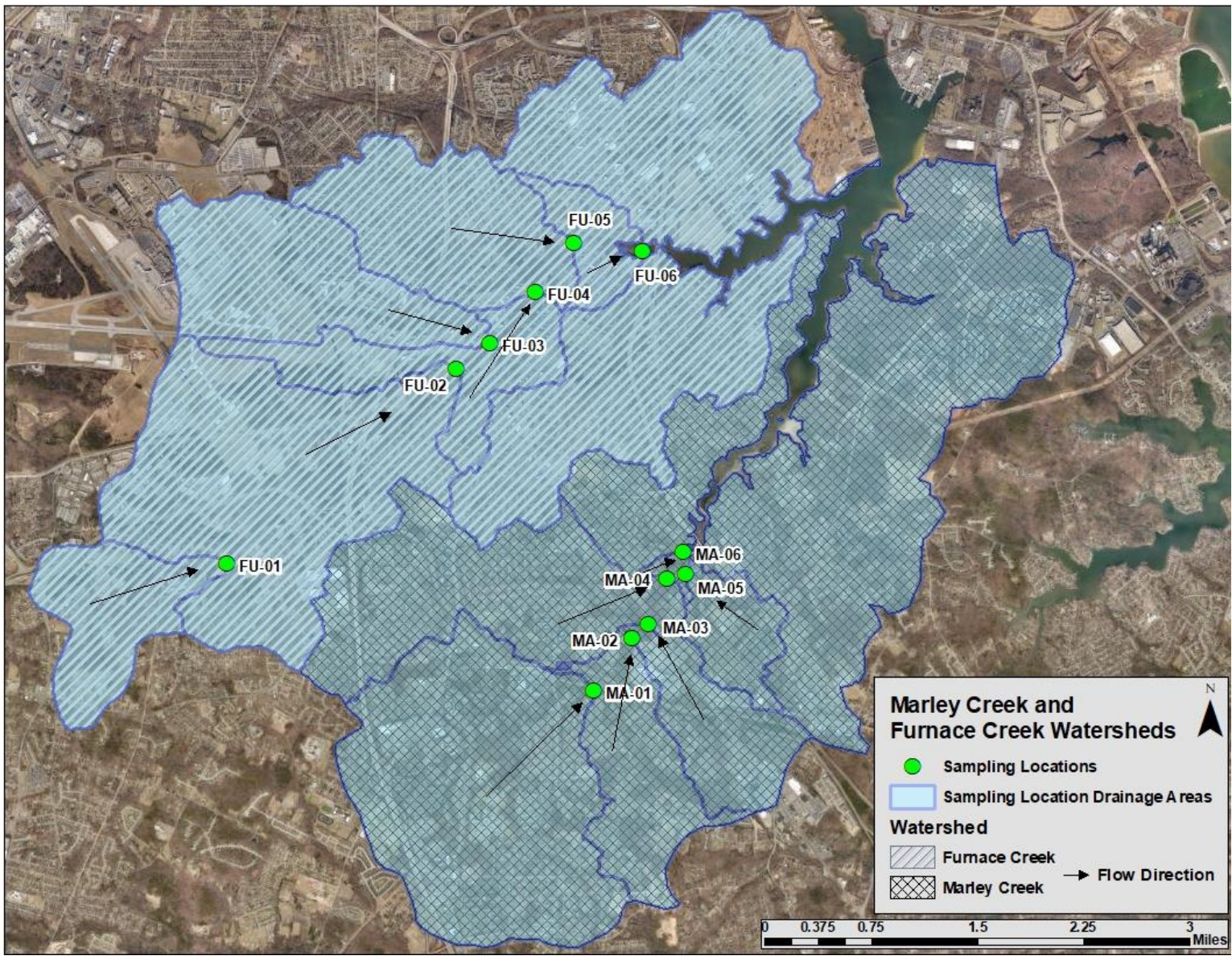


Figure A-2: Marley Creek and Furnace Creek Sampling Location and Watershed Map



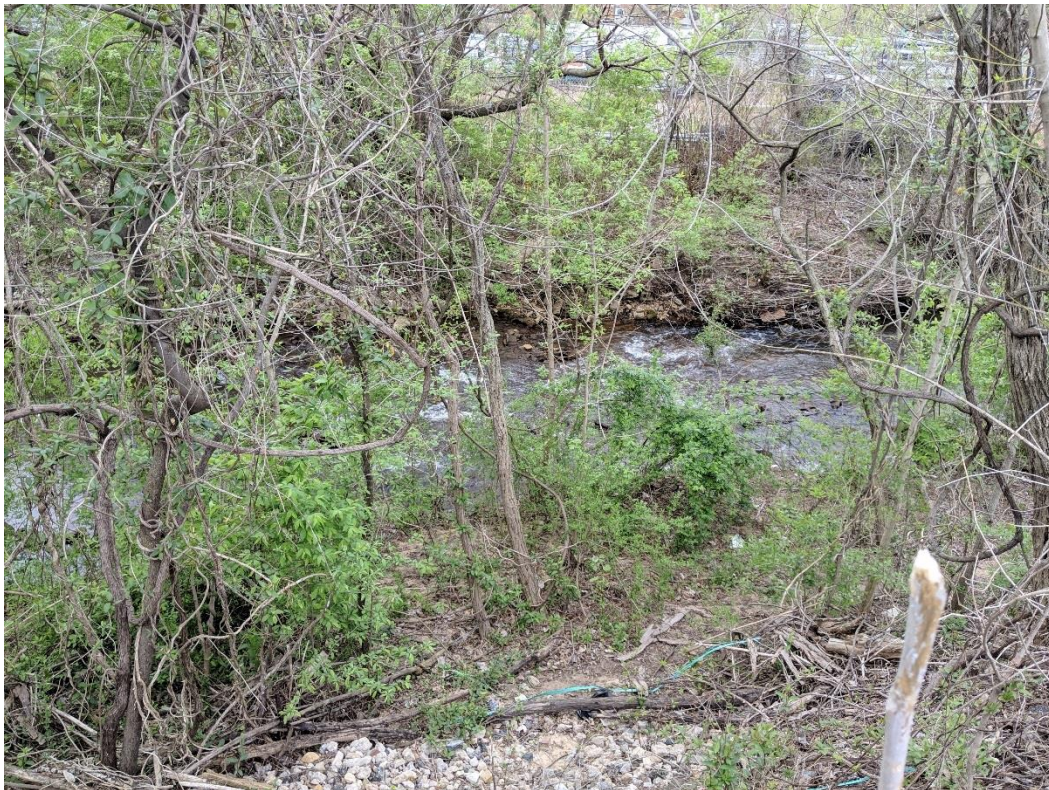
FU-01



FU-02



FU-03



FU-04



FU-05



FU-06



MA-01



MA-02



MA-03



MA-04



MA-05



MA-06

Appendix B

Field Data

Water Quality Data Field Data Sheets and Sampling
Event Field Notes

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU01

Date: 7/10/2019 Time: 13:31

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 87 °F Weather: sunny, clear

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.72 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.15 ft. High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Site location looks to be on private property. Sampling location is located within a wetland. Stream is clear and fast moving with low turbidity.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/10/2019 8:06	21.3	7.9	0.199	3.9	7.15	0

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20190710 Time Collected: 13:40 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) Yes - 1 Sample ID FU07-20190710 / 13:40 / 0.3 meters Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU02

Date: 7/10/2019 Time: 12:40

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 87 °F Weather: sunny, clear

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.72 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.15 ft High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Damaged Outfall.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/10/2019 8:06	19.50	8.75	0.337	9.2	6.92	0

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20190710 Time Collected: 12:46 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Average Tidal Monitoring Points High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tides

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU04

Date: 7/10/2019 Time: 10:59

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.17774 (Lat.) -76.62109 (Long.)

Weather Conditions:

New: 39.17770 (Lat.) -76.62106 (Long.)

Ambient Air Temperature: 85 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 9.07 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.48 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Sample collected less than 10 feet upstream of sample location. Original sample location is in rapids. Found abandoned shopping carts and

Clothes in a gradient leading to the stream.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/10/2019 8:06	19.92	8.94	0.382	5.7	7.04	0

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20190710 Time Collected: 10:59 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU05

Date: 7/10/2019 Time: 10:05

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.18275 (Lat.) -76.61399 (Long.)

Weather Conditions:

New: 39.18275 (Lat.) -76.61593 (Long.)

Ambient Air Temperature: 83 °F Weather: sunny, no clouds

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 9.07 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.72 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Path from car to stream is very steep. Sample ~ 15 ft upstream of sampling location, due to inaccessibility downstream of actual outfall location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/10/2019 8:06	18.42	8.91	0.372	7.4	6.75	0

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20190710 Time Collected: 10:05 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU06

Date: 7/10/2019 Time: 9:01

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.18178 (Lat.) -76.60710 (Long.)

Weather Conditions:

New: 39.18181 (Lat.) -76.60700 (Long.)

Ambient Air Temperature: 78 °F Weather: sunny, slightly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 9.07 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.0 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Presence of transient encampment close to sampling location. Exact location of sampling not accessible due to over grown vegetation. Safety concerns prevented access to middle of the stream, because the bottom of the stream was too soft. Tidal waters were calm with low turbidity.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/10/2019 8:06	19.36	7.69	0.390	26	6.13	0

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20190710 Time Collected: 9:01 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA01

Date: 7/11/2019 Time: 12:42

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: thunderstorms

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.07 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 9.80 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.53 feet High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Presence of transient encampment close to sampling location. Exact location of sampling not accessible due to over grown vegetation. Safety concerns prevented access to middle of the stream, because the bottom of the stream was too soft. Tidal waters were calm with low turbidity.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/11/2019 7:49	19.82	8.36	0.384	17.2	8.02	0

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20190711 Time Collected: 12:47 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA02

Date: 7/11/2019 Time: 11:41

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 87 °F Weather: thunderstorms

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8:38 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.69 feet High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Grafatti onsite along concrete wall leading to outfall. Sample was obtained ~ 45 feet because actual sampling location was inaccessible. Ponding and stagnant water throughout site adjacent to sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/11/2019 7:49	19.80	8.34	0.377	7.8	8.01	0

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20190711 Time Collected: 11:45 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA03

Date: 7/11/2019 Time: 10:50

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 87 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.72 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.91 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Trash observed in highway upgradient from sampling location. Sampling point is located slightly downstream of three storm outfalls.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/11/2019 7:49	19.80	8.56	0.415	7.2	8.21	0

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20190711 Time Collected: 10:53 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA04

Date: 7/11/2019 Time: 9:30

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 84 °F Weather: partly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.72 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.21 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Light brown water with minimal suspended sediment. Small dead aquatic organism (fish) near site. Site located in area of potential wetland soils. Site is accessible through a utility right-of-way.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/11/2019 7:49	20.45	6.88	0.419	29.8	8.23	0

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20190711 Time Collected: 9:40 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA05

Date: 7/11/2019 Time: 9:00

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 81 °F Weather: partly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.72 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.32 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Lots of thorns present in sampling location, hindered access to sampling location. Site is accessible through a utility right-of-way.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/11/2019 7:49	22.38	6.92	0.482	5.4	7.88	0

BACTERIA SAMPLE COLLECTION

Sample ID: MA05-20190711 Time Collected: 9:21 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA06

Date: 7/11/2019 Time: 8:35

Field Personnel: J. Pellegrino, A. Poudel, J. Derato GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 80 °F Weather: partly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.72 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.4 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Overgrown vegetation.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	7/11/2019 7:49	21.56	4.97	0.538	18.5	5.87	0

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20190711 Time Collected: 8:40 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU01

Date: 8/14/2019 Time: 11:40

Field Personnel: J. Pellegrino, R. Durborow GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 83 °F Weather: partly cloudy, humid

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.95 ft. High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/14/2019 8:30	20.33	5.53	0.181	2.1	6.87	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20190814 Time Collected: 11:50 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU02

Date: 8/14/2019 Time: 11:16

Field Personnel: J. Pellegrino, R. Durborow GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 83 °F Weather: partly cloudy, humid

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.99 ft High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Quick moving, clear water. Heavy silt buildup on stream bed.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/14/2019 8:30	19.41	6.27	0.304	5.1	7.54	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20190814 Time Collected: 11:26 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Average Tidal Monitoring Points High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU03

Date: 8/14/2019 Time: 10:45

Field Personnel: J. Pellegrino, R. Durborow GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 83 °F Weather: partly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.03 ft X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Transient encampments: debris in stream (tires). Fast moving and clear water.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/15/2019 8:30	19.89	5.95	0.429	7.1	7.39	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20190814 Time Collected: 10:55 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tides

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU04

Date: 8/14/2019 Time: 10:20

Field Personnel: J. Pellegrino, R. Durborow GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: partly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.02 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Plastic conduit through water (good condition). Water is clear and slow moving, downstream of rapids.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/14/2019 8:30	20.19	6.75	0.400	5.1	8.08	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20190814 Time Collected: 10:30 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU05

Date: 8/14/2019 Time: 09:45

Field Personnel: J. Pellegrino, R. Durborow GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: overcast, humid

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: ___ Rain ___ Snow ___ Mix

Day of Sampling: _____ inches Type: ___ Rain ___ Snow ___ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.02 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.94 feet ___X___ High ___ Low ___ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear, site has distinct fecal odor. Water flowing fast, low turbidity, clear. Water did not have odor. Site is an active junker/scrapper auto yard.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/14/2019 8:30	19.21	7.91	0.337	5.5	7.35	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20190814 Time Collected: 9:55 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU06Date: 8/14/2019 Time: 9:05Field Personnel: J. Pellegrino, R. Durborow GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: overcastPrecipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwj>):Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow MixDay of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfsTide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.82 feet High Low Ebb Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Transient encampments present along ridge. Slow moving water with no odor. Water had slight yellow tint.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
11J102930	8/14/2019 8:30	22.06	3.65	1.451	14.5	6.94	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20190814 Time Collected: 9:15 / 0.3 metersQA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA01

Date: 8/15/2019 Time: 11:16

Field Personnel: J. Pellegrino, A. Poudel GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 81 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.36 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear, steady flow. Aquatic life present (small fish, dragon flies, grasshoppers, other insects).

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/15/2019 7:55	19.93	6.06	0.335	2.5	7.02	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20190815 Time Collected: 11:24 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA02

Date: 8/15/2019 Time: 10:36

Field Personnel: J. Pellegrino, A. Poudel GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: overcast

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.26 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water was clear with steady flow. Surrounding site is wetland – excessive ponding, silt deposits, decaying organic matter, and iron-fixing bacteria.

Trash and debris present.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/15/2019 7:55	20.07	6.16	0.328	5.8	7.52	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20190815 Time Collected: 10:45 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA03

Date: 8/15/2019 Time: 10:06

Field Personnel: J. Pellegrino, A. Poudel GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: overcast

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.15 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear, steady flow. Settled silt and solids evident in stream bed. Some aquatic life present (aquatic insects). Site has skunk/musky odor. Water is knee deep.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/15/2019 7:55	20.22	6.58	0.352	5.0	7.55	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20190815 Time Collected: 10:20 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA04

Date: 8/15/2019 Time: 9:13

Field Personnel: J. Pellegrino, A. Poudel GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 76 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.84 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is still/slow moving. Water is clear, with silt plumes moving throughout. Stream bed releasing bubbles.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/15/2019 7:55	21.16	4.68	0.345	34.2	7.16	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20190815 Time Collected: 9:33 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID MADP-20190815 Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA05

Date: 8/15/2019 Time: 8:40

Field Personnel: J. Pellegrino, A. Poudel GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 77 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.7 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Fast moving water, clear flow with no odor.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/15/2019 7:55	23.51	6.32	0.408	14.4	7.8	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA05-20190815 Time Collected: 8:50 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA06

Date: 8/15/2019 Time: 8:12

Field Personnel: J. Pellegrino, A. Poudel GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 77 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.56 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Poison ivy on approach to monitoring station. Water was slow moving with floating organic compounds, silt, and little visibility.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
07F100580	8/15/2019 7:55	22.35	3.22	1.181	26.6	6.66	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20190815 Time Collected: 8:25 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

Date	Time	Calibration Analyst's Name	pH Standard (4)			Conductivity			Temp (oC)	Turbidity (NTU)	Dissolved Oxygen	
			pH Standard/Lot #	Stabilized pH	Calibrated pH	SC Std Lot #	mSC (µs/cm) reading	SC (µs/cm) Check std			Initial DO	Expected DO
8/14/19	0830	Pellegrino, J.	4/	3.68	4.0							
8/14/19	0832	Pellegrino, J.	7/	7.37	7.00							
8/14/19	0835	Pellegrino, J.	10/	10.03	10.00							
8/14/19	0837	↓				968672	1.554	1.451				
8/14/19	0840	↓								0.00		
8/14/19	0842	↓								125.9		
8/14/19												
CHECK 8/14	12		4	4.12	/		1.525			0.6		
			7	7.08	/					155.2		

10

10.03

15

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

August 15, 2014

Date	Time	Calibration Analyst's Name	pH Standard (4)			Conductivity			Temp (oC)	Turbidity (NTU)	Dissolved Oxygen	
			pH Standard/ Lot #	Stabilized pH	Calibrated pH	SC Std Lot #	mSC (µs/cm) reading	SC (µs/cm) Check std			Initial DO	Expected DO
8/15	7:55	A. Powder	4/ 96C044	3.98	4.00	96B672	1.506	1.485		0.510		
			7/ 96B719	6.99	7.00			1.452		125.9		
			10/ 86J364	9.97	10.00					0.8		
			4		4.04					128.3		
			7		7.08							
			10		10.14							

96A197

183912

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU01

Date: 9/11/2019 Time: 12:35

Field Personnel: J. Pellegrino, A. Schuppin GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 88 °F Weather: sunny, humid

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.11 ft. High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear; no odor; fast moving

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 Sonde	9/11/2019 8:17	19.27	7.92	0.201	0.3	7.51	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20190911 Time Collected: 12:40 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU02

Date: 9/11/2019 Time: 11:45

Field Personnel: J. Pellegrino, A. Schuppin GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 85 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.34 ft High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Stormwater structure still broken; water clear, fast moving, no odor

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 Sonde	9/11/2019 8:17	18.08	8.84	0.334	0.3	7.51	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20190911 Time Collected: 11:55 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Average Tidal Monitoring Points High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tides

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU04

Date: 9/11/2019 Time: 10:30

Field Personnel: J. Pellegrino, A. Schupp GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.62 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Slow moving; murky, no odor, settled sediment on streambed

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 Sonde	9/11/2019 8:17	18.30	9.24	0.342	0.2	8.47	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20190911 Time Collected: 10:40 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU05

Date: 9/11/2019 Time: 10:00

Field Personnel: J. Pellegrino, A. Schuppin GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: _____ inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.68 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear; no odor; fast moving

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 Sonde	9/11/2019 8:17	17.60	8.97	0.375	0.5	8.60	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20190911 Time Collected: 10:14 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-04

Date: 9/12/2019 Time: 10:10

Field Personnel: John Pellegrino; Aimee Schuppin GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 91 °F Weather: Sunny, Humid, and Hot

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 0.0 inches Type: Rain Snow Mix

Day of Sampling: 0.0 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.32 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

No flow (stagnant flow); debris of trash and plastic was noted near the creek bed. Water color was brown and murky with high sediment content.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 Sonde	9/12/2019	20.05	6.46	0.522	22.8	7.68	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20190912 Time Collected: 10:10; 10:12

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID MADP-20190912 Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-06

Date: 9/12/2019 Time: 8:45

Field Personnel: John Pellegrino; Aimee Schuppin GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 83 °F Weather: Sunny, Humid, and Hot

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.0 inches Type: Rain Snow Mix

Day of Sampling: 0.0 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.13 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Turbidity was over 200 NTUs. There was a smell of fecal matter near the outfall locations. Water levels were low. Trash and debris were noted at the sampling location. The water color was greyish/brown and murky.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 Sonde	9/12/2019	22.10	2.48	8.743	16.60	6.89	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20190912 Time Collected: 8:45

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

Date	Time	Calibration Analyst's Name	pH Standard (4)			Conductivity			Temp (oC)	Turbidity (NTU)	Dissolved Oxygen	
			pH Standard/ Lot #	Stabilized pH	Calibrated pH	SC Std Lot #	mSC (µs/cm) reading	SC (µs/cm) Check std			Initial DO	Expected DO
9/11/19	0817	Aimee S.	4/ 96C044	4.00	3.99				24.39	0.00/126		
9/11/19	0820	Aimee S	7/ 96B719	6.83	7.00				24.40			
9/11/19	0825	Aimee S	10/ 96A1078	10.00	10.01				24.50			
9/11/19	0830	Aimee S				#96E1013	1.413		24.52			
9/11/19	0845	Aimee S	126 NTU 1E19150131						24.34	0.0/126		
9/11/19	0840	Aimee S	0 NTU 96A197						24.33	0.0		
9/11/19	0845	Aimee S										

Note: ORP & DO not calibrated based on sampling plan for ORP & lab not providing DO calibration solution.

Bump check

Date: 9/11/19 Analyst Name: Aimee S

Lab # are the same

pH 4.00 - 4.10

Temp 30.50 °C Time 1546

7.00 - 7.00

Temp ~~28.10~~ 28.62 Time 1552

10.0 - 10.29

Temp ~~29.05~~ 29.05 Time 1557

SC (µs/cm) - 1.413 - 1.413

Temp 28.24 Time 1602

Turbidity - 0.0 - 0.3

Temp 27.27 Time 1606

126.0 - 127.3

Temp 29.72 Time 1613

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

0 NTU
96A197
126 NTU
14E19158131

Date	Time	Calibration Analyst's Name	pH Standard (4)			Conductivity			Temp (oC)	Turbidity (NTU)	Dissolved Oxygen	
			pH Standard/ Lot #	Stabilized pH	Calibrated pH	SC Std Lot #	m ^{SC} (µs/cm) reading	SC (µs/cm) Check std			Initial DO	Expected DO
9/12	0745	SP 0740	4/ 96C044	3.99	4.00	96E1013	1.101	1,411	24.11	0.9/0.0		
		SP 0745	7/ 96B719	7.60	7.00	96E1013	1.101	1,411	24.43	126/126		
		SP 0750	10/ 96A1078	10.10	10.02	96E1013	1.101	1,411				
	0											
9/12	1445	SP	4	4.04			1.411			0/1.3		
9/12			7	7.00						126/131		
9/12			16	10.21								
9/12												
9/12												

9/12
9/12
9/12
9/12
9/12

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU01

Date: 10/9/2019 Time: 12:14

Field Personnel: John Pellegrino; Agrima Poudel GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 63 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.48 ft. High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Wetland characteristics. Water is clear and fast moving. Strong sulfur odor. No evidence of trash or debris. *Safety Concern* swamp/wetland presents engulfment/entrapment hazard. Must use buddy system.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/9/2019 9:45	16.03	13.35	0.167	9.6	7.50	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20191009 Time Collected: 12:20 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU02

Date: 10/09/2019 Time: 11:49

Field Personnel: John Pellegrino; Agrima Poudel GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 63 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.39 ft High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear and odorless. Sample obtained from a fast-moving portion of the stream. Presence of transient encampments; bike found at the entrance of sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/9/2019 9:45	15.61	128.8	0.325	3.1	7.29	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20191009 Time Collected: 11:56 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Average Tidal Monitoring Points High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU03

Date: 10/9/2019 Time: 11:22

Field Personnel: John Pellegrino; Agrima Poudel GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 62 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.69 ft High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Transient encampments present. Stream is absent of trash and debris. Water level higher than normal.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/9/2019 9:45	16.03	11.82	0.430	6.3	7.52	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20191009 Time Collected: 11:32 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tides

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU05

Date: 10/09/2019 Time: 10:36

Field Personnel: John Pellegrino; Agrima Poudel GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 60 °F Weather: mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.74 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear, odorless, and fast moving.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/9/2019 9:45	15.64	105.1	0.363	6.5	7.20	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20191009 Time Collected: 10:40 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU06

Date: 10/9/2019 Time: 10:00

Field Personnel: John Pellegrino; Agrima Poudel GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 56 °F Weather: cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.85 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Transient encampments present near stream. No odor. Water is clear; moderate to slow flow. Egress has been recently mowed/landscaped.

No trash or debris evident.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/9/2019 9:45	16.50	7.66	2.765	8.0	7.25	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20191009 Time Collected: 10:15 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA01

Date: 10/10/2019 Time: 11:20

Field Personnel: John Pellegrino; Rona Durborow GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 61 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 0.09 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.46 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow; clear water; no odor. A tire was seen in the stream, otherwise the water and surrounding area are clean.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/10/2019 8:15	15.06	104.2	0.364	5.0	7.30	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20191010 Time Collected: 11:30 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA02

Date: 10/10/2019 Time: 10:40

Field Personnel: John Pellegrino; Rona Durborow GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 61 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.58 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is barley moving. Clear water with no odor. Sediment accumulation is high.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/10/2019 8:15	14.96	98.1	0.357	6.8	7.40	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20191010 Time Collected: 10:55 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID MADP-20191010 10:55 / 0.2 meters Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA03

Date: 10/10/2019 **Time:** 10:15

Field Personnel: John Pellegrino; Rona Durborow **GPS Coordinates:** 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 61 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.68 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is barley moving, clear, and has no odor. Some trash observed in sampling area, possibly from nearby highway.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/10/2019 8:15	15.01	113.5	0.373	5.5	7.34	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20191010 **Time Collected:** 10:20 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA04

Date: 10/10/2019 Time: 9:55

Field Personnel: John Pellegrino; Rona Durborow GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 61 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.66 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is barley moving and turbid. No debris observed. Submerged organic solids observed.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI6920 #32013	10/10/2019 8:15	15.5	169.8	0.399	19.0	7.39	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20191010 Time Collected: 9:55 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

YSI Multi-Probe Calibration Record

964174
NTN
19E19150131

D.O.

Date	Time	Calibration Analyst's Name	pH Standard (4)			Conductivity			Temp (oC)	Turbidity (NTU)	Dissolved Oxygen	
			pH Standard/Lot #	Stabilized pH	Calibrated pH	SC Std Lot #	SC (µs/cm) reading	SC (µs/cm) Check std			Initial DO	Expected DO
8/9	7:41	A.P.	4/861840	3.86	4.00	86K3V0	1.373	1.412	19.50	6.21	2.71	126.6
	9:45		7/86B380	7.11	7.00				19.29	8.81		139.8
			10/76L670	10.39	10.00				19.35			
8/9	1400	JP	4/ "	4.00								
			7/ "	7.00								
			10/ "	10.21			1.412			0	0	126.1

YSI 650 MDS PINE # 14091

YSI 6920 PINE # 32013

YSI Multi-Probe Calibration Record

Date	Time	Calibration Analyst's Name	pH Standard (4)			Conductivity			Temp (oC)	Turbidity (NTU)	Dissolved Oxygen	
			pH Standard/Lot #	Stabilized pH	Calibrated pH	SC Std Lot #	m ^{SC} (µs/cm) reading	SC (µs/cm) Check std			Initial DO	Expected DO
10/10/19	0800	Pellegrino	4/ 861846	4.20	4.0	861310	1.385	1.413		0/96.197	0.4	0.0
			7/ 86B386	6.85	7.00					126/	126.4	126.0
			10/ 762670	10.37	10.06					19517150131		
10/10/19			4/	3.99								
	@1315		7/	7.00								
			10/	10.31			1.412					
										126/	123.1	

See 10/9 cal sheet
for YSI X

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU01

Date: 11/13/2019 Time: 11:49

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 35.5 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.22 ft X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Wetland characteristics. Strong sulfur odor. *Safety Concern* swamp/wetland presents engulfment/entrapment hazard. Must use buddy system. Water is clear, fast moving, and odorless.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15967	11/13/19 7:30	5.7	14.95	0.149	4.6	8.5	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20191113 Time Collected: 11:53 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU02

Date: 11/13/2019 Time: 11:31

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 34.8 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.27 ft X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Organic odor. Construction happening adjacent to sampling point – water is clear. Some pedestrian traffic adjacent to steam.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15967	11/13/19 7:30	7.2	16.84	0.244	2.6	8.77	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20191113 Time Collected: 11:32 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Average Tidal Monitoring Points High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU03

Date: 11/13/2019 Time: 11:05

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 34.1 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.31 ft X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Transient encampments present. Water is clear, fast flowing, and odorless.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15967	11/13/19 7:30	8.36	13.36	0.372	4.7	7.59	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20191113 Time Collected: 11:11 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tides

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU04

Date: 11/13/2019 Time: 10:50

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 33.8 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.35 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear, fast moving water. Odorless. Ice present around sample location. Trash and abandoned shopping carts found along path to sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #15967	11/13/19 7:30	6.76	14.95	0.282	5.7	7.77	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20191113 Time Collected: 10:54 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU05

Date: 11/13/2019 Time: 10:15

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 32.2 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.49 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear, odorless, and fast moving. Water level is low compared to previous months.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #15967	11/13/19 7:30	7.19	14.13	0.411	1.7	7.21	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20191113 Time Collected: 10:20 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU06

Date: 11/14/2019 Time: 8:20

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 32 °F Weather: overcast

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.12 feet High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Attempted to sample location on 11/13 – water level was low compared to previous months. Samplers were unable to safely access water, due to entrapment hazards associated with soft ground. Samplers returned on 11/14 when tide levels were higher, and access was safer. Water was still and odorless.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #15967	11/14/19 6:00	5.40	19.27	2.114	56.3	7.10	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20191114 Time Collected: 8:24 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA02

Date: 11/14/2019 Time: 10:45

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 38 °F Weather: Sunny/Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.58 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is barely moving. Clear water with no odor.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #15967	11/14/19 6:00	5.42	19.07	0.323	0.5	7.70	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20191114 Time Collected: 10:50 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA03

Date: 11/14/2019 Time: 10:15

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 36 °F Weather: Sunny/Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.56 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear to slightly turbid. Trash accumulation near river banks.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #15967	11/14/19 6:00	5.50	18.27	0.225	-0.5	7.47	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20191114 Time Collected: 10:30 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA04

Date: 11/14/2019 Time: 9:45

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 35 °F Weather: Sunny, Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.48 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water does not appear to be flowing. Brown/mucky site conditions, sample has a slight tan/yellow hue. Trash present within streambed.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #15967	11/14/19 6:00	4.02	15.24	0.270	-2.0	7.69	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20191114 Time Collected: 9:57 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID MA-DUP-20191114 Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA06

Date: 11/14/2019 Time: 8:50

Field Personnel: Agrima Poudel; Justin Derato GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 33 °F Weather: Sunny/Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 0.06 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.24 feet High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Trash floating in water, normal tide level. Clear, slight flow downstream. Slight sewage odor from service building adjacent to sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #15967	11/13/19 6:00	7.05	15.53	4.928	1.8	6.89	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20191113 Time Collected: 9:00 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

Date & Time	Cal or Bump	Calibration Analyst's Name	pH Standard (4)				Conductivity			Temp (oC)	Turbidity			
			pH Std	Lot #	Stab pH	Cal pH	1.413 Std Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Std (NTU)	Lot #	NTU Stab	NTU Cal
7:31	Cal	A. Poudel	4	960044	3.83	4.00	968672	1.434	1.413	20.53	0	19130178	-1.2	0
			7	968719	7.01	6.99				20.75	126	19H19300	152.4	126
			10	968956	10.00	10.01				20.42		192		
2:07	Cal Bump	A. Poudel	4	960044	3.83	4.0	968672	1.540	-	18.14	0	19130178	-0.2	-
			7	968719	7.11	-			-	19.13	126	19H19300	128.7	-
			10	968956	10.01	-			-	19.38				

Record date, time, calibration analyst's name, and temperature of each solution as you calibrate.

Record Lot # of each calibration solution.

Record whether or not it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

Date & Time	Cal or Bump	Calibration Analyst's Name	pH Standard (4)				Conductivity				Temp (oC)	Turbidity			
			pH Std	Lot #	Stab pH	Cal pH	1.413 Std Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal	Std (NTU)		Lot #	NTU Stab	NTU Cal	
11/14/19	cal	A. Poudel	4	96C044	4.02	4.00	96B672	1.679	1.413	10.29	0	19130178	6.8	5	
6:00am	cal	A. Poudel	7	96B719	7.07	7.00				10.32	126	19119300	123.5	126.2	
	cal	A. Poudel	10	96B956	10.07	10.00				11.32					
11/14/19	bump	J. Derato	4	96C044	3.99	-	96B672	1.375	-	10.13	0	19130178	-4.6	-	
Cal check	bump	J. Derato	7	96B719	6.86	-				10.5	126	19119300	113.9	-	
1345	bump	J. Derato	10	96B956	9.87	-				1					

Record date, time, calibration analyst's name, and temperature of each solution as you calibrate.

Record Lot # of each calibration solution.

Record whether or not it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU01

Date: 12/11/2019 Time: 12:00

Field Personnel: John Pellegrino, Grace Dai

GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 38 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.20 inches Type: X Rain Snow Mix

Day of Sampling: 0.05 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.27 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.82 ft High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear and fast moving. Some foam floating from upstream. No odor or other indicators. No trash or debris.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 12014	12/11/19 9:10	7.26	11.17	0.213	1.7	7.19	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20191211 Time Collected: 12:20 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU02

Date: 12/11/2019 Time: 11:17

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 37 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.20 inches Type: X Rain Snow Mix

Day of Sampling: 0.05 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.27 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.61 ft High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear and fast moving. No odor. No other indicators.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #12014	12/11/19 9:10	8.29	11.14	0.330	-0.8	7.29	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20191211 Time Collected: 11:29 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Average Tidal Monitoring Points High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU03

Date: 12/11/2019 Time: 10:50

Field Personnel: John Pellegrino; Grace Dai

GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 36 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.20 inches Type: X Rain Snow Mix

Day of Sampling: 0.05 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.52 ft High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Transient encampments present. Water is clear, moderate speed. No debris or trash evident.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #12014	12/11/19 9:10	8:42	10.47	0.284	-1.0	7.37	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20191211 Time Collected: 11:01 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tides

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU04

Date: 12/11/2019 Time: 10:20

Field Personnel: John Pellegrino; Grace Dai

GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 36 °F Weather: sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.20 inches Type: X Rain Snow Mix

Day of Sampling: 0.05 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.27 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.42 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Fast moving, clear water. Water has foam forming on surface. No odor. Open drainage swale has trash and debris leading into water (shopping cart, clothes, mower).

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #12014	12/11/19 9:10	8.04	11.38	0.336	0.2	7.42	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20191211 Time Collected: 10:36 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU05

Date: 12/11/2019 Time: 9:56

Field Personnel: John Pellegrino; Grace Dai

GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 36 °F Weather: light wind, sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 0.20 inches Type: X Rain Snow Mix

Day of Sampling: 0.05 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.27 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.46 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear, fast moving. Site is adjacent to auto repair yard. No discernable odors, no pressure of nuisance pests (mosquitos).

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #12014	12/11/19 9:10	8.53	11.20	0.327	0.4	7.01	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20191211 Time Collected: 10:06 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU06

Date: 12/12/2019 Time: 8:50

Field Personnel: John Pellegrino; Grace Dai

GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 31 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.29 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -1.8 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

2x Transient encampments, very low water level, muddy conditions, very difficult walking condition due to mud surrounding stream, strong organic/mucky smell.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #12014	12/12/19 8:13	4.49	6.78	5.687	71.5	6.50	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-121219 Time Collected: 8:40 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA01

Date: 12/12/2019 Time: 12:00

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 36 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.29 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.29 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clean and fast moving. No odor, trash, debris, or other indicators.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #12014	12/12/19 8:13	6.16	11.90	0.341	-0.5	6.93	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20191212 Time Collected: 12:15 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID _____ Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA02

Date: 12/12/2019 Time: 11:25

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 35 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.29 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.21 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear with greenish hue. Moderate flow. Trash and debris has collected in ripple pools. Standing water in adjacent pools and wetland area has organic sheen.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #12014	12/12/19 8:13	5.54	11.23	0.326	0.6	7.04	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-121219 Time Collected: 11:36 / 0.2 meters

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID MADP-121219 11:36 / 0.2 meters Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA04

Date: 12/12/2019 Time: 10:20

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 34 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.25 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.29 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.02 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water level low, flow rate negligible. Ice formed on top of stream (< 1").

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI #12014	12/12/19 8:13	2.22	5.09	0.285	0.5	6.62	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-121219 Time Collected: 10:36 / 0.3 meters

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID Trip Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

12/11/19

Date & Time	Cal or Bump	Calibration Analyst's Name	pH Standard (4)				Conductivity				Temp (oC)	Turbidity			
			pH Std	Lot #	Stab pH	Cal pH	1.413 Std Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal	Std (NTU)		Lot #	NTU Stab	NTU Cal	
0846			4	966044	3.23	4.00						0			
0850			7	9661324	7.09	7.00						126			
0854			10	966956	10.14	10.02									
0901							966672	1.494	1.413			0	19130178	3.6	0.1 0.1
0906												126	AH1930014	2145.3	1224 125.6
0910						BUMP		BUMP							
					4/	3.99			1.377			0/		-1.5	
					7/	7.00						126/		121.5	
					10/	10.11									

Record date, time, calibration analyst's name, and temperature of each solution as you calibrate.

Record Lot # of each calibration solution.

Record whether or not it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

12/12/19

YSI Multi-Probe Calibration Record

Date & Time	Cal or Bump	Calibration Analyst's Name	pH Standard (4)				Conductivity			Temp (oC)	Turbidity			
			pH Std	Lot #	Stab pH	Cal pH	1.413 Std Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Std (NTU)	Lot #	NTU Stab	NTU Cal
12/12/19 07:50			4	99C044	4.26	4.00					0			
07:58			7	99E1325	7.00	7.00					126			
08:01			10	99B956	10.19	10.03								
08:03	08:03						99B672	1.405	1.413					
08:11	08:11										0	19130178	N/A	N/A
	08:13										126	19419300142	115.7	126.0
	Bump		4	↓	4.00									
	↓		7	↓	7.00						0			
	↓		10	↓	10.00			1.269			126			

-0.1
-0.9
123.6

Record date, time, calibration analyst's name, and temperature of each solution as you calibrate.

Record Lot # of each calibration solution.

Record whether or not it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-01

Date: 1/8/2020 Time: 11:19 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 40 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.11 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear and fast moving. No odor or other indicators of pollution.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/8 @8:42 AM	5.38	11.69	0.204	10.5	7.20	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20200108 Time Collected: 11:32

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-02

Date: 1/8/2020 Time: 10:53 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 40 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.77 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.21 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear and fast moving. No odor or other indicators of pollution. Nearby concrete inlet structure is still damaged.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/8 @8:42 AM	6.22	11.75	0.368	6.8	7.22	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20200108 Time Collected: 11:06

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-03

Date: 1/8/2020 Time: 10:21 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 39 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow X Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.33 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.33 feet High Low X Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear and fast moving. No odor or other indicators of pollution. Some transient encampments have moved locations but still remain in the general vicinity of the site.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/8 @8:42 AM	6.42	10.59	0.944	-0.5	7.12	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20200108 Time Collected: 10:36

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-04

Date: 1/8/2020 Time: 9:59 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 38 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow X Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.53 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.44 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water level moderately moving. Water is turbid with low suspended solids and high amounts of organic matter/leaf litter.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/8 @8:42 AM	5.58	12.19	0.571	14.2	7.11	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20200108 Time Collected: 10:12

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU05

Date: 1/8/2020 Time: 9:37 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 38 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow X Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.53 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.54 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water level moderately high and fast moving. Water is turbid with low visibility. No odor or other indicators of pollution.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/8 @8:42 AM	5.97	12.08	0.646	12.3	6.83	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20200108 Time Collected: 09:49

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU06 Date: 1/8/2020 Time: 9:00 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 36 °F Weather: Sunny and windy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.53 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.66 feet High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Organic odor. Medium flow rate. Water level is low, streambed and sand bars are exposed. Two transient encampments are located in the adjacent woods. Water is cloudy with suspended silt, leaf litter, twigs, and other particles. Snow-covered ground leading to site.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/8 @8:42 AM	4.69	7.01	1.341	21.8	6.95	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20200108 Time Collected: 09:15

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-01

Date: 1/9/2020 Time: 11:38 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 33 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.29 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.48 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is fast moving and clear. No odor or other indicators of pollution.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/9 @8:12 AM	5.40	12.25	0.650	0.7	7.18	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20200109 Time Collected: 11:52 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-02

Date: 1/9/2020 Time: 10:32 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 37 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.06 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.30 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is slow moving. White strands (possibly algae or didymo) cover stream bed. Sample collected at 11:18 to be submitted to Maryland DNR.

Sunken trees, leaf litter and other debris present in area around stream.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/9 @8:12 AM	4.33	12.48	0.631	-0.4	7.29	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20200109 Time Collected: 10:47 AM

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID MADP-20200109 Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-03

Date: 1/9/2020 Time: 10:11 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 30 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.29 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.26 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is slow moving with low turbidity. Sunken debris and trash can be observed in stream bed. Trash also covers riparian area along bank and drainage ditches along nearby highway.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/9 @8:12 AM	4.23	11.88	0.864	3.5	7.24	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20200109 Time Collected: 10:23 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-04

Date: 1/9/2020 Time: 9:35 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 29 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.39 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.25 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Low water level. Water is slow moving, and ice has formed on top. Leaf litter/organic matter present. Slight petroleum sheen on surface.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/9 @8:12 AM	3.91	10.31	0.453	5.3	7.24	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20200109 Time Collected: 9:49 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-05

Date: 1/9/2020 Time: 9:11 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 29 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwj>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.29 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.27 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear and moderately moving. Poor pool quality downstream – water has built up due to fallen tree branch.

Foam/suds observed flowing from upstream and collecting in pool downstream of sampling site.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/9 @8:12 AM	3.09	12.68	0.461	-0.2	7.21	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA05-20200109 Time Collected: 9:23 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-06

Date: 1/9/2020 Time: 8:35 AM

Field Personnel: John Pellegrino; Grace Dai GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 27 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 1.81 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.29 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): -0.3 feet High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water level is low. Water is slightly turbid, with leaf litter and organic matter present in the water. Sandbar and streambed are exposed.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI # 15D102155	1/9 @8:12 AM	4.10	10.49	1.689	3.7	6.96	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20200109 Time Collected: 8:48 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Trip Blank (Yes/No) N/A

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

1/8/2020

1/8
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Date & Time	Cal or Bump	Calibration Analyst's Name	pH Standard (4)				Conductivity			Temp (oC)	Turbidity			
			pH Std	Lot #	Stab pH	Cal pH	1.413 Std Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Std (NTU)	Lot #	NTU Stab	NTU Cal
0828	CAL	GRACE DAN	4	96C044	3.63	4.00	96E1013	1.648	1.414		0	19130178	0.6	-0.2
			7	96E1325	7.22	7.00					126	19H19300192	186.1	126.0
0839			10	96F270	10.12	10.03								
1600	BUMP	SONY P	4		4.21			1.381			0		-2.2	
			7		6.99						126		113.1	
			10		10.02									

Record date, time, calibration analyst's name, and temperature of each solution as you calibrate.

Record Lot # of each calibration solution.

Record whether or not it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

CALIBRATED @ GPS: 39.191000, -76.606944 (6721 CHESAPEAKE CENTER DR. GLEN ARVIE, MD)
0839 °F: 36°F

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

YSI Multi-Probe Calibration Record

1/4/2020

Date & Time	Cal or Bump	Calibration Analyst's Name	pH Standard (4)				Conductivity			Temp (°C)	Turbidity			
			pH Std	Lot #	Stab pH	Cal pH	1.413 Std Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Std (NTU)	Lot #	NTU Stab	NTU Cal
0812	CAL	GRACIDA	4	96C044	4.25	4.01	96E1013	1.177	1.422		0	19130178	0.2	0.3
			7	96E1325	6.85	7.02					126	19H1930093	119.5	126.0
			10	96F270	10.30	10.05								
1400	BUMP	JOHN P	4		4.02									
			7		6.91						0		0.1	
			10		9.92			1.685			126		123.6	

1/9
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Record date, time, calibration analyst's name, and temperature of each solution as you calibrate.

Record Lot # of each calibration solution.

Record whether or not it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

CALIBRATED @ 0812 GPS: 39.126682, -76.588443
AIR TEMP: 27°F

(8107 GOVERNOR RITCHIE HIGHWAY)
PASADENA, MD 21122

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-01

Date: 2/12/2020 Time: 11:35 AM

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 47 °F Weather: sunny; clouds moving in; brisk

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.08 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.53 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.83 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow; water is clear with no obvious odor

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/12 @10:00 AM	9.5	10.39	0.195	4.67	6.84	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20200212 Time Collected: 11:42

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-02

Date: 2/12/2020 Time: 11:20 AM

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 46 °F Weather: Sunny; brisk; clear skies

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.08 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.53 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.83 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear water with no obvious odor; moderate flow; minimal trash and debris along stream bank.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/12 @10:00 AM	9.3	10.91	0.323	2.89	6.87	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20200212 Time Collected: 11:21 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-03

Date: 2/12/2020 Time: 10:50

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 45 °F Weather: sunny with clear skies; brisk

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.08 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.80 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.01 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow and high water level comparatively to previous visits; clear with no obvious odor; minimal debris along stream bank;

Transient encampments (apparently abandoned) nearby.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/12 @10:00 AM	9.2	10.26	0.267	1.7	6.74	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20200212 Time Collected: 10:54

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-04

Date: 2/12/2020 Time: 10:30 AM

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 44 °F Weather: Partly cloudy, mostly clear skies; brisk

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.08 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.80 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.09 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow; clear water with no obvious odor; dumped trash accumulating nearby; foam forming on the stream surface.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/12 @10:00 AM	8.9	11.07	0.329	3.97	6.55	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20200212 Time Collected: 10:36 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-05

Date: 2/12/2020 Time: 10:20 AM

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 44 °F Weather: Crisp and clear; less clouds

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.08 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.80 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.12 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Flow is moderately moving, clear with no obvious odor; minimal debris along stream bank

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/12 @10:00 AM	9.0	10.82	0.322	3.51	5.70	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20200212 Time Collected: 10:21 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-06

Date: 2/12/2020 Time: 8:50 AM

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 43 °F Weather: Crisp, clear morning; minor clouds

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.72 inches Type: X Rain Snow Mix

Day of Sampling: 0.08 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.80 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.34 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Potential oil slick in water; trash and debris along shoreline likely deposited during recent high waters.

Slow flowing, clear water with no obvious odor or other indicators.

New and active transient encampment nearby.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 650 6920	2/12 @ 8:00AM	8.36	15.3	1.045	14.8	6.19	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20200212 Time Collected: 08:56 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-01

Date: 2/13/2020 Time: 10:50

Field Personnel: John Pellegrino and Grace Dai GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 50 °F Weather: Raining

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.80 inches Type: X Rain ___ Snow ___ Mix

Day of Sampling: 0.20 inches Type: X Rain ___ Snow ___ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.85 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.08 feet X High ___ Low ___ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is fast moving and murky with leaf litter.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/13 @ 8:00 AM	9.2	10.35	0.209	16.8	6.50	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20200213 Time Collected: 10:59

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-02

Date: 2/13/2020 Time: 10:10 AM

Field Personnel: John Pellegrino and Grace Dai GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 50 °F Weather: Raining

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.80 inches Type: X Rain ___ Snow ___ Mix

Day of Sampling: 0.20 inches Type: X Rain ___ Snow ___ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.53 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.08 feet X High ___ Low ___ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

High water level compared to previous visits; fast moving murky water; sediment and debris in water (tree branches, leaf litter).

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/13 @ 8:00 AM	8.8	9.85	0.225	18.26	6.60	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20200213 Time Collected: 10:29 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-03

Date: 2/13/2020 Time: 09:42

Field Personnel: John Pellegrino and Grace Dai GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 49 °F Weather: Raining

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.80 inches Type: X Rain _____ Snow _____ Mix

Day of Sampling: 0.20 inches Type: X Rain _____ Snow _____ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 8.23 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.08 feet X High _____ Low _____ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Fast moving; slightly turbid; silty/sandy stream bed deposits easily disturbed by foot traffic.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/13 @ 8:00 AM	8.6	10.53	0.220	15.59	6.53	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20200213 Time Collected: 09:53 AM

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID MADP-20200213 Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-04

Date: 2/13/2020 Time: 09:07 AM

Field Personnel: John Pellegrino and Grace Dai GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 48 °F Weather: Mild rain

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.80 inches Type: X Rain ___ Snow ___ Mix

Day of Sampling: 0.20 inches Type: X Rain ___ Snow ___ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 7.64 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.98 feet X High ___ Low ___ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

High water level compared to previous visits; fast flowing and murky; settled debris (sediment, leaf litter, branches) in stream bed.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/13 @ 8:00 AM	8.4	10.05	0.243	12.9	6.50	

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20200213 Time Collected: 09:28 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-05

Date: 2/13/2020 **Time:** 08:59

Field Personnel: John Pellegrino and Grace Dai **GPS Coordinates:** 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 47 °F Weather: Mild Rain

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.80 inches Type: X Rain ___ Snow ___ Mix

Day of Sampling: 0.20 inches Type: X Rain ___ Snow ___ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 7.64 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.97 feet X High ___ Low ___ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Foamy/sudsy water gathering at fallen branches; medium-high flow; high water level compared to previous visits.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/13 @ 8:00 AM	8.1	11.02	0.206	9.71	6.75	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA05-20200213 **Time Collected:** 09:01 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-06

Date: 2/13/2020 Time: 08:29 AM

Field Personnel: John Pellegrino and Grace Dai GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 47 °F Weather: Mild rain; cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.80 inches Type: X Rain _____ Snow _____ Mix

Day of Sampling: 0.20 inches Type: X Rain _____ Snow _____ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 7.07 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.93 feet X High _____ Low _____ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water slow moving and murky; water level higher than previous site visits.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	2/13 @ 8:00 AM	8.5	9.40	0.919	9.97	6.84	

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20200213 Time Collected: 08:41 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Multi-Probe Sonde Calibration Record

pH Standard						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	pH Std	Lot #	Stab pH	Cal pH		Date & Time	Result
2/12/2020 0810	Pellegrino	4	96E1020	4.21	3.97	14.27	2/12 1436	3.94
0812	↓	7	96E1325	4.87	7.01	15.91	2/12 1439	6.92
0815	↓	10	96F270	10.54	10.08	15.85	2/12 1441	10.04
Conductivity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (mS/cm)	Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Date & Time	Result
2/12/2020 0815	Pellegrino	1.413	96E1013	25.43	1.43		2/12 1443	1.618
Turbidity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (NTU)	Lot #	NTU Stab	NTU Cal		Date & Time	Result
2/12/2020 0820	Pellegrino	124	19F1230001	133.1	125.9	@1434	2/12 1434	0.89
2/12/2020 0820	Pellegrino	0	1968015	0.5	0.1	@1430	2/12 1430	0.99
1012	Pellegrino	0	19080154	0.24	0			
1013	↓	126	1961930492	148.73	126			

118.19

Model: YSI: 450 HDS Sonde: 4920 V2 Calibration Location: 6721 Chesapeake Center Drive
 Rental ID: _____ Glen Burnie, MD 21060

Second Model: Pro DSS Sonde + YSI calibrated at FU-05

Record date, time, and calibration analyst's name as you calibrate.
 Record Lot # of each calibration solution.
 Record temperature of pH solutions.
 Record whether it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Comments: Switched to new YSI following FU-06

See Pine calibration form for Second YSI

REPLACEMENT (ONLY) FORM

COMPANY: AECOM

CONTRACT #: _____

SHIP TO ADDRESS: P/UP @ PINE

*REQUIRED FIELD FOR CSR

SHIP DATE *	SHIP METHOD*	M3 EQUIPMENT DESCRIPTION*	QTY*	PINE ID REPLACED*	PINE ID (NEW)	M3 ITEM NUMBER*	DATE RETURNED
2/12	PUP	4SI 6920	1	27087			
				30421			
		4SI DSS	1		43872		
					43862		

CONTACT: JOHN PELLIGRINOPHONE: 240 409 0227PINE ORDER TAKER PRINTED FULL NAME: RYAN

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Multi-Probe Sonde Calibration Record

02/13/2020

pH Standard						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	pH Std	Lot #	Stab pH	Cal pH		Date & Time	Result
02/13/2020	JP	4	96C044					
0806	JP	7	96B719	7.04	7.00	9.9	1126	6.96
0809	JP	10	96F270	10.04	10.00	10.0	1127	10.01
Conductivity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (mS/cm)	Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Date & Time	Result
02/13/2020	JP	1.413	96E865	1.641	1.413	10.2	1129	1.463
Turbidity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (NTU)	Lot #	NTU Stab	NTU Cal		Date & Time	Result
02/13/2020	JP	0	19080154	-1.49	0.0		1120	1.10
0803	JP	126	19619366192	118.6	126.0		1124	125.01
				115.10				

Model: YSI ProDSS
 Rental ID: 043862

Calibration Location: Walmart
9107 Governor Ritchie Hwy
Pasadena MD 21122

Record date, time, and calibration analyst's name as you calibrate.
 Record Lot # of each calibration solution.
 Record temperature of pH solutions.
 Record whether it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Comments: _____

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-01

Date: 3/11/2020 Time: 11:23 AM

Field Personnel: John Pellegrino and Grace Dai GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 52 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: Rain Snow Mix

Day of Sampling: 0 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1 feet High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow, murky, suspended solids, sediment/small-leaf litter, two ducks present on site.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/11 @8:14 AM	11.0	10.07	0.214	8.1	7.21	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20200311 Time Collected: 11:29 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-02

Date: 3/11/2020 Time: 10:56 AM

Field Personnel: John Pellegrino and Grace Dai GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 50 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.88 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate, fast, and clear flow.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/11 @8:14 AM	10.6	10.50	0.347	5.1	7.12	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20200311 Time Collected: 11:00 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-03

Date: 3/11/2020 Time: 10:19 AM

Field Personnel: John Pellegrino and Grace Dai GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 50 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.68 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow, clear.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/11 @8:14 AM	11.7	10.23	0.488	1.5	7.30	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20200311 Time Collected: 10:25 AM

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID FUDP-20200311 @ 10:10 Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-04

Date: 3/11/2020 Time: 9:55 AM

Field Personnel: John Pellegrino and Grace Dai

GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 48 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.5 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Fast moving, low turbidity, suds on surface.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/11 @8:14 AM	10.3	10.74	0.422	4.2	7.89	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20200311 Time Collected: 9:55 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-05

Date: 3/11/2020 Time: 9:18 AM

Field Personnel: John Pellegrino and Grace Dai

GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 48 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.38 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow, suspended solids, leaf litter, twigs.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/11 @8:14 AM	18.6	10.45	0.388	1.39	7.62	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20200311 Time Collected: 9:30 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-06

Date: 3/11/2020 Time: 8:44 AM

Field Personnel: John Pellegrino and Grace Dai

GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 46 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.26 feet High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

High water level, medium flow, clear water, suspended debris (twigs, leaves, etc).

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/11 @8:14 AM	10.1	8.39	13.09	3.79	7.26	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20200311 Time Collected: 09:01 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-01

Date: 3/12/2020 Time: 10:50 AM

Field Personnel: John Pellegrino and Agrima Poudel GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 54 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.69 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Lots of vines in sampling area, restricting path to the sampling location. Water is clear and fast moving.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/12 @8:03 AM	11.8	10.75	0.35	0.9	7.60	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20200312 Time Collected: 11:55 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-02

Date: 3/12/2020 Time: 10:43 AM

Field Personnel: John Pellegrino and Agrima Poudel GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 48 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.57 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.45 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Murky/muddy conditions around the sampling location. Water is clear and steady, no moving. Some floating/suspended sediments (twigs).

Brown algae/moss present.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/12 @8:03 AM	10.5	9.10	0.349	1.7	7.69	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20200312 Time Collected: 10:55 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-03

Date: 3/12/2020 Time: 09:41 AM

Field Personnel: John Pellegrino and Agrima Poudel GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 46 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.14 feet High Low X Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Dead deer found at entrance to sampling location. Ducks seen at sampling location. Brown moss/algae-like growth on streambed.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/12 @8:03 AM	10.2	9.51	0.379	1.70	7.70	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20200312 Time Collected: 10:05 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-04

Date: 3/12/2020 Time: 09:16 AM

Field Personnel: John Pellegrino and Agrima Poudel GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 46 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lxw>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.82 feet High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Normal site conditions. Bits of sheen – possibly petroleum.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/12 @8:03 AM	9.9	6.99	0.502	0.9	7.56	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20200312 Time Collected: 09:25 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-05

Date: 3/12/2020 Time: 08:59 AM

Field Personnel: John Pellegrino and Agrima Poudel GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 46 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.71 feet High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Lots of foam downstream. Moss/algae growth on rocks adjacent to sampling location. Sheen observed, broke up slightly when disturbed.

Might be mix of organic and petroleum. Long grass-like algae observed on streambed.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/12 @8:03 AM	9.2	9.93	0.393	1.6	7.58	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA05-20200312 Time Collected: 09:06 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-06

Date: 3/12/2020 Time: 08:32 AM

Field Personnel: John Pellegrino and Agrima Poudel GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 46 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.83 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.57 feet High X Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Tide higher than usual. Lots of geese/wildlife observed nearby. Murky/smelly water.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI ProDSS 043862	3/12 @8:03 AM	11.1	8.01	13.3	8.60	7.01	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20200312 Time Collected: 08:42 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Multi-Probe Sonde Calibration Record

3/12

pH Standard							Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	pH Std	Lot #	Stab pH	Cal pH	Date & Time		Result	
0803	J. Pellegrino	7	96E1325	7.18			3/12/20		
↓	J. Pellegrino	7	96E1325	7.18	7.00	10.2	1215	6.88	
↓	J. Pellegrino	10	96F270	10.21	10.00	10.4	1215	9.98	
↓	J. Pellegrino	4	96C044	4.22	4.00	10.3	1215	3.97	
Conductivity							Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (mS/cm)	Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal	Date & Time		Result	
3/12 0811	J. Pellegrino	1.413	06A037	1.409	1.413		3/12/20 1215	1.587	
Turbidity							Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (NTU)	Lot #	NTU Stab	NTU Cal	Date & Time		Result	
3/12 0813	J. Pellegrino	0	1913078	3.10	0		3/12/20 1215	0.30	
↓	↓	126	19101930019	123.0	126		1215	120.70	

Model: Pro DSS 18J103024
 Rental ID: 043862 / 18K101817
 meter 043872 - probe

Calibration Location: Walmart parking lot

Record date, time, and calibration analyst's name as you calibrate.
 Record Lot # of each calibration solution.
 Record temperature of pH solutions.
 Record whether it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Comments: cloudy conditions

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Multi-Probe Sonde Calibration Record

pH Standard						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	pH Std	Lot #	Stab pH	Cal pH		Date & Time	Result
0814 0817 0820				4.16			83/11/20	
	GD	4	9GC044	4.16	4.00		1200	3.95
	GD	7	9GE1325	7.28	7.06		1202	6.96
	GD	10	9GF270	10.24	10.00		1204	10.05
Conductivity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (mS/cm)	Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Date & Time	Result
0822							03/11/20	
	GD	1.413	9GK142	—	—		1330	1.470
Turbidity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (NTU)	Lot #	NTU Stab	NTU Cal		Date & Time	Result
0806 0809							03/11/20	
	GD	0	19130178	4.64	0.00		12:04	-0.2
	GD	126	1991930012	162.63	126.0		12:05	117

Model: YSI - PRODS5 Calibration Location: Glen Burnie, MD
 Rental ID: 043862

Record date, time, and calibration analyst's name as you calibrate.
 Record Lot # of each calibration solution.
 Record temperature of pH solutions.
 Record whether it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Comments: _____

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-01

Date: 4/8/2020 Time: 11:50

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 71 °F Weather: Sunny with clear skies

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.04 inches Type: X Rain Snow Mix

Day of Sampling: 0.04 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.21 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.46 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Slightly cloudy water; no odor; moderate flow; a lot of floating organics.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650 HDS YSI 6920	4/8 @ 8:59	18.05	8.72	0.198	24.1	6.88	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20200408 Time Collected: 12:00

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID FUDP-20200408 Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-02

Date: 4/8/2020 Time: 11:25

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 70 °F Weather: Sunny + Clear

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.04 inches Type: X Rain Snow Mix

Day of Sampling: 0.04 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.21 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.69 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

No odor; moderate flow; clear water; no debris; birds around.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650 HDS YSI 6920	4/8 @ 8:59	15.12	9.55	0.313	5.1	6.85	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20200408 Time Collected: 11:35 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-03

Date: 4/8/2020 Time: 10:50

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 66 °F Weather: Sunny with clear skies

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.04 inches Type: X Rain Snow Mix

Day of Sampling: 0.04 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.21 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.67 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow; no debris in stream; no odor; water slightly cloudy; small encampment nearby. A person seen downstream fishing – was in the stream.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650 HDS YSI 6920	4/8 @ 8:59	15.60	9.28	0.449	16.9	7.24	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20200408 Time Collected: 11:00

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-04

Date: 4/8/2020 Time: 10:30

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 65 °F Weather: Sunny with clear skies

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.04 inches Type: X Rain Snow Mix

Day of Sampling: 0.04 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.21 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.61 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Slightly cloudy water; moderate flow; no debris in stream; no odor.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650 HDS YSI 6920	4/8 @ 8:59	14.36	9.85	0.382	8.6	7.43	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20200408 Time Collected: 10:35

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-05

Date: 4/8/2020 Time: 10:00

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 64 °F Weather: Clear skies

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.04 inches Type: X Rain Snow Mix

Day of Sampling: 0.04 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 4.98 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.53 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Fecal odor at site; moderate flow; a lot of bird activity; clear water; some debris in stream.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650 HDS YSI 6920	4/8 @ 8:59	13.68	9.67	0.369	6.9	7.03	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20200408 Time Collected: 10:15 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-06

Date: 4/8/2020 Time: 9:30

Field Personnel: John Pellegrino and Rona Durborow GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 61 °F Weather: A bit breezy, clear skies

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.04 inches Type: X Rain Snow Mix

Day of Sampling: 0.04 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.45 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.34 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Minor debris accumulated on shoreline. Moderate flow; no odor; water very murky. Large transient encampment nearby.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650 HDS YSI 6920	4/8 @ 8:59	15.77	10.89	7.639	36.0	7.19	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20200408 Time Collected: 09:35

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-01

Date: 4/9/2020 Time: 13:30

Field Personnel: Rona Durborow and Aimee Schuppin GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 54 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.08 inches Type: X Rain Snow Mix

Day of Sampling: 0.09 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.64 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.59 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear water; no odor; moderate flow.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650HDS YSI6920	4/9 @ 9:29	17.46	9.68	0.342	14.4	6.85	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20200409 Time Collected: 13:45

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-02

Date: 4/9/2020 Time: 12:35 PM

Field Personnel: Rona Durborow and Aimee Schuppin GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 68 °F Weather: Sunny but storm clouds nearby

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.08 inches Type: X Rain Snow Mix

Day of Sampling: 0.09 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.64 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.75 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Slow flow; floating organic matter; no odor; debris in stream; water relatively clear.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650HDS YSI6920	4/9 @ 9:29	15.68	8.40	0.333	14.1	7.01	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20200409 Time Collected: 12:50 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-03

Date: 4/9/2020 Time: 12:10 PM

Field Personnel: Rona Durborow and Aimee Schuppin GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 69 °F Weather: Rainy and cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.08 inches Type: X Rain Snow Mix

Day of Sampling: 0.09 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.64 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.78 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Slow flow, odor present (sewage); murky water.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650HDS YSI6920	4/9 @ 9:29	15.25	8.62	0.370	29.0	7.37	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20200409 Time Collected: 12:25 PM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-04

Date: 4/9/2020 Time: 10:40 AM

Field Personnel: Rona Durborow and Aimee Schuppin GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 58 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.08 inches Type: X Rain Snow Mix

Day of Sampling: 0.09 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.40 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.59 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

No flow; no odor; murky water; some debris in water and along shoreline.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650HDS YSI6920	4/9 @ 9:29	14.79	5.54	0.343	19.7	6.73	

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20200409 Time Collected: 11:00 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-05

Date: 4/9/2020 Time: 11:30 AM

Field Personnel: Rona Durborow and Aimee Schuppin GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 67 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.08 inches Type: X Rain Snow Mix

Day of Sampling: 0.09 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.64 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.74 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Very little flow; water stagnant; no odor; a lot of organic matter along shore. Water flowing at culvert – stagnant downstream; appears to have been recently flooded. Very silty bottom. Water is clear.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650HDS YSI6920	4/9 @ 9:29	16.01	10.35	0.352	37.6	7.19	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA05-20200409 Time Collected: 11:45 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-06

Date: 4/9/2020 Time: 10:00 AM

Field Personnel: Rona Durborow and Aimee Schupp GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 57 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.08 inches Type: X Rain Snow Mix

Day of Sampling: 0.09 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.64 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.31 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

A lot of birds in the area; slow flow; no odor; water relatively clear; debris in stream and along shoreline.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
650HDS YSI6920	4/9 @ 9:29	16.28	5.75	2.540	14.8	6.48	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20200409 Time Collected: 10:15 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Multi-Probe Sonde Calibration Record

4/8/2020, Wednesday

pH Standard						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	pH Std	Lot #	Stab pH	Cal pH		Date & Time	Result
0855	Pelligino	4	D6A042	4.05	4.00		1213	4.10
0857	↓	7	948719	6.97	7.00		1216	6.97
0859	↓	10	962648	10.22	10.03		1217	10.04
Conductivity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (mS/cm)	Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Date & Time	Result
0902	Pelligino	1.413	D6A037	1.280	1.412		1218	1.377
Turbidity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (NTU)	Lot #	NTU Stab	NTU Cal		Date & Time	Result
0847	Pelligino	0	20010025	0.3	0.0		1110	0.5
0851	↓	126	19419300192	182.7	126.0		1107	123.2
		0					1220	0.5
		124					1222	121.3

} Mid-day
} End of day

Model: 650 HDS YSI 6920
Rental ID: _____

Calibration Location: first calibration - Wal-Mart parking lot
turbidity bump test at FU-03 parking
final bump test at FU-01 parking

Record date, time, and calibration analyst's name as you calibrate.
Record Lot # of each calibration solution.
Record temperature of pH solutions.
Record whether it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Comments: Bump test performed following FU-03 - turbidity
No recalibration necessary

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Multi-Probe Sonde Calibration Record

4/9/2020, Thursday

pH Standard						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	pH Std	Lot #	Stab pH	Cal pH		Date & Time	Result
0900	Aimee S.	4		3.94	7.00	1403	1403	4.27
0908	↓	7	968719	4.94	7.00	1406	1406	7.07
0911	↓	10	962648	10.17	10.03		1409	9.94
Conductivity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (mS/cm)	Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Date & Time	Result
0915	Aimee S.	1.413	06A037	1.421	1.413	1412	1412	1.372
Turbidity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (NTU)	Lot #	NTU Stab	NTU Cal		Date & Time	Result
0929	Aimee S.	0		0.8	0.0		1415	8.4
09	↓	126		117.6	126.0		1418	125.4

Model: 650 HDS / YSI 6920 V2
 Rental ID: _____

Calibration Location: Walmart Parking Lot

Record date, time, and calibration analyst's name as you calibrate.
 Record Lot # of each calibration solution.
 Record temperature of pH solutions.
 Record whether it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Comments: _____

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-01

Date: 5/13/2020 Time: 12:15 PM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 65 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.95 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.53 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Strong flow, clear water, no odor. No trash observed near sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/13/2020 0912	14.5	9.95	0.193	2.90	6.58	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20200513 Time Collected: 12:17 PM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-02

Date: 5/13/2020 Time: 11:45 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 65 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.69 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.53 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Strong flow, clear water, no odor. No trash observed along shore.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/13/2020 0912	12.0	10.40	0.355	9.97	6.79	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20200513 Time Collected: 11:57 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-03

Date: 5/13/2020 Time: 11:30 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 64 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.95 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.49 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Strong flow, clear water, no odor. No debris.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/13/2020 0912	13.2	10.26	0.433	3.91	7.04	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20200513 Time Collected: 11:33 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-04

Date: 5/13/2020 Time: 10:55 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 62 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.95 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.44 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Strong flow, no odor. Water is slightly cloudy. A lot of trash observed along shore.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/13/2020 0912	12.0	10.90	0.357	0.81	7.01	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20200513 Time Collected: 11:05 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-05

Date: 5/13/2020 Time: 10:15 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 60 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.69 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.31 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear water, no odor, moderate flow. A lot of birds in the area. Some trash observed along the shore.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/13/2020 0912	10.5	10.66	0.344	3.50	6.72	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20200513 Time Collected: 10:20 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-06

Date: 5/13/2020 Time: 9:37 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 58 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.69 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.24 feet X High Low Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Moderate flow, no odor, minimal debris. Water is very clear. Appears to be less trash than usual. Transient encampments present.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/13/2020 0912	11.8	9.17	4.269	3.51	6.65	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20200513 Time Collected: 9:53 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-01

Date: 5/14/2020 Time: 10:59 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 68 °F Weather: Partly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.69 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.45 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear, fast moving and odorless. Lots of vegetation and wildlife present around sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/14/2020 0836	12.7	10.21	0.320	1.5	6.95	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20200514 Time Collected: 11:11 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-02

Date: 5/14/2020 Time: 10:18 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 64 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.45 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.25 feet High Low X Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear and fast moving. Some algae growth present on the stream bed. Trash present around the sampling location. Lots of wildlife activity – birds.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/14/2020 0836	11.7	8.11	0.369	1.05	7.06	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20200514 Time Collected: 10:25 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-03

Date: 5/14/2020 Time: 9:59 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 64 °F Weather: Partly cloudy, sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.69 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.17 feet High Low X Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear, steady moving water. Water appears to be slightly cloudy. Trash observed around sampling location. No odor. Water bank is very sandy.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/14/2020 0836	11.5	8.23	0.337	1.55	7.00	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20200514 Time Collected: 10:05 AM

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID MADP-20200514 Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-04

Date: 5/14/2020 Time: 9:33 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 61 °F Weather: Partly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.45 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.11 feet High Low X Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Stream is slow flowing and cloudy. Some bacterial sheen observed near sampling location. Iron flocculation observed. Frogs present at
sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/14/2020 0836	11.4	5.98	0.420	5.91	6.87	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20200514 Time Collected: 9:46 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-05

Date: 5/14/2020 Time: 9:14 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 59 °F Weather: Mostly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.69 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 1.00 feet High Low X Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water level is a lot higher than normal. Bacterial film/sheen observed near sampling location. Sample was collected downstream from standard location, due to higher than normal water level. Water is cloudy and fast moving.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/14/2020 0836	11.4	8.36	0.365	3.35	7.40	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA05-20200514 Time Collected: 9:23 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-06

Date: 5/14/2020 Time: 08:50 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 53 °F Weather: Slightly cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.02 inches Type: X Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.95 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 0.94 feet High X Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Site has a slightly sewage odor. Water is slowly flowing and cloudy. Crane (bird) seen at sampling location. Trash observed around sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI DSS 46376	5/14/2020 0836	12.4	7.10	0.739	2.46	7.45	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20200514 Time Collected: 9:03 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Multi-Probe Sonde Calibration Record

05/14/2020, Thursday
Aguirre + Rona

pH Standard						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	pH Std	Lot #	Stab pH	Cal pH		Date & Time	Result
0832	RD/AP	4		7.00	7.00		1131	4.14
0833	RD/AP	7		6.91	7.04		113A	7.04
0834	KD/AP	10		10.03	10.00		1136	10.02
Conductivity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (mS/cm)	Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Date & Time	Result
0838	RD/AP	1.413		1.503	1.413		1139	1.304 1.304
Turbidity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (NTU)	Lot #	NTU Stab	NTU Cal		Date & Time	Result
0827	RD/AP	0		2.037	0.00		11:27	-0.12
0829	RD/AP	126		118.10	126.00		11:29	124.11

Model: YSI PRO DSS
 Rental ID: 174100363
626910-10

Calibration Location: Walmart Parking Lot
Post cal - Walmart parking lot

Record date, time, and calibration analyst's name as you calibrate.
 Record Lot # of each calibration solution.
 Record temperature of pH solutions.
 Record whether it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Comments: Turb. was calibrated when conditions were sunny.
post-cal done in cloudy conditions.

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Multi-Probe Sonde Calibration Record

*13 May 2020, Wednesday
Aga, ma + Lona*

pH Standard						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	pH Std	Lot #	Stab pH	Cal pH		Date & Time	Result
<i>0904</i>		4	<i>76E1020</i>	<i>3.74</i>	<i>4.00</i>		<i>1247</i>	<i>4.14</i>
<i>0905</i>		7	<i>06A693</i>	<i>4.91</i>	<i>7.05</i>		<i>1248</i>	<i>7.05</i>
<i>0907</i>		10	<i>76L648</i>	<i>10.15</i>	<i>10.00</i>		<i>1249</i>	<i>10.02</i>
Conductivity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (mS/cm)	Lot #	SC (mS/cm) Stab	SC (mS/cm) Cal		Date & Time	Result
<i>0908</i>		1.413	<i>76H974</i>	<i>1.560</i>	<i>1.413</i>		<i>1250</i>	<i>1.481</i>
Turbidity						Temp (oC)	Bump	
Date & Time	Calibration Analyst's Name	Std (NTU)	Lot #	NTU Stab	NTU Cal		Date & Time	Result
<i>0909</i>	<i>Y51</i>	0	<i>19330173</i>	<i>0.074</i>	<i>0.0</i>		<i>1246</i>	<i>1.72</i>
<i>0912</i>		126	<i>20B200500</i>	<i>123.835</i>	<i>126.0</i>		<i>1245</i>	<i>126.31</i>

Model: *YSI Pro DSS*
 Rental ID: _____

Calibration Location: *Behind Pine Environmental*

Record date, time, and calibration analyst's name as you calibrate.
 Record Lot # of each calibration solution.
 Record temperature of pH solutions.
 Record whether it is a calibration or bump test. If it is a bump test, start on an empty row. Record the result under "Stab" columns and record N/A under "Cal" columns.

Comments: *Pro did not include 0 NTU solution - we need to specify need with Pro DSS*

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-01

Date: 6/10/2020 Time: 10:59 AM

Field Personnel: Agrima Poudel and John Pellegrino GPS Coordinates: 39.15013 (Lat.) -76.66172 (Long.)

Weather Conditions:

Ambient Air Temperature: 84 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.45 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.46 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Fast-moving and clear water, with no odor or other indicators of pollution. High presence of vegetation and wildlife.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/10/2020 0836	19.14	8.14	0.215	3.3	7.45	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU01-20200610 Time Collected: 11:06 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-02

Date: 6/10/2020 Time: 10:31 AM

Field Personnel: Agrima Poudel and John Pellegrino GPS Coordinates: 39.16994 (Lat.) -76.63152 (Long.)

Weather Conditions:

Ambient Air Temperature: 84 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.45 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.51 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is clear and fast moving. Vegetation and wildlife present. Debris (twigs/branches/leaves) present in flow.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/10/2020 0836	17.98	8.38	0.323	4.6	7.50	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU02-20200610 Time Collected: 10:42 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-03

Date: 6/10/2020 Time: 10:07 AM

Field Personnel: Agrima Poudel and John Pellegrino GPS Coordinates: 39.17252 (Lat.) -76.62697 (Long.)

Weather Conditions:

Ambient Air Temperature: 82 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.45 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.52 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Strong flow, clear water, no odor. Bank is very sandy; vegetation very overgrown. Transient encampment present nearby.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/10/2020 0836	18.52	8.32	0.467	5.4	7.53	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU03-20200610 Time Collected: 10:16 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-04

Date: 6/10/2020 Time: 9:43 AM

Field Personnel: Agrima Poudel and John Pellegrino GPS Coordinates: 39.17770 (Lat.) -76.62106 (Long.)

Weather Conditions:

Ambient Air Temperature: 81 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.69 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.52 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Strong flow, no odor, clear water. Vegetation is overgrown.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/10/2020 0836	18.83	8.45	0.389	5.0	7.35	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU04-20200610 Time Collected: 9:55 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-05

Date: 6/10/2020 Time: 9:06 AM

Field Personnel: Agrima Poudel and John Pellegrino GPS Coordinates: 39.18275 (Lat.) -76.61593 (Long.)

Weather Conditions:

Ambient Air Temperature: 81 °F Weather: Partly Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: Rain Snow Mix

Day of Sampling: 0.00 inches Type: Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.48 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.41 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Clear water, no odor, strong flow.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/10/2020 0836	17.73	8.45	0.375	7.3	7.63	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU05-20200610 Time Collected: 9:15 AM

QA/QC samples: Duplicate Sample (Yes/No) Yes Sample ID FUDUP-20200610 Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: FU-06

Date: 6/10/2020 Time: 8:40 AM

Field Personnel: Agrima Poudel and John Pellegrino GPS Coordinates: 39.18181 (Lat.) -76.60700 (Long.)

Weather Conditions:

Ambient Air Temperature: 79 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.00 inches Type: __ Rain ___ Snow ___ Mix

Day of Sampling: 0.00 inches Type: __ Rain ___ Snow ___ Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 5.45 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.30 feet X High ___ Low ___ Ebb

Low Flow (Baseflow) Sample / High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Slow flow, high tide, no odor, minimal debris. Water is very turbid. Transient encampments present.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/10/2020 0836	23.35	5.25	3.343	41.5	6.96	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: FU06-20200610 Time Collected: 8:51 AM

QA/QC samples: Duplicate Sample (Yes/No) __ No __ Sample ID __ N/A __ Field Blank (Yes/No) __ No __

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-01

Date: 6/11/2020 Time: 11:00 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.13693 (Lat.) -76.61356 (Long.)

Weather Conditions:

Ambient Air Temperature: 77 °F Weather: Raining

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.24 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 7.30 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.68 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is murky and fast moving. Trash observed in and around stream.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/11/2020 0841	20.42	6.78	0.319	20.9	8.11	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA01-20200611 Time Collected: 11:15 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-02

Date: 6/11/2020 Time: 10:30 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14233 (Lat.) -76.60846 (Long.)

Weather Conditions:

Ambient Air Temperature: 80 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.24 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 7.01 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.78 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is murky and slow moving; garbage present around sampling location.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/11/2020 0841	20.83	6.42	0.317	28.7	7.88	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA02-20200611 Time Collected: 10:35 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-03

Date: 6/11/2020 Time: 10:10 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14378 (Lat.) -76.60640 (Long.)

Weather Conditions:

Ambient Air Temperature: 80 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.24 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.47 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.75 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Slow flow, murky water. Garbage from recent high flows present in and around stream. Birds in the area.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/11/2020 0841	20.98	6.75	0.600	29.7	7.77	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA03-20200611 Time Collected: 10:20 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-04

Date: 6/11/2020 Time: 9:45 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14841 (Lat.) -76.60388 (Long.)

Weather Conditions:

Ambient Air Temperature: 79 °F Weather: Sunny

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.24 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.47 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.71 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Stream is slow flowing and murky. Fecal odor present at sampling location. A lot of vegetation observed. Evidence of frog activity. Birds in the area.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/11/2020 0841	21.08	1.32	0.353	91.0	6.88	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA04-20200611 Time Collected: 9:55 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-05

Date: 6/11/2020 **Time:** 9:30 AM

Field Personnel: Agrima Poudel and Rona Durborow

GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.24 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.47 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.69 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is slow flowing. Sample was collected downstream from designated location, due to access being inhibited by higher than normal water level. Water is murky with no odor. Debris from flooding present (organic & garbage). Bird activity nearby.

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/11/2020 0841	23.05	6.43	0.258	18.9	8.02	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA05-20200611 **Time Collected:** 9:35 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) No

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Sampling Station ID: MA-06

Date: 6/11/2020 Time: 09:05 AM

Field Personnel: Agrima Poudel and Rona Durborow GPS Coordinates: 39.14881 (Lat.) -76.60143 (Long.)

Weather Conditions:

Ambient Air Temperature: 78 °F Weather: Cloudy

Precipitation Data (obtain BWI data from <https://w2.weather.gov/climate/index.php?wfo=lwx>):

Past 72 hours prior to sampling: 0.09 inches Type: X Rain Snow Mix

Day of Sampling: 0.24 inches Type: X Rain Snow Mix

Flow Determination:

USGS Gauge Data (obtain from <https://waterdata.usgs.gov/usa/nwis/uv?01589500>): 6.47 cfs

Tide Level (obtain from <https://tidesandcurrents.noaa.gov/stationhome.html?id=8574680>): 2.61 feet X High Low Ebb

Low Flow (Baseflow) Sample High Flow (Storm Event) sample (refer to tables on back and circle one)

Site Condition Observations (note things such as unusual sampling conditions, algal blooms, accumulated debris, presence of transient encampments, congregations or evidence of avian or other wildlife, stream water characteristics [color, turbidity, odor, flow, etc.]):

Water is murky and slow flowing. A lot of vegetation and animal activity around the sampling location (insects and birds).

FIELD MEASUREMENTS

Instrument ID	Last Calibration (Date/Time)	Temp (°C)	DO (mg/L)	Specific Cond. (mS/cm)	Turbidity (NTUs)	pH (SU)	Chlorine (mg/L)
YSI 6920 #5703	6/11/2020 0841	22.84	1.08	6.746	14.2	6.6	N/A

BACTERIA SAMPLE COLLECTION

Sample ID: MA06-20200611 Time Collected: 9:15 AM

QA/QC samples: Duplicate Sample (Yes/No) No Sample ID N/A Field Blank (Yes/No) Yes; MABLK-20200611

Anne Arundel County Bacteria TMDL Monitoring: Marley and Furnace Creek Watersheds

Field Data Sheet

Flow Determination Threshold Rates

Monitoring Point Name	High Flow Threshold (cfs)	Low Flow threshold (cfs)
FU-1	> 18.70	<= 18.70
FU-2	> 18.70	<= 18.70
FU-3	> 18.70	<= 18.70
FU-4	> 18.70	<= 18.70
FU-5	> 18.70	<= 18.70
MA-1	> 18.37	<= 18.37
MA-2	> 18.37	<= 18.37
MA-3	> 18.37	<= 18.37
MA-4	> 18.37	<= 18.37
MA-5	> 18.37	<= 18.37

Tidal Monitoring Points Average High/Low Tide

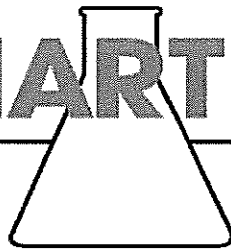
Monitoring Point Name	Average High Tide (feet)	Average Low Tide (feet)
FU-6	1.37	0.22
MA-6	1.37	0.22

Appendix C

Laboratory Reports and Chain of Custody Forms

Laboratory Analytical Results and Chain of Custody Forms

MARTEL



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 44000.

Samples received by Martel.

P.O. Number: 115488

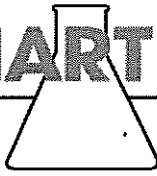
Project Identification: 60607423, AA County Entero - 7/10/19

Friday, July 12, 2019

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
44000 000001	Furnace Creek 07	07/10/2019 13:20			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	179	mpn/100ml	SM Enterolert	1	07/10/2019 15:24 MA
44000 000002	Furnace Creek 06	07/10/2019 09:01			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	866	mpn/100ml	SM Enterolert	1	07/10/2019 15:24 MA
44000 000003	Furnace Creek 05	07/10/2019 10:05			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	222	mpn/100ml	SM Enterolert	1	07/10/2019 15:24 MA
44000 000004	Furnace Creek 04	07/10/2019 10:59			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	260	mpn/100ml	SM Enterolert	1	07/10/2019 15:24 MA
44000 000005	Furnace Creek 03	07/10/2019 11:40			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	140	mpn/100ml	SM Enterolert	1	07/10/2019 15:24 MA
44000 000006	Furnace Creek 02	07/10/2019 12:46			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	517	mpn/100ml	SM Enterolert	1	07/10/2019 15:24 MA



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
44000 000007	Furnace Creek 01				07/10/2019 13:40
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	345	mpn/100ml	SM Enterolert	1	07/10/2019 15:24 MA

SMPLOG03

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054 EMAIL: martel@martellabs.com

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stdshdl.frx

Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.


Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054

Martel Log # <u>44000</u> Client Code <u>AECOM G.</u>	Sampler <u>Agrima Poudel</u>
Client Name/Phone/FAX: <u>AECOM 1301-820-3488 (301-820) 3000</u>	Project Name/# <u>AA CO ENTERO</u>
Client Address: <u>12920 Milestone Center Dr</u>	Contract/P.O Number <u>P^o: 601607423 / PO: 115488</u>
Email Address: <u>agrima.poudel@acom.com</u>	Sample Turnaround Time

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
FU07-20190710	Furnace Creek 07	W	STERIL BOTTLE FLIP TOP / SOD THIO	1	7/10/19	13:20	IDDEX ENTEROINT
FU06-20190710	Furnace Creek 06	↓	↓	1	↓	9:01	↓
FU05-20190710	Furnace Creek 05	↓	↓	1	↓	10:05	↓
FU04-20190710	Furnace Creek 04	↓	↓	1	↓	10:59	↓
FU03-20190710	Furnace Creek 03	↓	↓	1	↓	11:40	↓
FU02-20190710	Furnace Creek 02	↓	↓	1	↓	12:40	↓
FU01-20190710	Furnace Creek 01	↓	↓	1	↓	13:40	↓

Transferred by: <u>J. Deo</u>	Received by: <u>[Signature]</u>	Date: <u>7/10/19</u>	Time: <u>1501</u>	Cooler Receipt Information (LAB USE ONLY) Received on ice/ice packs? <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No temp. = <u>2.0°C</u> Sample containers pres'd? - <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No If No, explain Custody Seal present/intact? - Yes / <input checked="" type="checkbox"/> No <u>N/A</u>
Transferred by:	Received by:	Date:	Time:	
Transferred by:	Received by:	Date:	Time:	

Initials: [Signature] Date: 7/10/19



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 44028.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 7/11/19

Tuesday, July 16, 2019

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44028	000001	Marley Creek 06				07/11/2019 08:40
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	365	mpn/100ml	SM Enterolert	1	07/11/2019 15:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44028	000002	Marley Creek 05				07/11/2019 09:21
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	345	mpn/100ml	SM Enterolert	1	07/11/2019 15:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44028	000003	Marley Creek 04				07/11/2019 09:40
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	461	mpn/100ml	SM Enterolert	1	07/11/2019 15:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44028	000004	Marley Creek 03				07/11/2019 10:53
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	378	mpn/100ml	SM Enterolert	1	07/11/2019 15:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44028	000005	Marley Creek 02				07/11/2019 11:45
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	613	mpn/100ml	SM Enterolert	1	07/11/2019 15:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44028	000006	Marley Creek 01				07/11/2019 12:47
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	727	mpn/100ml	SM Enterolert	1	07/11/2019 15:11 MA	

Martel Laboratories JDS Inc.

SMPLOG03

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
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AECOMG

Page 2 OF 2
07/16/2019
stdshdl.frx**Notes and references:**

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.



Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054

Martel Log # <u>44028</u> Client Code <u>AECOM6</u> Client Name/Phone/FAX: <u>AECOM 1301-820-3488 1301-820-3000</u> Client Address: <u>12420 Millstone Center Dr. Suite 150 Germantown</u> <u>MD, 20874</u> Email Address: <u>ayrma.poude1@aecom.com</u>	Sampler <u>Ayrima Poude1</u> Project Name/# <u>AA Co Entero</u> Contract/P.O Number <u>601607923</u> Sample Turnaround Time
--	--

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
MA01-20190711	Marley Creek -01	W	steril bottle flip top / sod. thio	1	7/11/19	840	IDDEX Entero1ert
MA05-20190711	Marley Creek -05	↓	↓	↓	↓	921	↓
MA04-20190711	Marley Creek -04	↓	↓	↓	↓	940	↓
MA03-20190711	Marley Creek -03	↓	↓	↓	↓	1053	↓
MA02-20190711	Marley Creek -02	↓	↓	↓	↓	1145	↓
MA01-20190711	Marley Creek -01	↓	↓	↓	↓	1247	↓

Transferred by: <u>Schw Poubertino</u>	Received by: <u>[Signature]</u>	Date: <u>7/11/19</u>	Time: <u>1424</u>	Cooler Receipt Information (LAB USE ONLY) Received on ice/ice packs? - Yes/No temp. = <u>7.8</u> Sample containers pres'd? - <input checked="" type="checkbox"/> Yes/No If No, explain Custody Seal present/intact? - Yes/No <u>(N/A)</u> Initials: <u>[Signature]</u> Date: <u>7/11/19</u>
Transferred by:	Received by:	Date:	Time:	
Transferred by:	Received by:	Date:	Time:	



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 44456.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 8/14/19

Wednesday, August 21, 2019

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44456	000001	FU01-20190814				08/14/2019 11:50
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	687	mpn/100ml	SM Enterolert	1	08/14/2019 14:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44456	000002	FU02-20190814				08/14/2019 11:26
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	166	mpn/100ml	SM Enterolert	1	08/14/2019 14:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44456	000003	FU03-20190814				08/14/2019 10:55
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	365	mpn/100ml	SM Enterolert	1	08/14/2019 14:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44456	000004	FU04-20190814				08/14/2019 10:30
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	866	mpn/100ml	SM Enterolert	1	08/14/2019 14:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44456	000005	FU05-20190814				08/14/2019 09:55
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	517	mpn/100ml	SM Enterolert	1	08/14/2019 14:11 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44456	000006	FU06-20190814				08/14/2019 09:15
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	921	mpn/100ml	SM Enterolert	1	08/14/2019 14:11 MA	

Martel Laboratories JDS Inc.

SMPLOG03

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AECOMG

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08/21/2019
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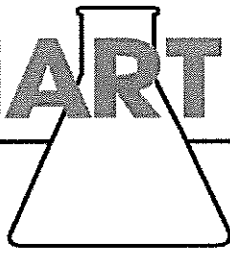
Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.



Project Manager



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 44516.

Samples received by Martel.

P.O. Number: 115488

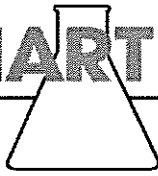
Project Identification: #60607423, AA County Entero - 8/15/19

Wednesday, August 21, 2019

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44516	000001	MA01- 20190815				08/15/2019 11:24
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	248	mpn/100ml	SM Enterolert	1	08/15/2019 14:45 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44516	000002	MA02- 20190815				08/15/2019 10:45
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	1200	mpn/100ml	SM Enterolert	1	08/15/2019 14:45 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44516	000003	MA03- 20190815				08/15/2019 10:20
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	770	mpn/100ml	SM Enterolert	1	08/15/2019 14:45 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44516	000004	MA04- 20190815				08/15/2019 09:33
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	921	mpn/100ml	SM Enterolert	1	08/15/2019 14:45 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44516	000005	MA05- 20190815				08/15/2019 08:50
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	210	mpn/100ml	SM Enterolert	1	08/15/2019 14:45 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44516	000006	MA06- 20190815				08/15/2019 08:25
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	921	mpn/100ml	SM Enterolert	1	08/15/2019 14:45 MA	



MARTEL NO.		CLIENT SAMPLE IDENTIFICATION			Sample Date/Time	
44516	000007	MADP- 20190815			08/15/2019 09:15	
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	1550	mpn/100ml	SM Enterolert	1	08/15/2019 14:45 MA	

SMPLOG03

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Page 2 OF 2

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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.


Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054

Martel Log # 44516 Client Code AECOM G.
 Client Name/Phone/FAX: 12420 MILESTONE CENTER DR, SUITE 150
GERMANTOWN, MD 20876
 Client Address: AECOM (740) 409-0227 / (301) 820-3000
 Email Address: john.pellegrino@aecom.com / agrima.poudel@aecom.com

Sampler AGRIMA POUDEL
 Project Name/# A.A. CO. ENTERO.
 Contract/P.O Number 60607423 / 115488
 Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
MA01- 20190815	MA-01	W	sterile plastic	1	8/15/19	1124	1DDEX ENTEROLERT
MA02- 20190815	MA-02	↓	↓	↓	↓	1045	↓
MA03- 20190815	MA-03	↓	↓	↓	↓	1020	
MA04- 20190815	MA-04	↓	↓	↓	↓	0933	
MA05- 20190815	MA-05	↓	↓	↓	↓	0850	
MA06- 20190815	MA-06	↓	↓	↓	↓	0825	
MA0P- 20190815	MA-DP	↓	↓	↓	↓	0915	

Transferred by: <u>John Pellegrino</u>	Received by: <u>Mary Adelman</u>	Date: <u>8/15/19</u>	Time: <u>1308</u>
Transferred by: _____	Received by: _____	Date: _____	Time: _____
Transferred by: _____	Received by: _____	Date: _____	Time: _____

Cooler Receipt Information (LAB USE ONLY)

Received on ice/ice packs? Yes / No temp. = 6.0°C

Sample containers pres'd? Yes / No If No, explain _____

Custody Seal present/intact? - Yes No N/A

Initials: MA Date: 8/15/19

AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 44888.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 9/11/19

Tuesday, September 17, 2019

FINAL**Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44888	000001	FU05-20190911				09/11/2019 10:14
Compound	Test Value	Test Unit	Method	Detection Limit		Analysis Date/Time/Initial
Enterococcus, Quantitray	210	mpn/100ml	SM Enterolert	1		09/11/2019 15:58 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44888	000002	FU04-20190911				09/11/2019 10:40
Compound	Test Value	Test Unit	Method	Detection Limit		Analysis Date/Time/Initial
Enterococcus, Quantitray	435	mpn/100ml	SM Enterolert	1		09/11/2019 15:58 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44888	000003	FU03-20190911				09/11/2019 11:15
Compound	Test Value	Test Unit	Method	Detection Limit		Analysis Date/Time/Initial
Enterococcus, Quantitray	53	mpn/100ml	SM Enterolert	1		09/11/2019 15:58 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44888	000004	FU02-20190911				09/11/2019 11:45
Compound	Test Value	Test Unit	Method	Detection Limit		Analysis Date/Time/Initial
Enterococcus, Quantitray	133	mpn/100ml	SM Enterolert	1		09/11/2019 15:58 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44888	000005	FU01-20190911				09/11/2019 12:35
Compound	Test Value	Test Unit	Method	Detection Limit		Analysis Date/Time/Initial
Enterococcus, Quantitray	127	mpn/100ml	SM Enterolert	1		09/11/2019 15:58 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44888	000006	FU06-20190911				09/11/2019 13:25
Compound	Test Value	Test Unit	Method	Detection Limit		Analysis Date/Time/Initial
Enterococcus, Quantitray	199	mpn/100ml	SM Enterolert	1		09/11/2019 15:58 MA



Martel Laboratories *JDS* Inc.

SEP17K0

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Page 2 OF 2

09/17/2019

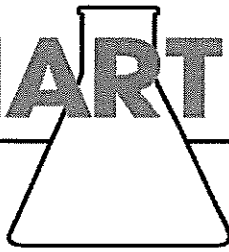
stdshdl.frx

Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.


Project Manager

**AECOM**

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 44931.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 9/12/19

Tuesday, September 17, 2019

FINAL**Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44931	000001	MA06-20190912				09/12/2019 08:45
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	228	mpn/100ml	SM Enterolert	1	09/12/2019 15:57 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44931	000002	MA05-20190912				09/12/2019 09:25
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	179	mpn/100ml	SM Enterolert	1	09/12/2019 15:57 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44931	000003	MA04-20190912				09/12/2019 10:10
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	517	mpn/100ml	SM Enterolert	1	09/12/2019 15:57 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44931	000004	MADP-20190912				09/12/2019 10:12
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	649	mpn/100ml	SM Enterolert	1	09/12/2019 15:57 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44931	000005	MA03-20190912				09/12/2019 10:48
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	71	mpn/100ml	SM Enterolert	1	09/12/2019 15:57 MA	
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION					Sample Date/Time
44931	000006	MA02-20190912				09/12/2019 11:30
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial	
Enterococcus, Quantitray	70	mpn/100ml	SM Enterolert	1	09/12/2019 15:57 MA	

MARTEL NO. 44931	000007	CLIENT SAMPLE IDENTIFICATION MA01-20190912			Sample Date/Time 09/12/2019 12:12	
Compound		Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray		72	mpn/100ml	SM Enterolert	1	09/12/2019 15:57 MA

MARTEL NO. 44931	000008	CLIENT SAMPLE IDENTIFICATION MABK-20190912			Sample Date/Time 09/12/2019 08:15	
Compound		Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray		<1	mpn/100ml	SM Enterolert	1	09/12/2019 15:57 MA

SEP17L0

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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.

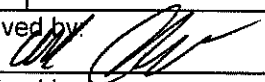

Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

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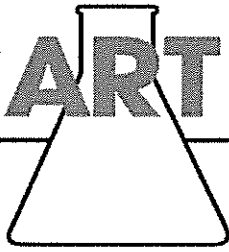
Martel Log # <u>44931</u>	Client Code <u>AECOMG.</u>	Sampler <u>Aimee Schyppin</u>
Client Name/Phone/FAX: <u>AECOM 301-820-3488 1301-820-3000</u>		Project Name/# <u>AA Co Enters</u>
Client Address: <u>12420 Milestone Center Dr Suite 150 Beltsville</u> <u>MD 20876 powder</u>		Contract/P.O Number <u>60607423</u>
Email Address: <u>agrima.patel@e.aecom.com</u>		Sample Turnaround Time

Station No/ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
MA06- 20190912	Marley Creek - 06	W	steril bottle flip-top /	1	9/12/19	0845	1 DDEX Enterobierb
MA05- 20190912	Marley Creek - 05	W	steril bottle flip-top	1	9/12/19	0925	1 DDEX Enterobierb
MA04- 20190912	Marley Creek - 04	W	steril bottle flip-top	1	9/12/19	1010	1 DDEX Enterobierb
MA01- 20190912	Ma - DP	W	steril bottle flip-top	1	9/12/19	1012	1 DDEX Enterobierb
MA03- 20190912	Marley Creek - 03	W	steril bottle flip-top	1	9/12/19	1048	1 DDEX Enterobierb
MA02 20190912	Marley Creek - 02	W	steril bottle flip-top	1	9/12/19	1130	1 DDEX Enterobierb
MA01 20190912	Marley Creek - 01	W	steril bottle flip-top	1	9/12/19	1212	1 DDEX Enterobierb
MA03- 20190912	MA - BK	W	steril bottle flip-top	1	9/12/19	0820 0815	1 DDEX Enterobierb

Transferred by: <u>Aimee Schyppin</u>	Received by: 	Date: <u>9/12/19</u>	Time: <u>13:25</u>	Cooler Receipt Information (LAB USE ONLY) Received on ice/ice packs? <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No temp. = <u>1.0°C</u> Sample containers pres'd? - <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No If No, explain Custody Seal present/intact? - <input checked="" type="checkbox"/> Yes / <input type="checkbox"/> No N/A
Transferred by:	Received by:	Date:	Time:	
Transferred by:	Received by:	Date:	Time:	

Initials: AT Date: 9/12/19

MARTEL



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 45329.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 10/9/19

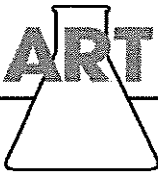
Monday, October 14, 2019

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
45329 000001	FU06-20191009	10/09/2019 10:15			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	387	mpn/100ml	SM Enterolert	1	10/09/2019 14:02 MA
45329 000002	FU05-20191009	10/09/2019 10:40			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	579	mpn/100ml	SM Enterolert	1	10/09/2019 14:02 MA
45329 000003	FU04-20191009	10/09/2019 11:07			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	488	mpn/100ml	SM Enterolert	1	10/09/2019 14:02 MA
45329 000004	FU03-20191009	10/09/2019 11:32			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	187	mpn/100ml	SM Enterolert	1	10/09/2019 14:02 MA
45329 000005	FU02-20191009	10/09/2019 11:56			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	261	mpn/100ml	SM Enterolert	1	10/09/2019 14:02 MA
45329 000006	FU01-20191009	10/09/2019 12:20			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	99	mpn/100ml	SM Enterolert	1	10/09/2019 14:02 MA

MARTEL



Certificate of Analysis

Martel Laboratories JDS Inc.

SMPLOG03

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054 EMAIL: martel@martellabs.com

AECOMG

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10/14/2019
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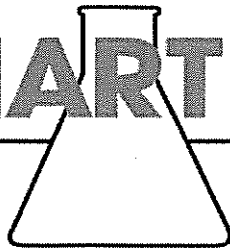
Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.

Project Manager

MARTEL



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 45355.

Samples received by Martel.

P.O. Number: 115488

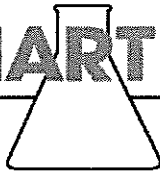
Project Identification: #60607423, AA County Entero - 10/10/19

Monday, October 14, 2019

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
45355 000001	MA01-20191010	10/10/2019 11:30			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	34	mpn/100ml	SM Enterolert	1	10/10/2019 14:23 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
45355 000002	MA02-20191010	10/10/2019 10:55			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	47	mpn/100ml	SM Enterolert	1	10/10/2019 14:23 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
45355 000003	MA03-20191010	10/10/2019 10:20			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	104	mpn/100ml	SM Enterolert	1	10/10/2019 14:23 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
45355 000004	MA04-20191010	10/10/2019 09:55			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	816	mpn/100ml	SM Enterolert	1	10/10/2019 14:23 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
45355 000005	MA05-20191010	10/10/2019 09:30			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	488	mpn/100ml	SM Enterolert	1	10/10/2019 14:23 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
45355 000006	MA06-20191010	10/10/2019 08:50			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	2420	mpn/100ml	SM Enterolert	1	10/10/2019 14:23 MA



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
45355 000007	MADP-20191010	10/10/2019 10:00			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	75	mpn/100ml	SM Enterolert	1	10/10/2019 14:23 MA

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1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054 EMAIL: martel@martellabs.com

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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation. Year in method code is approved date.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.


Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054

Martel Log # 45335 Client Code AECOM G1 Sampler Lona Durberow

Client Name/Phone/FAX: AECOM / 301-820-8488 / 301-820-3000 Project Name# AA Co. Entero

Client Address: 12420 Milestone Center Drive, Suite 150, Greenbelt, MD 20746 Contract/P.O Number 60407923

Email Address: Lona.durberow@aecom.com Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
HA01-20191010	Harley Creek - 01	W	Steril bottle flip top / Soad thio	1	10/10/19	1130	IDDEX Enterolert
HA02-20191010	Harley Creek - 02	W	Steril bottle flip top / Soad thio	1	10/10/19	1056	IDDEX Enterolert
HA03-20191010	Harley Creek - 03	W	Steril bottle flip top / Soad thio	1	10/10/19	1020	IDDEX Enterolert
HA04-20191010	Harley Creek - 04	W	Steril bottle flip top / Soad thio	1	10/10/19	0955	IDDEX Enterolert
HA05-20191010	Harley Creek - 05	W	Steril bottle flip top / Soad thio	1	10/10/19	0930	IDDEX Enterolert
HA06-20191010	Harley Creek - 06	W	Steril bottle flip top / Soad thio	1	10/10/19	0850	IDDEX Enterolert
HA0P-20191010	Harley Creek	W	Steril bottle flip top / Soad thio	1	10/10/19	0925 / 1130	IDDEX Enterolert
						10:00	

Transferred by: Lona Durberow Received by: [Signature] Date: 10/10/19 Time: 1300

Transferred by: _____ Received by: _____ Date: _____ Time: _____

Transferred by: _____ Received by: _____ Date: _____ Time: _____

Initials: AD Date: 10-10-19

Cooler Receipt Information (LAB USE ONLY)
 Received on ice/ice packs? Yes/No temp. = 5
 Sample containers pres'd? Yes/No If No, explain _____
 Custody Seal present/intact? - Yes/No N/A

AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 45801.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 11/12/19

Monday, November 18, 2019

FINAL**Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45801 000001	FURNACE CREEK 05				11/12/2019 10:20
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	33	mpn/100ml	SM Enterolert	1	11/13/2019 13:32 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45801 000002	FURNACE CREEK 04				11/12/2019 10:54
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	214	mpn/100ml	SM Enterolert	1	11/13/2019 13:32 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45801 000003	FURNACE CREEK 03				11/12/2019 11:11
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	39	mpn/100ml	SM Enterolert	1	11/13/2019 13:32 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45801 000004	FURNACE CREEK 02				11/12/2019 11:32
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	65	mpn/100ml	SM Enterolert	1	11/13/2019 13:32 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45801 000005	FURNACE CREEK 01				11/12/2019 11:53
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	24	mpn/100ml	SM Enterolert	1	11/13/2019 13:32 MA



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11/18/2019

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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.


Project Manager



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 45823.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 11/14/19

Monday, November 18, 2019

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45823 000001	FURNACE CREEK 06				11/14/2019 08:20
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	225	mpn/100ml	SM Enterolert	1	11/14/2019 13:08 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45823 000002	MARLEY CREEK 01				11/14/2019 11:25
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	35	mpn/100ml	SM Enterolert	1	11/14/2019 13:08 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45823 000003	MARLEY CREEK 02				11/14/2019 10:50
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	11/14/2019 13:08 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45823 000004	MARLEY CREEK 03				11/14/2019 10:30
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	11/14/2019 13:08 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45823 000005	MARLEY CREEK 04				11/14/2019 09:57
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	1730	mpn/100ml	SM Enterolert	1	11/14/2019 13:08 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45823 000006	MARLEY CREEK 05				11/14/2019 09:31
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	20	mpn/100ml	SM Enterolert	1	11/14/2019 13:08 MA



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45823	000007	MARLEY CREEK 06			11/14/2019 09:00
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	11/14/2019 13:08 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
45823	000008	MARLEY CREEK DUP			11/14/2019 09:57
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	11/14/2019 13:08 MA

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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation.

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Project Manager

AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 46181.

Samples received by Martel.

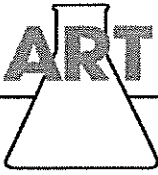
P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 12/11/19

Monday, December 16, 2019

FINAL**Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46181 000001	FU05-121119, FURNACE CREEK 05				12/11/2019 10:06
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	249	mpn/100ml	SM Enterolert	1	12/11/2019 13:58 MA
46181 000002	FU04-121119, FURNACE CREEK 04				12/11/2019 10:36
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	73	mpn/100ml	SM Enterolert	1	12/11/2019 13:58 MA
46181 000003	FU03-121119, FURNACE CREEK 03				12/11/2019 11:01
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	38	mpn/100ml	SM Enterolert	1	12/11/2019 13:58 MA
46181 000004	FU02-121119, FURNACE CREEK 02				12/11/2019 11:30
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	64	mpn/100ml	SM Enterolert	1	12/11/2019 13:58 MA
46181 000005	FU01-121119, FURNACE CREEK 01				12/11/2019 12:20
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	59	mpn/100ml	SM Enterolert	1	12/11/2019 13:58 MA



Martel Laboratories *JDS* Inc.

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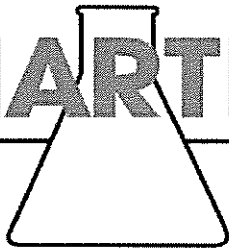
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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation.

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Project Manager



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 46230.

Samples received by Martel.

P.O. Number: 115488

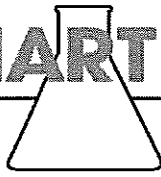
Project Identification: #60607423, AA County Entero - 12/12/19

Monday, December 16, 2019

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000001	MA06-121219, MARLEY CREEK 06				12/12/2019 09:40
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000002	MA05-121219, MARLEY CREEK 05				12/12/2019 10:02
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	105	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000003	MA04-121219, MARLEY CREEK 04				12/12/2019 10:36
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	548	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000004	MA03-121219, MARLEY CREEK 03				12/12/2019 11:15
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000005	MA02-121219, MARLEY CREEK 02				12/12/2019 11:36
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000006	MA01-121219, MARLEY CREEK 01				12/12/2019 12:15
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	98	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000007	FU06-121219, FURNACE CREEK 06				12/12/2019 08:40
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	64	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000008	MABK-121219, MARLEY CREEK BLANK				12/12/2019 08:30
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	<1	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46230 000009	MADP-121219, MARLEY CREEK DUPLICATE				12/12/2019 11:25
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	12/12/2019 14:20 MA

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Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 • Martel@Martellabs.com

Martel Log # 470280 Client Code AEL0MG Sampler GRACE DAI

Client Name/Phone/FAX: AEL0M/3018203000 Project Name/# AAL0 ENTERO/60607423

Client Address: 12420 MILSTONE CENTER DR GERMANTOWN MD 20876 Contract/P.O Number _____

Client Email Address: agrinn@public.ecom.com Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
MA06-121219	MARLEY CREEK 06	W	STERILE STERILE BOTTLE FLIP TOP	1	12/12/19	09:40	100EX ENTEROLERT
MA05-121219	05					10:02	
MA04-121219	04					10:36	
MA03-121219	03					11:15	
MA02-121219	02					11:36	
MA01-121219	01					12:15	
FA06-121219	FURNACE CREEK DU					08:40	
MA06-121219	MARLEY CREEK BLANK					08:30	
MA07-121219	MARLEY CREEK DUPLICATE					11:25	

Transferred by: GRACE DAI Received by: [Signature] Date: 12/12/19 Time: 13:43

Transferred by: _____ Received by: [Signature] Date: _____ Time: _____

Transferred by: _____ Received by: _____ Date: _____ Time: _____

Initials: GR Date: 12/12/19

Cooler Receipt Information (LAB USE ONLY)
 Received on ice/ice packs? Yes/No temp. = 4.7 °C
 Sample containers pres'd? Yes/No If No, explain _____
 Custody Seal present/intact? - Yes/No Yes



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 46548.

Samples received by Martel.

P.O. Number: 115488

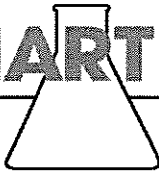
Project Identification: #60607423, AA County Entero - 1/8/20

Monday, January 13, 2020

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
46548 000001	FU06-20200108, FURNACE CREEK 06	01/08/2020 09:15			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	42	mpn/100ml	SM Enterolert	1	01/08/2020 13:12 MA
46548 000002	FU05-20200108, FURNACE CREEK 05	01/08/2020 09:49			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	20	mpn/100ml	SM Enterolert	1	01/08/2020 13:12 MA
46548 000003	FU04-20200108, FURNACE CREEK 04	01/08/2020 10:12			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	20	mpn/100ml	SM Enterolert	1	01/08/2020 13:12 MA
46548 000004	FU03-20200108, FURNACE CREEK 03	01/08/2020 10:36			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	6	mpn/100ml	SM Enterolert	1	01/08/2020 13:12 MA
46548 000005	FU02-20200108, FURNACE CREEK 02	01/08/2020 11:06			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	16	mpn/100ml	SM Enterolert	1	01/08/2020 13:12 MA
46548 000006	FU01-20200108, FURNACE CREEK 01	01/08/2020 11:32			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	23	mpn/100ml	SM Enterolert	1	01/08/2020 13:12 MA



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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.


Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories, JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 • Martel@Martellabs.com

Martel Log # 40548 Client Code AECOM
 Client Name/Phone/FAX: AECOM / 3018203000
 Client Address: 12420 MILBURN CENTER DR. BELMONTOWN, MD 20870
 Client Email Address: agyma.pundal@acocom.com

Sampler GLACE PAI
 Project Name# AA CO ENTERO/00007423
 Contract/P.O Number _____
 Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
FU06-2020108	FURNACE CREEK D6	W	sterile Bottle flip top	1	01/08/19	0915	1 DO EX ENTERO UBERT
FU05-2020108	05	/				0944	
FU04-2020108	04	/				1012	
FU03-2020108	03	/				1036	
FU02-2020108	02	/				1106	
FU01-2020108	01	↓		↓	↓	1132	↓

Transferred by: Glacia Dai Date: 1/8/20 Time: 12:00
 Received by: _____
 Transferred by: _____ Date: _____ Time: _____
 Received by: _____
 Transferred by: _____ Date: _____ Time: _____
 Received by: _____

Initials: CDL Date: 1/8/20

Cooler Receipt Information (LAB USE ONLY)
 Received on ice/ice packs? Yes / No temp. = 4.5°C
 Sample containers pres'd? Yes / No If No, explain _____
 Custody Seal present/intact? - Yes/No N/A



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 46573.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 1/9/20

Monday, January 13, 2020

**FINAL
Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46573 000001	MA06-20200109, Marley Creek				01/09/2020 08:48
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	980	mpn/100ml	SM Enterolert	1	01/09/2020 14:37 MA

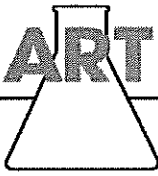
MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46573 000002	MA05-20200109, Marley Creek				01/09/2020 09:23
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	12	mpn/100ml	SM Enterolert	1	01/09/2020 14:37 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46573 000003	MA04-20200109, Marley Creek				01/09/2020 09:49
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	3	mpn/100ml	SM Enterolert	1	01/09/2020 14:37 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46573 000004	MA03-20200109, Marley Creek				01/09/2020 10:23
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	01/09/2020 14:37 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46573 000005	MA02-20200109, Marley Creek				01/09/2020 10:47
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	01/09/2020 14:37 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
46573 000006	MA01-20200109, Marley Creek				01/09/2020 11:52
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	5	mpn/100ml	SM Enterolert	1	01/09/2020 14:37 MA



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
46573 000007	MADP-20200109, Marley Creek	01/09/2020 10:35			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	01/09/2020 14:37 MA

SMPLOG03

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
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Page 2 OF 2

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Notes and references:

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Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

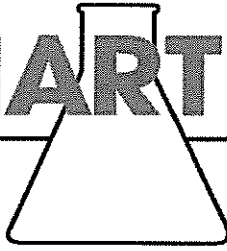
Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 • Martel@Martellabs.com

Martel Log # 44573 Client Code AECOMG Sampler Grave Dair
 Client Name/Phone/FAX: AECOM/3018203000 Project Name# AACO ENTERO / 00607423
 Client Address: 1240 MILESTONE CENTER DR. GERMANTOWN MD 20870 Contract/P.O Number _____
 Client Email Address: vgyrma.pouda1@aecom.com Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
MA06-20200109	MARLEY CREEK	W	sterile bottle Flip Top	1	01/09/2020	0848	IDDEX ENTEROLERT
MA05-20200109						0923	
MA04-20200109						0949	
MA05-20200109						1023	
MA02-20200109						1047	
MA01-20200109						1152	
MA07-20200109						1035	

Transferred by: Grave Dair Received by: [Signature] Date: 1/9/20 Time: 1300
 Transferred by: _____ Received by: _____ Date: _____ Time: _____
 Transferred by: _____ Received by: _____ Date: _____ Time: _____

Cooler Receipt Information (LAB USE ONLY)
 Received on ice/ice packs? Yes/No temp. = 3.0
 Sample containers present? Yes/No If No, explain _____
 Custody Seal present/intact? Yes/No DA
 Initials: oe Date: 1/9/20

**AECOM**

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 47000.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 2/12/20

Monday, February 17, 2020

FINAL**Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
47000 000001	FU06-20200212, FURNACE CREEK 06	02/12/2020 08:56			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	21	mpn/100ml	SM Enterolert	1	02/12/2020 13:42 MA
47000 000002	FU05-20200212, FURNACE CREEK 05	02/12/2020 10:21			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	15	mpn/100ml	SM Enterolert	1	02/12/2020 13:42 MA
47000 000003	FU04-20200212, FURNACE CREEK 04	02/12/2020 10:36			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	30	mpn/100ml	SM Enterolert	1	02/12/2020 13:42 MA
47000 000004	FU03-20200212, FURNACE CREEK 03	02/12/2020 10:54			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	15	mpn/100ml	SM Enterolert	1	02/12/2020 13:42 MA
47000 000005	FU02-20200212, FURNACE CREEK 02	02/12/2020 11:21			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	7	mpn/100ml	SM Enterolert	1	02/12/2020 13:42 MA
47000 000006	FU01-20200212, FURNACE CREEK 01	02/12/2020 11:42			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	7	mpn/100ml	SM Enterolert	1	02/12/2020 13:42 MA



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02/17/2020
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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.


Project Manager

MARTEL

AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 47036.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 2/13/20

Monday, February 17, 2020

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time
47036 000001	MA01-20200213, MARLEY CREEK 01	02/13/2020 10:59
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	270 mpn/100ml SM Enterolert	1 02/13/2020 13:57 MA
47036 000002	MA02-20200213, MARLEY CREEK 02	02/13/2020 10:29
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420 mpn/100ml SM Enterolert	1 02/13/2020 13:57 MA
47036 000003	MA03-20200213, MARLEY CREEK 03	02/13/2020 09:53
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420 mpn/100ml SM Enterolert	1 02/13/2020 13:57 MA
47036 000004	MA04-20200213, MARLEY CREEK 04	02/13/2020 09:28
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	727 mpn/100ml SM Enterolert	1 02/13/2020 13:57 MA
47036 000005	MA05-20200213, MARLEY CREEK 05	02/13/2020 09:01
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	139 mpn/100ml SM Enterolert	1 02/13/2020 13:57 MA
47036 000006	MA06-20200213, MARLEY CREEK 06	02/13/2020 08:41
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	1050 mpn/100ml SM Enterolert	1 02/13/2020 13:57 MA

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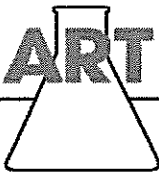
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Page 1 OF 2

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Questions, comments or concerns? Contact your Martel representative or email martel@martellabs.com

02/17/2020



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
47036	000007	MADP-20200213, MARLEY CREEK DUP			02/13/2020 09:40
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	02/13/2020 13:57 MA

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Project Manager

MARTEL

AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 47378.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 3/11/20

Monday, March 16, 2020

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
47378 000001	FU06-20200311, FURNACE CREEK- 06	03/11/2020 09:01			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	13	mpn/100ml	SM Enterolert	1	03/11/2020 13:42 MA
47378 000002	FU05-20200311, FURNACE CREEK- 05	03/11/2020 09:30			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	10	mpn/100ml	SM Enterolert	1	03/11/2020 13:42 MA
47378 000003	FU04-20200311, FURNACE CREEK- 04	03/11/2020 09:55			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	15	mpn/100ml	SM Enterolert	1	03/11/2020 13:42 MA
47378 000004	FU03-20200311, FURNACE CREEK- 03	03/11/2020 10:25			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	4	mpn/100ml	SM Enterolert	1	03/11/2020 13:42 MA
47378 000005	FU02-20200311, FURNACE CREEK- 02	03/11/2020 11:00			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	4	mpn/100ml	SM Enterolert	1	03/11/2020 13:42 MA
47378 000006	FU01-20200311, FURNACE CREEK- 01	03/11/2020 11:23			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	3	mpn/100ml	SM Enterolert	1	03/11/2020 13:42 MA

Martel Laboratories *JDS* Inc.

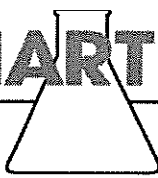
AECOMG

Page 1 OF 2

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054

Questions, comments or concerns? Contact your Martel representative or email martel@martellabs.com

03/16/2020



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
47378 000007	FUDP-20200311, FURNACE CREEK- DP				03/11/2020 10:10
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	<1	mpn/100ml	SM Enterolert	1	03/11/2020 13:42 MA

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1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054 EMAIL: martel@martellabs.com

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Notes and references:

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Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 826-7790 • FAX (410) 821-1054

Martel Log # 47378 Client Code AELDM6
 Client Name/Phone/FAX: AELDM/301-820-3488/301-820-3000
 Client Address: 12420 Milestone Center Drive, Suite 150, Germantown MD 20876
 Sampler PELLEGRINO
 Project Name/# AA Co. Entero
 Contract/P.O Number 00607423

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analysis Required/Comments
F406-20200311	Furnace Creek - 06	W	Starkle Bottle - Flip Top	1	03/11/2006	0901	1DDEK Enteroent
F405-20200311	-05					0930	
F404-20200311	-04					0955	
F403-20200311	-03					1025	
F402-20200311	-02					1100	
F401-20200311	-01					1123	
F400P-20200311	-DP					1010	

Sample Turnaround Time _____
 Cooler Receipt Information (LAB USE ONLY)
 Received on ice/ice packs? - Yes/No 3 temp. = 3
 Sample containers present? - Yes/No _____ If No, explain _____
 Custody Seal present/intact? - Yes/No N/A
 Transferred by: Sonia Pellegrino Date: 3/11/06 Time: 1315
 Received by: _____ Date: _____ Time: _____
 Transferred by: _____ Date: _____ Time: _____
 Initials: oe Date: 3/11/20

MARTEL

AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 47413.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 3/12/20

Monday, March 16, 2020

FINAL**Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
47413 000001	MABLNK-20200312, MARLEY BLANK	03/12/2020 08:00			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	<1	mpn/100ml	SM Enterolert	1	03/12/2020 15:18 MA
47413 000002	MA06-20200312, MARLEY CREEK 06	03/12/2020 08:42			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	03/12/2020 15:18 MA
47413 000003	MA05-20200312, MARLEY CREEK 05	03/12/2020 09:06			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	98	mpn/100ml	SM Enterolert	1	03/12/2020 15:18 MA
47413 000004	MA04-20200312, MARLEY CREEK 04	03/12/2020 09:25			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	2420	mpn/100ml	SM Enterolert	1	03/12/2020 15:18 MA
47413 000005	MA03-20200312, MARLEY CREEK 03	03/12/2020 10:05			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	03/12/2020 15:18 MA
47413 000006	MA02-20200312, MARLEY CREEK 02	03/12/2020 10:55			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	03/12/2020 15:18 MA



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
47413	000007	MA01-20200312, MARLEY CREEK 01			03/12/2020 11:55
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	29	mpn/100ml	SM Enterolert	1	03/12/2020 15:18 MA

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Notes and references:

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Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 • Martel@Martellabs.com

Martel Log # 40548 47413 Client Code AECOM6 Sampler Agrima Poudel
 Client Name/Phone/FAX: AECOM 3018203000 Project Name# _____
 Client Address: 12420 Miestone Center Dr Contract/P.O Number 60607423
 Client Email Address: agrima.poudel@aecom.com Sample Turnaround Time _____

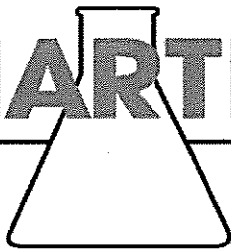
Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
MA00-20200312	MARLEY BLANK	W	STERIL BOTTLE FLIP TOP	1	3/12/20	8:00	ENTERO
MA00-20200312	MARLEY CREEK 01					0922	
MA05-20200312	MARLEY CREEK 05					0906	
MA04-20200312	MARLEY CREEK 04					0925	
MA03-20200312	MARLEY CREEK 03					1005	
MA02-20200312	MARLEY CREEK 02					1055	
MA01-20200312	MARLEY CREEK 01	↓	↓	↓	↓	1155	↓

Transferred by: [Signature] Received by: [Signature] Date: 3/12/20
 Time: 1315
 Transferred by: _____ Received by: _____ Date: _____
 Time: _____
 Transferred by: _____ Received by: _____ Date: _____
 Time: _____

Cooler Receipt Information (LAB USE ONLY)
 Received on ice/ice packs? Yes/No Yes/No temp = 3.5
 Sample containers pres'd? - Yes/No Yes/No if No, explain _____
 Custody Seal present/intact? - Yes/No N/A

Initials: AP Date: 3/12/20

MARTEL



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 47720.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 4/8/20

Monday, April 13, 2020

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
47720 000001	FU01-20200408, FURNACE CREEK 01	04/08/2020 12:00			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	11	mpn/100ml	SM Enterolert	1	04/08/2020 13:45 MA
47720 000002	FU02-20200408, FURNACE CREEK 02	04/08/2020 11:35			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	13	mpn/100ml	SM Enterolert	1	04/08/2020 13:45 MA
47720 000003	FU03-20200408, FURNACE CREEK 03	04/08/2020 11:00			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	727	mpn/100ml	SM Enterolert	1	04/08/2020 13:45 MA
47720 000004	FU04-20200408, FURNACE CREEK 04	04/08/2020 10:35			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	119	mpn/100ml	SM Enterolert	1	04/08/2020 13:45 MA
47720 000005	FU05-20200408, FURNACE CREEK 05	04/08/2020 10:15			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	159	mpn/100ml	SM Enterolert	1	04/08/2020 13:45 MA
47720 000006	FU06-20200408, FURNACE CREEK 06	04/08/2020 09:35			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	50	mpn/100ml	SM Enterolert	1	04/08/2020 13:45 MA

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Questions, comments or concerns? Contact your Martel representative or email martel@martellabs.com

04/13/2020



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
47720 000007	FUDP-20200408, FURNACE CREEK DUPLICATE	04/08/2020 11:45			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	8	mpn/100ml	SM Enterolert	1	04/08/2020 13:45 MA

SMPLOG03

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
PH 410-825-7790 FAX 410-821-1054 EMAIL: martel@martellabs.com

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Notes and references:

40CFR136=U.S. "Code of Federal Regulations", Title 40, Protection of the Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. SM="Standard Methods for the Examination of Water and Wastewater", American Public Health Association, American Water Works Association, and Water Environment Federation.

All samples tested were in acceptable condition, unless otherwise noted.
The results presented herein relate only to the samples or items tested.


Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 • Martel@Martellabs.com

Martel Log # 47720 • Client Code AECCMH67
 Client Name/Phone/FAX: AECCMH 301-820-3000
 Client Address: 12420 Milstone Center Drive
 Client Email Address: cgriwa.pourel@aecom.com

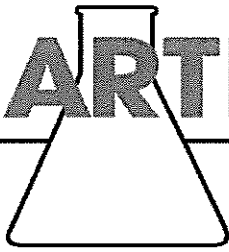
Sampler Rona Durbin
 Project Name/# _____
 Contract/P.O Number 60607423
 Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
FU01-20200408	Furnace Creek 01	W	Flip Top	1	7/8/20	1200	1 DDEX Intercolert
FU02-20200408	Furnace Creek 02			1		1135	
FU03-20200408	Furnace Creek 03			1		1100	
FU04-20200408	Furnace Creek 04			1		1036	
FU05-20200408	Furnace Creek 05			1		1015	
FU06-20200408	Furnace Creek 06			1		0935	
FDDP-20200408	Furnace Creek Duplicate	↓	↓	1	↓	1145	↓

Transferred by: Rona Durbin Received by: _____ Date: 7/8/2020 Time: 1325
 Transferred by: _____ Received by: _____ Date: _____ Time: _____
 Transferred by: _____ Received by: _____ Date: _____ Time: _____

Cooler Receipt Information (LAB USE ONLY)
 Received on ice/ice packs? - Yes/No temp. = 3
 Sample containers present? - Yes/No if No, explain
 Custody Seal present/intact? - Yes/No (N/A)
 Initials: RD Date: 7/8

MARTEL



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 47759.

Samples received by Martel.

P.O. Number: 115488

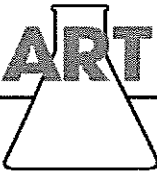
Project Identification: #60607423, AA County Entero - 4/9/20

Monday, April 13, 2020

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
47759 000001	MA06-20200409, MARLEY CREEK 06	04/09/2020 10:15			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	1200	mpn/100ml	SM Enterolert	1	04/09/2020 16:25 MA
47759 000002	MA05-20200409, MARLEY CREEK 05	04/09/2020 11:45			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	98	mpn/100ml	SM Enterolert	1	04/09/2020 16:25 MA
47759 000003	MA04-20200409, MARLEY CREEK 04	04/09/2020 11:00			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	980	mpn/100ml	SM Enterolert	1	04/09/2020 16:25 MA
47759 000004	MA03-20200409, MARLEY CREEK 03	04/09/2020 12:25			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	04/09/2020 16:25 MA
47759 000005	MA02-20200409, MARLEY CREEK 02	04/09/2020 12:50			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	04/09/2020 16:25 MA
47759 000006	MA01-20200409, MARLEY CREEK 01	04/09/2020 13:45			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	19	mpn/100ml	SM Enterolert	1	04/09/2020 16:25 MA



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Notes and references:

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The results presented herein relate only to the samples or items tested.


Project Manager



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 49145.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 5/13/20

Monday, May 18, 2020

**FINAL
Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
49145 000001	FU06-20200513, FURNACE CREEK 06				05/13/2020 09:53
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	43	mpn/100ml	SM Enterolert	1	05/13/2020 14:00 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
49145 000002	FU05-20200513, FURNACE CREEK 05				05/13/2020 10:20
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	61	mpn/100ml	SM Enterolert	1	05/13/2020 14:00 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
49145 000003	FU04-20200513, FURNACE CREEK 04				05/13/2020 11:05
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	58	mpn/100ml	SM Enterolert	1	05/13/2020 14:00 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
49145 000004	FU03-20200513, FURNACE CREEK 03				05/13/2020 11:33
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	36	mpn/100ml	SM Enterolert	1	05/13/2020 14:00 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
49145 000005	FU02-20200513, FURNACE CREEK 02				05/13/2020 11:57
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	121	mpn/100ml	SM Enterolert	1	05/13/2020 14:00 MA

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
49145 000006	FU01-20200513, FURNACE CREEK 01				05/13/2020 12:17
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	12	mpn/100ml	SM Enterolert	1	05/13/2020 14:00 MA

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Project Manager



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 49171.

Samples received by Martel.

P.O. Number: 115488

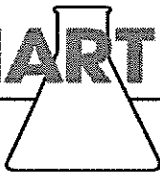
Project Identification: #60607423, AA County Entero - 5/14/20

Monday, May 18, 2020

FINAL

Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time
49171 000001	MA06-20200514, MARLEY CREEK 06	05/14/2020 09:03
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420 mpn/100ml SM Enterolert	1 05/14/2020 13:41 MA
49171 000002	MA05-20200514, MARLEY CREEK 05	05/14/2020 09:23
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	84 mpn/100ml SM Enterolert	1 05/14/2020 13:41 MA
49171 000003	MA04-20200514, MARLEY CREEK 04	05/14/2020 09:46
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	2420 mpn/100ml SM Enterolert	1 05/14/2020 13:41 MA
49171 000004	MA03-20200514, MARLEY CREEK 03	05/14/2020 10:05
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420 mpn/100ml SM Enterolert	1 05/14/2020 13:41 MA
49171 000005	MA02-20200514, MARLEY CREEK 02	05/14/2020 10:25
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420 mpn/100ml SM Enterolert	1 05/14/2020 13:41 MA
49171 000006	MA01-20200514, MARLEY CREEK 01	05/14/2020 11:11
Compound	Test Value Test Unit Method	Detection Limit Analysis Date/Time/Initial
Enterococcus, Quantitray	78 mpn/100ml SM Enterolert	1 05/14/2020 13:41 MA



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
49171 000007	MADP-20200514, MARLEY CREEK DUP	05/14/2020 10:05			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	05/14/2020 13:41 MA

SMPLOG03

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
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The results presented herein relate only to the samples or items tested.


Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 • Martel@Martellabs.com

Martel Log # 49171 Client Code AECOM6
 Project Name/# AA CO EMPYD
 Contract/P.O Number U 000 7A23
 Sampler POWDEL
 Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
MA00-20200514	MARLEY CREEK 00	W	steril bottle flip top	1	5/14/20	9:03	IDDEX ENTERO RPT
MA05-20200514	MARLEY CREEK 05	W		1	5/14/20	9:23	
MA04-20200514	MARLEY CREEK 04	W		1	5/14/20	9:40	
MA03-20200514	MARLEY CREEK 03	W		1	5/14/20	10:05	
MA02-20200514	MARLEY CREEK 02	W		1	5/14/20	10:25	
MA01-20200514	MARLEY CREEK 01	W		1	5/14/20	11:11	
MA0P-20200514	MARLEY CREEK DP	W		1	5/14/20	10:05	

Client Address: 12420 MILESTONE CENTER DR SUITE 150 GERMANTOWN, MD 20876
 Client Email Address: AA@AECOM.COM

Transferred by: <u>[Signature]</u>	Date: <u>5/14/20</u>	Time: <u>17:30</u>	Cooler Receipt Information (LAB USE ONLY) Received on ice/ice packs? - Yes/No <u>Y-S</u> temp. = <u>4.5</u> Sample containers present? - Yes/No <u>Y-S</u> If No, explain _____ Custody Seal present/intact? - Yes/No <u>N/A</u>
Transferred by: _____	Date: _____	Time: _____	
Transferred by: _____	Date: _____	Time: _____	

Initials: CP Date: 5/14



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 49510.

Samples received by Martel.

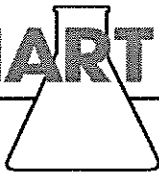
P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 6/10/20

Monday, June 15, 2020

**FINAL
Certificate of Analysis**

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time			
49510 000001	FU06-20200610, FURNACE CREEK 06	06/10/2020 08:51			
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	345	mpn/100ml	SM Enterolert	1	06/10/2020 14:11 MA
49510 000002	FU05-20200610, FURNACE CREEK 05	06/10/2020 09:15			
Enterococcus, Quantitray	548	mpn/100ml	SM Enterolert	1	06/10/2020 14:11 MA
49510 000003	FU04-20200610, FURNACE CREEK 04	06/10/2020 09:55			
Enterococcus, Quantitray	435	mpn/100ml	SM Enterolert	1	06/10/2020 14:11 MA
49510 000004	FU03-20200610, FURNACE CREEK 03	06/10/2020 10:16			
Enterococcus, Quantitray	238	mpn/100ml	SM Enterolert	1	06/10/2020 14:11 MA
49510 000005	FU02-20200610, FURNACE CREEK 02	06/10/2020 10:42			
Enterococcus, Quantitray	727	mpn/100ml	SM Enterolert	1	06/10/2020 14:11 MA
49510 000006	FU01-20200610, FURNACE CREEK 01	06/10/2020 11:06			
Enterococcus, Quantitray	435	mpn/100ml	SM Enterolert	1	06/10/2020 14:11 MA



MARTEL NO. 49510	000007	CLIENT SAMPLE IDENTIFICATION FUDUP-20200610, FURNACE CREEK DUP			Sample Date/Time 06/10/2020 09:20
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	921	mpn/100ml	SM Enterolert	1	06/10/2020 14:11 MA

SMPLOG03

1025 Cromwell Bridge Road - Baltimore, Maryland 21286
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Notes and references:

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The results presented herein relate only to the samples or items tested.


Project Manager

CHAIN OF CUSTODY / SAMPLE INFORMATION FORM

Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054 • Martel@Martellabs.com

Martel Log # 49510 Client Code AELDM 6 Sampler pow del

Client Name/Phone/FAX: AELDM 1 301-820-3488 / 301-944-2598 Project Name# AA CO. DM 100

Client Address: 12420 MILESTONE CENTER DR. SUITE 150, BARMANTON, MD 20876 Contract/P.O Number 00601423

Client Email Address: agyma@powdel@aecom.com Sample Turnaround Time _____

Station No./ Sample ID	Station Location	Matrix	Container Description/Preservation Status	# of Containers	Date	Time	Analyses Required/Comments
FU04-20200610	FURNACE CREEK 01	W	STERIL BOTTLE FLIP-TOP	1	6/10/20	8:51	IDDEX ENTADJORT
FU05-20200610	FURNACE CREEK 05	W	STERIL BOTTLE FLIP-TOP	1	6/10/20	9:15	
FU04-20200610	FURNACE CREEK 04	W	STERIL BOTTLE FLIP-TOP	1	6/10/20	9:55	
FU03-20200610	FURNACE CREEK 03	W	STERIL BOTTLE FLIP-TOP	1	6/10/20	10:10	
FU02-20200610	FURNACE CREEK 02	W	STERIL BOTTLE FLIP-TOP	1	6/10/20	10:42	
FU01-20200610	FURNACE CREEK 01	W	STERIL BOTTLE FLIP-TOP	1	6/10/20	11:06	
FU0UP-20200610	FURNACE DUP	W	STERIL BOTTLE FLIP-TOP	1	6/10/20	9:20	

Transferred by: agyma Received by: [Signature] Date: 6/10 Time: 12:50

Transferred by: _____ Received by: _____ Date: _____ Time: _____

Transferred by: _____ Received by: _____ Date: _____ Time: _____

Initials: agyma Date: 6/10

Received on ice/ice packs? Yes / No temp = 4.0

Sample containers present? Yes / No if No, explain _____

Custody Seal present/intact? - Yes/No N/A



AECOM

12420 Milestone Center Dr, Suite 150

Germantown, MD 20876

Attention: Janet Frey/Agrima Poudel

Report for Lab No: 49535.

Samples received by Martel.

P.O. Number: 115488

Project Identification: #60607423, AA County Entero - 6/11/20

Monday, June 15, 2020

FINAL
Certificate of Analysis

MARTEL NO.	CLIENT SAMPLE IDENTIFICATION	Sample Date/Time
49535 000001	MABLK-20200611 MARLEY STATION BLANK	06/11/2020 08:45
Compound	Test Value Test Unit Method Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	<1 mpn/100ml SM Enterolert 1	06/11/2020 15:07 MA
49535 000002	MA06-20200611 MARLEY STATION 6	06/11/2020 09:15
Compound	Test Value Test Unit Method Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420 mpn/100ml SM Enterolert 1	06/11/2020 15:07 MA
49535 000003	MA05-20200611 MARLEY STATION 5	06/11/2020 09:35
Compound	Test Value Test Unit Method Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	1300 mpn/100ml SM Enterolert 1	06/11/2020 15:07 MA
49535 000004	MA04-20200611 MARLEY STATION 4	06/11/2020 09:55
Compound	Test Value Test Unit Method Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	1410 mpn/100ml SM Enterolert 1	06/11/2020 15:07 MA
49535 000005	MA03-20200611 MARLEY STATION 3	06/11/2020 10:20
Compound	Test Value Test Unit Method Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420 mpn/100ml SM Enterolert 1	06/11/2020 15:07 MA
49535 000006	MA02-20200611 MARLEY STATION 2	06/11/2020 10:35
Compound	Test Value Test Unit Method Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420 mpn/100ml SM Enterolert 1	06/11/2020 15:07 MA



MARTEL NO.	CLIENT SAMPLE IDENTIFICATION				Sample Date/Time
49535 000007	MA01-20200611 MARLEY STATION 1				06/11/2020 11:15
Compound	Test Value	Test Unit	Method	Detection Limit	Analysis Date/Time/Initial
Enterococcus, Quantitray	>=2420	mpn/100ml	SM Enterolert	1	06/11/2020 15:07 MA

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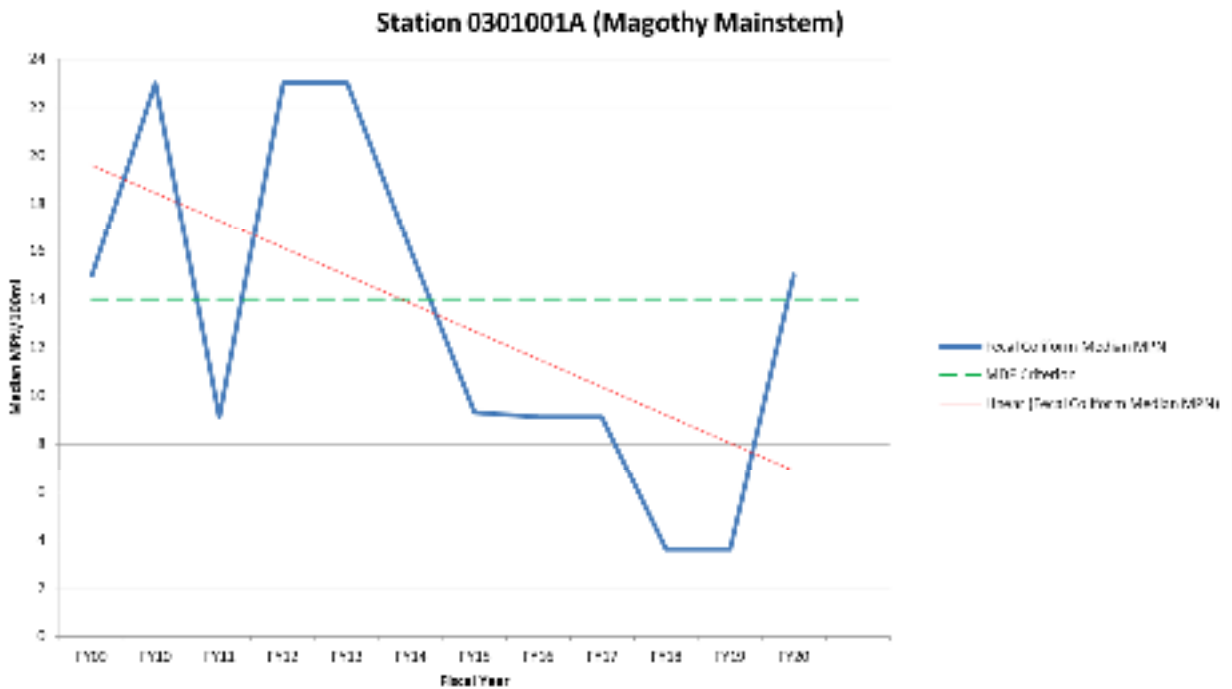
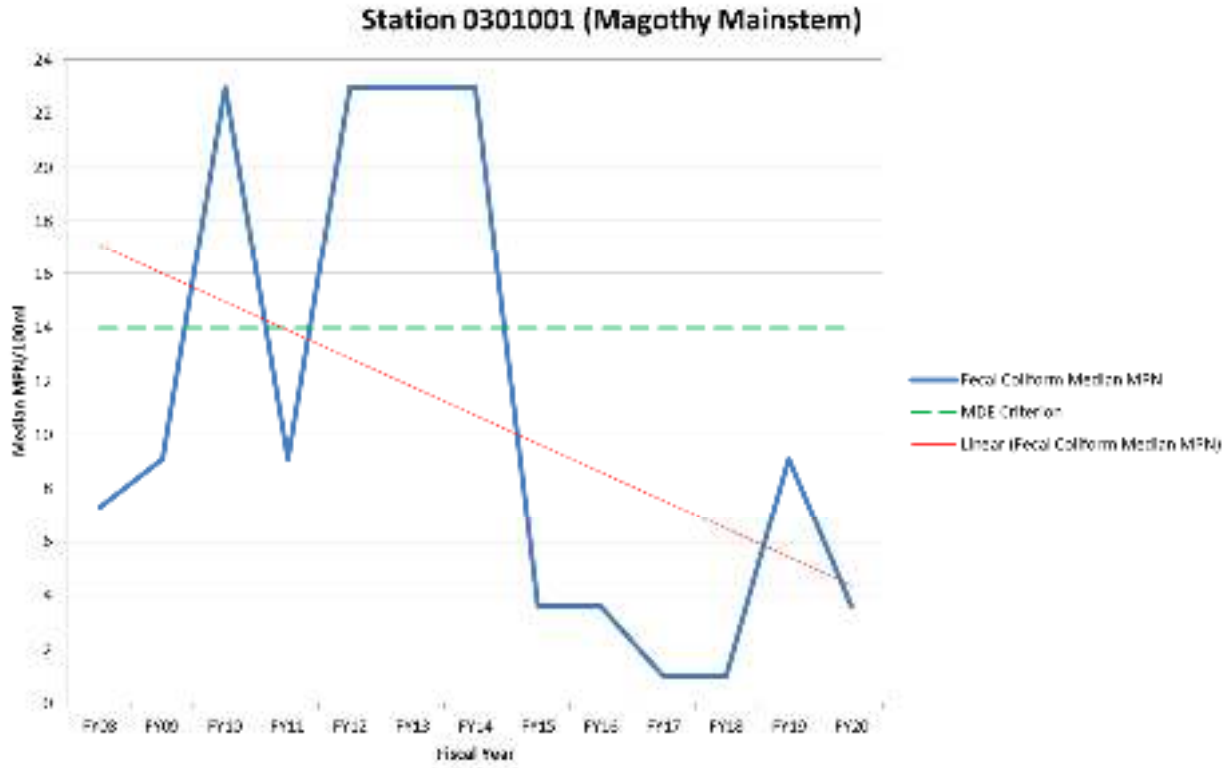
Project Manager

Appendix D

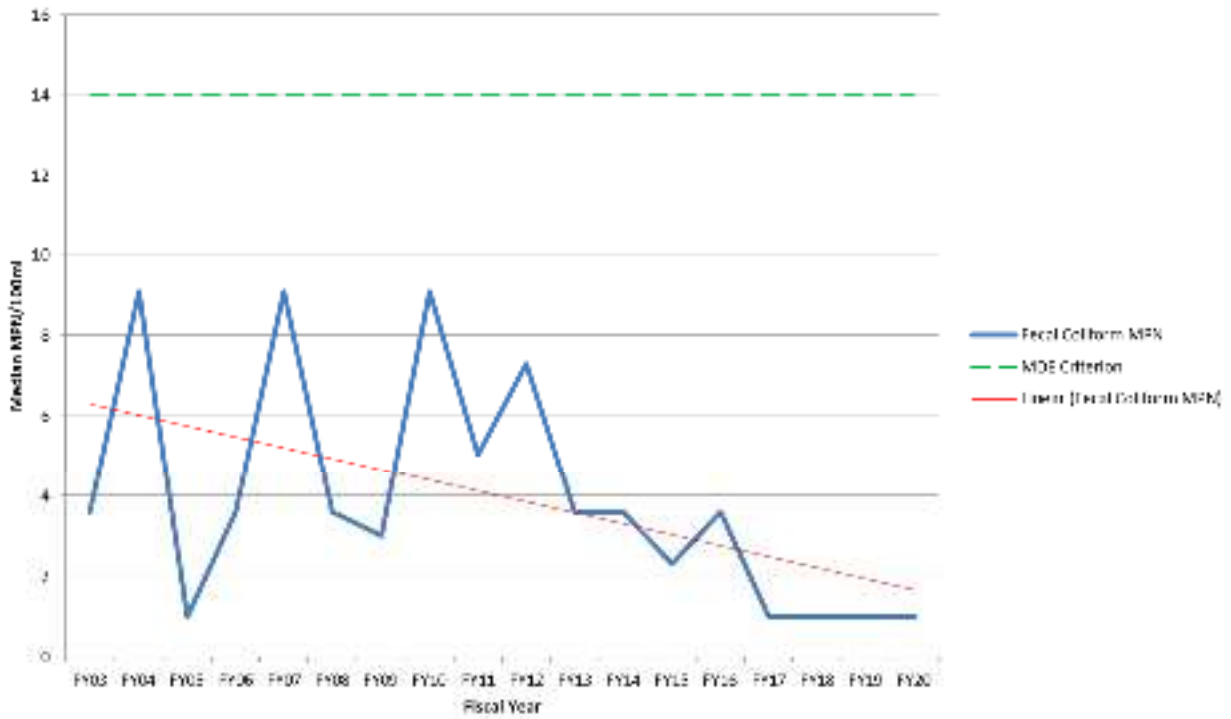
Electronic Database

Appendix D

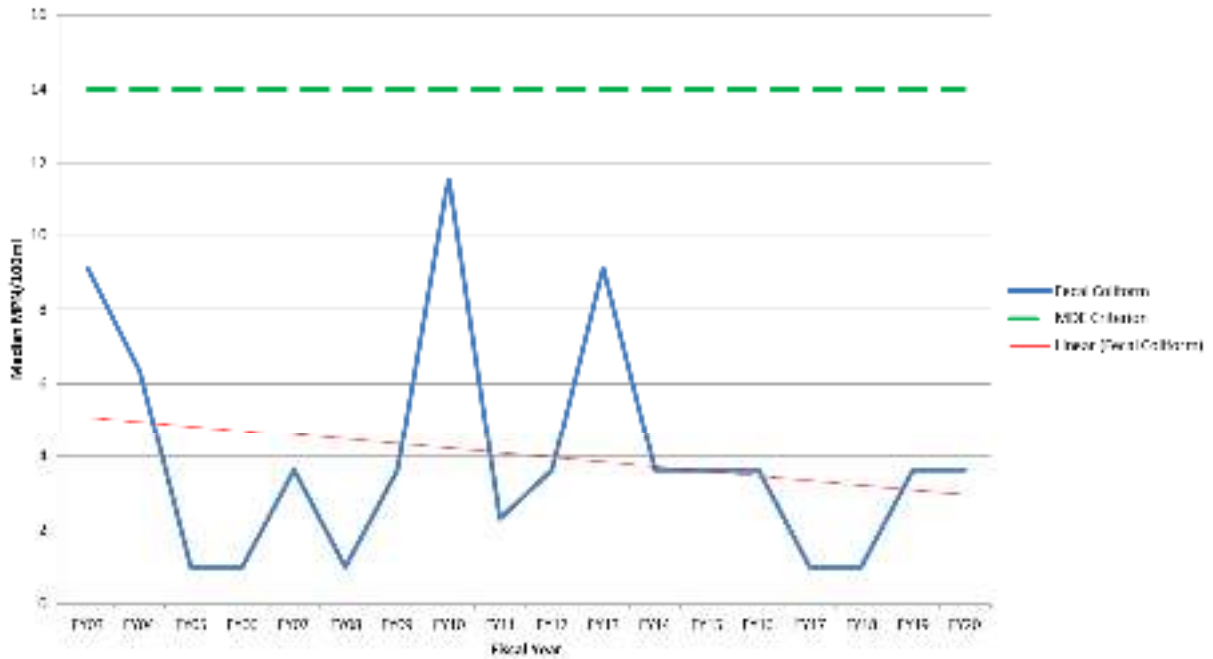
**Annual Median Bacteria Concentrations at MDE Shellfish Harvesting
Monitoring Stations within TMDL Watersheds**



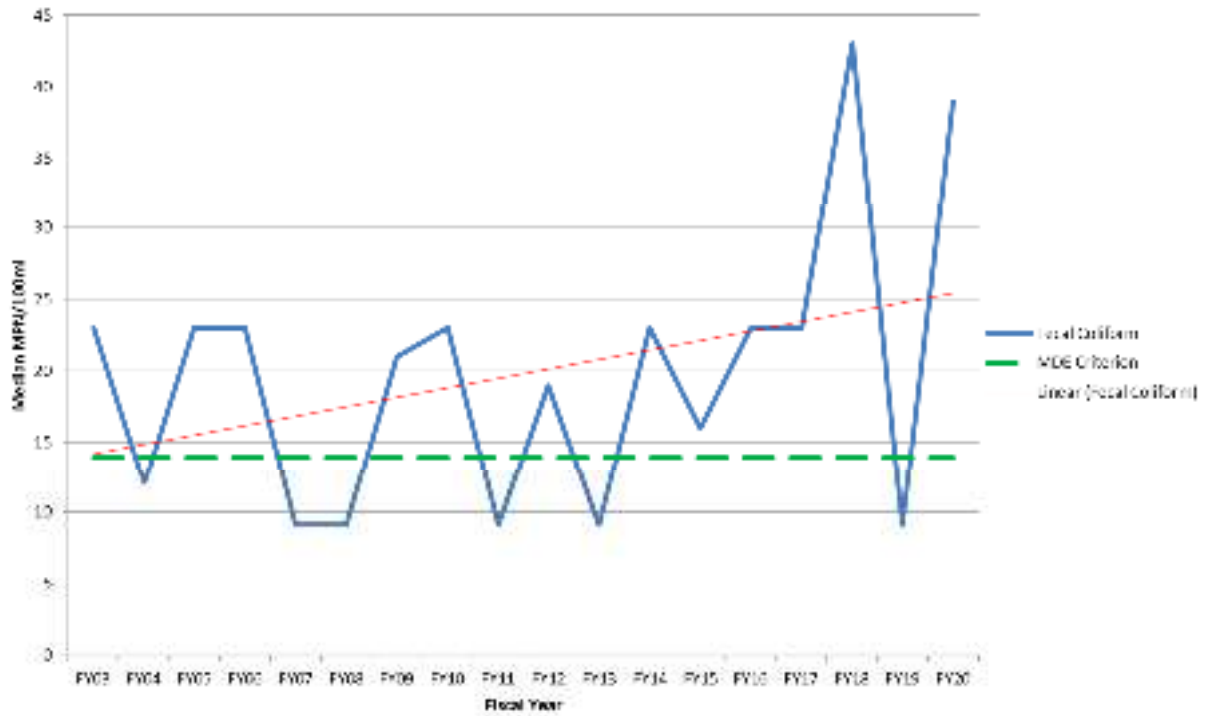
Station 0301001C (Magothy Mainstem)



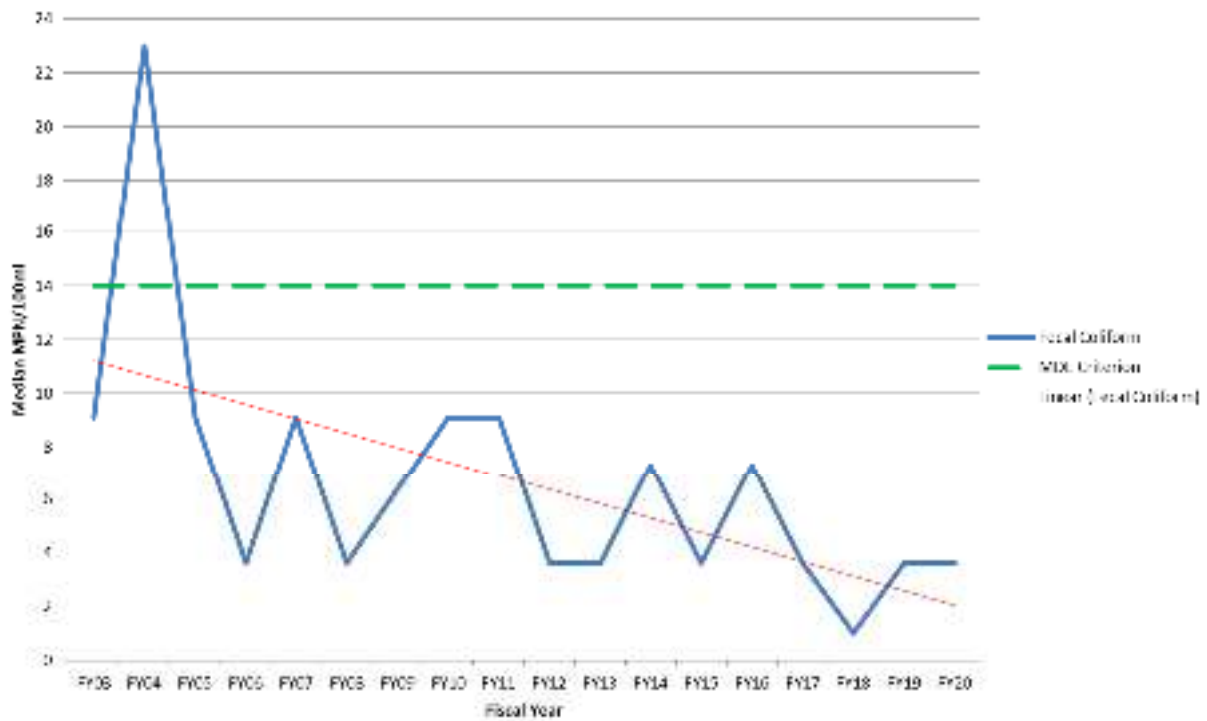
Station 0301800 (Magothy Mainstem)

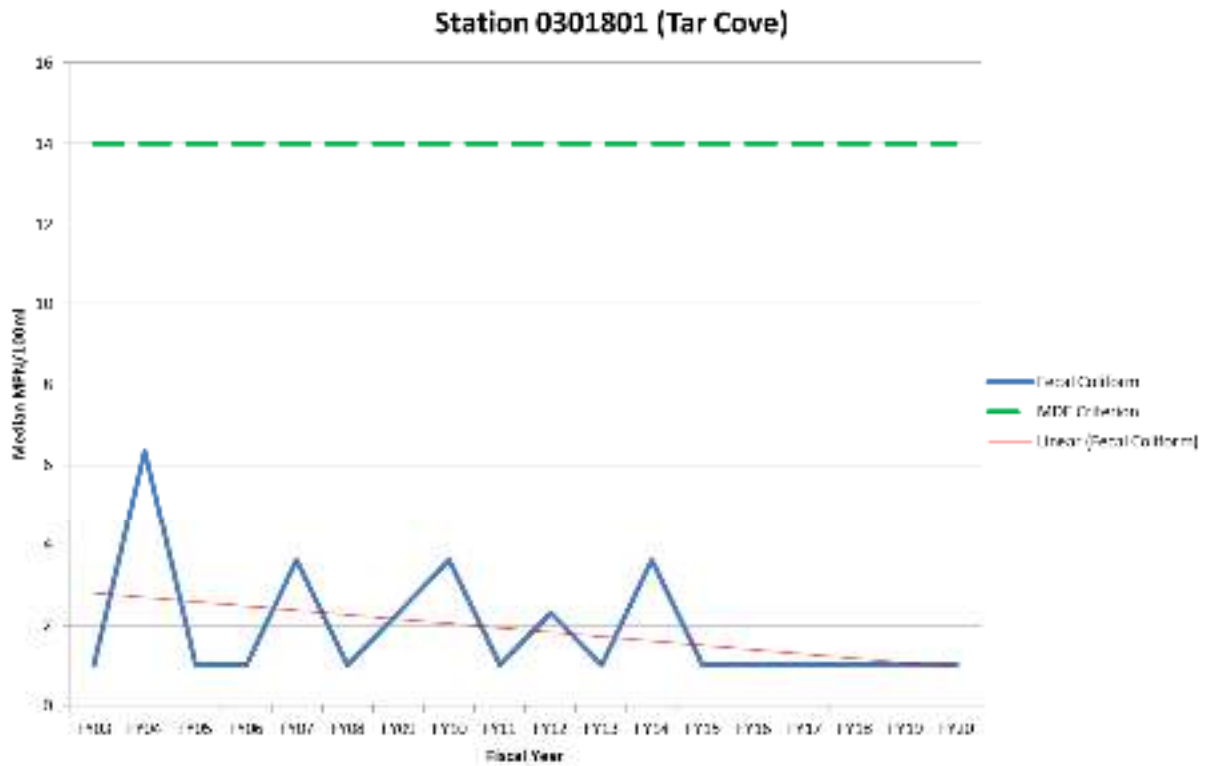
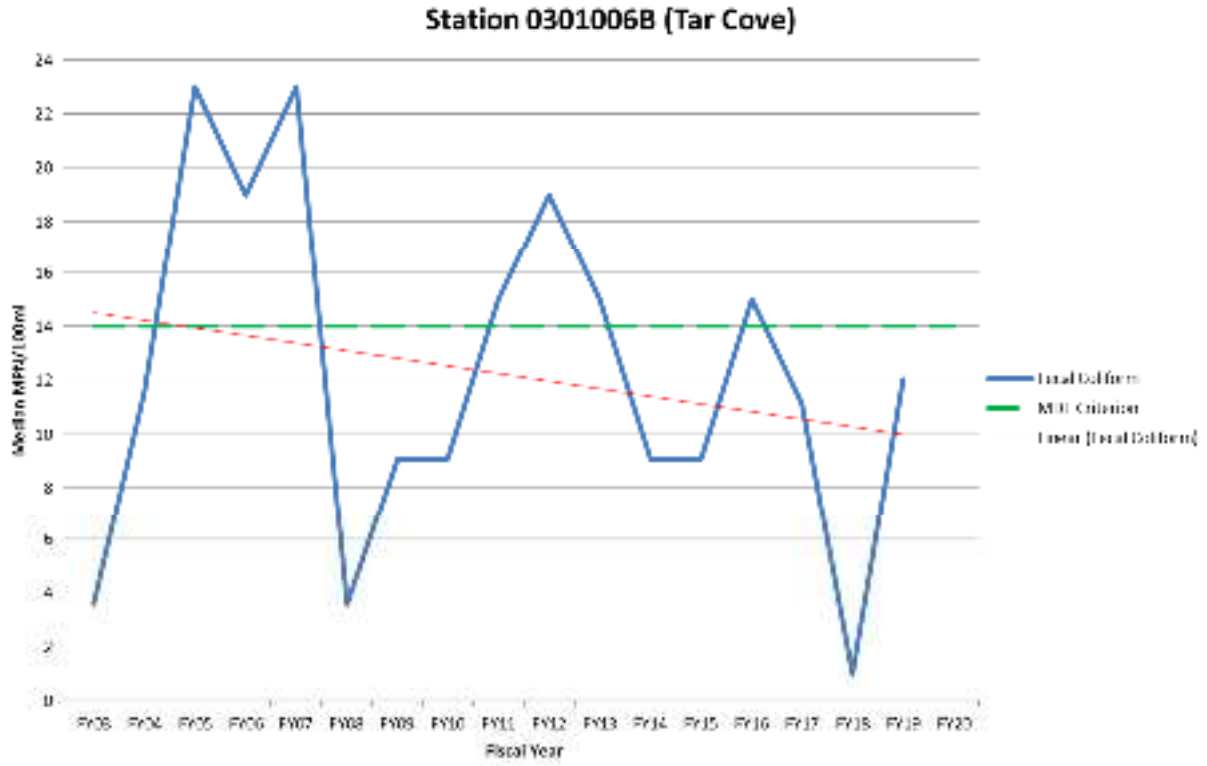


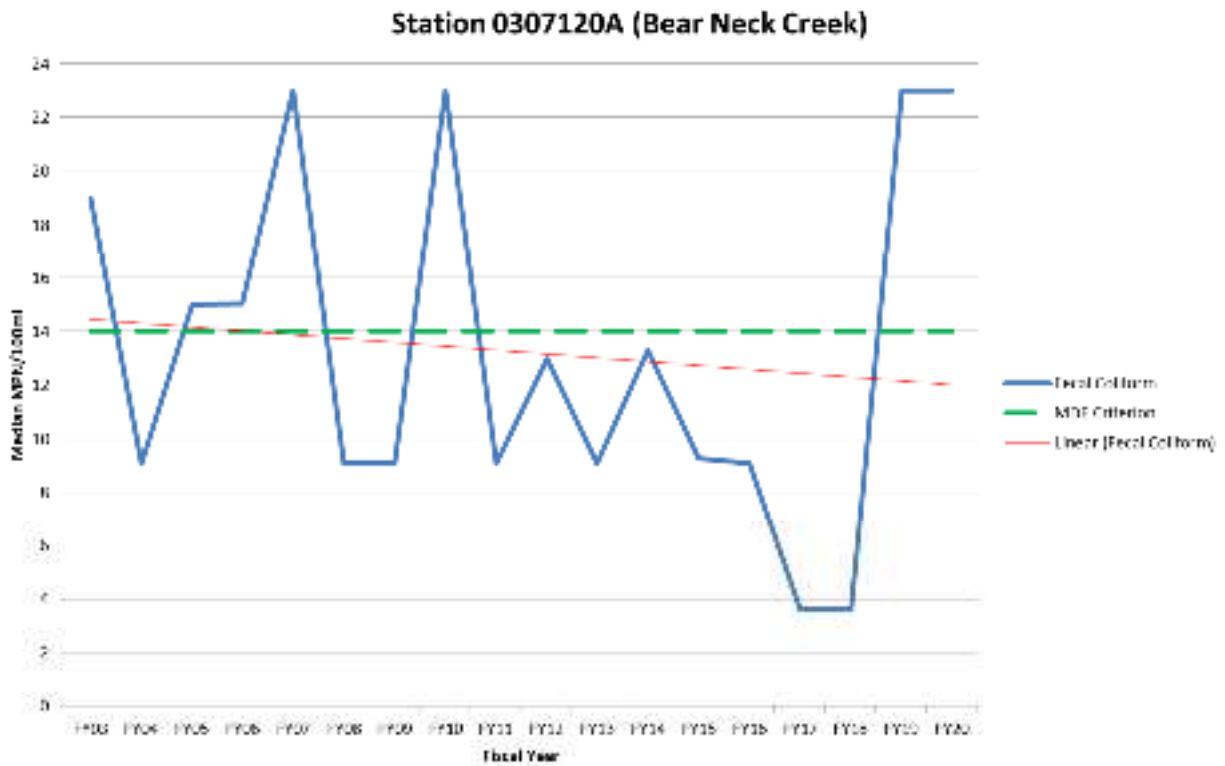
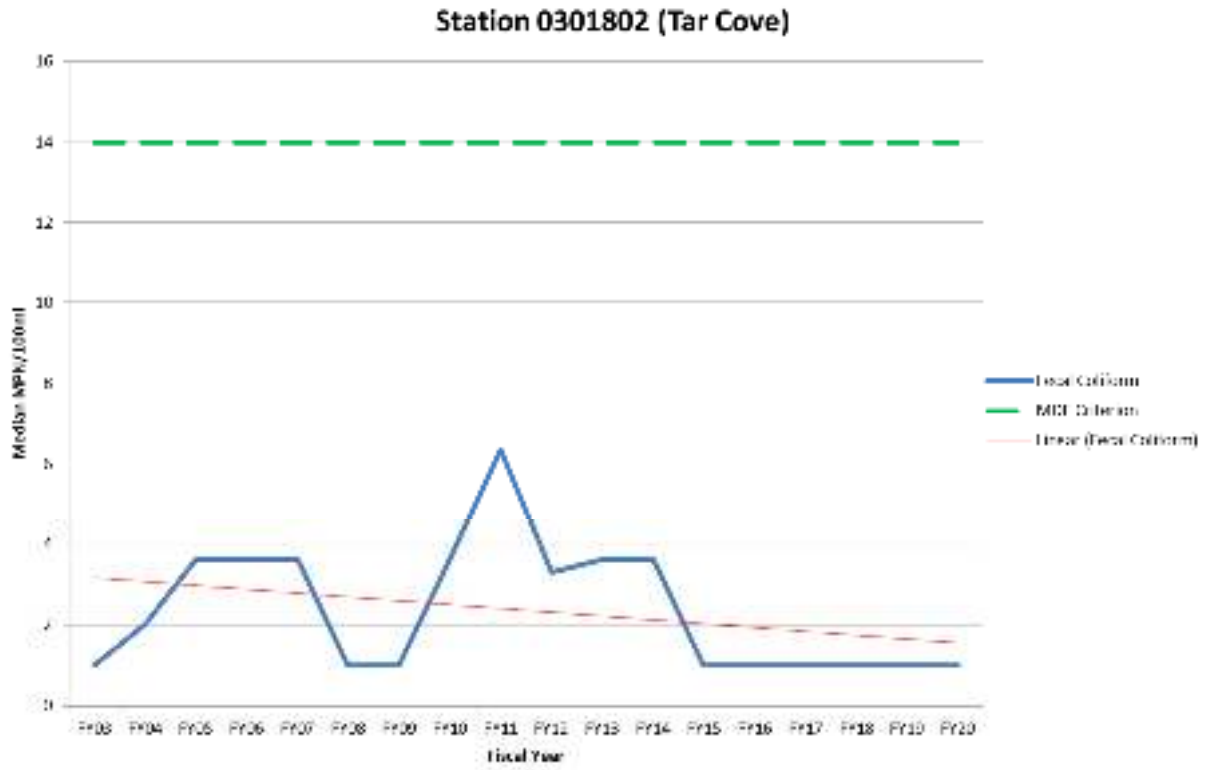
Station 0301011 (Forked Creek)

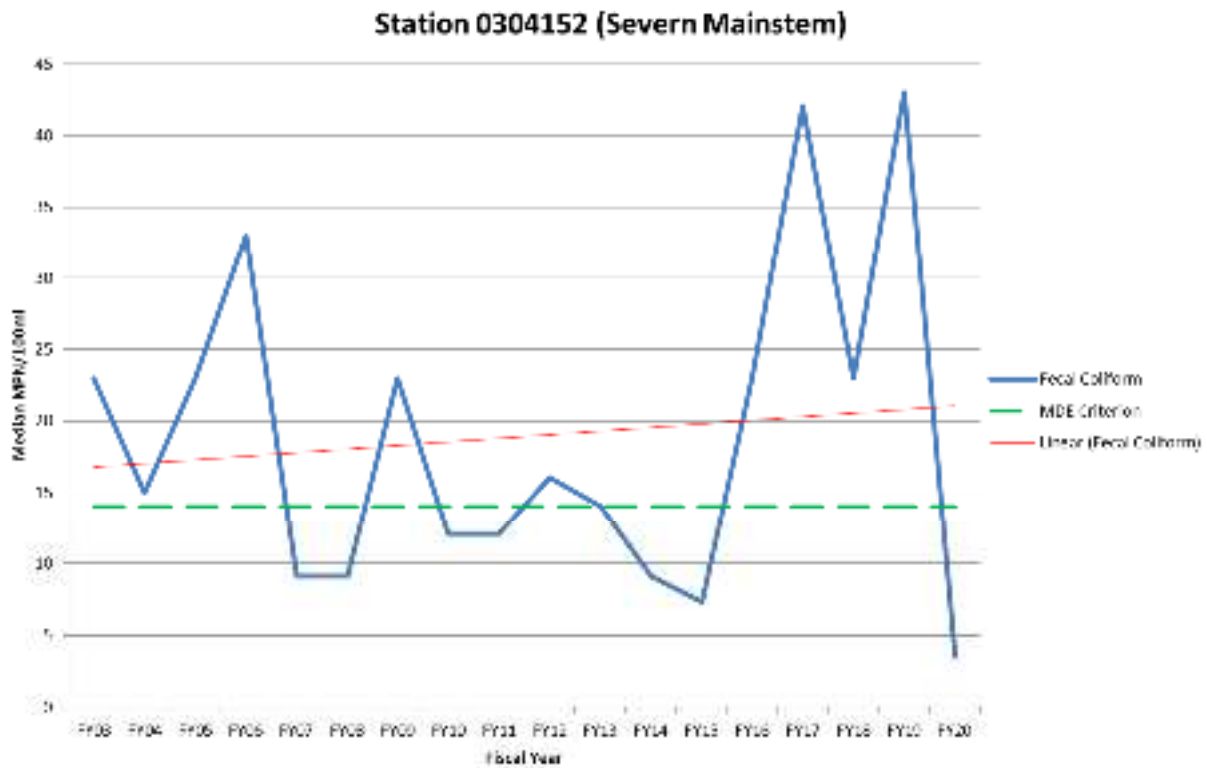
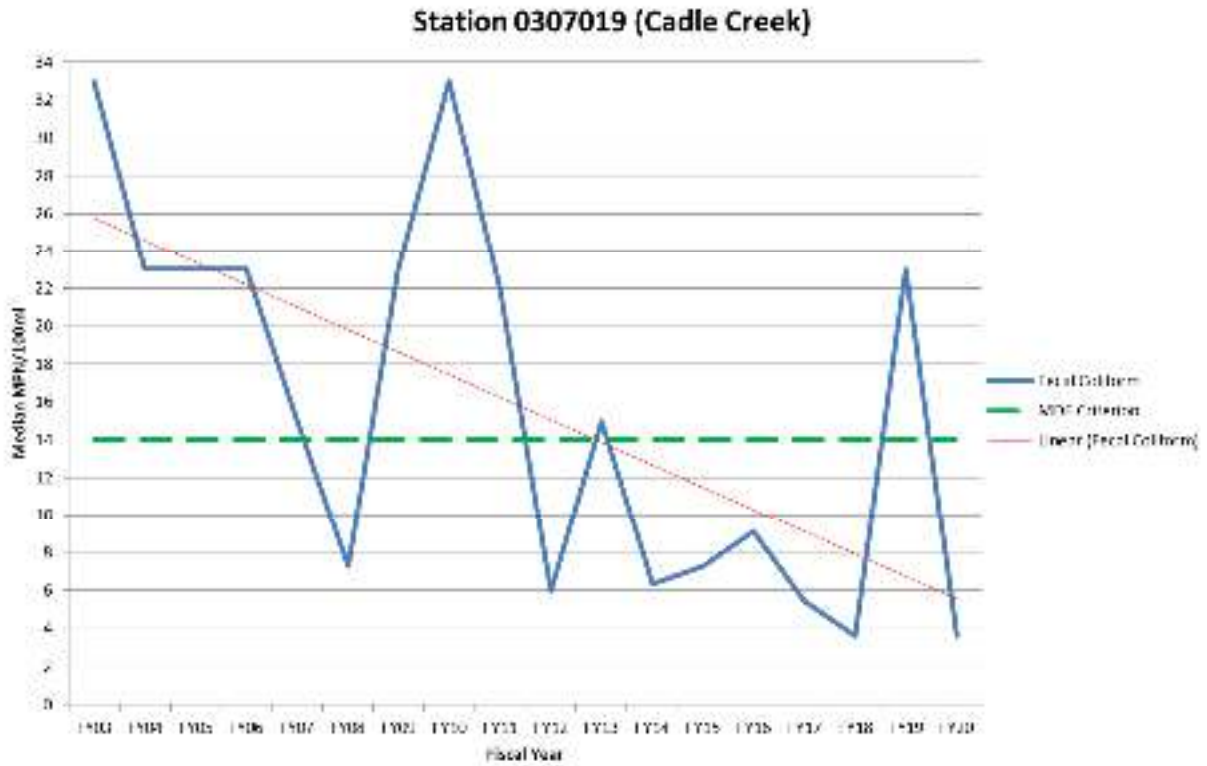


Station 0301005C (Tar Cove)

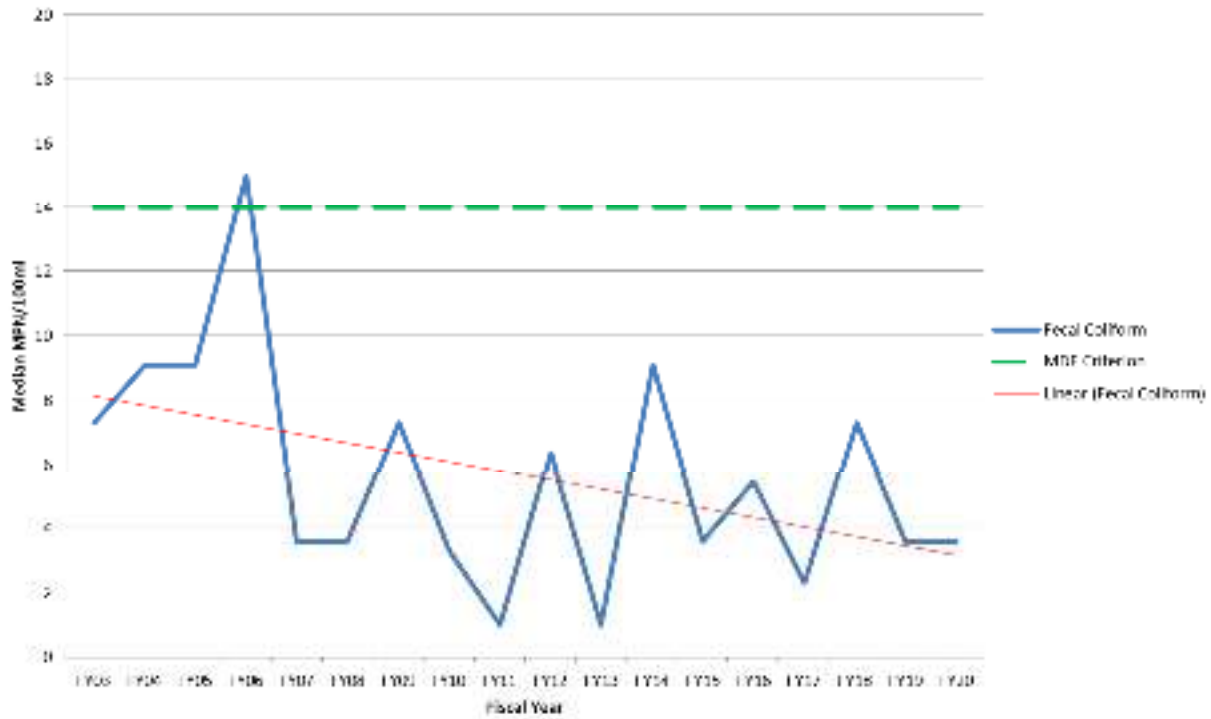




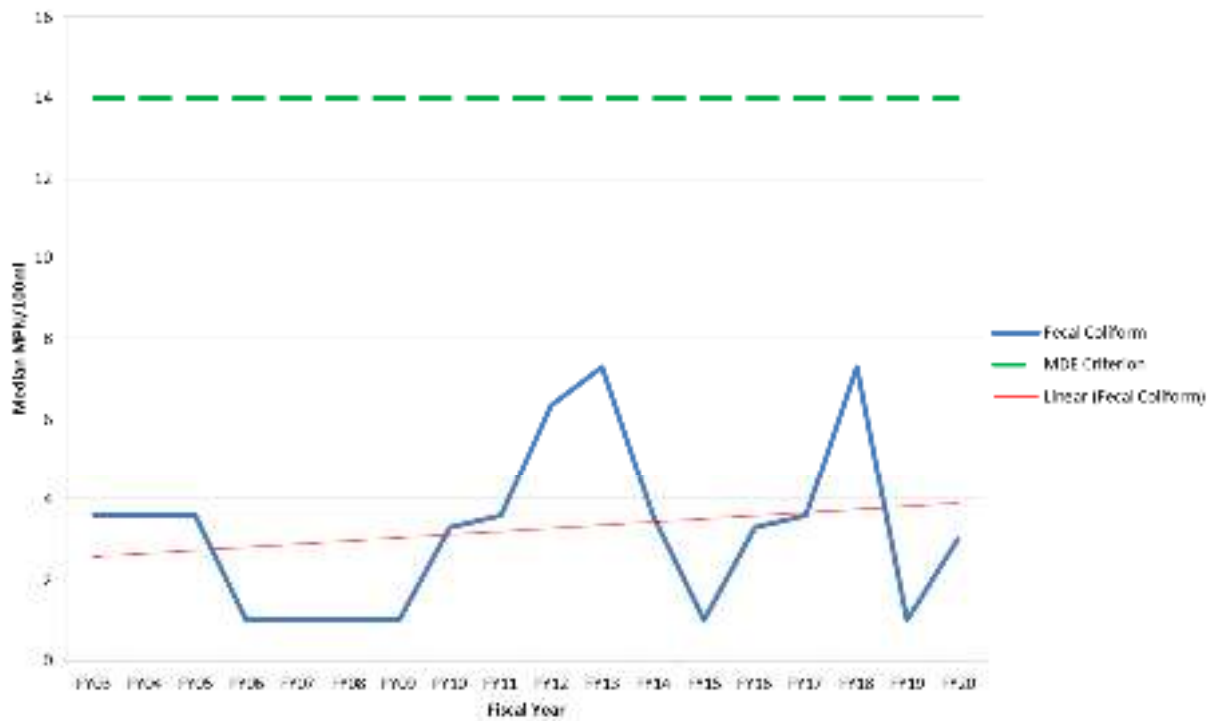




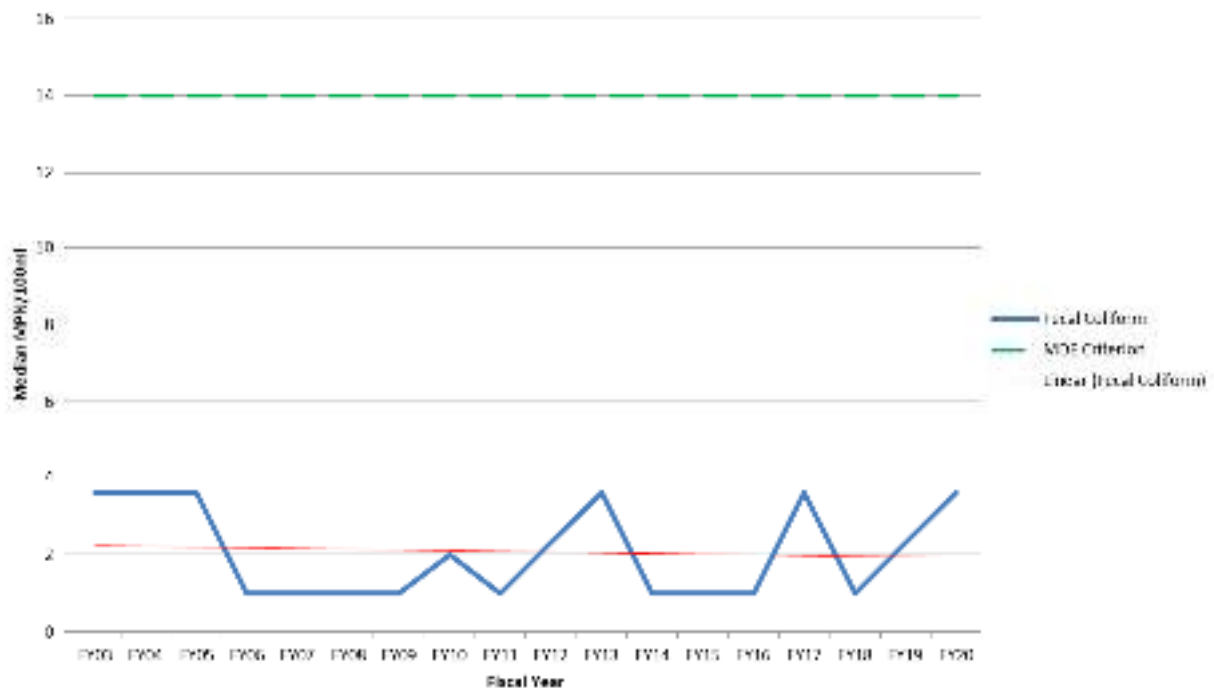
Station 0304150 (Severn Mainstem)



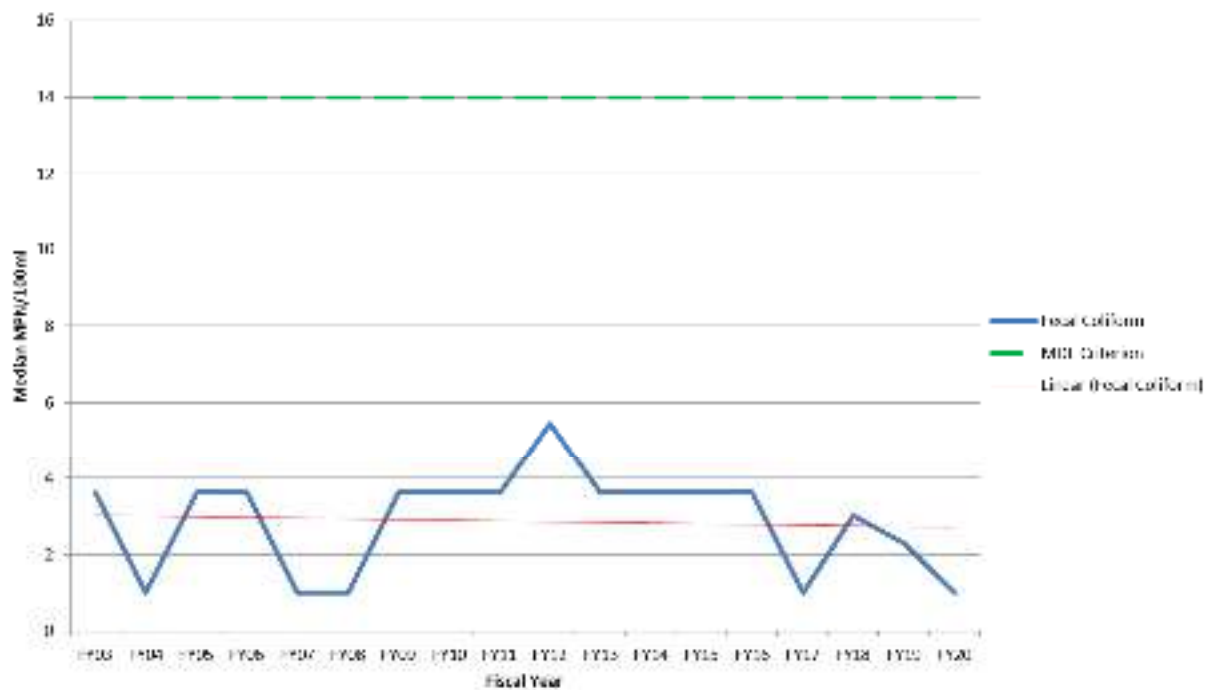
Station 0304002A (Severn Mainstem)



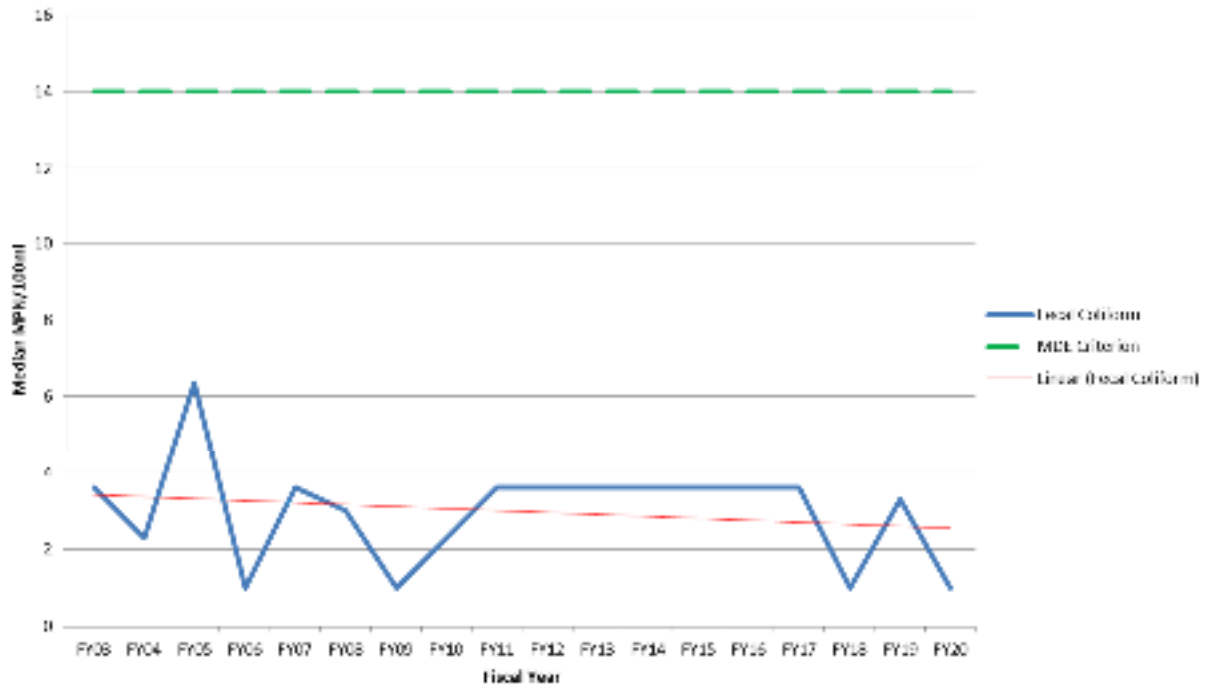
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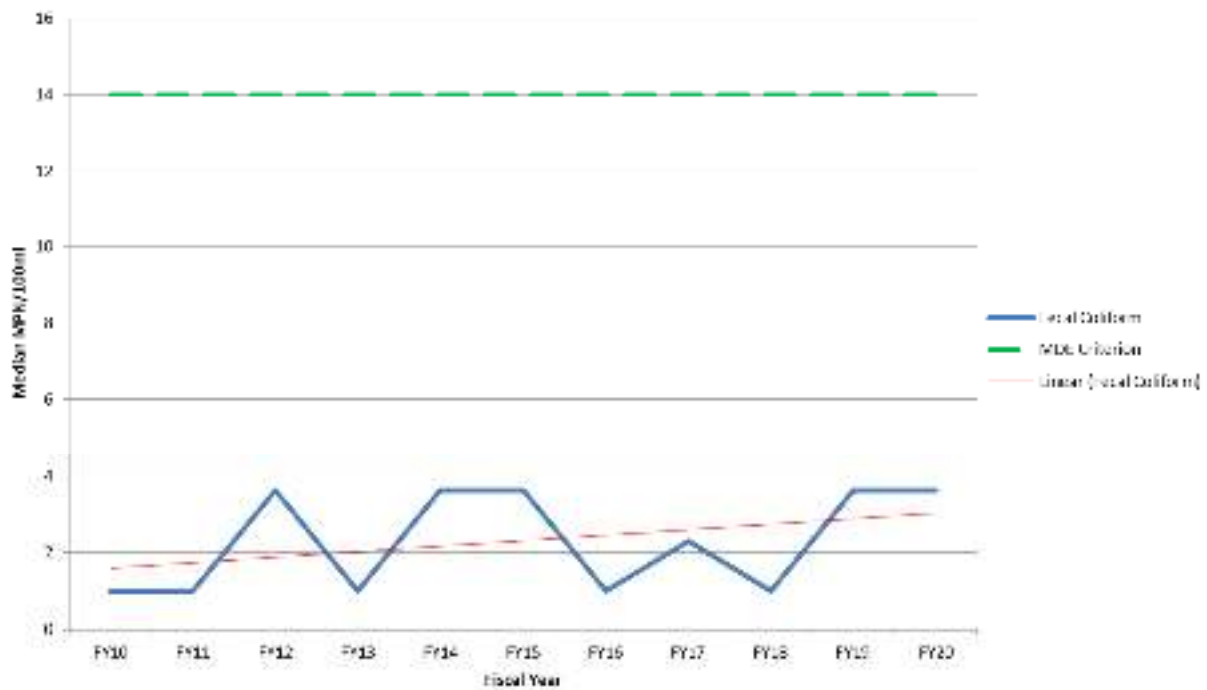
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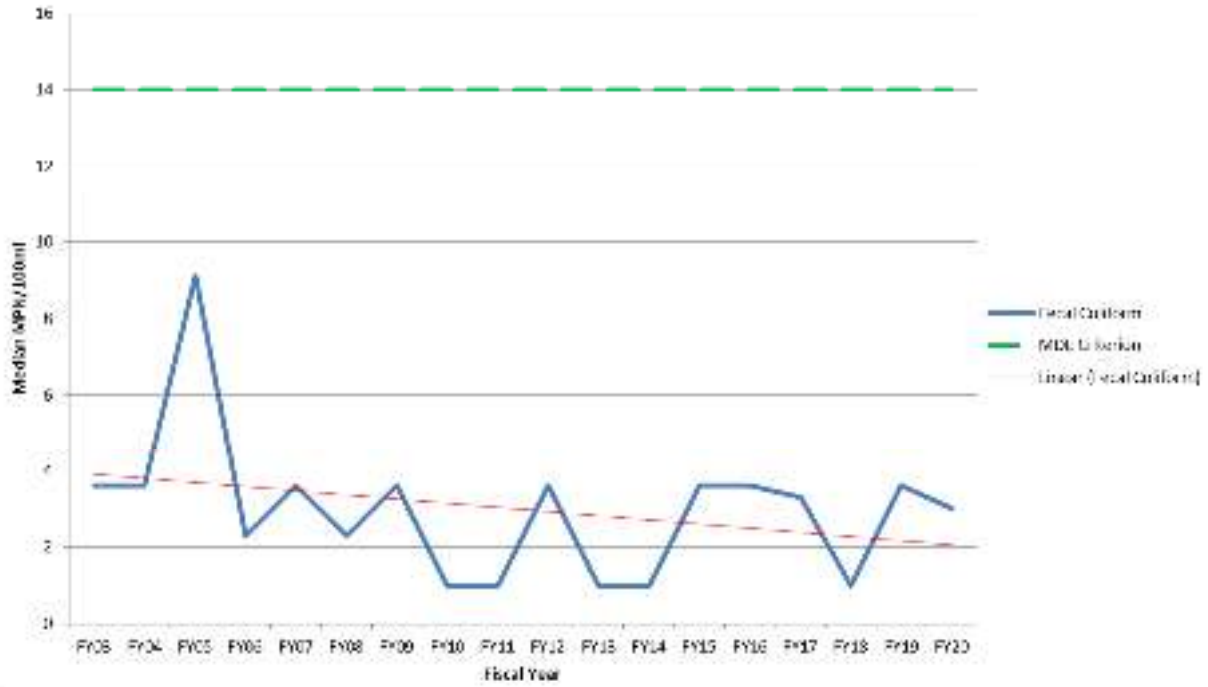
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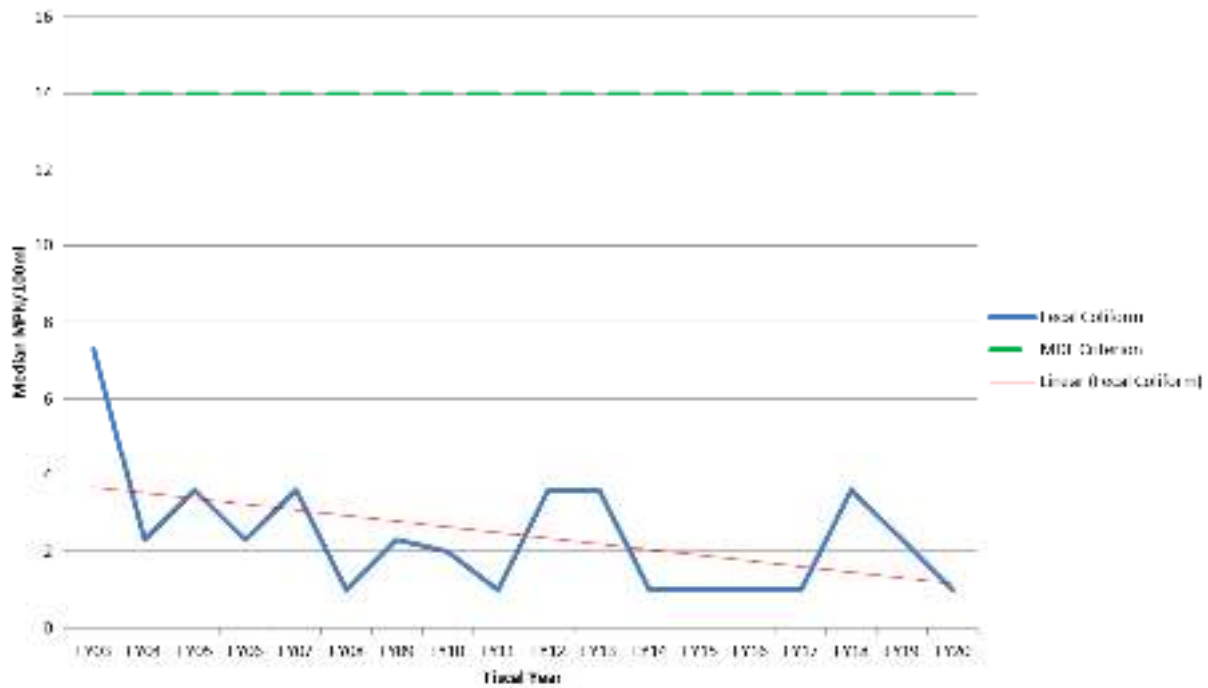
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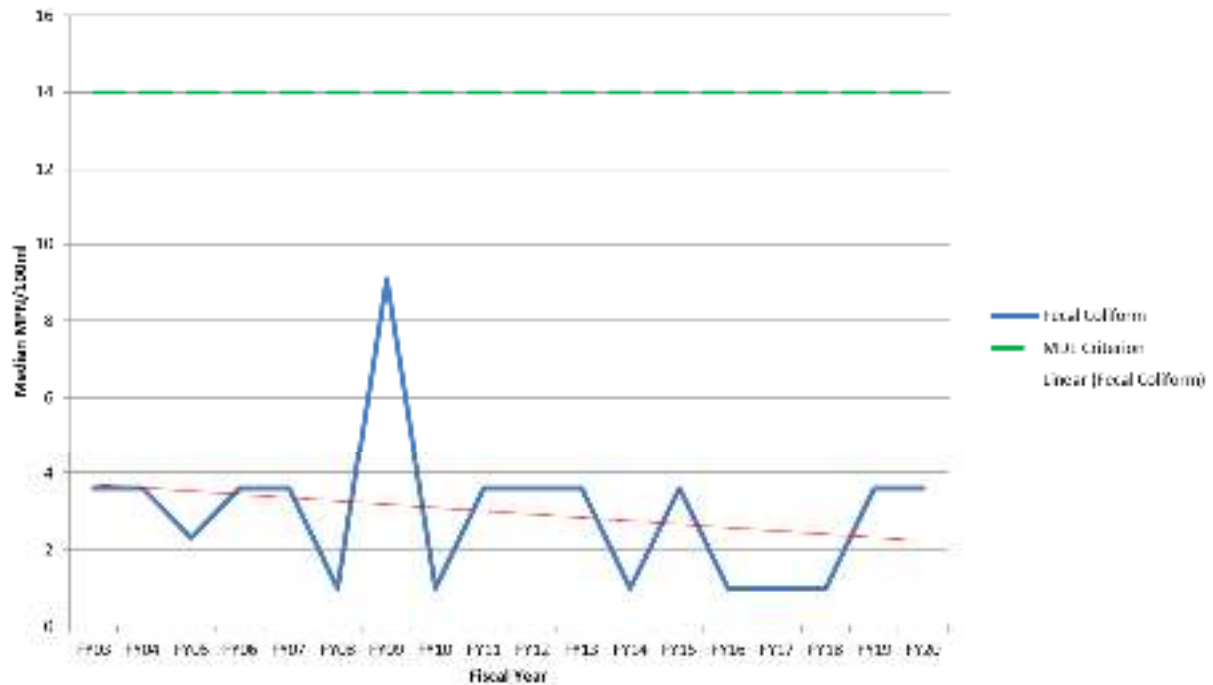
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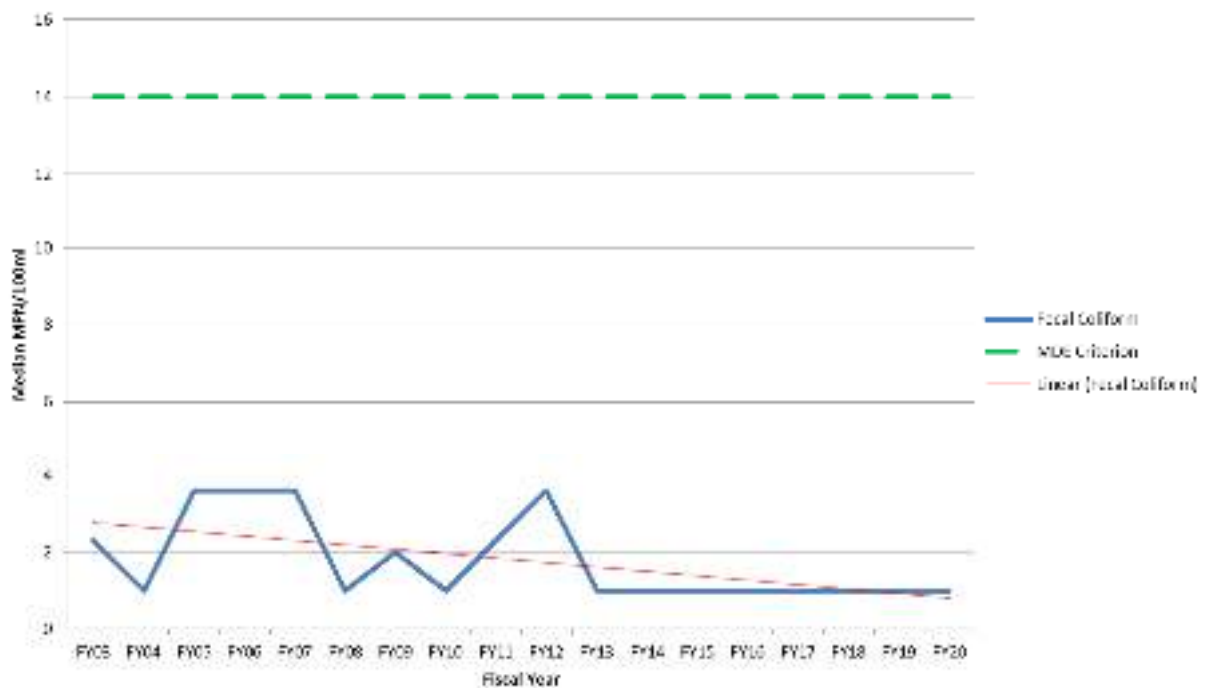
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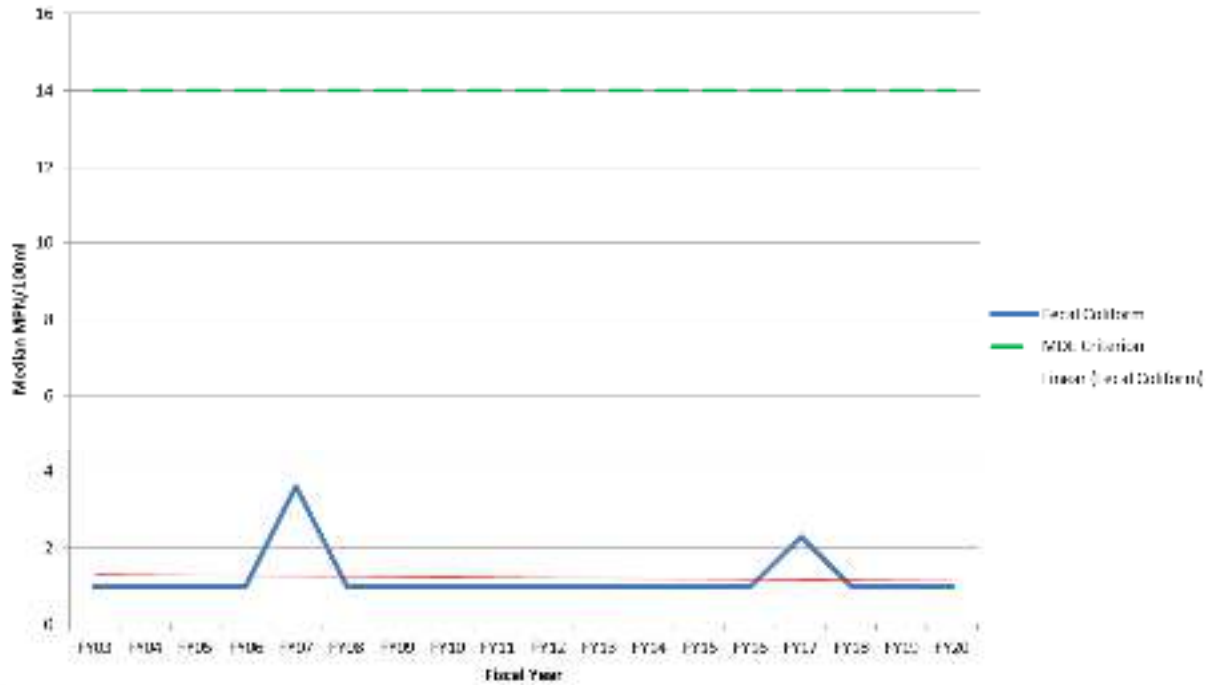
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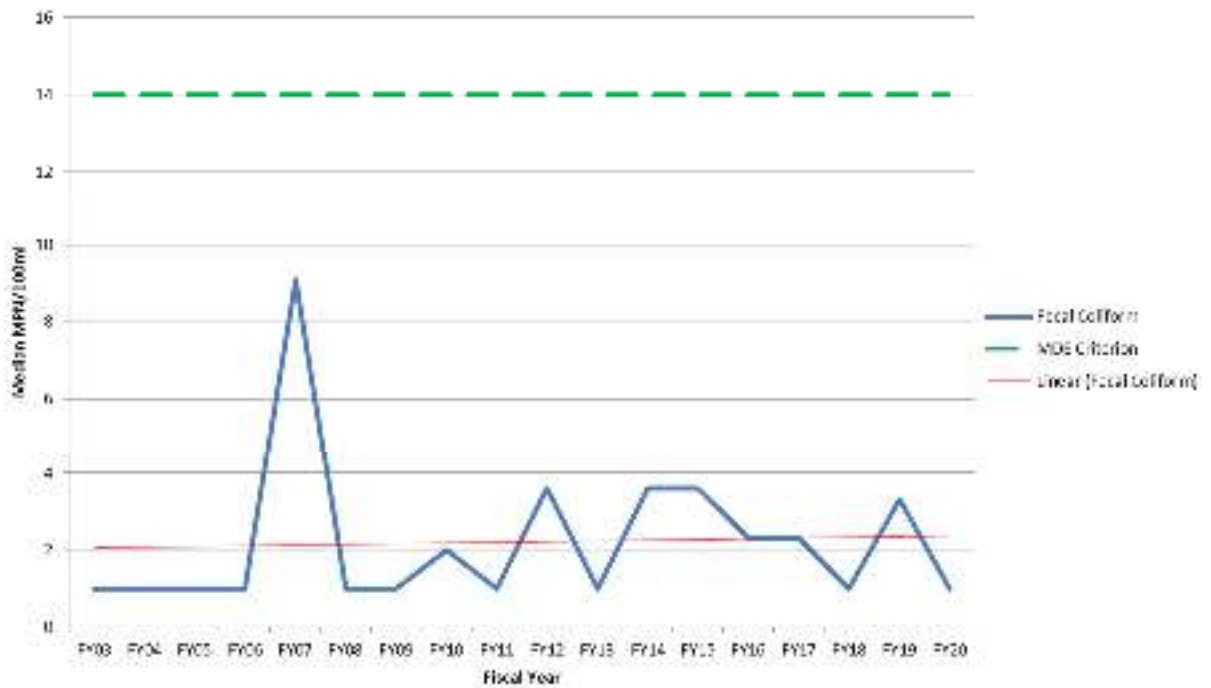
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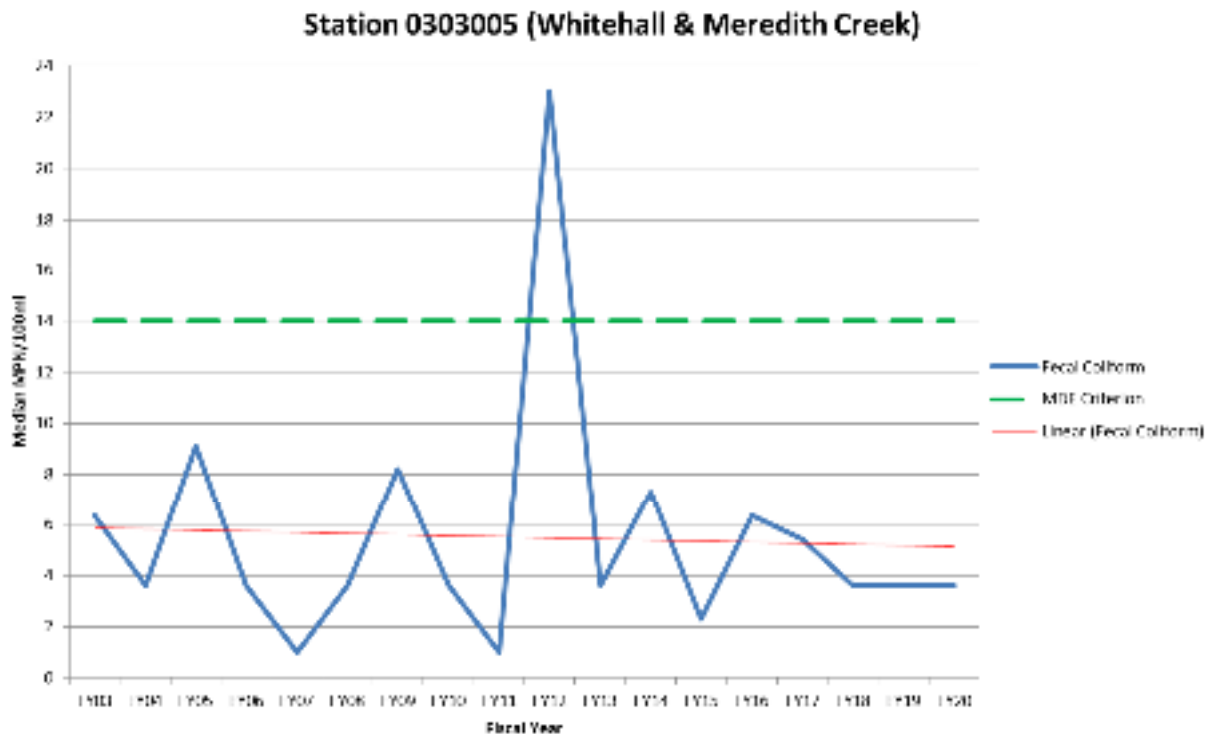
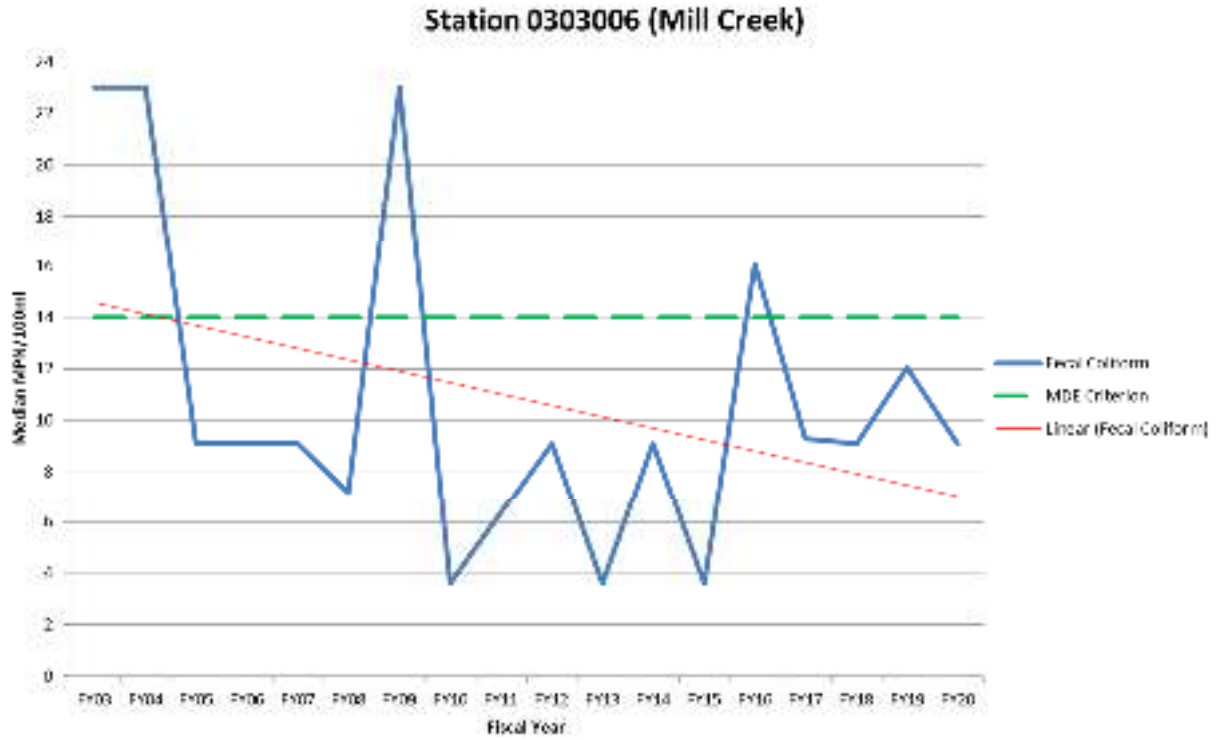


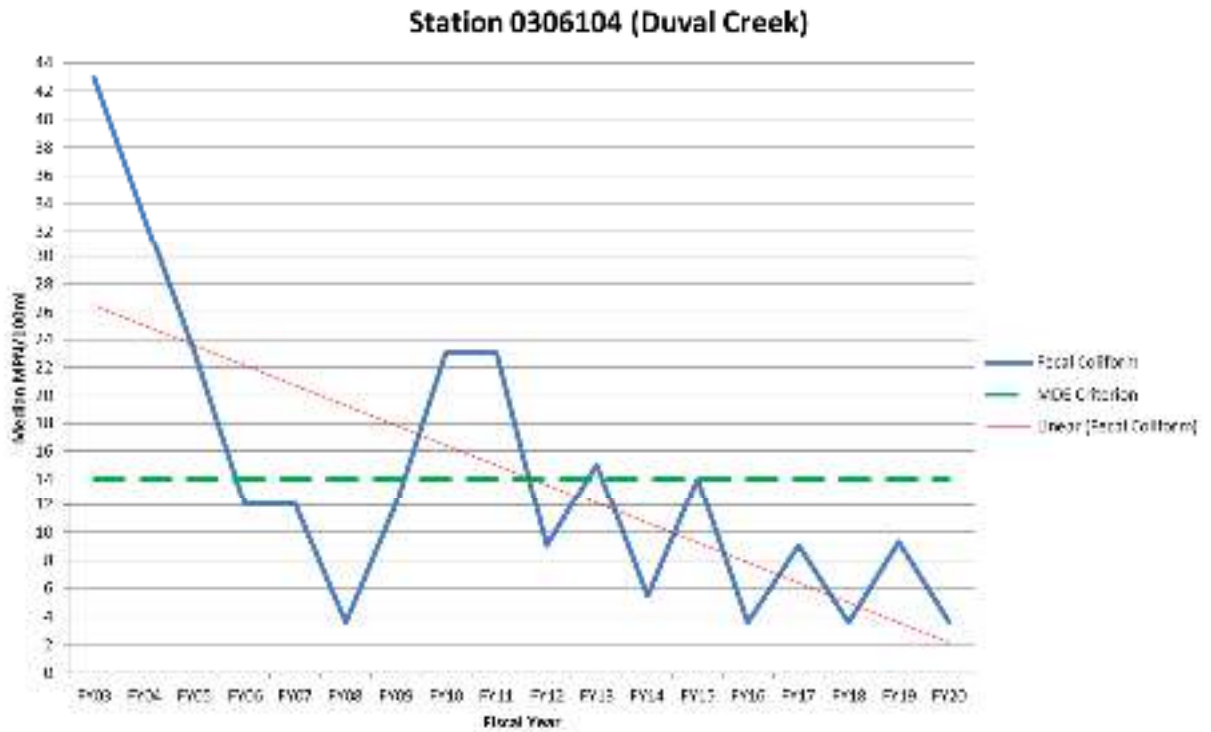
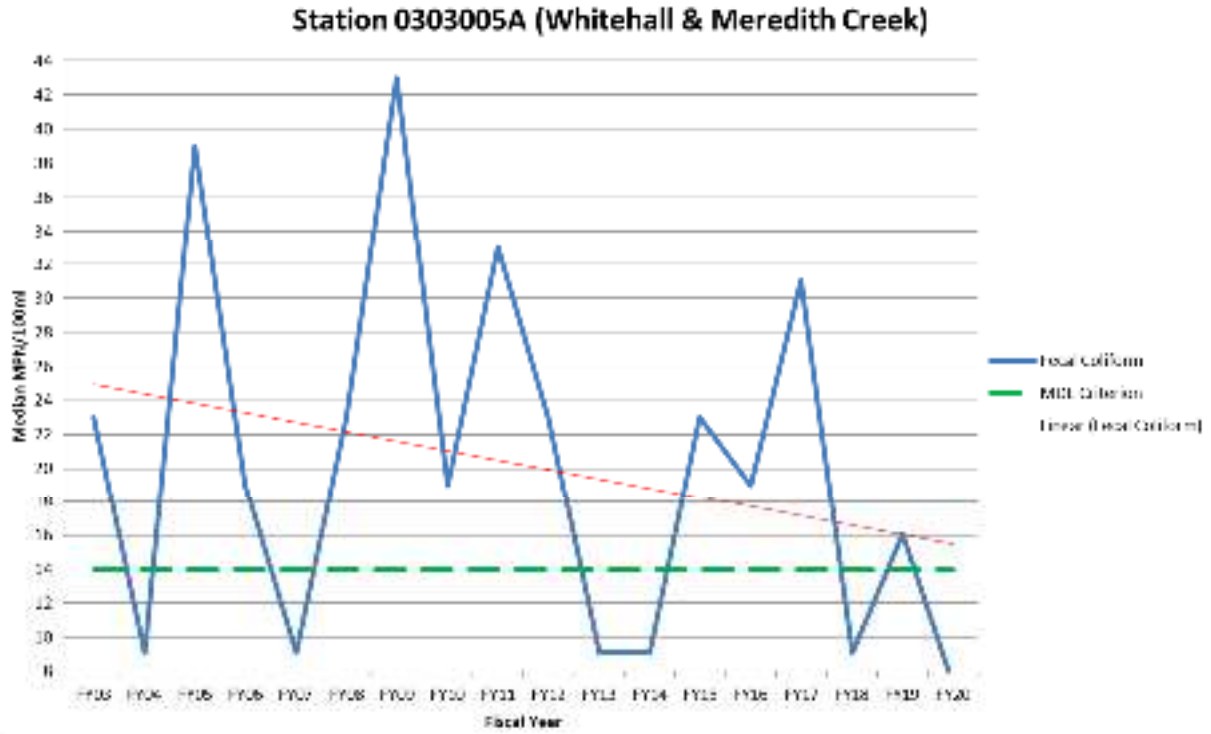
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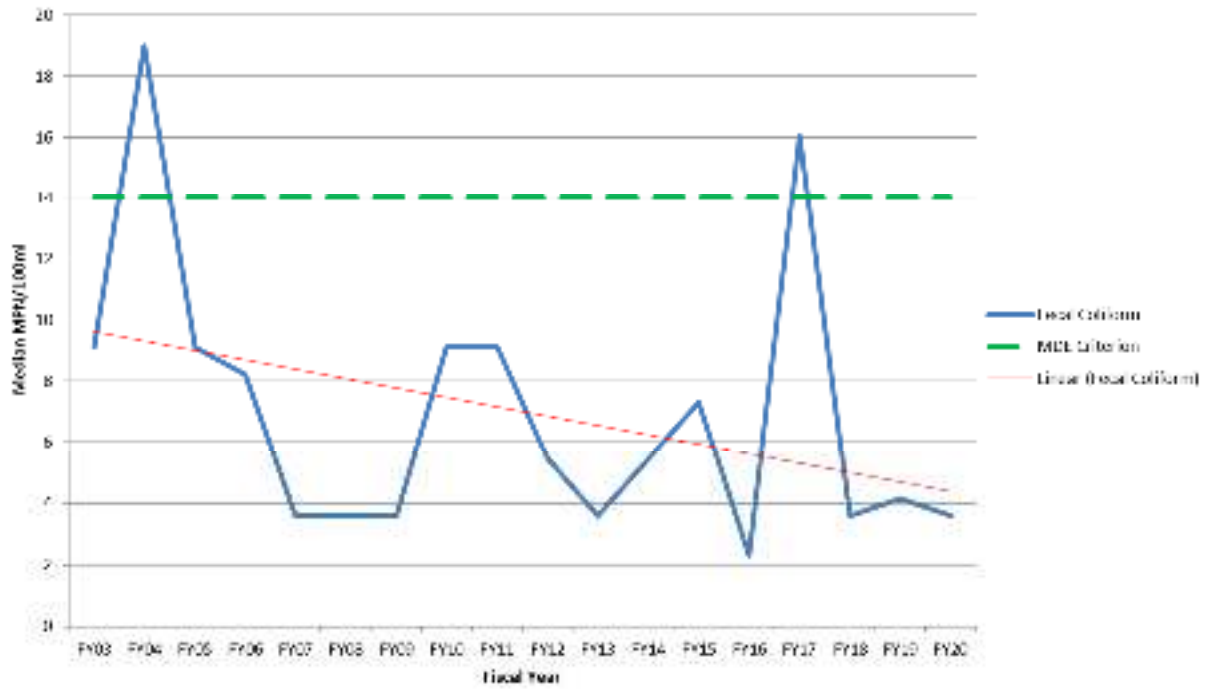
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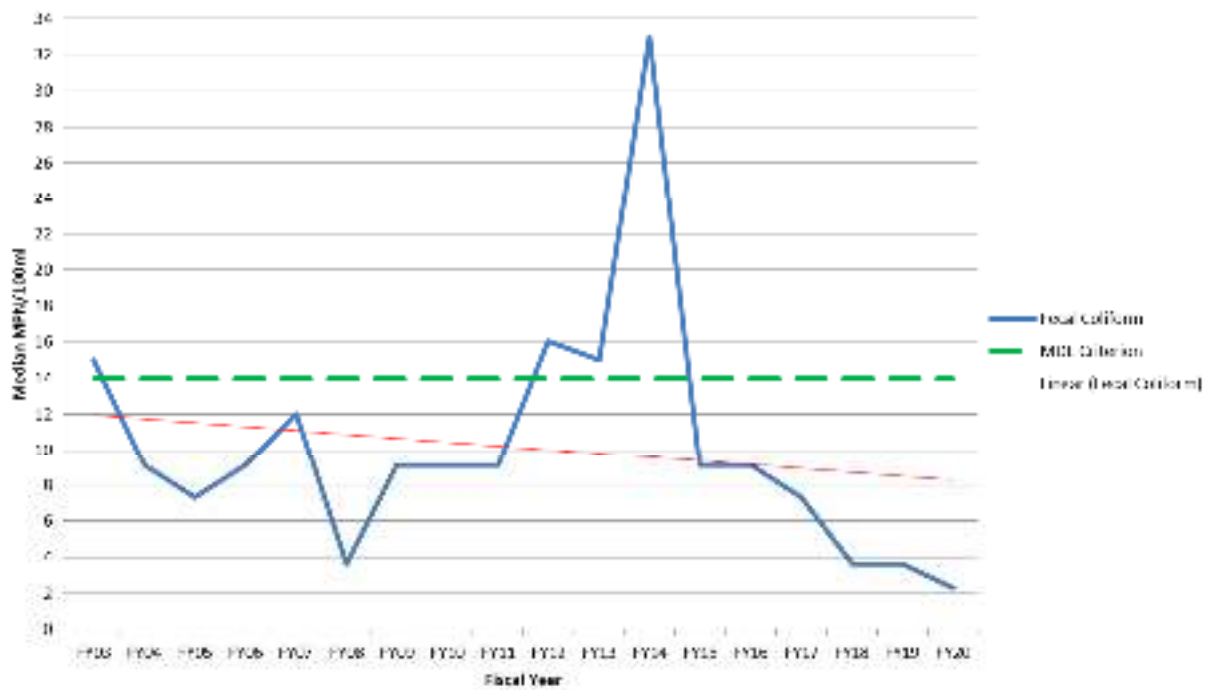




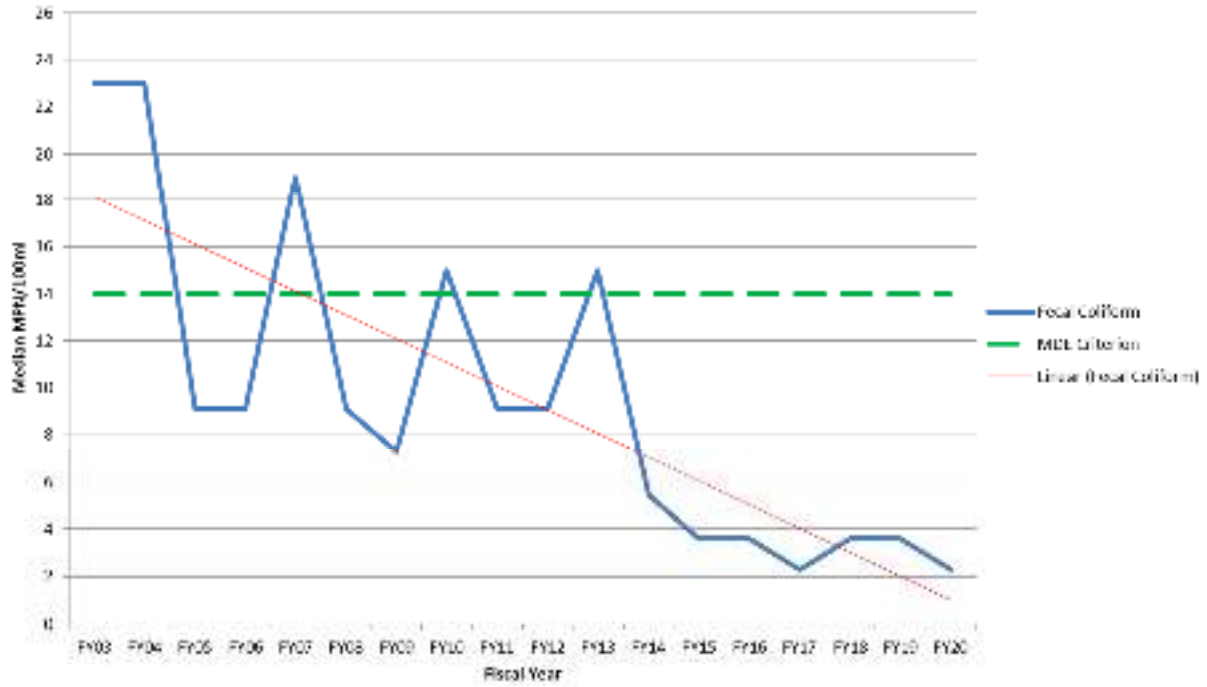
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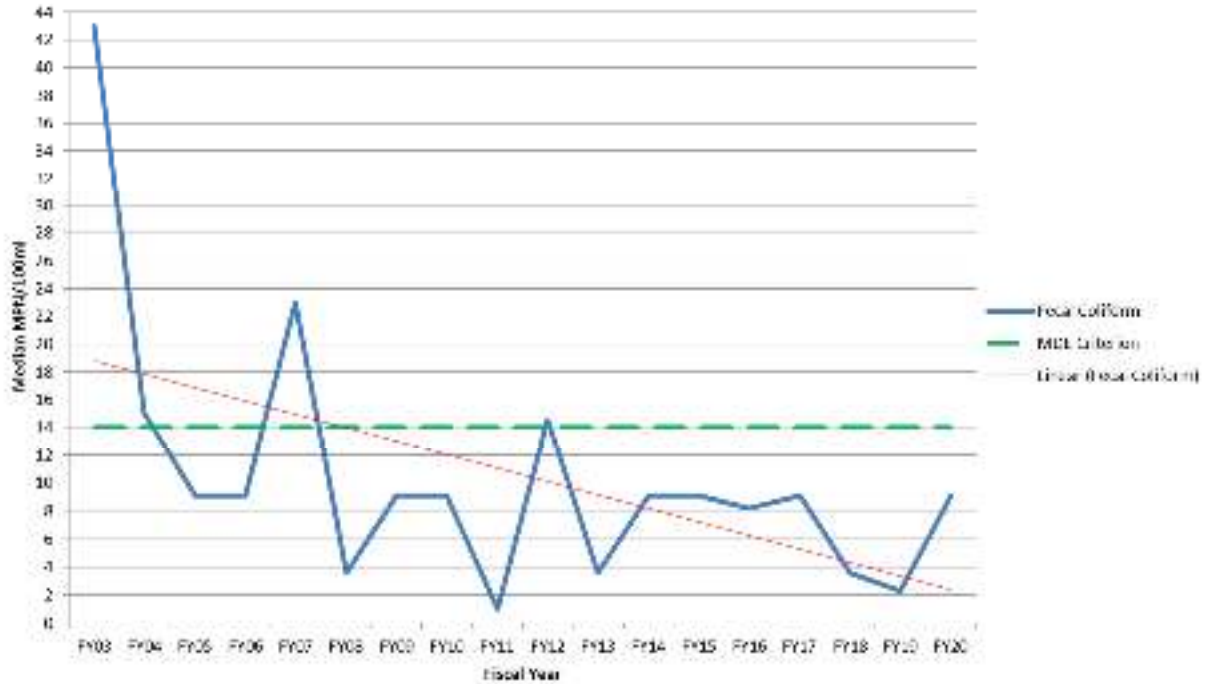
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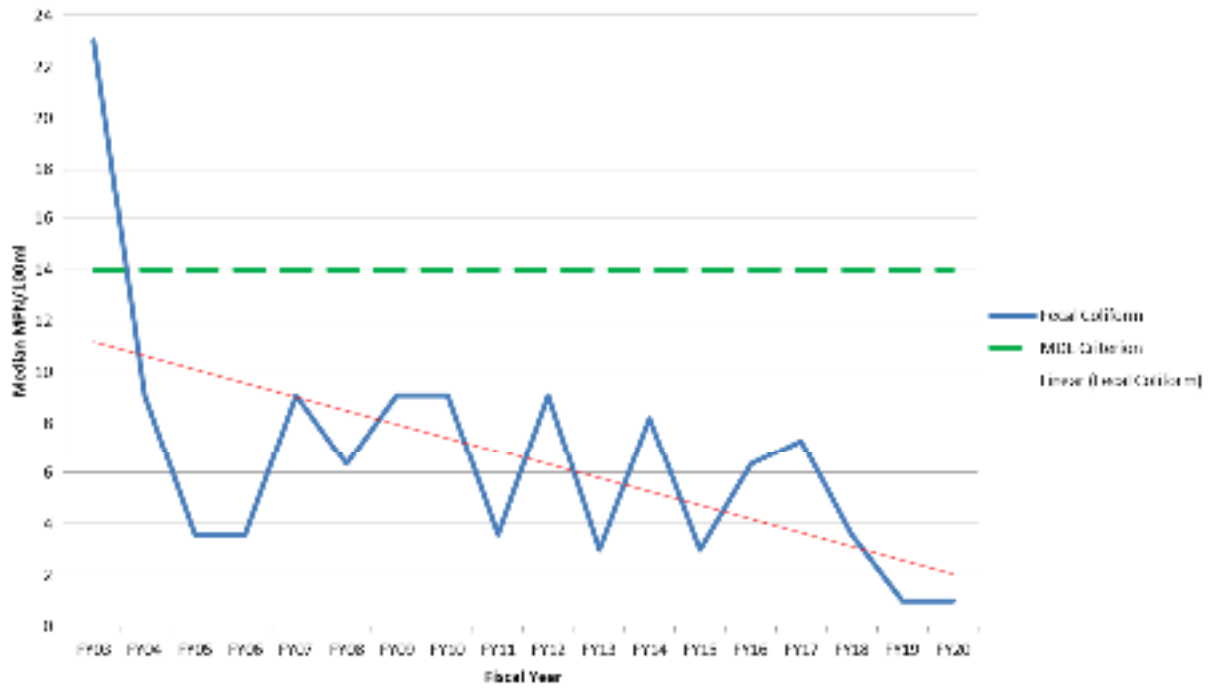
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Station 0306002 (South Mainstem)



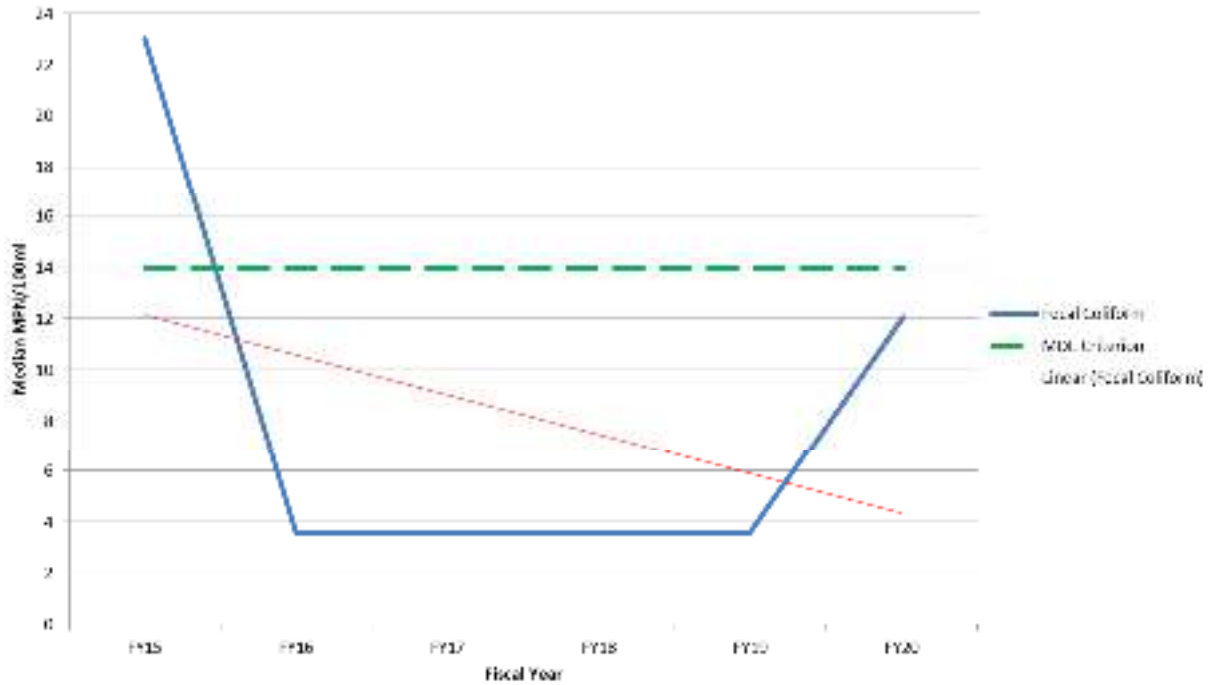
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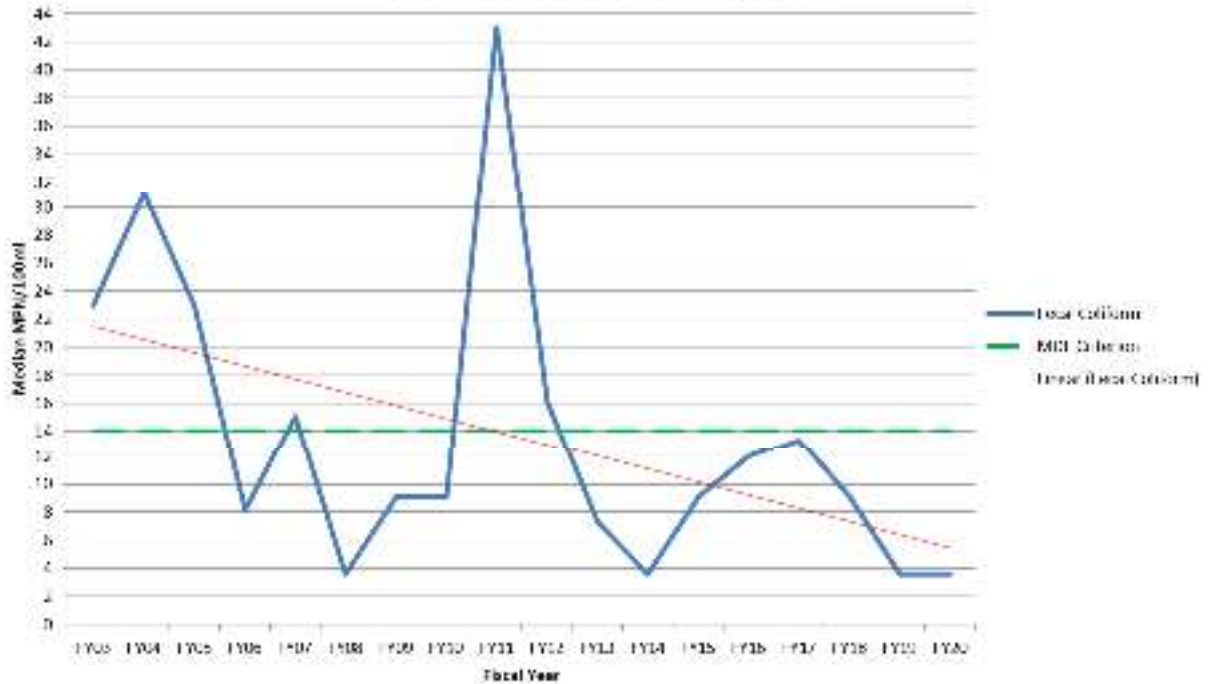
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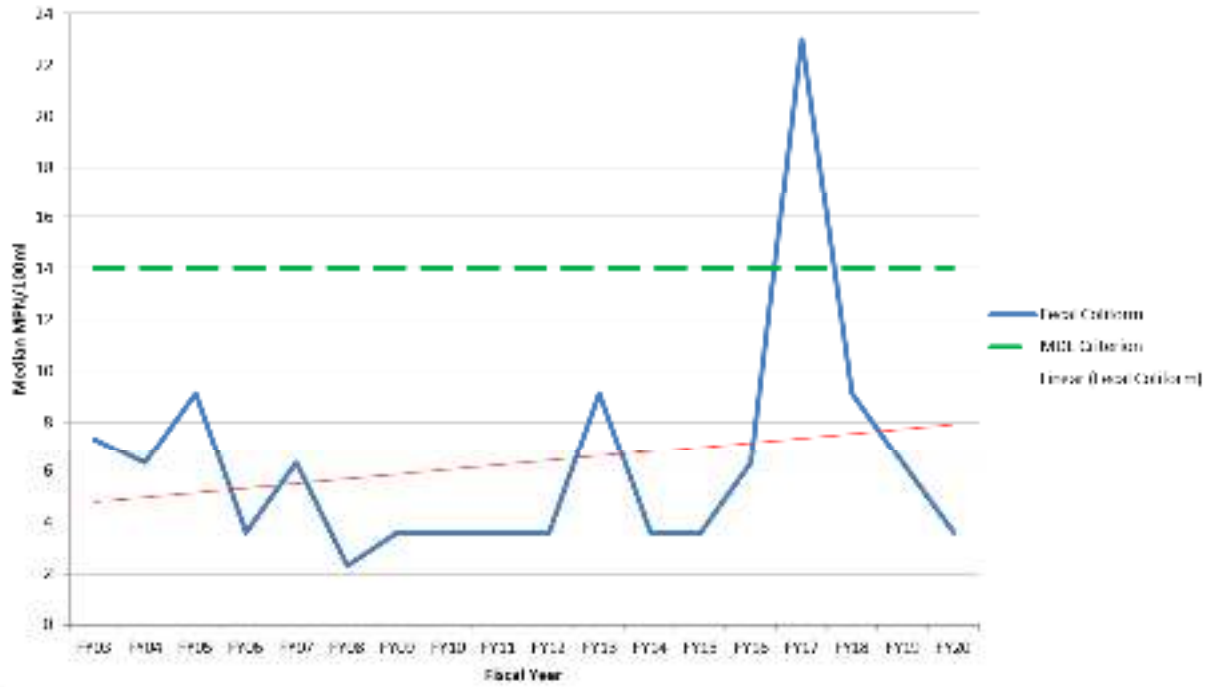
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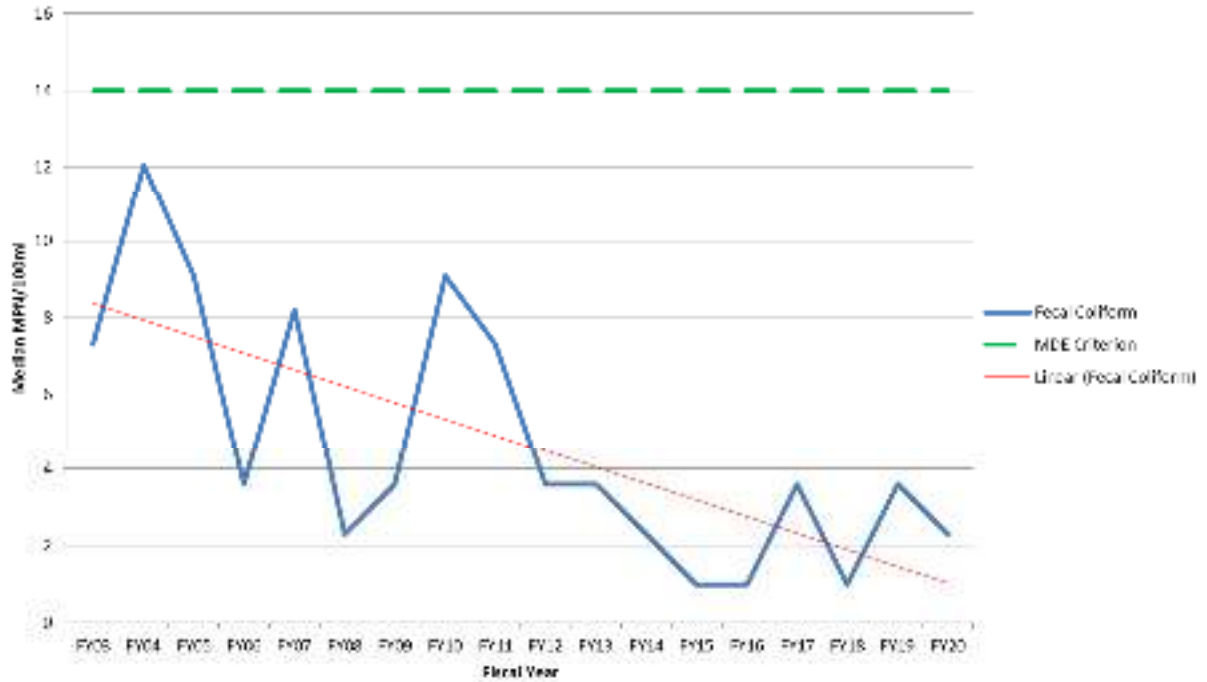
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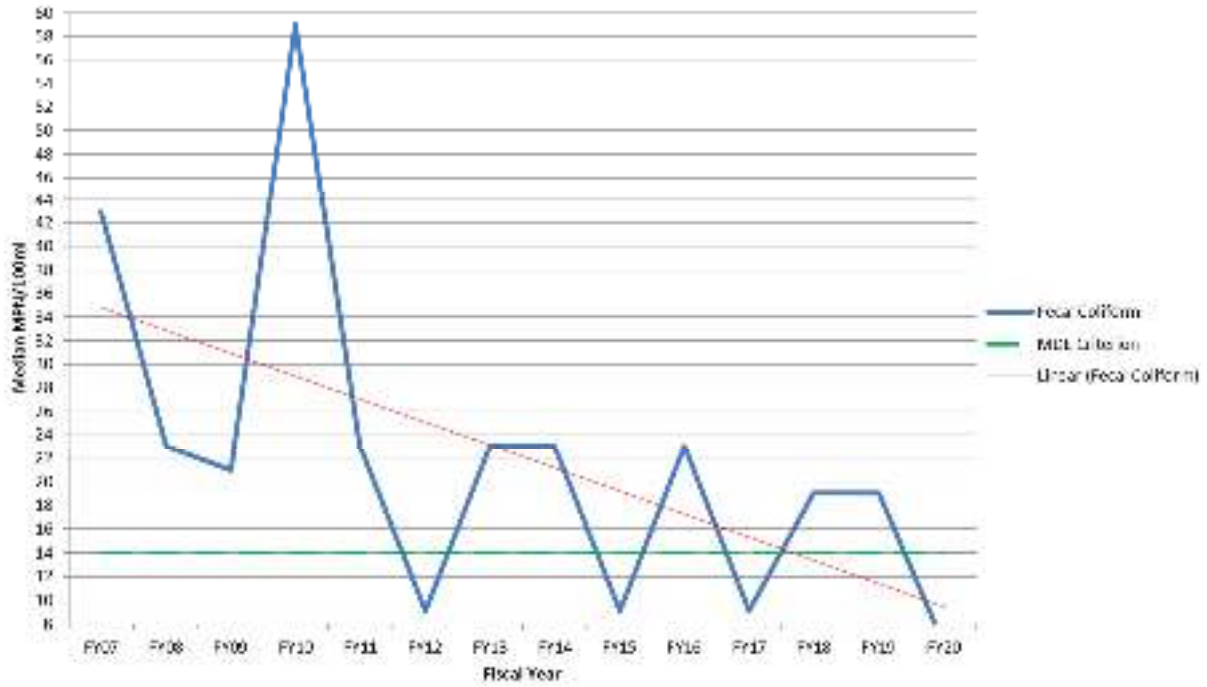
Station 0306801 (Selby Bay)



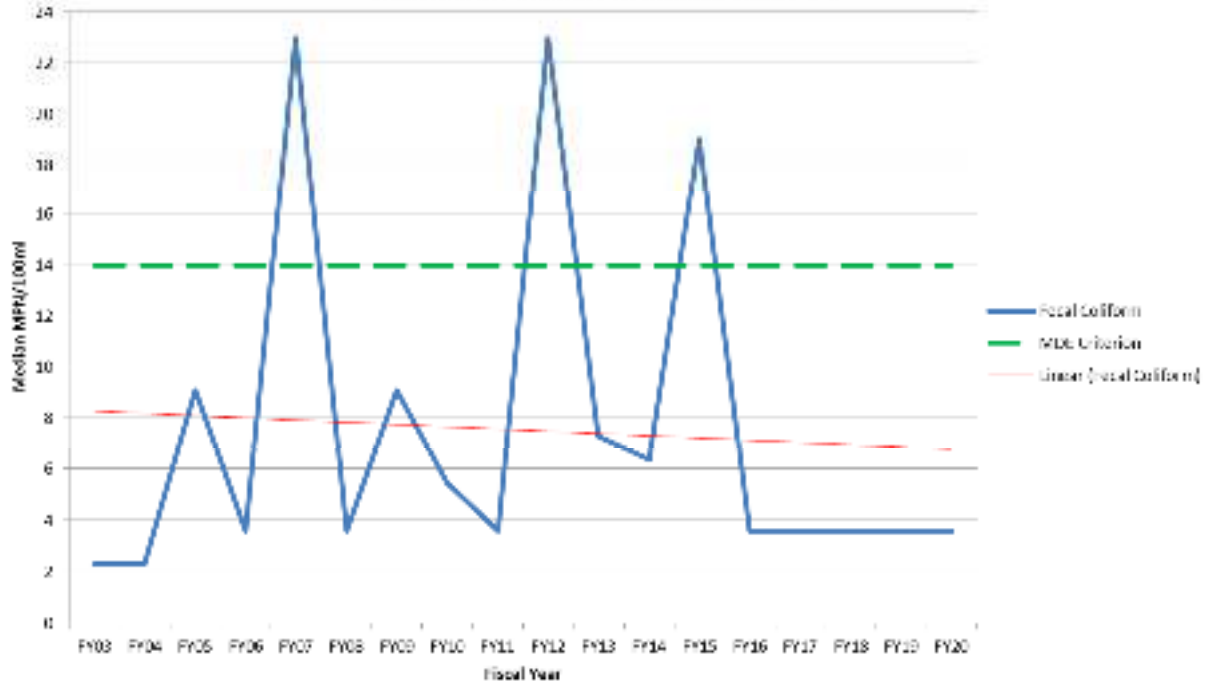
Station 0306115 (Selby Bay)

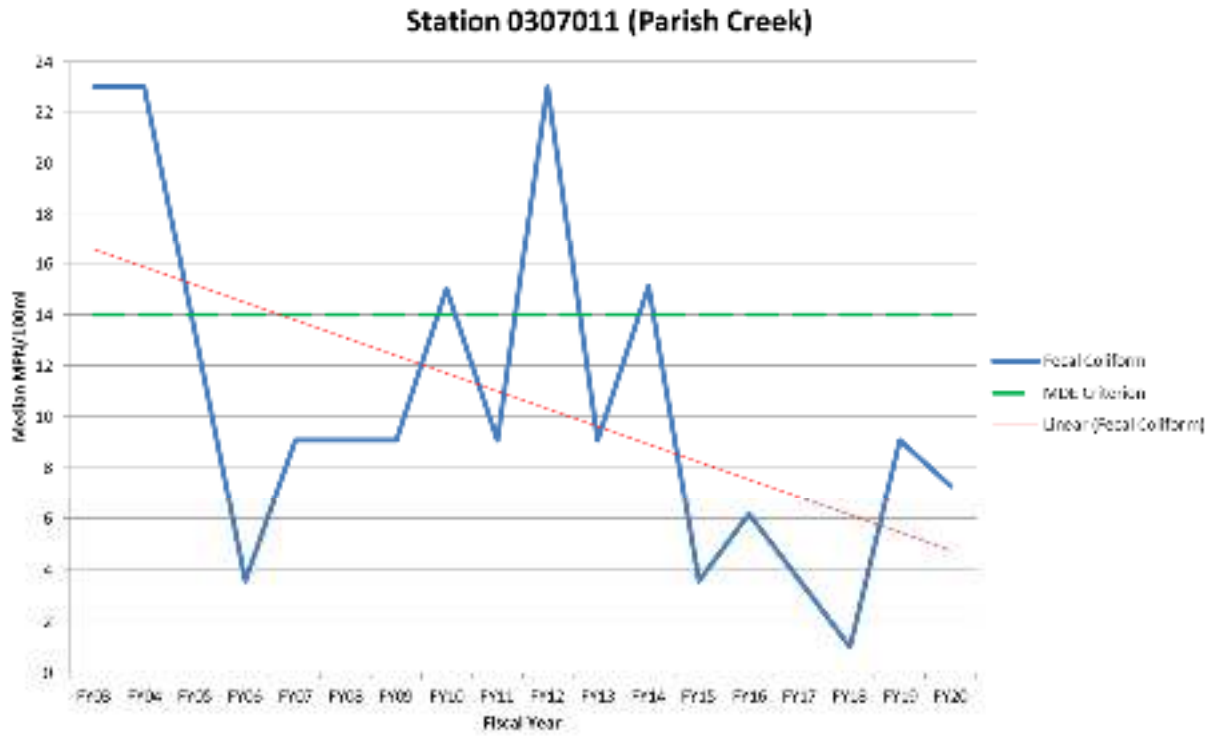


Station 0501004 (Tracy & Rockhold Creeks)



Station 0307205 (West Mainstem)





Appendix E

Rhode River Water Quality Monitoring – 2020 Summary

Rhode River Monitoring – 2020

Prepared for

Anne Arundel County Department of Public Works

Tammy Domanski, Director

AACC Environmental Center

1. Introduction.

The Anne Arundel County Department of Public Works is interested in assessing the effect of the 2017 conversion of the Mayo Water Reclamation Facility (MWRF) from a treatment plant to a pumping station. The conversion is predicted to significantly reduce nitrogen and phosphorous flow into the Rhode River and Chesapeake Bay in accordance with Chesapeake Bay TMDL reduction goals (Total Maximum Daily Load). The Anne Arundel Community College Environmental Center began monitoring mid-May 2017. Monitoring was performed weekly May through August 2017 through 2019. Parameters measured include dissolved oxygen, conductivity, salinity, pH, clarity, suspended solids, ammonia, nitrate/nitrite, phosphate, and three forms of chlorophyll. In addition, enterococcus levels were measured.

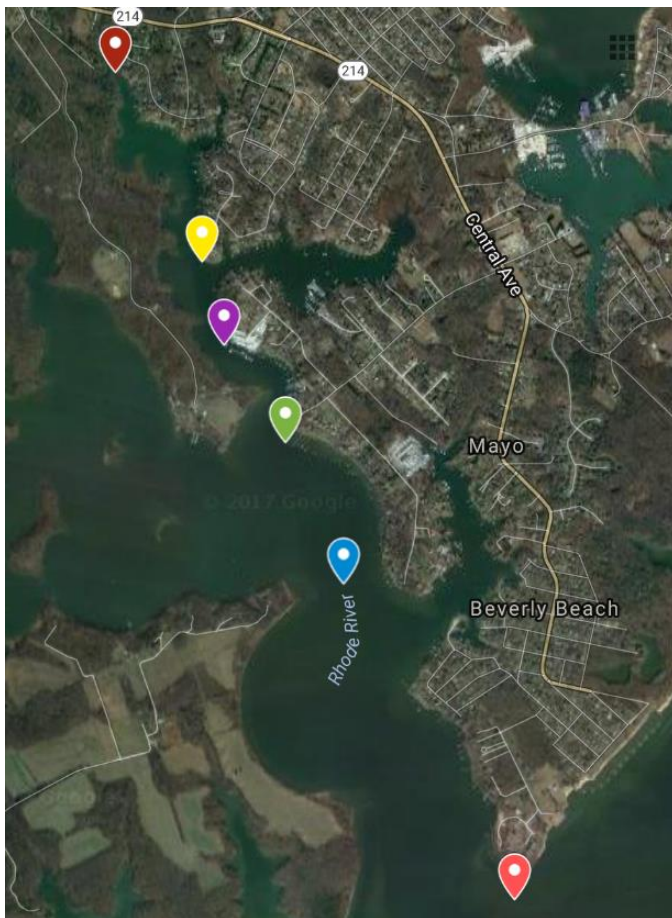


Figure 1. Sampling Sites.

Red marker= dock on West Shore Drive (WSH); Yellow marker=dock on Overhill Drive (OP); Purple Marker = midstream near Rhode Marina (RO3); Green marker= Carrs Wharf pier (CW); Blue marker= midstream between Locust Point and mouth of Cadle Creek (RO2); Orange marker= midstream near Mayo Facility outfall (SM)

Six sites were chosen for monitoring (Fig 1) based on the need to monitor the length of the river, to compare and contrast mid-stream and shore locations and to study sites differentially affected by shore runoff versus outfall flow or flow from the Bay into the river. In addition, the sites fit the criteria set forth by the Mid-Atlantic

Tributary Assessment Coalition (Wicks et al., 2011). Three sites are collected mid-stream (RO2, RO3, SM). Three sites are collected from docks by AACC Environmental Center technicians (WSH, OP, CW). The sites can also be divided into three groups based on location with two sites are near the headwaters (WSH, OP), representing slower mixing and exchange. Two points are midway down the river (RO3, CW), and two points are closer to the mouth of the river and the outfall (RO2, SM).

At the conclusion of the first two-year monitoring cycle it was agreed that additional monitoring was needed. During 2018, the “after” monitoring season, there was a record rainfall that skewed

measurements significantly with significant contribution of nitrate from the Chesapeake Bay confounding the possibility of measuring any improvement due to the MWRP conversion. Results from 2019 reflect a season that at the start was still being significantly impacted by the extreme rain from the previous months, but by the end was demonstrating resilience and a return to more typical seasonal patterns. The 2020 rain levels were average and weather was more stable in general.

2. Methods.

The following parameters were monitored weekly with a YSI meter (YSI Professional Plus (YSI 556 was used during the 2017 and 2018 seasons): water temperature, dissolved oxygen, conductivity, pH and salinity. Measurements were made at the surface and 0.2 m from bottom. Clarity measurements were made with a Secchi Disk. Two water samples were collected at these sites, one in a sterile bottle and one in an acid-washed bottle, and placed on ice for transport to the AACC lab. At AACC, samples were filtered for total suspended solids (TSS) and enterococci measurements. In addition, samples were filtered, and filtrate and glass fiber membranes were frozen for later transport to, and analysis at, the Chesapeake Biological Laboratories (CBL) (Solomons, MD).

Sampling took place between 8 a.m. and 1 p.m. (with one exception) and samples were processed by 4 p.m. TSS and enterococci were calculated 24 hrs after processing. Frozen nutrient filtrate and chlorophyll-containing filters were transported to CBL within 28 days.

Enterococci enumeration was conducted using EPA Method 1600 using membrane filtration and selection on indoxyl- β -D-glucoside (mEI) agar. Nutrient and Chlorophyll measurements were performed at the University of Maryland Chesapeake Biological Laboratory (CBL). Specifically, the tests performed included: 1) chlorophyll a utilizing spectrophotometry, 2) total nitrogen by a cadmium reduction method, and 3) phosphate (PO_4) by the ascorbic acid method. Method details are outlined at <https://www.umces.edu/nasl/methods> .

For all parameters, quality control measurements were performed at a rate of approximately 10%. Quality control measurements that deviated by more than 10% were further analyzed and potentially removed from data analysis if an error in method or reporting was confirmed. In addition, regular laboratory quality control analyses are performed to ensure the validity of methods and performance of equipment.

Rainfall daily totals were tracked at multiple sources including the Community Collaborative Rain, Hail and Snow Network (www.cocorahs.org).

3. Results and Discussion.

A. Rainfall. Runoff is a major factor in the health of waterways. The Anne Arundel County Health Department recommends avoiding contact with rivers and streams 48 hours after a rain event of 0.5 inches or more due to increased bacterial levels. In addition, sediment runoff produces plumes of suspended material that block sunlight and carry nutrients and a variety of

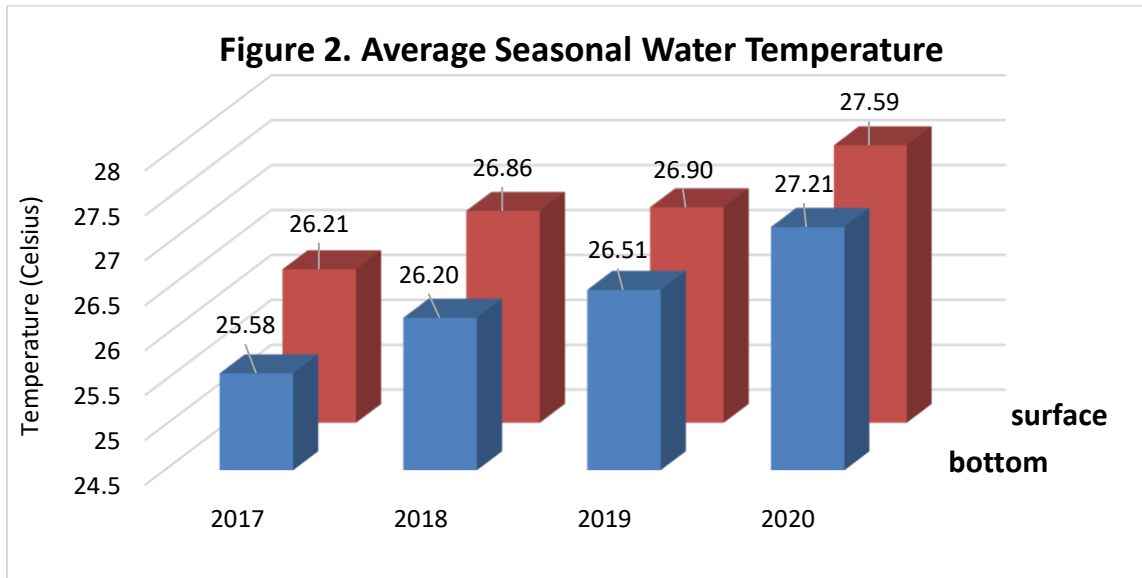
pollutants. Table 1 lists rainfall of at least 0.1 inches. The values in table 1 represent data from three collection sites near the shore of, west of, and south of Rhode River.

The rain total during the 2020 season was near double the total in 2019, but like 2019, only three of the 2020 sampling days were impacted. In addition, although there were more calendar days in 2020 with at least 0.1 inches of rain when compared with 2017 and 2018, 2020 had fewer sampling days affected.

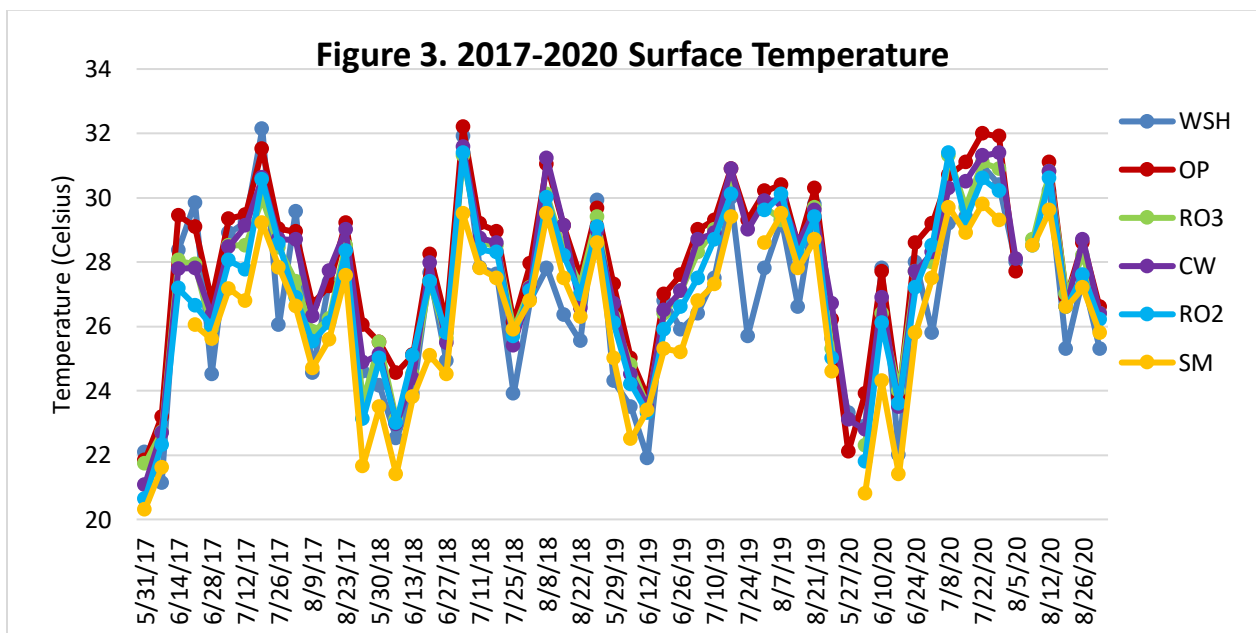
Table 1. 2017-2020 Rainfall of 0.1 inches or greater along Rhode River. (data from www.cocorahs.org). Highlighted rows indicate at least 0.4 inches up to 48 hours prior to sample collection.

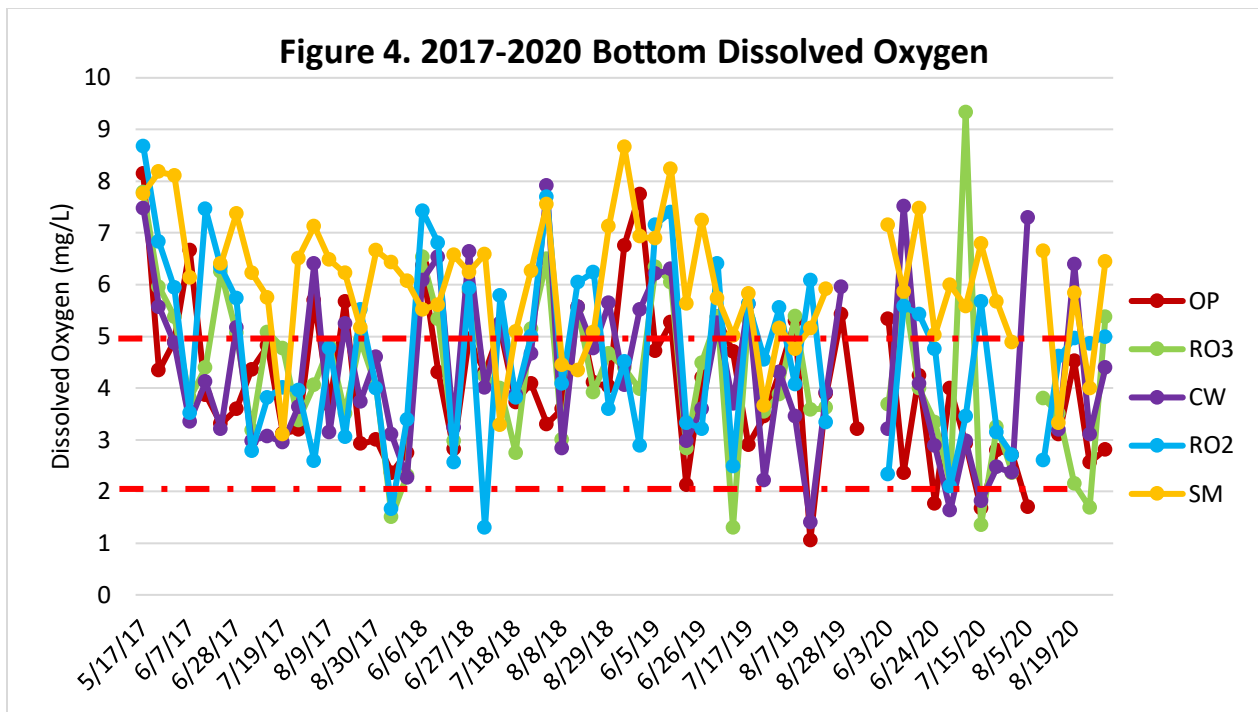
2017		2018		2019		2020	
Date	Rainfall (inches)	Date	Rainfall (inches)	Date	Rainfall (inches)	Date	Rainfall (inches)
5/05/17	.60	5/13/18	.99	5/24/19	0.46	5/22/20	.18
5/06/17	.85	5/14/18	.55	5/27/19	0.27	5/23/20	1.10
5/07/17	.11	5/15/18	.79	5/29/19	0.99	5/29/20	.41
5/12/17	.93	5/16/18	.70	5/31/19	0.78	6/5/20	.85
5/13/17	1.29	5/17/18	.79	6/10/19	0.27	6/6/20	.44
5/23/17	.40	5/18/18	2.47	6/11/19	0.13	6/18/20	.27
5/25/17	.35	5/19/18	1.09	6/13/19	1.85	6/21/20	.22
5/26/17	.65	5/27/18	.10	6/14/19	0.14	6/23/20	.11
6/17/17	.12	6/01/18	.49	6/18/19	0.36	6/26/20	.57
6/20/17	.41	6/3/18	.21	6/19/19	0.57	6/28/20	.21
6/23/17	.18	6/4/18	2.03	6/25/19	0.10	7/1/20	.45
6/24/17	.20	6/10/18	.10	7/7/19	0.20	7/2/20	.49
7/5/17	.46	6/11/18	.66	7/9/19	1.17	7/7/20	2.25
7/6/17	.38	6/20/18	1.18	7/12/19	1.21	7/14/20	.17
7/7/17	.91	6/23/18	.39	7/18/19	0.37	7/21/20	.87
7/15/17	.19	7/18/18	1.54	7/23/19	0.14	7/23/20	.50
7/21/17	.22	7/22/18	7.32	8/2/19	0.36	7/31/20	.24
7/23/17	.94	7/23/18	3.37	8/8/19	0.61	8/1/20	.14
7/24/17	.89	7/24/18	1.76	8/18/19	0.14	8/3/20	.35
7/28/17	.41	7/25/18	1.14	8/22/19	0.52	8/4/20	1.47
7/29/17	2.67	7/26/18	.22	8/24/19	0.35	8/5/20	2.50
8/8/17	1.32	7/28/18	.19			8/6/20	.24
8/12/17	.30	8/01/18	.61			8/8/20	2.69
8/13/17	.64	8/03/18	1.06			8/13/20	.20
8/18/17	.42	8/13/18	.12			8/14/20	.71
8/19/17	1.22	8/14/18	.17			8/16/20	.86
8/29/17	.50	8/22/18	.76			8/17/20	.12
8/30/17	.80					8/18/20	.55
						8/20/20	.15
						8/26/20	.10
						8/29/20	.80
						9/2/20	.25
TOTAL=	18.36	TOTAL=	30.8	TOTAL=	10.99	TOTAL=	20.46

A. Water Temperature, Dissolved Oxygen and Clarity. The 2017-2020 average surface and bottom temperatures are illustrated in Figure 2. There is a continued increase in the average seasonal temperature along the Rhode River. An ANOVA 1-way analysis of the four years of data, including surface and bottom readings, resulted in a p-value of 8×10^{-8} , illustrating that the change over time is significant, and a paired t-test on the 2019 and 2020 values determined that the increase is significant over just one year ($p=0.011$).



During the 2020 season, the highest surface temperature was measured at Overhill Drive Pier and Carrs Wharf on July 29th. The highest bottom temperature was Overhill Drive Pier on July 22nd.





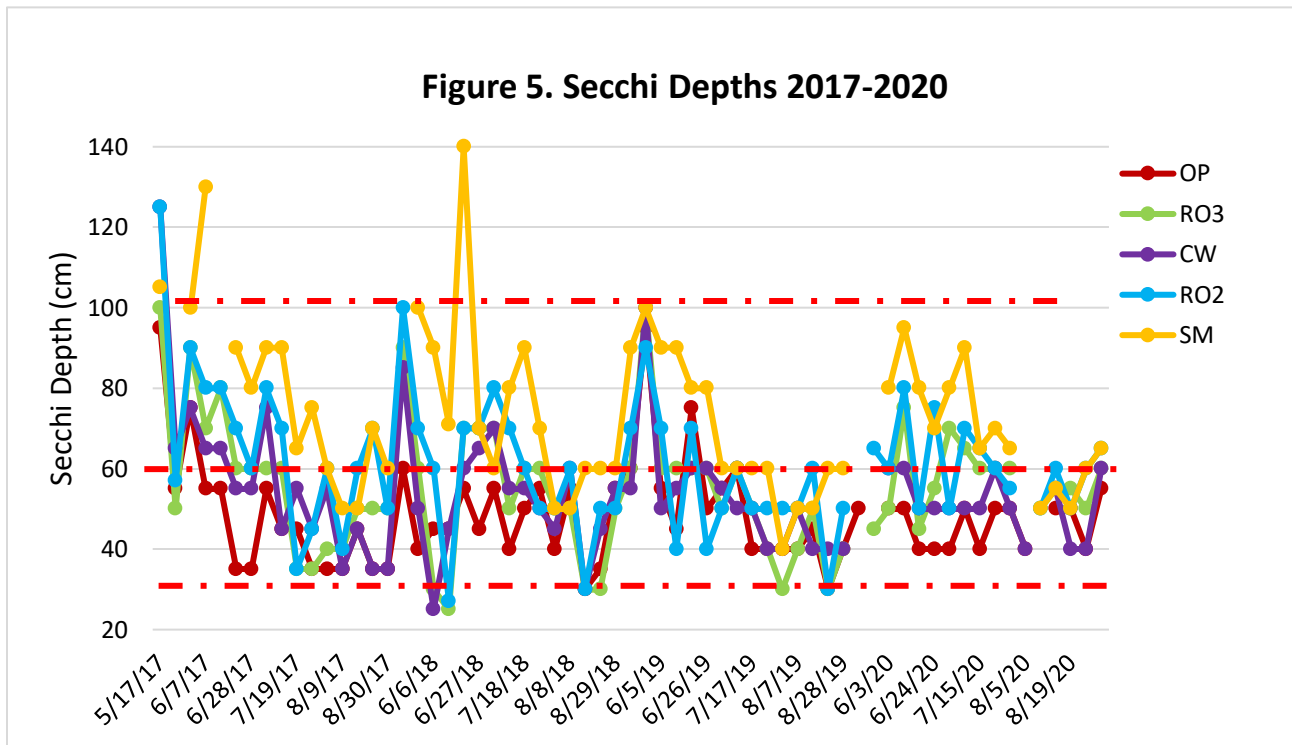
Higher water temperatures are associated with lower dissolved oxygen levels, increased algal growth and decreased clarity. Figure 4 illustrates the bottom DO values over the three-season period. Levels of DO below 5 mg/L are not optimal for most aquatic organisms, and the level of DO can be significantly affected by algal blooms that initially produce oxygen during photosynthesis, but eventually block photosynthesis in submerged aquatic vegetation (SAV) underwater, reducing oxygen production by those organisms.

Dissolved oxygen values below 5.0 mg/L put stress on marine organisms, and levels below 2.0 mg/L are considered hypoxic. In 2020 only 29.6% of bottom DO measurements were above 5.0 mg/L, a significant drop from the previous three years at 48.6% in 2019, 48.0% in 2018, and 41.9% observed in 2017 (1-way ANOVA $p=0.002$). Of note, the occurrences of dissolved oxygen below 2.0 mg/L increased in frequency over the four seasons, with one value below 2.0 mg/L in 2017, three values below the threshold in both 2018 and 2019, and seven in 2020. Additionally, although the percentage of bottom DO values greater than 5.0 mg/L improved over the first three seasons, the overall average of the season's bottom DO was relatively consistent at 4.76 mg/L DO ± 0.019 . During the 2020 season, however, the average bottom DO decreases significantly to 4.07 mg/L ($p=0.002$ in 2-tailed test).

The calculations for bottom DO did not include the WSH site. During the 2018-2020 seasons WSH was typically less than 0.5 m total depth, so DO was only measured at the surface. Dissolved oxygen values at WSH showed improvement with 35.7% of values over 5.0 mg/L in 2020, lower than 40% 2017 but higher than 33.3% in 2018 and 20% in 2019. These values may be affected by clarity. In addition, there weren't any occurrences of values below 2.0 mg/L in 2020 compared with 4 occurrences 2019, one in 2017 none in 2018.

Dissolved oxygen levels are also related to clarity. In this study, Secchi Depth was determined weekly at each site (Figure 5). Secchi Depths were compared to thresholds set forth in the

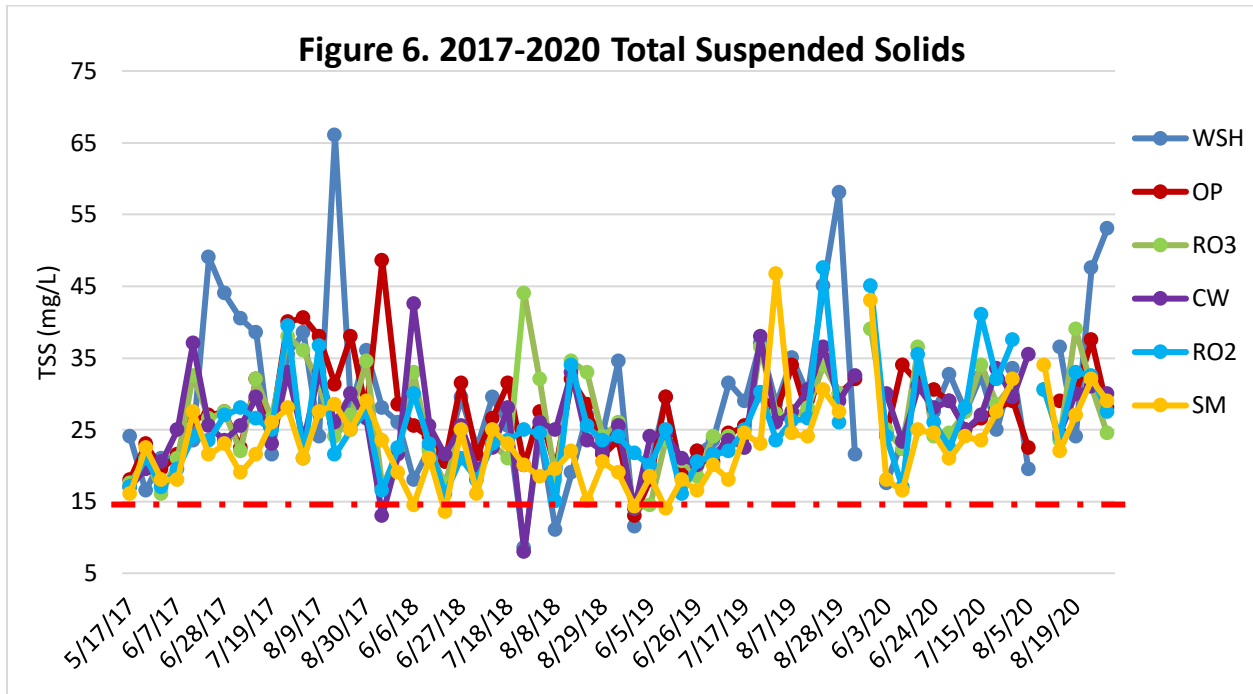
MTAC Sampling and Data Analysis Protocols for the Mid-Atlantic Tidal Tributary indicators (Wickes et al, 2011). The guidelines provide a scorecard associated with clarity for brackish water (0=< 30 cm; 1= 30-60; 2= 60-100, 3=100-160; 4= 160-180; 5= >180). Figure 5 does not include the WSH sampling site, since that site is very shallow, typically less than 0.5 m, and the water was often clear to the bottom. The graph also shows the cutoffs for MTAC water quality grades (red lines). Although the goal of this project is not to assign a scorecard grade, these cutoffs provide a convenient tool for comparing sites to each other over the three seasons of sampling.



During the 2020 season there were no Secchi values that reached the 100 cm (1 m) threshold, a significant decrease from the 4.1- 7.5% values over the three previous seasons. As figure 5 illustrates, the values for 2020 did not show a significant peak early in the season, as other years did. 43.8% of the 2020 measurements were between 60- 99 cm in 2020, similar to 42.5% in 2017 and 43.2% in 2018 and higher than 38.7% in 2019. None of the sites measured less than 30 cm during the 2020 season, matching the 2019 and 2017 measurements, in comparison with values under 30 cm three times during the 2018 season. At WSH, the headwaters site, during 2020 total depth never reached 1 m, and 72% of the time the water was clear to the bottom with the lowest measured Secchi depth at 30 cm and the highest at 50 cm.

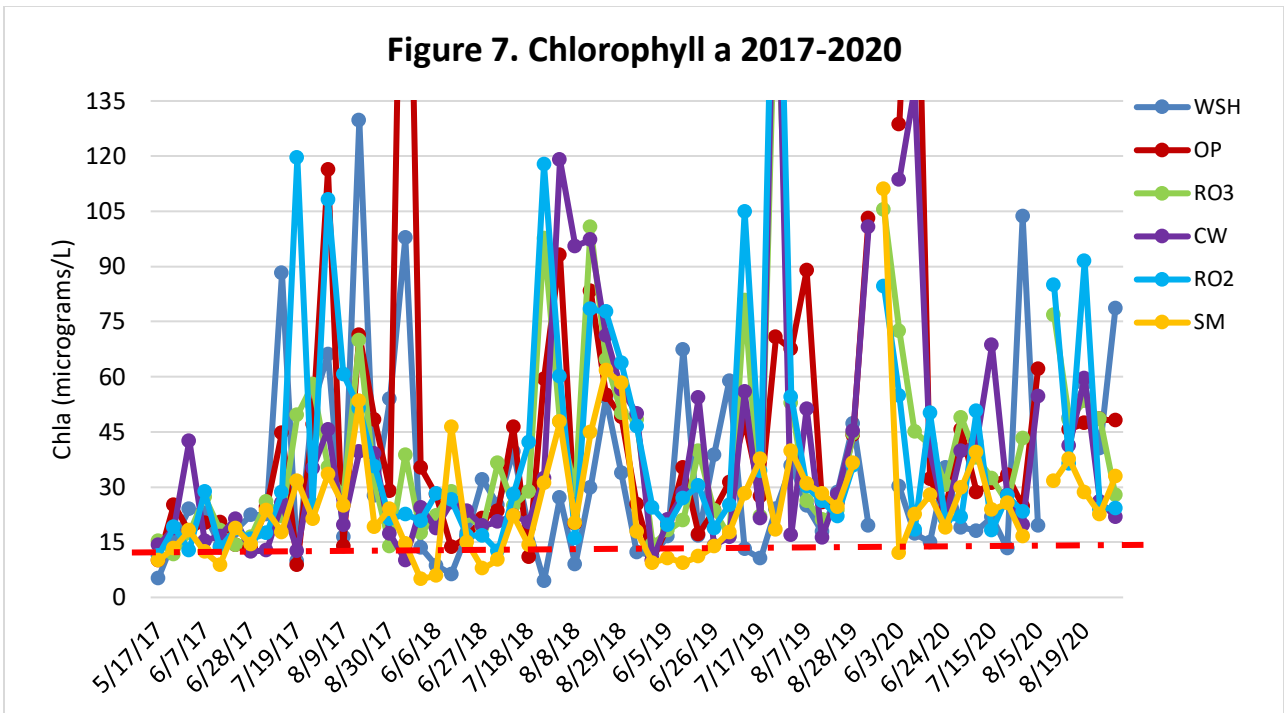
Average Secchi depths were calculated excluding the values at WSH which would skew calculations due to the “clear to bottom” values. After three years of decline from a high in 2017 of 61.8 cm in 2017 to 52.9 cm in 2019, 2020 rebounded with an average of 56.9 cm. All four seasons demonstrated a pattern of decreasing clarity as the season progressed and water temperature increased, followed by a noticeable increase during the last part of August that is independent of rain events and water temperature.

B. Total Suspended Solids (TSS). TSS values higher than 15 mg/L do not support SAV growth (Batiuk et al., 1992). In general, higher Secchi Depth values correlate with lower TSS values (Figures 5 and 6), and that inverse relationship, in general, was evident in the 2020 measurements. TSS values throughout the 2017, 2019 (with one exception) and 2020 seasons were above the 15 mg/L threshold at all sites. However, during 2018, there were multiple occasions when the values were below the threshold. Average TSS in 2018, at 23.7 mg/L, was significantly lower than 27.8 mg/L in 2017 ($p=0.001$ in 2-tailed test), but that was followed by an increase to 25.6 mg/L in 2019. Another significant increase followed again in 2020 with a TSS average of 29.2 mg/L (two-tailed t test $p=6 \times 10^{-6}$).



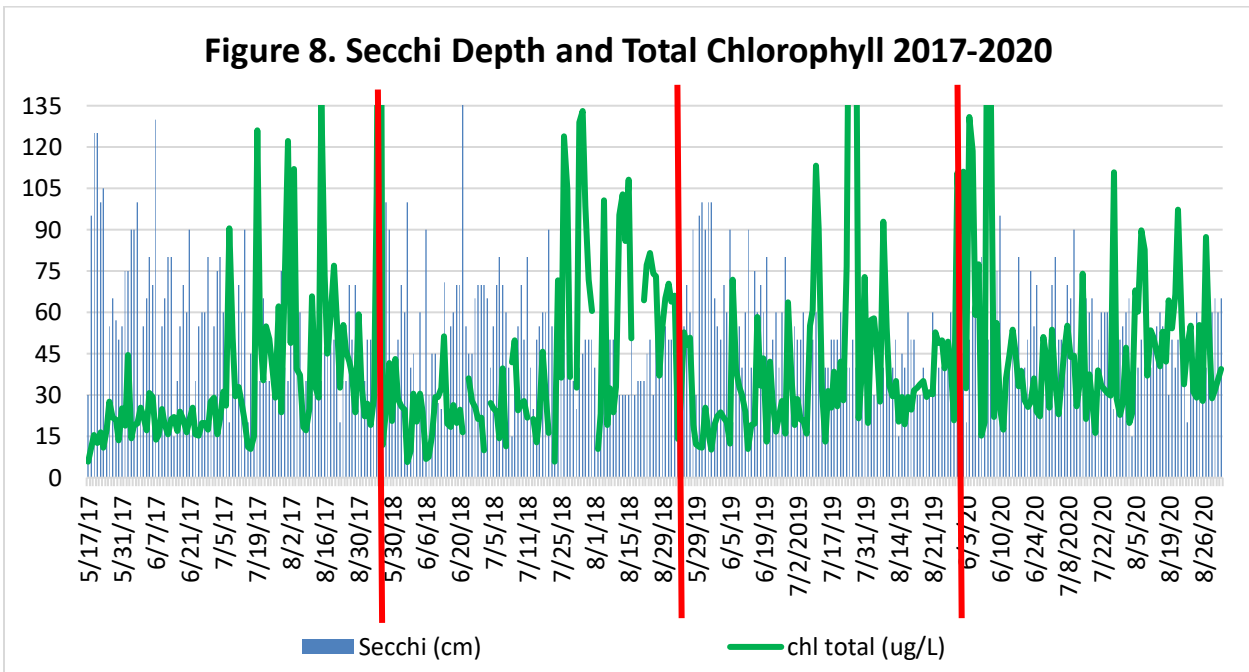
C. Chlorophyll a. Chlorophyll a, a photosynthetic pigment in phytoplankton, is an indicator of phytoplankton biomass. The Chesapeake Bay Program has determined that chlorophyll a concentrations above 15 $\mu\text{g/L}$ are detrimental to SAV growth. As illustrated in Figure 7, the measurements along Rhode River frequently exceed the 15 $\mu\text{g/L}$ threshold. Comparing seasonal total chlorophyll a averages shows that the 2017 average is 30.1 $\mu\text{g/L}$ rose to a statistically higher 2018 average of 39.4 $\mu\text{g/L}$. That value fell to 36.6 $\mu\text{g/L}$ in 2019 but has been followed by another noticeable but not statistically significant increase to 45.9 $\mu\text{g/L}$ in 2020 (two tail t-test $p=0.09$).

Figure 7. Chlorophyll a 2017-2020



Chlorophyll concentrations are typically lower early in the season and increase as the water warms and nutrient concentrations increase. That pattern was observed from 2017 through 2019. However, from early May through early June 2020 an algal bloom (*Prorocentrum minimum*) was observed along the mid-Chesapeake Bay including the West and Rhode Rivers. The bloom caused the appearance of the characteristic mahogany color, decreased clarity, increased TSS, and very high chlorophyll concentrations (figures 5-8). The inverse relationship between clarity and total chlorophyll concentration is illustrated in figure 8, and the unusual pattern with high chlorophyll (green) and low clarity (blue) early in the 2020 season is evident when compared with the previous three seasons.

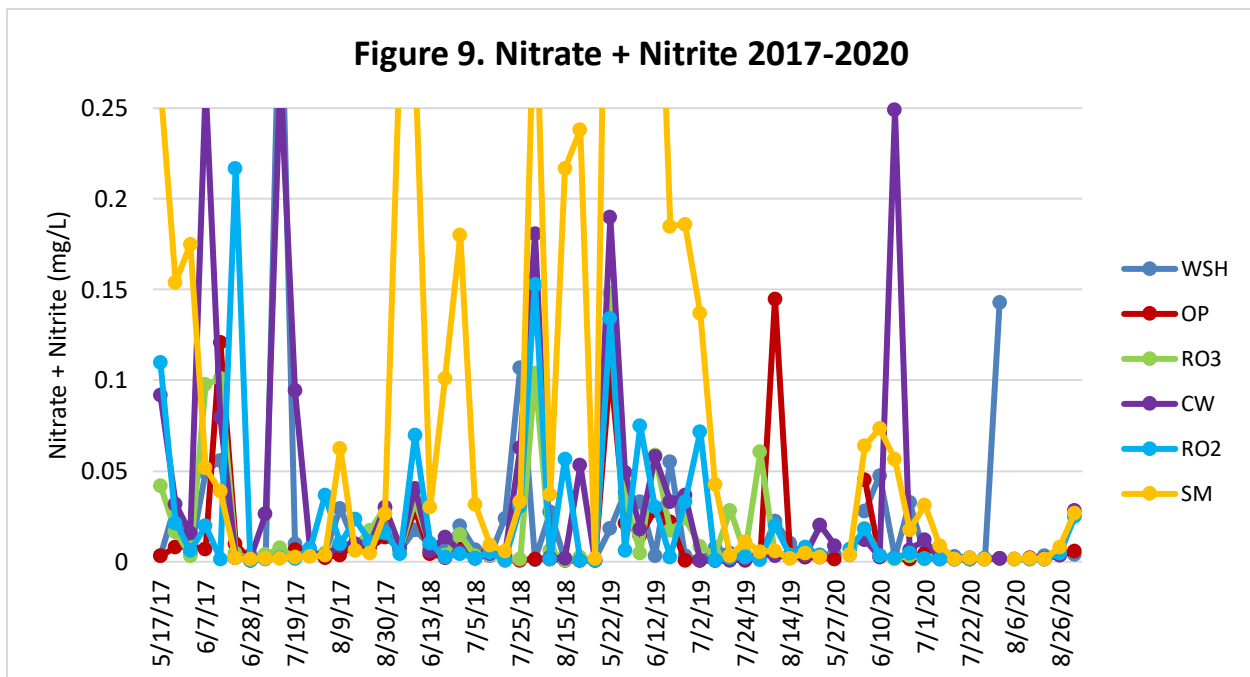
Figure 8. Secchi Depth and Total Chlorophyll 2017-2020



D. Nutrients: Nitrate and Nitrite, Ammonia, Total Dissolved Nitrogen. In both 2018 and 2019, the increase in the overall average of nitrate/nitrite in the Rhode River were driven specifically by the large spikes measured at the mouth of the river, SM (figure 9 and refer to the 2019 report for details). However, the very high nitrate/nitrite input from the Bay trended down in the second half of the 2019 season.

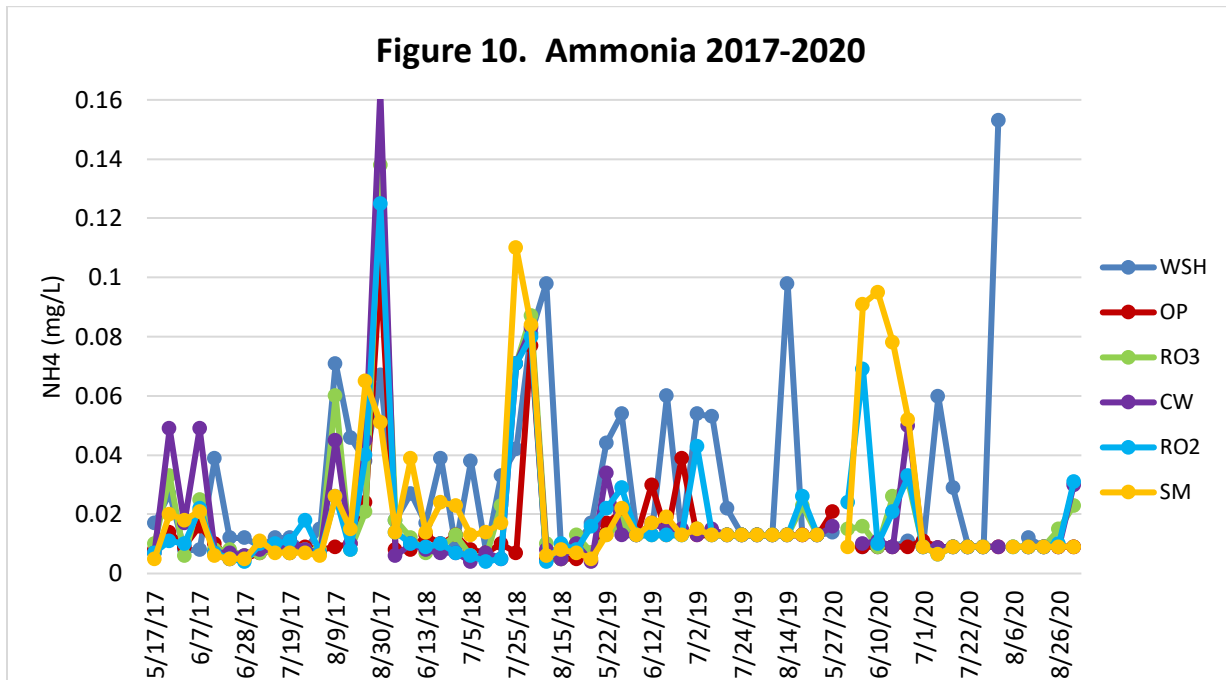
Figure 9 also illustrates that in 2020 the mouth of the Rhode River showed only a modest spike at the start of the season when compared with each of the three previous years, did not have any other spikes during the remainder of the season, and was consistently as low as the other sites (the scale on the y-axis in figure 9 is truncated to highlight those values). The spike at the WSH headwaters site (8/5/20) was likely due to runoff from over 5 inches over rain that fell the day before sampling. The spike at CW (6/17/20) does not have an obvious cause but construction on the pier was on-going during the first three weeks of the sampling season.

Over the first three years of sampling there was an increase in the average concentration of nitrate/nitrite; 0.035 mg/L in 2017, 0.036 mg/L in 2018, and 0.047 mg/L in 2019. By contrast, in 2020 the average decreased to 0.013 mg/L. Of note, 2017 monitoring occurred before the Mayo WRF conversion, and the first two post-conversion seasons were skewed by record rainfall and inflow the Bay, so 2020 was the first post-conversion season not complicated by extreme weather conditions. Statistical analysis confirmed that the nitrate/nitrite concentration average in 2020 is significantly lower than the 2017 average (two-tailed $p=0.004$).

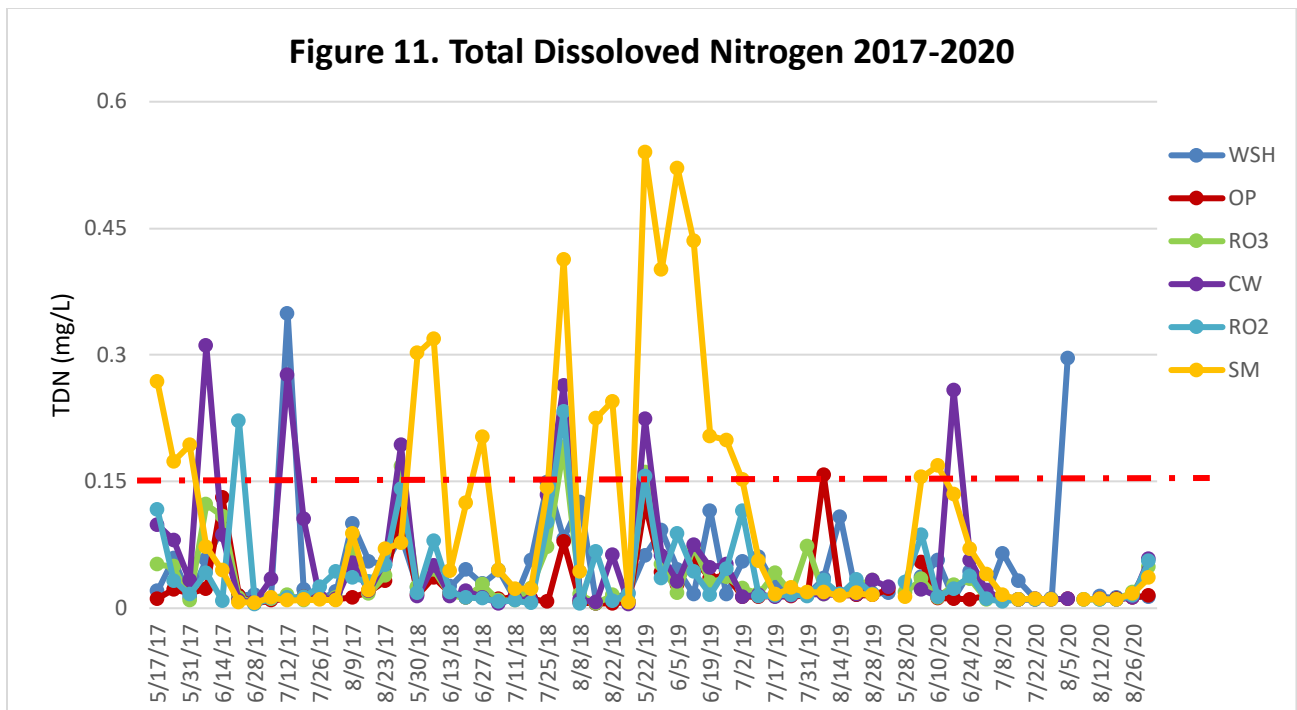


Like nitrate/nitrite, there was no significant difference between the 2017 and 2018 ammonia averages, but there was a decrease in the 2019 average ammonia concentration. The average in

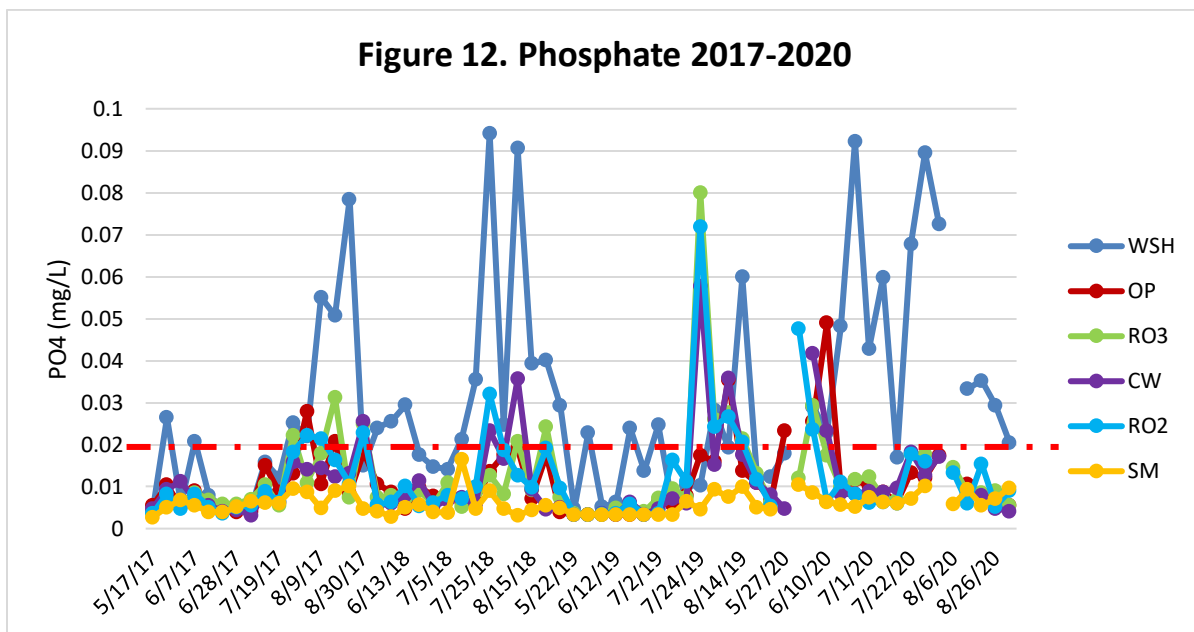
both 2017 and 2018 was 0.021 mg/L, 0.018 mg/L in 2019, and 0.019 mg/L in 2020. While the seasonal averages remained relatively unchanged, the spikes in each season do not follow a noticeable pattern (figure 10). Stormwater runoff may have played a limited role in the resulting high values, but for most spikes there were not significant rain events prior to sampling. In 2019 many of the spikes occurred at the headwaters site in a shallow, relatively confined area where mixing and dilution would be slow. However, in 2020, while some ammonia spikes were observed at WSH, there was also an early season sustained peak at the mouth of the river (SM) that isn't explained by weather.



The Chesapeake Bay Program defines total dissolved nitrogen as the sum of nitrate, nitrite and ammonia, with the upper healthy limit 0.15 mg/L (Batiuk et al, 1992). In all four seasons greater than 85% of the samples were below the threshold (91% in 2017, 89% in 2018, and 86% in 2019, 96% in 2020) with a significant increase in the percentage when comparing pre- to post-conversion of the Mayo WRF (figure 11).

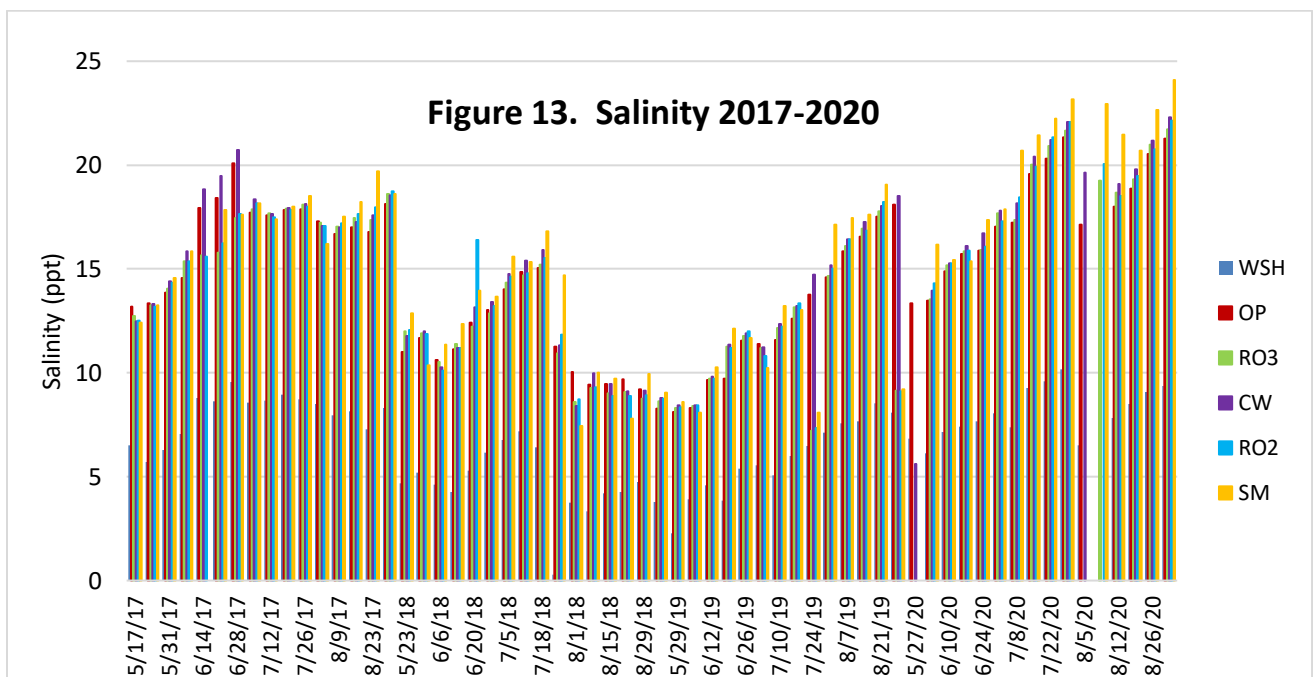


E. Nutrients: Phosphate. There are basically two forms of phosphorus that are present in waterways, inorganic phosphate (PO_4) and organic phosphorous. Of the two, PO_4 is the form utilized by phytoplankton and SAV. The Chesapeake Bay Foundation sets the maximum healthy concentration for phosphate at 0.02 mg/L. The average phosphate concentrations over the course of the monitoring period were 0.012 mg/L in 2017, 0.014 mg/L in 2018, 0.012 mg/L in 2019, and 0.018 mg/L in 2020 (figure 12) (Note that the 2018 average had been reported as 0.018 mg/L in the 2019 report due to a data transcription error for 8/15/18 that has since been corrected). ANOVA analysis illustrated that there is a significant variation in the sampling period ($p=0.044$). In a two-tailed t-test 2020 was found to be significantly higher than 2017 and 2019 ($p=0.03$).



Most samples were below the threshold, with WSH being the exception on multiple occasions. During the 2018 season, many of the peaks were associated with significant rain events, suggesting an impact from stormwater runoff. However, in 2019, the peaks on July 24th and mid-to-late August can't be accounted for by rainfall. Two considerations may include that RO3 is near the Rhode River Marina, and there are often birds and fishermen at Carrs Wharf. Rinse water or other chemical runoff from the marina could have contributed to the spikes on July 24th. During the 2020 season, the concentration at WSH was over the 0.02 mg/L threshold 87% of the time (13 of 15 samples). Possible factors contributing to these spikes at WSH are addressed in the Conclusion section.

F. Salinity. Salinity can be significantly affected by rainfall. Table 1 lists rain events of 0.1 inches or more from May through August with rainfall greater than 0.4 in within 48 hrs prior to sampling highlighted. There was significantly more rain during the 2018 season, resulting in one additional sampling date in 2018 being affected when compared to 2017, but three days more when compared with 2019. As noted in the 2018 report, the record rainfall and flow of freshwater into the Bay significantly impacted salinity, and there was an atypical late season drop in salinity that carried over into the early portion of 2019 (figure 12). In the 2019 sampling season salinity values were initially low but recovered by the end of the season.

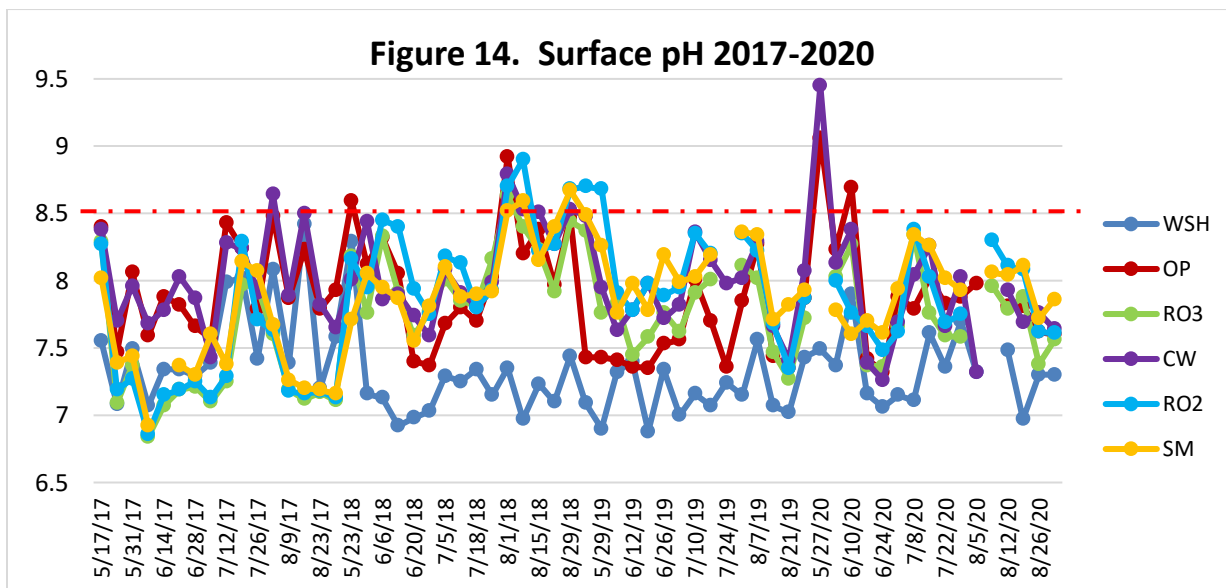


Salinity averages, including surface and bottom values but leaving out the extra early May sampling in 2017, were 8.48 ppt in 2017, 5.74 ppt in 2018, 6.34 ppt in 2019, and 9.21 ppt in 2020. The data illustrate that salinity has fully recovered from the unprecedented rainfall and inflow from late 2018 through early 2019. In fact, average salinity was statistically higher in 2020 when compared with 2017 (two-tailed $p=1 \times 10^{-7}$). Although the 2020 salinity measurements are higher than 2017, they are slightly lower than the calculated averages reported by the Maryland Eyes on the Bay program (Maryland Department of Natural Resources).

G. pH. According to the EPA, values between 6.5 and 8.5 are optimal for plant and marine life. During 2017 and 2018, the pH tended to increase in August, with multiple 2018 values above of the optimal cutoff that coincided with high ammonia concentrations (figure 14). Also concerning is the 2018 and 2019 pattern in which pH measurements diverge, with lower values toward the headwaters, WSH and OP, and higher pH values at the other sites. This may suggest input from two different, but extreme sources. Runoff from surfaces at the headwaters and input from the Chesapeake Bay at the mouth.

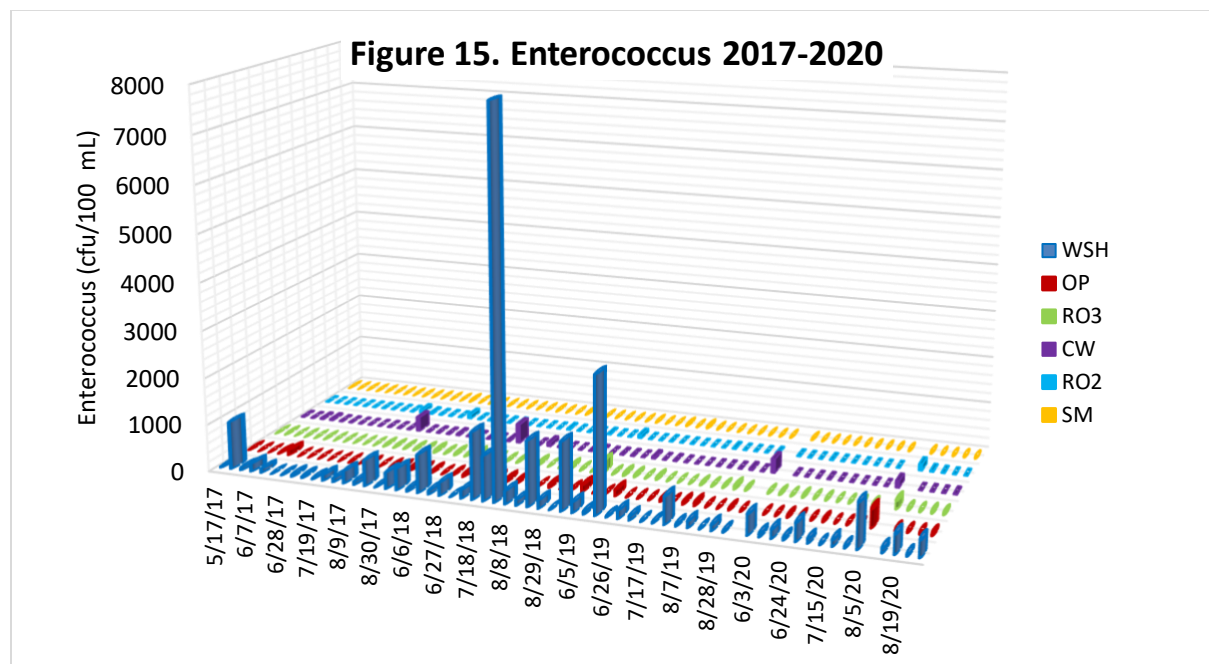
In 2020, pH values showed less deviation between sites, but early in the season several measurements were significantly above the upper healthy limit of 8.5. These data coincide with measurements made by the Maryland Department of Natural Resources (MD-DNR) Eyes on the Bay program and are likely due to the algal bloom observed along much of the Chesapeake Bay early in the 2020 season. High values were also measured at a number of other sites monitored by Eyes on the Bay.

Even with the extreme spikes at the start of 2020, the pH average is not significantly different than 2019. The pH averages over the four seasons are: 7.53 in 2017, 7.82 in 2018, 7.73 in 2019 and 7.69 in 2020.



H. Fecal bacteria: Enterococci. Enterococci are indicators of fecal contamination from warm-blooded animals such as mammals (humans, dogs, livestock and wildlife) and some bird species (geese and ducks). Enterococci can cause human disease, and its presence is also an indicator for the possible presence more pathogenic bacteria. There is a strong correlation between enterococcal levels and the potential for human illness, especially in the young and elderly (EPA method 1600). As illustrated in Figure 15, 91.8% of the 2017 values were below the 104 cfu/100 mL cutoff, compared with 85.5% in 2018, 88.9% in 2019, and 86.7% in 2020. As in 2019, in 2020 more than half of the values over the 104 cfu/100 mL threshold were measured at the headwaters site WSH. That area is shallow, narrow and near the marshy wetland. In addition,

during the week of August 5th and 6th, there was over 4 inches of rain over a three-day period and five of the six sites were over the cutoff. In general, Rhode River does not have a consistent problem with enterococci contamination at most sites tested, although the headwaters site, WSH is the exception.



Seasonal enterococcus averages are typically reported as geometric means to account for the large fluctuations in point-to-point data. The EPA 2012 guidance cites 35 cfu/100 mL as the geometric mean cutoff for sampling performed over time (correlated with 36 illnesses per 1000 swimmers as stated in the Maryland Beaches Program Fact Sheet). Each season, the geometric means at most sites are well below the geometric mean threshold, with the exception of WSH, which consistently results in a geometric mean above the 35 cfu/100 mL cutoff (table 2).

Geometric mean	2017	2018	2019	2020
WSH	74	314	88	97
OP	8	17	15	12
RO3	6	19	14	11
CW	8	12	7	8
RO2	5	5	4	5
SM	3	3	4	3

Table 2. Geometric Means for each year of study.

The location of WSH, near the marshy headwaters in a relatively confined and shallow location, is the likely explanation for the high bacterial counts at that location. In several comparisons of bacterial counts with other parameters tested, there is a similar pattern for phosphate spikes at the WSH site (discussed in conclusions).

4. Conclusions.

Initial analysis of the 2020 data and comparison with the first three seasons' data highlight several trends. Importantly, there was a significant decrease in nitrate/nitrite levels in 2020. Again in 2020 bacterial levels remain in the safe range along much of the river. In addition, there was a general stabilizing of 2020 values with fewer extremes than observed in the past several years, and the salinity levels have rebounded back to the average measured over the past 30 years and reported by Eyes on the Bay. However, some parameters continue to be adversely affected by stresses both natural and manmade. For example, the average water temperature continues to increase, and that increase adversely impacts a number of other important parameters.

The importance of the decrease in nitrate/nitrite values between 2017 (0.035 mg/L) and 2020 (0.013 mg/L) is two-fold. First, a specific goal of the Mayo WRF conversion is to decrease nitrate flow from the facility into the Bay. It was disappointing, but not surprising that 2018 and 2019 did not produce the predicted reduction in nitrate levels. There was a promising start to the 2018 season, when the early season spike at SM was attenuated in comparison to 2017 (compare May 2018 to May 2017). However, starting in mid-July there were multiple significant rain events that resulted in record influx of water from both shore runoff and from the Bay that impacted values through mid-2019 (figure 9). Toward the end of 2019, the nitrate measurements decreased dramatically, but due to the early season spikes, the overall 2019 season average was still very high (0.047 mg/L). The values in 2020 were consistently lower resulting in the very low average of 0.013 mg/L.

Also, in 2020 there were very few nitrate spikes at any of the sites monitored. When considering the seasonal nitrate concentration pattern, there was a characteristic spike in June 2020 that was also observed each of the three previous seasons (figure 9), but it was significantly smaller, and importantly, even at its highest was less than one-third of the concentration measured in 2017 (0.0735 mg/L on 6/10/20 versus 0.0266 mg/L on 5/17/17).

Although there were pH spikes noted several times over the four seasons, overall pH remained relatively stable over the four years of testing. During the 2020 season, after an initial alkaline spike due to the early algal bloom, the pH leveled off and remained stable from mid-June through the end of the season at that start of September.

While the decrease in nitrate concentrations along the Rhode River is a positive and promising outcome, there are still significant areas that are not improving or are worsening. Enterococcus concentration, while not a typical value included in the Bay Report Card, is an important measure of safety for swimming and other water activities. The sites monitored in this study include a mixture of shore and mid-stream sites. Historically, the Rhode River has few issues with high counts away from shore, and only relatively sporadic high counts at shore sites (data from this study and historic data from the West and Rhode Riverkeeper and Arundel Rivers Federation). However, the headwaters site at WSH continues to have values above the thresholds established by the EPA on a regular basis (104 cfu/100 mL for a single sample and 35

cfu/100 mL geometric mean). Although this site is sampled from a private pier it is very shallow, is not likely to be used for swimming, and the EPA has historically set different parameters for waters not commonly used for swimming. Even when values are very high after a rain event, dilution ensures that values in deeper, more open areas tend to be significantly lower.

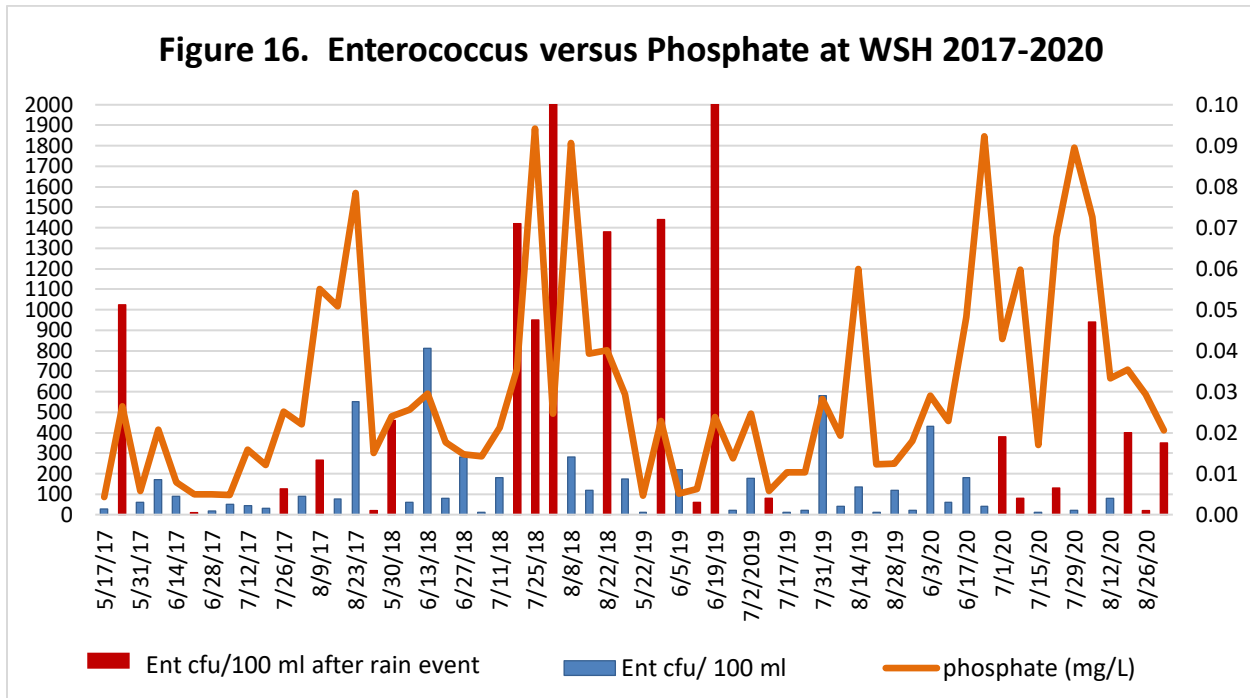
Regardless, high bacterial concentrations anywhere along the river are concerning, and similar trends have been noted in other rivers and streams in the area. The source is often hard to track and can include septic failures, sewer line leaks, runoff from roads and lawns, and animals in the area. As concentrations in headwaters increase, the potential for the problem to move downstream also increases. Issues with drainage, increases in impervious surfaces and more development all contribute to this growing problem.

Water temperature increase over time is another area of concern. According to the Eyes on the Bay website, Chesapeake Bay temperatures were average June through August 2020 (<https://news.maryland.gov/dnr/2020/10/12/eyes-on-the-bay-late-summer-update/>). In contrast, all four years of monitoring Rhode River have shown increases in the average water temperature. Higher water temperatures decrease oxygen solubility, which may explain the lower average dissolved oxygen in 2020 (4.76 mg/L 2017-2019 to 4.07 mg/L in 2020). Other contributors to this significant drop include the early season algal bloom that also contributed to the increased chlorophyll and decreased clarity in 2020.

As discussed in the 2019 report when comparing shoreline sample data (WSH, OP, CW) with mid-stream sample data (RO2, RO3, SM), several parameters showed significant differences in the first three years of testing. While no difference in averages was noted when comparing shoreline to midstream temperature, salinity, or surface dissolved oxygen there were differences in average clarity, enterococci, and TSS. The interesting differences were the highly significant, and opposite pattern between shore and midstream nitrate/nitrite and phosphate levels. As the rainfall and inflow from the Bay returned to normal in 2020, some of the earlier patterns were not observed. For example, the differences in TSS and nitrate/nitrite were not significant when comparing shore to mid-stream sites in 2020 higher at shoreline sites, making the source of the occasional spikes less clear and likely due to a combination of runoff and external inflow.

However, in 2020 phosphate values showed a pronounced pattern with all of the values over 0.05 mg/L occurring at the headwaters site, WSH. As mentioned earlier in the report, many parameters showed an overall stabilization of values when comparing sites monitored along the river. However, phosphate values at WSH showed extremes that were not easily explained by runoff. Runoff due to rain, especially at shallow shore sites such as WSH, is directly correlated with increased enterococcus values. Figure 16 illustrates this with the red bars showing enterococcus values that were impacted by at least 0.3 inches of rain prior to sampling. All of the highest values were significantly impacted by rain. While an overlay of phosphate concentrations at WSH suggests that over 50% of the phosphate peaks correlated with rain, a significant portion did not.

Another possible contributor to high phosphate may be from sediment, which can be increased by high pH or low dissolved oxygen. In comparisons of dissolved oxygen levels with phosphate, there was not a discernible pattern, and pH tended to be lower at WSH than other sites. However, those observations do not eliminate possible leaching from the sediment which is more significant in the shallow headwaters than at deeper sites away from shore. The cause of the spikes may also be related to animal waste, fertilizer use by homeowners in the area or other contributing factors.



Rain has a significant impact on many parameters including salinity, temperature, clarity, TSS, pH and nutrient levels. After the record rain from mid-2018 through early 2019 that adversely impacted a number of parameters that contribute to overall score assigned to area rivers and the Bay, and resulted in decreased 2018 report card grades, there were slight improvements in 2019. The 2019 River Report Card, as reported by the Arundel Rivers Federation cited a slight increase in water quality when compared with 2018 with all parameters reported (pH, clarity, dissolved oxygen, temperature, SAV, total phosphorus and total nitrogen) remaining the same or showing slight improvements. In 2019 the Chesapeake Bay Foundation’s State of the Bay reported a slight decrease overall, but a slight improvement in the rivers on the lower western shore. The 2020 report cards have not yet been generated for the Rhode River or the Chesapeake Bay, but from our monitoring, although nitrate/nitrite and total nitrogen values have decreased, increases in temperature, total suspended solids, phosphate and chlorophyll, along with decreased clarity and dissolved oxygen suggest that the river has not made significant gains in 2020.

5. Acknowledgements and References.

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