UNIVERSITY SUSTAINABILITY COUNCIL

SUSTAINABLE WATER USE AND WATERSHED REPORT 2021

sustainableumd

Water Use and Stormwater Steering Committee and the University Sustainability Council. The report was reviewed and revised by the Water Use and Stormwater Steering Committee on October 15, 2021 and by the University Sustainability Council on March 11, 2022.

TABLE OF CONTENTS

BACKGROUND

In September 2012, the University Sustainability Council formed a Sustainable Water Use and Watershed Protection Workgroup to further evaluate the University's existing goals, standards and practices relative to water management and to make recommendations for improved performance. The Workgroup, consisting of key campus stakeholders involved in water use and stormwater management issues, produced the *2014 Sustainable Water Use and Watershed Report* (hereinafter the *"2014 Report"*) that was reviewed and accepted by the Council.

The *2014 Report* included 13 recommendations that were organized into four focal areas: 1) campus roles and responsibilities around water and stormwater issues; 2) furthering potable water conservation; 3) several approaches to improve stormwater management; and 4) annual reporting. In response to the *2014 Report*, Facilities Management (FM) with support from the Department of Environmental Safety, Sustainability and Risk (ESSR) formed a new Sustainable Water and Stormwater Steering Committee chaired by the Associate Vice President of Facilities Management. The intent of the Steering Committee was to understand and stay abreast of campus-wide water and stormwater challenges, evaluate specific project/program resource needs and identify funding as needed. The Steering Committee assembled small working groups to further research the *2014 Report's* individual recommendations and bring proposed strategies, projects and requests for resources back for review. After a year of researching issues, the small groups were merged into a single Water and Stormwater Workgroup. The Workgroup consisted of staff who routinely work on water and stormwater issues on behalf of the university and have hands-on knowledge of current practices, permits and conditions.

BACKGROUND continued

The following tables outline the Sustainable Water Use and Watershed Protection Workgroup and Steering Committee Members.

Sustainable Water Use & Watershed Protection Workgroup Members		
Scott Lupin – Chair	Associate Director	ESSR & Office of Sustainability
Jason Baer	Assistant Director	ESSR
Michael Carmichael	Coordinator	Facilities Management
Darwin Feuerstein	Assistant Director	Facilities Management
Rob Hermstein	Deputy Director	Facilities Management
Christopher Ho	Engineer	Facilities Management
Kaitlyn Peterson	Environmental Specialist	ESSR
Kris Phillips	Director	Facilities Management
Dave Shaughnessy	Assistant Director	Facilities Management

Sustainable Water Use & Watershed Protection Steering Committee Members		
Charles Reuning - Chair	Associate Vice President	Facilities Management
Jason Baer	Assistant Director	ESSR (Ex Officio)
Darwin Feurstein	Assistant Director	Facilities Management (Ex Officio)
Chris Ho	Engineer	Facilities Management (Ex Officio)
Maureen Kotlas	Executive Director	ESSR
Kristy Long	Executive Director	Facilities Management
Scott Lupin	Associate Director	ESSR & Office of Sustainability
Bill Olen	Executive Director	Facilities Management
Kris Phillips	Director	Facilities Management
Harry Teabout	Executive Director	Facilities Management

POTABLE WATER SUPPLY & INFRASTRUCTURE

The *2014 Report* provided a brief summary of water supply and use at the university. The university obtains all of its water from the Washington Suburban Sanitation Commission (WSSC) which also provides for the collection/treatment of sanitary waste and serves as the regulatory authority on water and sanitary waste matters. Maryland has not experienced prolonged periods of drought since 2001 and increasing precipitation in the Metro DC region and Maryland is expected to continue to be more of a challenge than water shortages as global climate change progresses.

The university has completed limited water harvesting facilities over the past decade including the capture and reuse of groundwater at the Physical Science Building, and stormwater collection systems at Knight Hall and Washington Quad. Restrictive regulatory requirements on water capture and reuse in the region — compounded by cost and technical challenges — have limited UMD's ability to expand water capture and reuse.

As UMD's population continues to expand and campus infrastructure requires more water for cooling and other uses, annual demand for water could be impacted. Current data indicates that the university population has grown from 43,600 to 46,594 or 6.4% between 2014 and 2020. Campus facility space has also increased from 14,763,254 to 15,326,492 square feet or 3.8% between 2014 and 2020. Water efficient fixtures, equipment and landscaping are required in new construction and renovations as specified in the university's Design Criteria/Facilities Standards. Outreach programming in residence halls, Greek Houses and campus offices aims to support building occupants in choosing to conserve potable water where feasible. At the same time, water bottle filling stations and associated outreach programming encourages people on campus to reuse and refill their own water bottles, which could increase potable water consumption slightly.

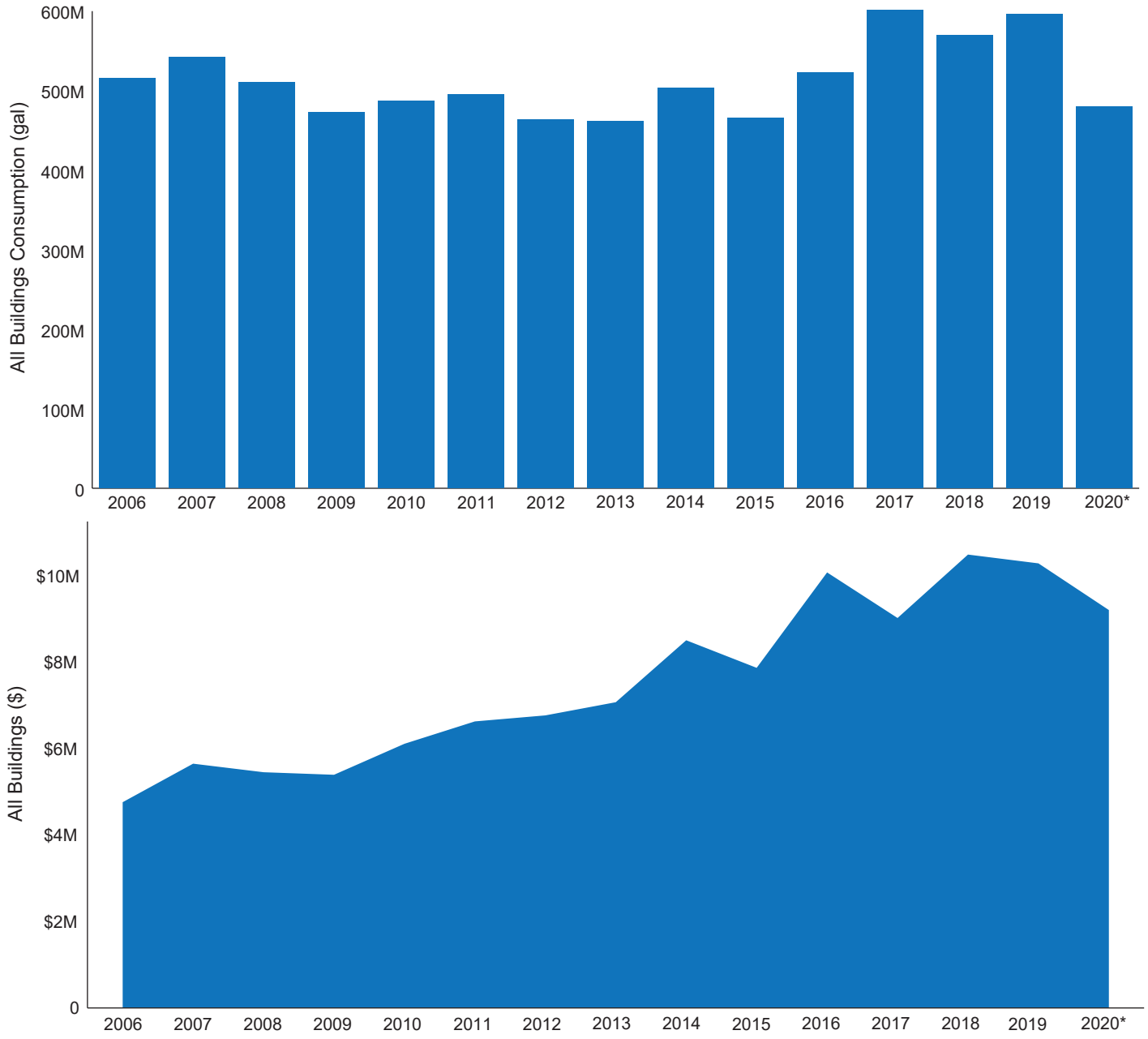
Restrictive regulatory requirements on water capture and reuse in the region — compounded by cost and technical challenges — have limited UMD's ability to expand water capture and reuse.

WATER CONSUMPTION AT UMD

UMD is a major consumer of potable water in the Washington, D.C. region. Water use at UMD has remained relatively steady over the past decade despite campus growth. From 2006 to 2020, UMD's water consumption ranges between 470 million to over 600 million gallons per year, averaging to around 525 million gallons. This equates to a water consumption per gross square foot of 30 to 40 gallons/gsf. This is largely due to water efficiencies gained through the installation of improved devices and prompt detection and repair of leaking equipment over the intervening years.

Although total potable water consumption has remained stable, the campus cost outlay to WSSC has increased steadily. From 2006 to 2020, the total cost for water increased from approximately $4.8 million in 2006 to $10 million in 2020. Figure 1 (below) shows trends in total volume of water consumed by the College Park campus and the associated annual dollar cost.

Fig. 1 Water Consumption and Cost
University of Maryland, College Park Main Campus (2006-2020)



WATER CONSUMPTION AT UMD continued

Figure 2 shows consumption and cost per gross square foot of building space, and Figure 3 shows estimated yearly consumption and cost per person based on Full Time Equivalent (FTE) students and employees. All three of these figures tell a similar story in which consumption has not changed drastically but costs have steadily increased. The *2014 Report* evaluated water use and costs from 2006 - 2012. Since 2012, the campus cost for water has increased from approximately $7.2 million to $10 million or approximately 39%.

The WSSC service area continues to see growth in population and built square footage while managing an aging infrastructure. The impact of climate change and rising summer temperatures are likely to add to system challenges. The resulting trend toward higher campus costs can only be limited through water conservation and reuse measures.

As mentioned in the *2014 Report*, water supplied by WSSC is treated for potable use, but the majority of the water is used for non-potable purposes, including heating, cooling and to a lesser degree, irrigation.

Fig. 2 Water Consumption and Cost per GSF

University of Maryland, College Park Main Campus (2006-2020)

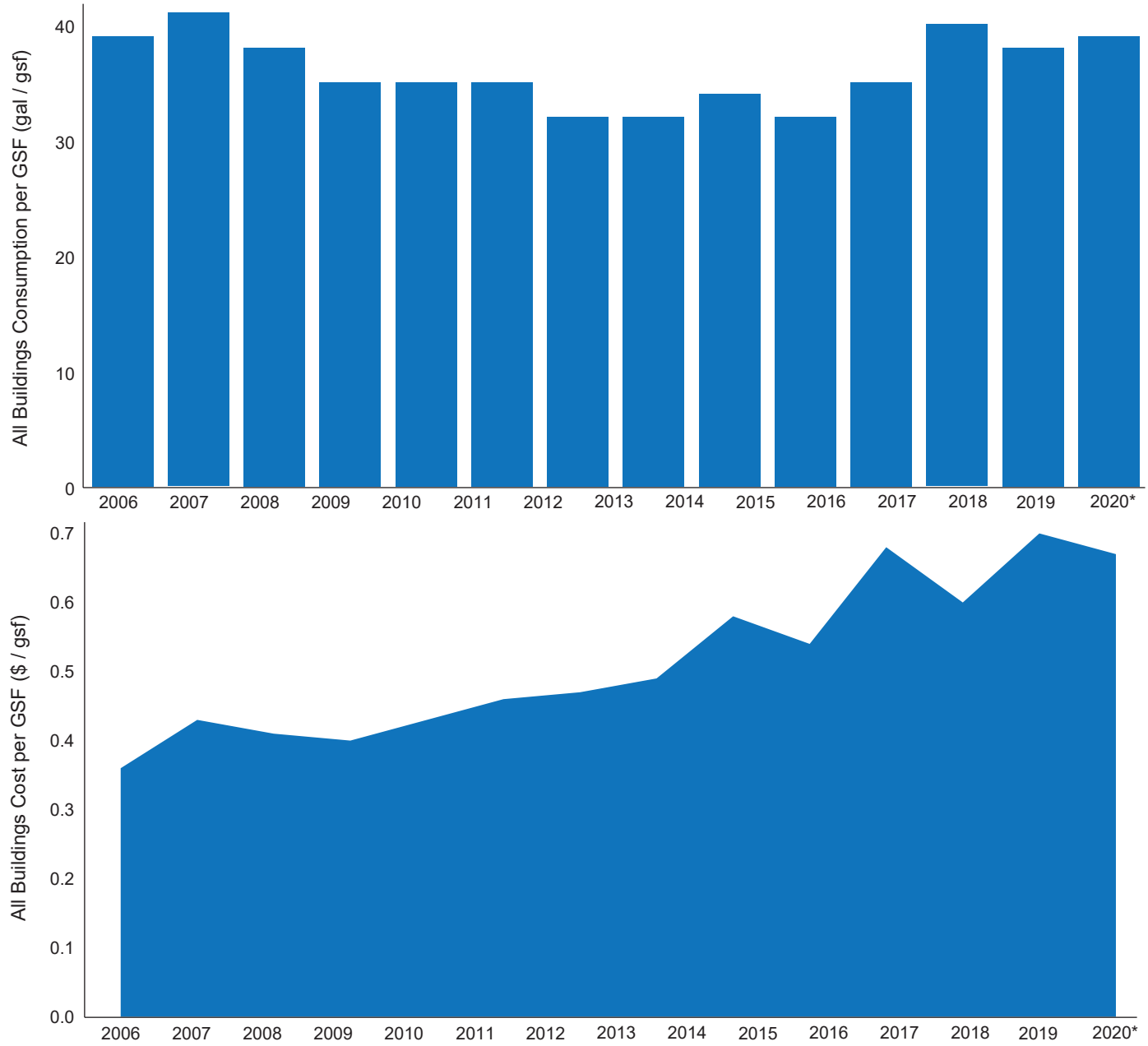
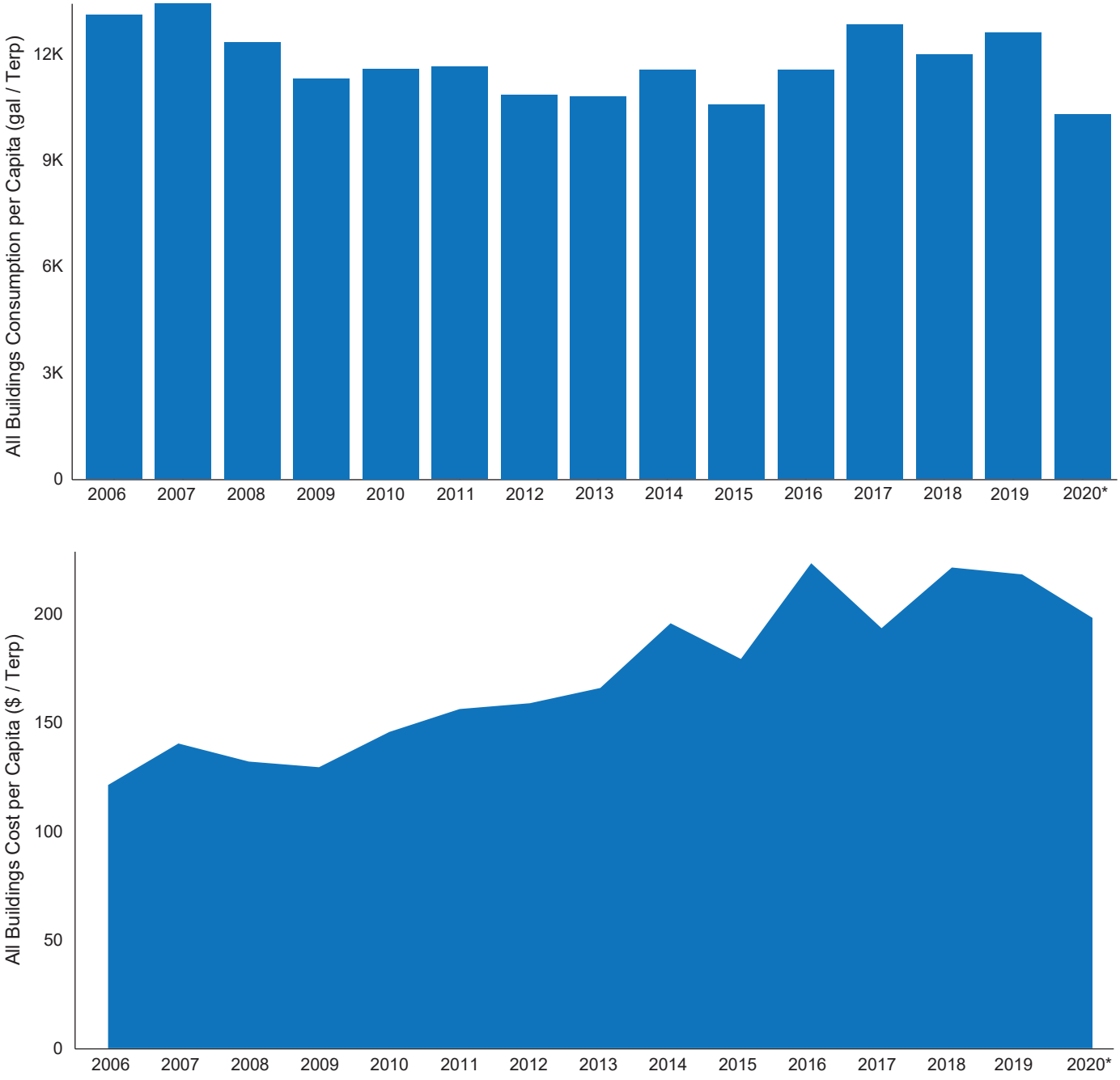


Fig. 3 Water Consumption and Cost per Capita

University of Maryland, College Park Main Campus (2006-2020)



* The data for year 2020 is not representative of normal campus operations. Due to the COVID-19 pandemic, UMD moved to a remote learning and working environment in March. Campus activity gradually increased over the year but did not return to full capacity.

STORMWATER MANAGEMENT AT UMD

Hydrologically, the University of Maryland campus drains to the Paint Branch and Northeast Branch, leading to the Anacostia River and ultimately to the Chesapeake Bay (See Appendix A – Anacostia Watershed Map). Although steady improvements have been recorded in recent years, the Anacostia is still considered an "impaired" river. The Chesapeake Bay, which is a water body vital to the environment and economy for the State of Maryland, shows signs of improvement, but remains stressed due to decades of pollution runoff, excess sediment and nutrient/phosphorus input.

Stormwater management has been an issue of growing concern since the initial regulations, governing the Bay's control measures, were issued in the mid-1980s. The university, and other contributors within the watershed, are being driven by evolving stormwater regulations to improve water quality in the Anacostia River and the Chesapeake Bay.

Summary of Permits and Regulatory Requirements

Stormwater management at the university is governed by several state and federal permits as summarized in Table 1. In the early years of environmental regulation, stormwater was controlled via an "end-of-pipe" approach at outfalls; Since 1988 the university has held a National Pollution Discharge Elimination System (NPDES) "Industrial" permit issued under the federal Clean Water Act. The permit allows certain types of "industrial" wastewater to be discharged from the university's storm sewer system to 13 permitted outfalls that are located along the Paint Branch, Campus Creek and Guilford Run. This NPDES permit establishes allowable levels of pollutants and requires monthly sampling and quarterly reporting to the Maryland Department of the Environment (MDE) and the U.S. Environmental Protection Agency (EPA).

In the late 1990s, greater regulatory focus was placed on non-point source stormwater pollution. In 2004, the university was required to obtain a second type of NPDES permit due to UMD's operation of a "municipal" separate storm sewer system (known as an "MS4" permit). This second permit, required development of Best Management Practices (BMP's) to mitigate stormwater runoff contamination that may result from campus activities. It emphasizes administrative controls and strategies to broaden campus community education and involvement.

Photo Credit: Emma Howells

In 2018, MDE redefined the MS4 permit. It maintained the requirements for the six minimum control measures (MCMs), and added a new Chesapeake Bay restoration requirement to reduce nutrient and sediment loads. The MCMs include (1) community/staff participation, (2) training, (3) outreach, (4) illicit discharge detection and (5) elimination, and (6) controlling stormwater runoff during and after construction. The restoration requirement mandates that 20% of all existing developed land with no water quality treatment infrastructure must be retrofitted to control stormwater quality.

STORMWATER MANAGEMENT AT UMD continued

In addition to these two overarching NPDES permits, the university also has other specific stormwater permits as summarized below:

- **MDE 12-SW Permit –** This permit requires stormwater pollution prevention comply with stormwater regulation at six campus locations that are considered to be industrial in nature by MDE. This permit requires routine site inspections, control measures and sampling to preclude pollutant runoff.
- **MDE 17-HT Permit –** This permit governs the discharge of water to the storm sewer from fire protection systems, including hydrants and piping.
- **MDE 14-GP (Construction Sites) –** MDE requires permits for both temporary and permanent stormwater quality management. Temporary stormwater management is required for construction that disturbs more than 5,000 square feet of land and/or initiates more 100 cubic yards of excavation. Each Erosion and Sediment (E&S) Control permit governs construction site practices as they relate to stormwater controls at that particular site (e.g. silt fencing, erosion control matting, temporary swales, vehicle wash-down areas, and stabilized construction entrances, etc.).

Since 2002, MDE has required permanent stormwater quality management for redevelopment and new construction activities involving over 5,000 square feet of land disturbance. In 2009, MDE adopted the current Stormwater Management Act. This Act underpins a smart growth approach to development, by requiring that it is done in a way that replicates pre-development hydrologic conditions. Post-development hydrology must mimic an undeveloped and forested state. This is achieved by requiring implementation of Environmental Site Design (ESD)[1] to the maximum extent practicable.

Table 1. Stormwater Permits

Permit Name	Purpose	Renewal Cycle
Industrial Discharge Permit (08-DP-2618)	Allows certain types of "industrial" wastewater discharges to storm sewer and 13 outfalls; establishes discharge limits, testing and reporting	5 Years
Phase II MS-4 Permit (13-SF-5501)	Over-arching campus permit requiring Pollution Prevention; Best Management Practices; retrofit requirements for untreated surfaces; and annual reporting	5 Years
Multi Sector General Discharge Permit (12SW)	Requires inspection, Best Management Practices, monitoring and testing at 6 specific campus locations	5 Years
General Discharge Permit for Treated Water (17-HT)	Permits the discharge of treated water from hydrostatic testing, water mains, hydrants, etc. Requires field monitoring and sampling	5 Years
General Discharge Permit for Stormwater Associated with Construction Activity (14-GP)	Requires use of Best Management Practices to treat water prior to discharge to prevent impacts to surface water	As Needed (Issued to discrete construction projects)
E&S and Stormwater Management	Requires erosion and sediment control plans and temporary / permanent stormwater controls for development sites Some portions of plans associated with development project terminate once site is stabilized; Long-term requirements for maintenance and inspection of permanent controls last in perpetuity	As Needed

[1]ESD is defined as "using small-scale stormwater management practices, nonstructural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources." The ESD stormwater controls require the treatment of the first inch of precipitation during a given storm. Prior practices focused on management of water volume, while this new approach focused on "first-flush" water quality as well.

Staffing, Departments and Responsibilities

The responsibility and authority for stormwater management at UMD has been largely divided between Facilities Management (FM) and the Department of Environmental Safety, Sustainability & Risk (ESSR).

- ESSR is responsible for the NPDES Industrial Discharge and 12-SW permits. ESSR also leads the MS4 Illicit Discharge Detection and Outfall Reconnaissance programs.
- FM's Department of Facilities Planning serves as the lead role in stormwater planning and land use; and MS4 permit reporting.
- FM's Department of Building and Landscape Maintenance is responsible for providing routine inspections and maintenance of all installed stormwater facilities.
- FM's Department of Capital Projects obtains stormwater permits related to new construction.

Monitoring stormwater measurement equipment at a campus outfall

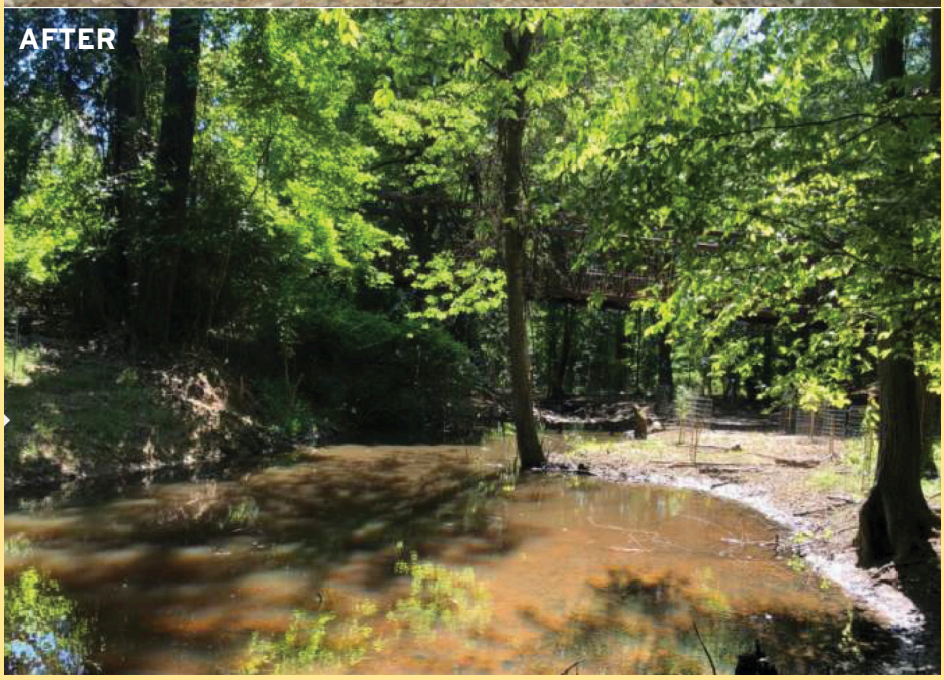
POST-2014 SUSTAINABLE WATER USE AND WATERSHED REPORT PRIORITIES & ACCOMPLISHMENTS

Organization of Roles, Responsibilities and Authorities

The Sustainable Water Use Steering Committee, and the related Water and Stormwater Working Group were established to foster communications and collaboration between the various departments within FM and ESSR. The Working Group meets on a regular basis to identify issues and to recommend solutions. The Steering Committee provides guidance, approval and funding as needed by the Working Group to effectively implement solutions.

Campus Creek Restoration

The *2014 Report* recommended the restoration of Campus Creek. This creek originates west of University Boulevard and runs east through the campus to the Paint Branch. With successful partnerships and support among many stakeholders including grant funding from the Department of Natural Resources (DNR), Facilities Management and the University Sustainability Fund, the first phase to restore the most degraded upstream portions was completed in 2019. The second phase of the project to restore the remainder of the creek is anticipated to be completed well before the State Watershed Implementation Plan for the Chesapeake Bay deadline of 2025.



A familiar part of Campus Creek to many pedestrians on campus is the bridge behind the School of Public Health. This view shows how the restoration project changed this site to improve tree health so that roots are not sticking out into the space above the creek, reduce potential for scouring of soil from creek banks, and increase opportunity for floodplain vegetation to filter and capture sediment and process nutrients suspended in the creek water.

For additional before and after photos and a more detailed summary visit sustainingprogress.umd.edu/building-future and scroll down to the section on Restoration of Campus Creek.

Stormwater Banking

Many construction projects on campus are challenged to meet permanent stormwater management regulatory requirements due to land and site constraints. Since the core of campus is mostly built out, the majority of construction on campus is considered redevelopment, where new improvements replace existing infrastructure on impervious land area. Redevelopment projects, when compared to new development projects, are less impactful to the environment and have reduced stormwater management requirements, where at least 50% of stormwater flow from these sites must be treated.

The university has been meeting its construction and stormwater requirements through a combination of providing onsite best management practices (such as microbioretention facilities) where feasible and supplementing with credits as needed from a "stormwater bank" established with MDE. The original "stormwater bank" was established in 2003, in conjunction with the University of Maryland Global College (UMGC) and involved the construction of a surface sand filter at the base of the University House lawn, which was later integrated with the Peace and Friendship Garden.

A total of 30 construction projects have utilized the bank to date. Although all of the original impervious area bank credits have been expended, the university continues to maintain a bank credit balance by the excess treatment of previously untreated impervious surfaces and exceeding minimum treatment requirements on redevelopment projects.

Expand Inspection and Maintenance of Stormwater Facilities

The university has over 150 aboveground and belowground stormwater facilities of varying design, all which have different inspection and maintenance requirements. These facilities include vaults, oil/water separators, grit traps, swales, ponds, etc. which are designed to control stormwater discharges. Regular and qualified inspection and maintenance are required to ensure the facilities function properly and to ensure the campus meets stormwater permit requirements.

During storm events, turbulent energy from stormwater flowing into the creek from the outfall is dissipated in the new plunge pool which is nested in a soft bed of sand and wood chips that filter sediment and other particles. Water can percolate through this bed into the rock storage chamber below. This design protects the creek from erosion and filters pollutants from first flush runoff so that they do not harm aquatic life downstream.

Over the past several years, Facilities Management has significantly expanded tracking, inspection and regular maintenance of stormwater management facilities. A GIS inspection system was implemented to keep track of inspection reports and to maintain a database of inspection records. (See Appendix B – Campus Stormwater Facilities & Outfalls)

Water Harvesting Assessment

The *2014 Report* recommended that the university invest in water harvesting, treatment and re-use with the development of a system to collect rainwater and mechanical wastewater for re-use within districts. It was further recommended that a water audit be completed by 2016 to identify sources that would be the basis for developing a conceptual plan.

In response to this recommendation, the university commissioned Sustainable Water, a firm having experience in water harvesting, treatment and

reuse, to assess the potential application of water harvesting at UMD. Sustainable Water's April 2015 report concluded that UMD was an excellent candidate for water harvesting and that:

- UMD consumed approximately approximately 1.3 million gallons of water per day or 500 million gallons per year;
- Water rates increased by 7% per year in the 2 years prior to the assessment;
- Opportunities existed to reduce purchased water from WSSC by approximately 35 - 45%; and purchased wastewater treatment services by approximately 45 - 60%; and
- Water harvesting could counter rising WSSC water and sewer charges while providing a measure of water resiliency in the event of a service disruption.

While it was Sustainable Water's opinion that UMD was a good candidate for water re-use, the effort has not proceeded for a variety of reasons including competing demands on staff time, other major facility initiatives, and the lack of clear regulatory standards that would apply to the design and permitting of a water re-use system.

Vehicle Wash Facilities

The university maintains an inventory of over 1,500 vehicles and other mobile equipment that require routine maintenance including cleaning to remove oils, grease, gasoline, salt, grit, and dirt. These facilities are regulated by UMD's stormwater permits and must be approved before use. Currently, the university does not have an approved vehicle wash.

Previously, the Motor Pool Building (Building 011) had an approved vehicle wash that was regularly used. However, all washing activities stopped in 2017 when this building was repurposed as part of the Innovation District redevelopment. The routine cleaning of vehicles and equipment is an important part of a preventative maintenance program that reduces corrosion and prolongs vehicle and equipment service life.

As a result of these concerns, UMD commissioned Maryland Environmental Service (MES) and EA Engineering to evaluate potential washing options for all vehicles and mobile equipment. The results of that study were presented in a report titled "Vehicle and Equipment Washing Analysis and Recommendations Report." This study found that lack of proper washing is causing over $110,000 a year in extra repair and replacement costs due to corrosion. In addition, the study highlighted the regulatory requirements related to vehicle washing and UMD's lack of a compliant wash facility.

MES and EA evaluated many washing options as part of the study. The Water and Stormwater Working Group reviewed findings, developed a recommendation, and presented their work to the Sustainable Water Use Steering Committee. Their recommendation was to build two small vehicle wash stations at Buildings and Landscape Maintenance (Wye Oak Building) and Motor Pool (Severn Building) as well as upgrades to the existing bus wash facility at the Shuttle Bus Facility. This option was preferred by staff to others evaluated because it would minimize labor required to shuttle vehicles from one location to another, minimize impact to campus traffic, and meets all regulatory requirements. The budgetary estimate to build the three wash facilities was $1,139,000.

The Steering Committee reviewed the recommendation and determined that a wash facility should be constructed at the Severn Building (Motor Pool) and an existing bay at the Wye Oak Building (Building and Landscape Maintenance) should be upgraded to wash that unit's vehicles and equipment. These facilities are in design.

Annual Reporting

The *2014 Report* recommended that an annual progress update be provided to the University Sustainability Council. Since 2016, representatives from FM with support from ESSR have presented an annual update each spring. In addition, an annual report is submitted to the Maryland Department of the Environment (MDE) concerning campus stormwater management under the MS4 permit, as required by regulation.

CONCLUSIONS & RECOMMENDATIONS

The university has made notable progress in many of the areas outlined in the *2014 Report*. This is particularly true relative to overall stormwater management including better defining roles and responsibilities; and activities associated with the renewed MS4 permit and the 12-SW permit. Other specific improvements include:

- Senior management is better informed and routinely engaged in the campus stormwater management program.
- Overall communication and coordination among key staff involved in water/ stormwater issues and the university's compliance with water pollution regulatory requirements has been bridged. These individuals routinely meet, share information and collectively identify priorities.
- In spite of facility growth, potable water consumption has remained steady over the past decade ranging from approximately 500-600 million gallons per year.
- Management of the MS4 permit program, a high priority, has been sound and the university is staying ahead of requirements.
- Stormwater facility inspection and maintenance has significantly expanded.
- The first phase of the Campus Creek restoration was successfully completed and a second phase is in the design process.
- An expanded campus-wide inspection program has been put into place to prevent stormwater pollution and illicit discharges.
- Educational opportunities have been facilitated in stormwater management.
- Annual reporting to the University Sustainability Council and the Maryland Department of the Environment has been consistent and on schedule.

The university continues to seek further opportunities for improvement around water, stormwater and watershed management. The following issues have been identified:

- As stated in the *2014 Report,* the campus is likely facing a growing long-term risk due to regional population growth, climate change and aging infrastructure relative to its water supply.
- All water is provided to campus by WSSC, a single source which presents a business continuity risk.
- The University is experiencing increasing water and sewer costs and increasingly stringent stormwater regulation. New and updated permits to be issued by MDE will increase regulatory requirements and the related workload on existing FM and ESSR staff.
- The university has over 150 stormwater facility structures that require more frequent inspection and a steady source of funding for maintenance and repair.
- The university experiences periodic, localized flooding which results in insurance claims to the State of Maryland.
- Construction continues to pose a substantial risk to stormwater permit compliance due to the number of contractors and subcontractors involved and the level of knowledge they must have to ensure unallowed discharges do not occur.

Based on these conclusions, the Sustainable Water Use and Watershed Workgroup makes the following recommendations (summarized in Appendix C):

Management of the MS4 permit program, a high priority, has been sound and the university is staying ahead of requirements.

Maintain Senior Management Engagement in Water and Stormwater Issues

The reorganization of roles and responsibilities for water and stormwater matters on campus has led to significantly improved communications and operations. Prior to the *2014 Report,* FM and ESSR staff had certain operational responsibilities, but communication and coordination required improvement. Moreover, senior management was not collectively engaged in water and stormwater matters to the extent needed. Without collaborative management processes in place, program staffing needs, program priorities, and assignment of tasks were managed at the unit level when a holistic approach was required.

Establishing the Water and Stormwater Steering Committee and associated Working Group has successfully bridged these gaps. While the *2014 Report* identified the fragmented approach as a concern, it also envisioned a robust, consolidated water and stormwater authority for the campus. The essential crux of this recommendation was the need for centralized services to "coordinate planning, regulatory matters, costs, construction and repair, permitting, billing, reporting..." The grassroots alternative model that has emerged has resolved the underlying concerns that supported that recommendation for centralized authority.

It is recommended that the current organizational structure and annual reporting mechanisms remain in-place and that senior management remain engaged in the ongoing stewardship of campus water and stormwater challenges.

Convert Campus Irrigation Systems to Groundwater Sources Where Cost-Effective; Seek Reductions in Potable Water Use

Water is essential for the university to operate. Water costs increased approximately 39% between 2014 and 2020. The university now spends on average $10 million per year on potable water. Moreover, the water is provided by WSSC, a single source, which creates a business continuity risk due to potential drought and system failures.

OEA staff member, Samantha Brodsky takes a water sample from a creek.

The university has made significant improvements with conservation measures on actual potable uses such as efficient plumbing fixtures and equipment, but the primary use of water at the university is for heating, cooling and irrigation, which does not require treatment to potable water quality standards.

It is recommended that UMD evaluate potable water usage for each irrigation system and where cost-effective, install wells and source these systems with groundwater in lieu of potable water. In the 2014 Report, the Golf Course, fields and other irrigated areas accounted for an estimated 9% of UMD's annual potable water use. Based on current usage and costs, this equates to 4.5 million to 5.4 million gallons per year and an approximate annual cost of $900,000.

Moreover, UMD should consider establishing potable water use reduction goal that is sustainable and achievable. This should consider potential reductions that may result from the NextGen Energy Project.

Expand Inspection and Repair of Stormwater Facilities and Develop a Computerized Inspection Tracking System

Stormwater facility inspections and maintenance generate significant records required by the university's stormwater permits. Facilities Management has begun the implementation of a GIS database and field inspection tool that will allow for the electronic collection of these records and integration of inspection tracking with the university's financial management system. The integration will generate reminders and work tickets as necessary to meet the periodic inspection requirements. Repair and man-hour costs can also be tracked to forecast future budgets and funding needs which Facilities Management should monitor to assess the effectiveness of the new system and adjust as necessary.

Stay Ahead of Stormwater Permit Requirements

The NPDES Industrial and MS4 permits are renewed every 5 years. When the current MS4 permit renews in 2023, it is reasonable to expect more stringent requirements to further advance the improvement of the water quality of the Chesapeake Bay.

With the completion of the Phase 1 Campus Creek stream restoration, the university has exceeded the 20% impervious restoration requirement for the current MS4 permit. Completing the remainder of the stream restoration for the entirety of Campus Creek will better prepare the university to meet the requirements in the next iteration of the MS4 permit.

The MS4 permit mandates maintaining inspection and maintenance records to ensure existing stormwater facilities are functioning as designed to provide water quality. The new GIS system described in the previous recommendation facilitates inspection and record documentation. The system allows real time field entry into the database so that staff and consultants can provide unified documentation of the stormwater water assets.

It is recommended that the university maintain adequate staffing and funding to ensure its stormwater facilities are inspected, maintained and repaired as required by regulation and that the second phase of the Campus Creek restoration be completed.

Complete Phase II of the Campus Creek Restoration

Building upon the successes of the initial phase, the university is continuing the design of the second phase to restore the remainder of the Campus Creek. Grant funding from the Chesapeake Bay Trust, as well as assistance from campus group stakeholders, is allowing the project to move forward with design. Additional construction grant funding from DNR, similar to Phase 1, will be requested to implement the project. The university should set a goal of restoring the remainder of Campus Creek by 2024.

Design, Fund and Construct the Severn and BLM Vehicle/Equipment Wash Facilities

Based on recommendations from the Water Steering Committee, new vehicle and equipment wash facilities are to be located at Motor Pool (Severn Building) and Building and Landscape Maintenance (Wye Oak Building). These facilities are scheduled for design and construction funding will then be sought. These facilities are considered essential to properly maintain the university fleet and equipment and to ensure washing adheres to campus stormwater permit requirements. The lack of a proper washing facility shortens the lifespan of campus vehicles and landscaping equipment while improper washing can lead to regulatory non-compliance. It is recommended that the design and construction of the vehicle wash facilities be considered a priority.

Evaluate Recurring Campus Flooding Locations — Design and Install Mitigation Measures

The university has experienced localized flooding as a result of significant precipitation events. This results in property damage, emergency response actions and the filing of insurance claims with the State of Maryland. Climate change is expected to increase the frequency of these events and continue to impact university costs and resources.

It is recommended that Facilities Management create a workgroup of stakeholders to evaluate the existing data associated with localized flooding events over the past 3-5 years and identify trends and specific locations were flooding is a recurring event. This workgroup should develop feasible mitigation measures to reduce the occurrence of these events and mitigate damage and expense. Progress should be reported to the Water Use and Watershed Steering Committee on a regular basis and to the University Sustainability Council as part of the *Sustainable Water and Stormwater Annual Report*.

Brendan Iribe Center Computer Science Engineering Park

Expand In-house Training and Reporting by UMD Construction Site Inspectors

Stormwater management and the regulatory permitting under which the university operates imposes significant requirements on campus operations. The 3 major permits (covered earlier in this report) have a number of conditions ranging from maintenance and best practices to specific permit discharge limits. The need to continuously comply creates an ongoing challenge to prevent illicit discharges and introduction of pollutants into the storm sewer system. ESSR maintains an ongoing pollution prevention program that involves a combination of training and inspection. It is primarily focused on routine campus operations with a focus on Shuttle Bus, Grounds, fuel tanks, etc.

Construction and renovation sites pose unique challenges because:

- The sites typically involve earthwork and the disturbance of soils;
- Construction activities require the installation and ongoing maintenance of many stormwater protection strategies;
- Projects often involve many contractor and subcontractor staff who may be unaware of the university's stormwater regulatory setting and the activities that may result in non-compliance;

As a result of these challenges, it is recommended that an expanded training program be established for project managers and site inspectors who have oversight responsibility for construction sites. It is recommended that Facilities Management and ESSR jointly develop an annual training program that focuses on:

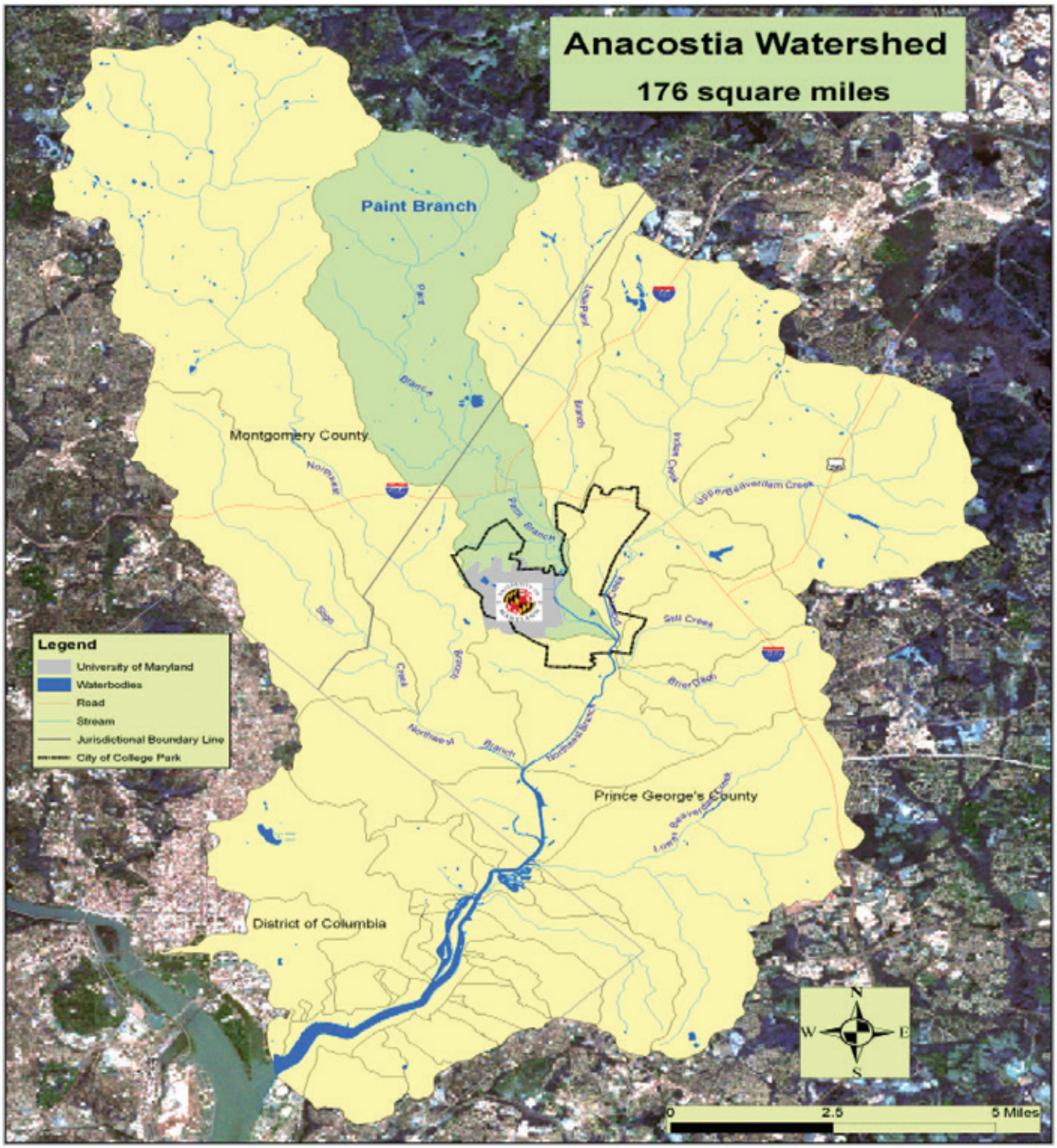
- An overview of the university's environmental permits and major requirements designed to prevent stormwater pollution;
- Typical construction activities that may result in improper discharges to the storm sewer system;
- Critical pollution prevention strategies that university staff with oversight responsibilities must be aware of and routinely inspect on construction sites.
- Internal reporting procedures.

Concluding Remarks

The Sustainable Water Use and Watershed Workgroup's eight recommendations as detailed above will put the University of Maryland on a path to better financial, social and environmental outcomes as regional pressure to respond to a changing climate and more stringent water pollution regulations are expected to remain high in coming years. Maintaining the new governance structures for water and stormwater management will allow for continuous improvement and ongoing reduction of risks to the university's business and reputation. The university should continue to make strides in water conservation and effectively manage the increasing requirements and associated administrative obligations around stormwater regulation.

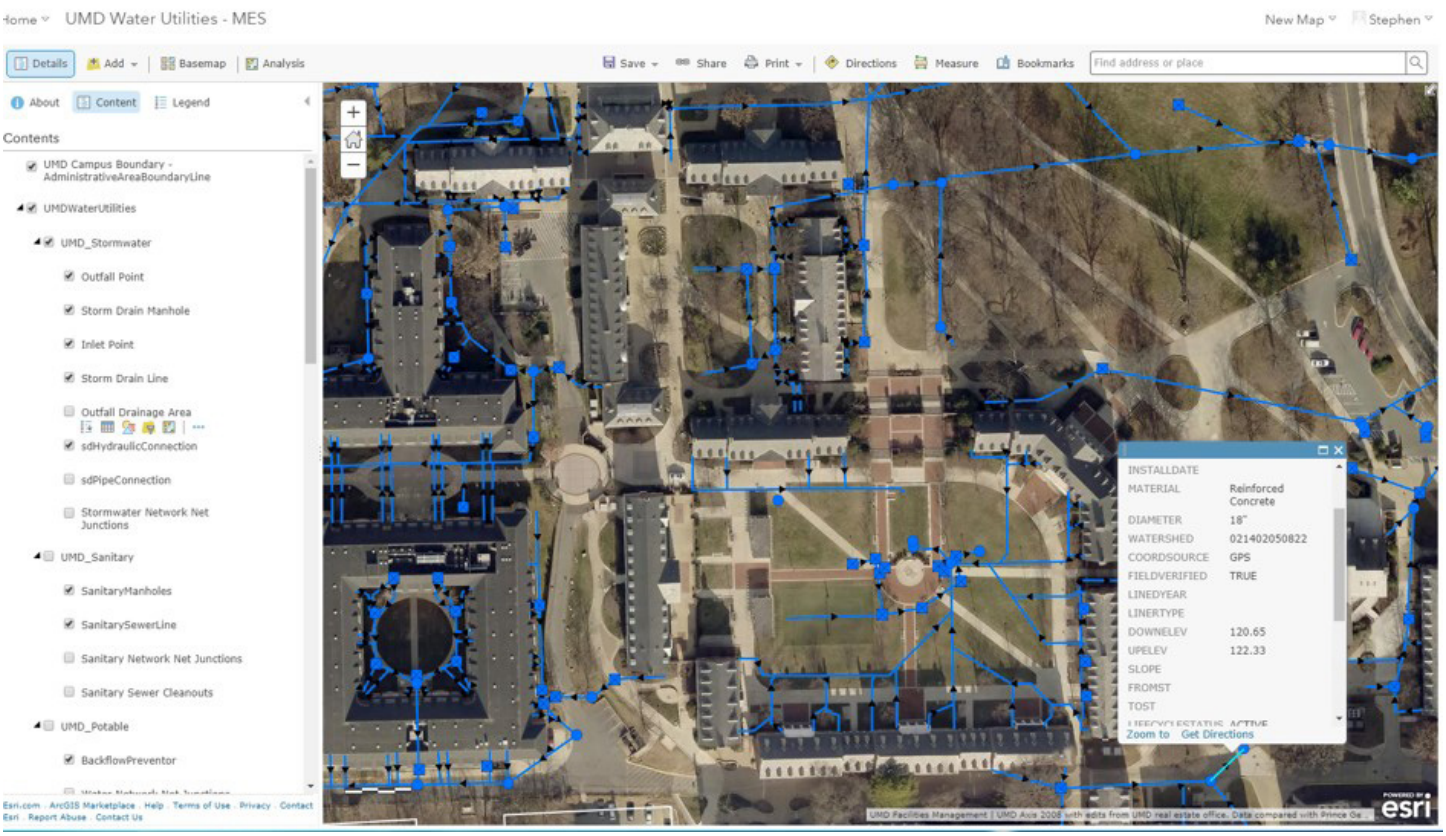
APPENDIX A

ANACOSTIA WATERSHED MAP



APPENDIX B

CAMPUS STORMWATER FACILITIES & OUTFALLS



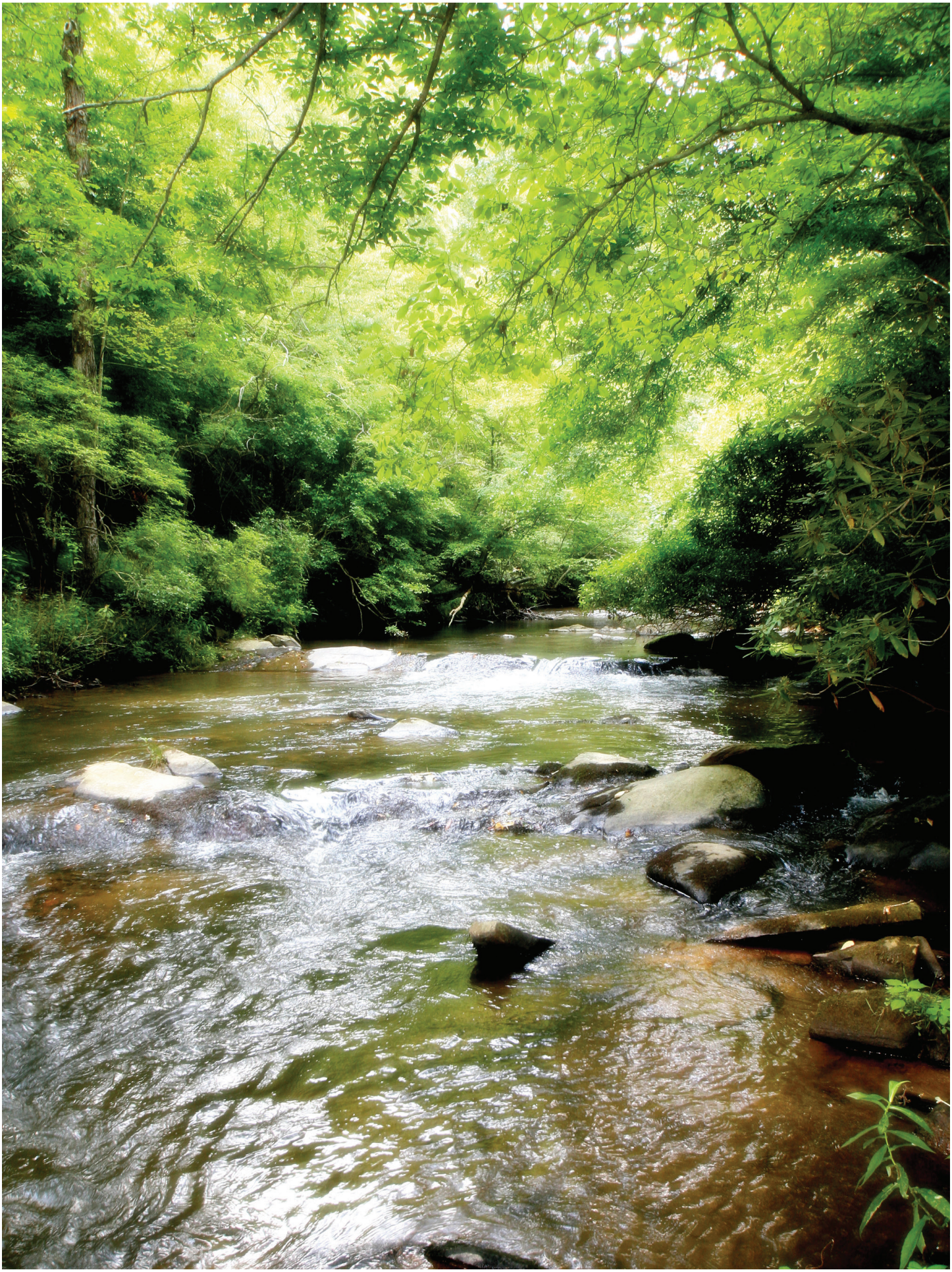
As recommended in the 2014 Sustainable Water Use and Watershed Report, Facilities Management developed a GIS-based asset inventory of the stormwater systems on campus. The inventory includes outfall points, storm drain mapping, and manhole locations among other data points.

APPENDIX C

SUSTAINABLE WATER USE & WATERSHED REPORT 2021 RECOMMENDATIONS

Recommendation 1:	**Maintain senior management engagement in water and stormwater issues**
Recommendation 2:	**Convert campus irrigation systems to groundwater sources where cost-effective; seek reductions in potable water use**
Recommendation 3:	**Expand inspection and repair of stormwater facilities and develop a computerized inspection tracking system**
Recommendation 4:	**Stay ahead of stormwater permit requirements**
Recommendation 5:	**Complete Phase II of the campus creek restoration**
Recommendation 6:	**Design, fund, and construct the Severn and Wye Oak vehicle and equipment wash facilities**
Recommendation 7:	**Evaluate recurring campus flooding locations – design and install mitigation measures**
Recommendation 8:	**Expand in-house training and reporting by UMD construction site inspector**

NOTES



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