AGENDA

JAMES CITY COUNTY BOARD OF SUPERVISORS

BUSINESS MEETING

COUNTY GOVERNMENT CENTER BOARD ROOM

101 MOUNTS BAY ROAD, WILLIAMSBURG, VA 23185

January 23, 2024

1:00 PM

A. CALL TO ORDER

B. ROLL CALL

C. PRESENTATION(S)

1. Proclamation - February 2024 as Williamsburg Community Foundation Month
2. Proclamation - Rich Krapf
3. Colonial Soil and Water Conservation District Annual Report

D. CONSENT CALENDAR

1. Appointment of Assistant Fire Marshal and Authorization of Fire Prevention Powers
2. Contract Award - Annual Job Order Contract Services
3. Contract Awards - Annual Stormwater Construction and Repair Services
4. Contract Amendment - Tyler Technology
5. Fitness Court Grants - Williamsburg Health Foundation and National Fitness Campaign
6. Grant Award - $95,594 - Commonwealth’s Attorney - V-STOP Grant Program Fund
7. Minutes Adoption
8. Resolution of Chesapeake Bay Preservation Ordinance Violation at 3520 Barrett's Ferry Drive
9. Resolution of Illicit Discharge Detection and Elimination Violation at 4540 Casey Boulevard

E. BOARD DISCUSSIONS

1. Solid Waste Consolidation

F. BOARD CONSIDERATION(S)

1. Yarmouth Creek Watershed Management Plan Adoption
2. Support of the Virginia American Revolution 250 Commission

3. Interim Agreement for New Consolidated Government Center

4. Appointment of Alternate for the Hampton Roads Planning District Commission and Transportation Planning Organization

5. Amend the Board Calendar to add April 12, 2024, at 7:30 am for the 2023 James City County Service Award Ceremony at the Busch Gardens Globe Theater

G. BOARD REQUESTS AND DIRECTIVES

H. REPORTS OF THE COUNTY ADMINISTRATOR

I. CLOSED SESSION

1. Consideration of a personnel matter, the appointment of individuals to County Boards and/or Commissions pursuant to Section 2.2-3711(A)(1) of the Code of Virginia

    a. Planning Commission Appointment

J. ADJOURNMENT

1. Adjourn until 9 am on February 1, 2024, for Local Government Day at the Capitol in Richmond, VA

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Ryan T. Ashe, Fire Chief

SUBJECT: Appointment of Assistant Fire Marshal and Authorization of Fire Prevention Powers

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Assistant Fire Marshal Joseph C. Davis has completed all the necessary training and certification requirements to be appointed as an Assistant Fire Marshal in accordance with Commonwealth of Virginia Code Section 27-30, et. seq. An Assistant Fire Marshal is responsible for fire prevention, code enforcement, and fire investigations.

Assistant Fire Marshal training includes certification as a Fire Inspector and Fire Investigator through the Virginia Department of Fire Programs as well as the Core Code Academy through the Department of Housing and Community Development to enforce the Virginia Statewide Fire Prevention Code.

This appointment must be authorized by the Board of Supervisors. A resolution is attached that complies with all Commonwealth of Virginia requirements.

Staff recommends approval.

RTA/ap
Appt-AFM_AuthFPP-mem

Attachment

R E S O L U T I O N

APPOINTMENT OF ASSISTANT FIRE MARSHAL AND

AUTHORIZATION OF FIRE PREVENTION POWERS

WHEREAS, Section 27-34.2 of the Code of Virginia, 1950, as amended provides that the County may authorize the Fire Marshal and his assistants to have the authority to arrest, procure, and serve warrants of arrest, and to issue summons in the manner authorized by the general law for violation of fire prevention and fire safety laws and related Ordinances; and

WHEREAS, Section 27-34.3 of the Code of Virginia, 1950, as amended provides that the County may authorize the local Fire Marshal to exercise the powers authorized by the Fire Prevention Code; and

WHEREAS, Section 27-36 of the Code of Virginia, 1950, as amended provides that the County may appoint one or more assistants, who, in the absence of the Fire Marshal, shall have the powers and perform the duties of the Fire Marshal; and

WHEREAS, Joseph C. Davis has completed all the minimum training and certification requirements of the Virginia Department of Fire Programs and Department of Housing and Community Development.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby appoints Joseph C. Davis as a James City County Assistant Fire Marshal with all such fire prevention powers as provided in Virginia Code Sections 27.30, et. seq. and those contained in Virginia Code Sections 27-34.2 and 27-34.3.

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Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

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Teresa J. Saeed
Deputy Clerk to the Board

VOTES

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Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

Appt-AFM_AuthFPP-res

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Mark Abbott, Capital Projects Coordinator

SUBJECT: Contract Award - Annual Job Order Contract Services

A Request for Proposals (RFP) was solicited from qualified firms to simplify the purchasing process and speed up work when job order contract services are required by having a firm pre-selected based upon their qualifications per the requirements of the Virginia Public Procurement Act and establishing an “in place” contract for needed professional services.

Interested firms responded to the RFP by describing their interest, qualifications, project approach, and experience in performing similar work. A panel of staff members representing Capital Projects, Williamsburg-James City County (WJCC) Public Schools, and James City Service Authority evaluated the proposals and selected the most qualified firm. The contract has an initial term of one year with two additional one-year options available to the County. The RFP included Cooperative procurement provisions allowing WJCC Public Schools and other entities to use the architectural firm if they so choose.

Firm selected for contract award is:

The Matthews Group, Inc., t/a TMG Construction Corporation

Staff recommends approval of the attached resolution awarding a contract to the firm listed above.

MA/md
CA-AnnJOContrSer-mem

Attachment

R E S O L U T I O N

CONTRACT AWARD - ANNUAL JOB ORDER CONTRACT SERVICES

WHEREAS, a Request for Proposals has been advertised and evaluated for the job order contract services; and

WHEREAS, the firm listed below was determined to be the best qualified to provide the required services:

The Matthews Group, Inc., t/a TMG Construction Corporation

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby awards the contract for annual job order contract services to the firm listed in this resolution.

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Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

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Teresa J. Saeed
Deputy Clerk to the Board

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Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

CA-AnnJOContrSer-res

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Shawn A. Gordon, Chief Civil Engineer, Capital Projects

SUBJECT: Contract Award - Annual Stormwater Construction and Repairs Services

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A Request for Proposals (RFP) was solicited from qualified firms to simplify the purchasing process and speed up work when stormwater construction and repairs services are required by having firms pre-selected based upon their qualifications per the requirements of the Virginia Public Procurement Act and establishing an "in place" contract for needed professional services.

Interested firms responded to the RFP by describing their interest, qualifications, project approach, and experience in performing similar work. A panel of staff members representing Capital Projects and Stormwater and Resource Protection evaluated the proposals and selected the most qualified firms. The contracts have an initial term of one year with four additional one-year renewal options per the terms and conditions available to the County. The RFP included Cooperative procurement provisions allowing Williamsburg-James City County Public Schools and other entities to use the selected construction firms if they so choose.

Firms selected for contract award are:

Environmental Quality Resources, LLC
Finish Line Construction, Inc. dba. Finish Line Environmental
Gilley Construction, LLC
Capitol Carbonic Gas Corp. dba. Harbor Dredge & Dock
Henry S. Branscome, LLC
LEX Property Services, LLC dba. Longhill Excavating

Staff recommends approval of the attached resolution awarding a contract to the firms listed above.

SAG/md
CA-AnnSWCRepSer-mem

Attachment

R E S O L U T I O N

CONTRACT AWARD - ANNUAL STORMWATER CONSTRUCTION AND

REPAIRS SERVICES

WHEREAS, a Request for Proposals has been advertised and evaluated for annual stormwater construction and repairs services; and

WHEREAS, the firms listed below were determined to be the best qualified to provide the required services:

Environmental Quality Resources, LLC
Finish Line Construction, Inc. dba. Finish Line Environmental
Gilley Construction, LLC
Capitol Carbonic Gas Corp. dba. Harbor Dredge & Dock
Henry S. Branscome, LLC
LEX Property Services, LLC dba. Longhill Excavating

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby awards the contract for annual stormwater construction and repairs services to the firms listed in this resolution.

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Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

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Teresa J. Saeed
Deputy Clerk to the Board

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Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

CA-AnnSWCRepSer-res

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: David W. Bauernschmidt, Programmer Analyst/Project Manager Supervisor

SUBJECT: Contract Amendment - Tyler Technology

James City County currently utilizes a wide range of Tyler Technology software which includes Land Management (PermitLink, permitting and zoning), Financials (Accounts Payable, Purchasing, Budget), Asset Management (work orders, preventative maintenance, tracking), and Document Storage.

James City County has been using an "on-prem" model, which means that the software is hosted on our internal servers and James City County is responsible for the day-to-day operations of the platform. This "on-prem" model has worked well; however, more vendors are shifting from an "on-prem" model to an "in-cloud" model. Tyler Technology, along with many other vendors, are starting to enhance the "in-cloud" versions and only maintaining the product "on-prem." Additionally, since systems are becoming more complex (third-party enhancements, etc.), maintaining an "on-prem" model is not realistic or viable.

Staff is requesting to amend the existing contract to move from "on-prem" to "in-cloud" model. This contract modification shall go into effect in the March 2024 timeframe. The five-year proposal for this move is replacing the existing contract with these new amounts:

Year	Amount
1	$345,681
2	$345,681
3	$345,681
4	$362,966
5	$381,114

This constitutes a five-year total of $1,781,123, subject to annual reviews and adjustments. This amount replaces the estimated five-year "on-prem" license amount of $1,150,612 for the same period. Tyler Technology is the incumbent firm providing services, and the cost is determined to be fair and reasonable.

Attached is a resolution authorizing the amendment to the current contract with Tyler Technology as noted above.

DWB/md
ContrAmdTylerTech-mem

Attachment

R E S O L U T I O N

CONTRACT AMENDMENT - TYLER TECHNOLOGY

WHEREAS, the current “on-prem” Tyler Technology Agreement needs to be amended; and

WHEREAS, a James City County contract currently exists with Tyler Technology; and

WHEREAS, funds are available in the Fiscal Year 2024 budget for the prorated cost differential for year one of the five-year renewal contract for software subscription, support, and services, and funding for future years will be requested in the budget in the applicable fiscal years; and

WHEREAS, it was determined that moving these technology services to an “in-cloud” solution for the next five-year term for services best meets the needs of the County.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby agrees to the contract amendment for Tyler Technology to move from an “on-prem” solution to an “in-cloud” solution.

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Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

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Teresa J. Saeed
Deputy Clerk to the Board

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Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

ContrAmdTylerTech-res

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Carla T. Brittle, Tourism and Centers Administrator

SUBJECT: Fitness Court Grants - Williamsburg Health Foundation and National Fitness Campaign

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The Williamsburg Health Foundation (WHF) has awarded James City County's Department of Parks & Recreation a $150,000 grant for the purpose of installing an outdoor fitness court at the Warhill Sports Complex.

The Department of Parks & Recreation will use the $150,000 towards the purchase of a National Fitness Campaign Court that includes a fitness circuit of equipment that uses body weight to improve seven movements for everyday health. There is a supporting mobile application that leads individuals through the workout in addition to planned free instructor-led classes hosted in partnership with local fitness providers. The free facility will allow citizens to workout outside, and at the same location as their children while they are engaged at sports practices.

The total cost of the court including installation is estimated to be $210,000. In addition to the WHF grant, the National Fitness Campaign has also tentatively awarded James City County a $30,000 grant towards the purchase of the court, bringing the County share down to $30,000. If additional sponsorship is not secured, the remaining funds will be used from existing Capital Improvements Program accounts.

Staff recommends approval of the attached resolution to accept the $150,000 grant and authorizes the execution of documents to accept the WHF grant.

CTB/md
WHF-NFCFitCtGrt-mem

Attachment

R E S O L U T I O N

FITNESS COURT GRANTS - WILLIAMSBURG HEALTH FOUNDATION AND

NATIONAL FITNESS CAMPAIGN

WHEREAS, the Williamsburg Health Foundation (WHF) has made funds available for the collaboration, innovation, and investment on impact systems that improve the health and well-being of citizens living in James City County; and

WHEREAS, James City County seeks to offer innovative outdoor exercise opportunities that reduce barriers of time, cost, and access for citizens.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, accepts the $150,000 grant award from the WHF to assist with the purchase and installation of a National Fitness Campaign outdoor fitness court.

NOW, THEREFORE, BE IT FURTHER RESOLVED that the Board of Supervisors of James City County, Virginia, hereby authorizes the County Administrator to complete the required documents related to the acceptance of the $150,000 from the Williamsburg Health Foundation.

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Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

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Teresa J. Saeed
Deputy Clerk to the Board

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Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

WHF-NFCFitCtGrt-res

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Nathan R. Green, Commonwealth's Attorney

SUBJECT: Grant Award - $95,594 - Commonwealth's Attorney - V-STOP Grant Program Fund

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The Commonwealth's Attorney has been awarded a $95,594 grant (Federal Share $56,744; Local Match $38,850); from the V-STOP Grant Program Fund through the State Department of Criminal Justice Services. The grant will fund the personnel costs for the continuation of one full-time position for victims of crimes involving domestic violence, sexual assault, and stalking. The Commonwealth's Attorney has been successful in obtaining this grant for more than 10 years and plans to apply for this grant in the future.

The attached resolution appropriates these funds to the Special Projects/Grants Fund through December 31, 2025.

Staff recommends approval of the attached resolution.

NRG/ap
GA-VSTOPProg24-mem

Attachment

R E S O L U T I O N

GRANT AWARD - $95,594 - COMMONWEALTH'S ATTORNEY -

V-STOP GRANT PROGRAM FUND - $95,594

WHEREAS, the Commonwealth's Attorney for the City of Williamsburg and James City County has been awarded a $95,594 federal grant (Federal Share $56,744; County Match $38,850), which is awarded annually from the V-STOP Grant Fund through the State Department of Criminal Justice Services; and

WHEREAS, this grant would fund the personnel costs to advocate for victims of crimes involving domestic violence, sexual abuse, and stalking beginning January 1, 2024 through December 31, 2025; and

WHEREAS, this grant requires a local cash of $38,850, which is available in the Commonwealth's Attorney's General Fund account.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby authorizes the acceptance of this grant and the following appropriation to the Special Projects/Grants Fund:

Revenues:	
Federal - Calendar Year (CY)24 V-STOP	$56,744
CY24 V-STOP James City County Matching Funds	38,850
Total	$95,594
Expenditure:	
CY24 V-STOP Grant Program	$95,594

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Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

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Teresa J. Saeed
Deputy Clerk to the Board

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Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

GA-VSTOPProg24-res

MINUTES

JAMES CITY COUNTY BOARD OF SUPERVISORS

REGULAR MEETING

COUNTY GOVERNMENT CENTER BOARD ROOM

101 MOUNTS BAY ROAD, WILLIAMSBURG, VA 23185

December 12, 2023

5:00 PM

A. CALL TO ORDER

B. ROLL CALL

P. Sue Sadler, Stonehouse District
James O. Icenhour, Jr., Jamestown District
John J. McGlennon, Roberts District
Ruth M. Larson, Vice Chairman, Berkeley District
Michael J. Hipple, Chairman, Powhatan District

Scott A. Stevens, County Administrator
Adam R. Kinsman, County Attorney

Mr. Hipple apologized to the citizens in attendance for the delay in starting the meeting. He mentioned the Board had a Swearing-In Ceremony for the newly and re-elected Board members.

Mr. Hipple noted prior to the moment of silence Supervisor Sadler would introduce the Pledge Leaders.

Ms. Sadler thanked Mr. Hipple. She introduced her grandsons, Connor and Evan Schultz. She gave highlights of Connor and Evan's various interests and activities.

C. MOMENT OF SILENCE

D. PLEDGE OF ALLEGIANCE

1. Connor and Evan Schultz, students at Providence Classical School

Connor and Evan led the Board and citizens in the Pledge of Allegiance.

E. PRESENTATIONS

1. Chairman's Awards

Mr. Hipple noted tonight's meeting allowed him as the Board Chairman to make awards to County staff and/or members of the public. He requested Mr. Eric Stone, Retired Battalion Chief of Williamsburg Fire Department, come to the podium.

Mr. Stone addressed the Board and citizens noting he recommended this individual to Chairman Hipple for the Chairman's Award. He noted this individual had contributed significantly to the community in relation to children and education. Mr. Stone desired Chairman Hipple to introduce the nominee.

Mr. Hipple recognized Ms. Jacqueline Bridgeforth-Williams, Founder and Executive Director of The Village Initiative. He noted her organization was dedicated to equality and justice in the Williamsburg-James City County (WJCC) Schools. Mr. Hipple further noted The Village Initiative's mission included policy advocacy, learning support, local black history, and responding to crisis. Mr. Hipple stated the organization engaged in tutoring, mentoring, and leadership programs for K-12 Schools and partnered to integrate local black history into classrooms. He mentioned The Village Initiative had been recognized and awarded at the state and national level in addition to locally for its efforts. Mr. Hipple presented Ms. Bridgeforth-Williams with the Chairman's Award.

The Board and audience applauded.

Ms. Bridgeforth-Williams thanked Chairman Hipple and the Board of Supervisors. She noted The Village Initiative was founded in 2016 and its mission was to bring equity and equality to all children within the community. Ms. Bridgeforth-Williams expressed her gratefulness to be honored at all levels for the organization's efforts. She extended positive remarks in regard to her team and supporters. Ms. Bridgeforth-Williams mentioned the Early Learning and Literacy Program distributed approximately 500 books a month to the schoolchildren of WJCC Schools. She encouraged public contribution. Ms. Bridgeforth-Williams noted The Village Initiative was honored to serve the community and make a difference. Ms. Bridgeforth-Williams highlighted the importance of preserving African American History and thanked the Board and citizens.

The Board and citizens applauded.

Ms. Bridgeforth-Williams mentioned for public notification purposes the organization's website: villagewjcc.org, adding she welcomed support and donations. She expressed her hope that the public would follow The Village Initiative's work and be a part of it.

The Board and citizens applauded.

Mr. Hipple asked Mr. Greg Thompson, Retired Firefighter of James City County, to the podium.

Mr. Thomspon mentioned he would like to share a story with the Board and citizens regarding a young man. He noted this young man had a dream to be a firefighter since he was a little boy, adding he had pursued his dream and is now a Firefighter III for James City County. Mr. Greg Thompson asked Mr. Colton Thompson and Ms. Glenda Frantz (Colton's mother) to the podium. He mentioned that this young man Mr. Colton Thompson, fell in love, adding Colton met his girlfriend's mother who lived in Minnesota who had health issues and needed a kidney transplant. Mr. Greg Thompson stated Mr. Colton Thompson pursued testing and was determined to be a perfect match for the kidney transplant for his girlfriend's mother. He noted Mr. Colton Thompson traveled to Minnesota for the testing and surgery and successfully donated his kidney to his girlfriend's mother. Mr. Greg Thompson reported Mr. Colton Thompson's girlfriend's mother was experiencing a healthy recovery from surgery and would be attending her daughter's wedding in May 2024. He cited the Chairman's Award Proclamation.

Mr. Hipple cited the Chairman's part of the proclamation and presented the award to Mr. Colton Thompson for his dedicated service to the County and for his selfless act as a living kidney donor.

The Board and citizens joined in a standing ovation.

Mr. Colton Thompson stated this was completely unexpected. He mentioned he had thought his dad, Mr. Greg Thompson, was receiving an award as to the reason for his attendance. He extended his thanks to his parents, stepparents, the County's Fire Department, and James City County for giving him the ability to do this. He mentioned the County's utmost support during the process and after surgery to ensure a healthy recovery. Mr. Colton Thompson thanked Fire Rescue Captain Brian Harriss and expressed positive remarks about him. He encouraged public consideration on living organ donation. He thanked the Board and citizens.

The Board and citizens applauded.

Mr. Hipple mentioned the Board's appreciation of all efforts and involvement within James City County. He remarked these awards exemplify County staff's exceptional commitment not just to the citizens, but to any individual in need. He stated as a community we should all be proud of the County staff and citizens within James City County.

The Board and citizens applauded.

Ms. Larson expressed her desire to speak for a moment. She mentioned a young constituent in the Berkeley District who is in need of a liver and a kidney transplant. Ms. Larson encouraged willing and eligible individuals to reach out to her via County email and she would connect those interested with the family.

2. Proclamations for State Legislators

Mr. Hipple requested Supervisor Icenhour to the podium.

Mr. Icenhour noted a proclamation for the Honorable Delegate Michael P. Mullen for his service in the State legislature and appreciation for his representation of James City County. He requested the Honorable Delegate Mullen to the podium. Mr. Icenhour stated the Honorable Delegate Mullen was elected to the Virginia House of Delegates in 2016, where he had continuously served the past eight years. He noted Honorable Delegate Mullen had served as Vice Chair for the Rules Committee, Labor and Commerce Committee, the Counties, Cities, and Towns Committee, and the Courts of Justice Committee. Mr. Icenhour further noted that as a former Assistant Commonwealth's Attorney, Honorable Delegate Mullen utilized his criminal justice background to advocate for children and families in addition to improving the criminal justice system. He highlighted other various accomplishments during his tenure. Mr. Icenhour noted the County's appreciation regarding his leadership and responsiveness to concerns within the community. Mr. Icenhour presented the proclamation to the Honorable Delegate Mullen.

The Board and citizens applauded.

Honorable Delegate Mullen addressed the Board and citizens stating it was an honor to have served the citizens of James City County. He thanked the Board for this extraordinary honor.

Mr. Hipple requested Supervisor McGlennon to the podium to introduce the next nominee.

Mr. McGlennon noted a proclamation for the Honorable Senator T. Monty Mason for his service in the State legislature and appreciation for his representation of James City County. He further noted prior to serving in the Senate of Virginia the Honorable Senator Mason was elected twice to the House of Delegates in the 93rd District. Mr. McGlennon mentioned the Honorable Senator Mason had served on the Commerce and Labor Committee, Privileges and Elections Committee, Rehabilitation and Social Services Committee, Agriculture Conservation and Natural Resources Committee, and the General Laws and Technology Committee. He highlighted other various accomplishments during his tenure. Mr. McGlennon noted the County's appreciation regarding his leadership and responsiveness to concerns within the community. He presented the proclamation to the Honorable Senator Mason.

Honorable Senator Mason thanked the Board and citizens for this honor and recognition. He stated it was a privilege to have served in this role and given the opportunity to serve and collaborate with so many great individuals within the community. Honorable Senator Mason mentioned the exceptional Elected Officials and County staff who served this community. He reiterated his thanks to the Board and citizens.

Ms. Sadler requested the Honorable Senator Tommy Norment to the podium. She noted a proclamation for the Honorable Senator Norment for his service in the State legislature and appreciation for his representation of James City County. Ms. Sadler stated the Honorable Senator Norment had served on the James City County Board of Supervisors representing the Roberts District from January 1988-December 1991. She noted that the Honorable Senator Norment was elected to the Senate of Virginia in 1992 and had continuously served for the past 31 years. Ms. Sadler further noted he had served as a member of the Senate Judiciary, Finance and Appropriations, Rules Committee, and Commerce and Labor Committee. She stated the Honorable Senator Norment worked on legislation to make the community safer and to ensure Virginia remained an exceptional state to raise a family and to do business. Ms. Sadler highlighted other various accomplishments during his tenure. She noted the County's appreciation regarding his leadership and responsiveness to concerns within the community. Ms. Sadler presented the proclamation to the Honorable Senator Norment.

Honorable Senator Norment noted his public service career started in James City County having served on the Board of Supervisors, adding he was grateful for the opportunities to have served the people of this community. He thanked Chairman Hipple and the Board for their exceptional public service to James City County. He mentioned his love for James City County as he grew up in the community and his children were educated here. The Honorable Senator Norment thanked the Board and citizens for the recognition.

Mr. Hipple opened Public Comment.

3. Service Award Presentation - Supervisor Sue Sadler

Mr. Stevens, County Administrator, addressed the Board and citizens noting he wanted to thank Supervisor Sadler for her years of service on the James City County Board of Supervisors and the James City Service Authority (JCSA) Board of Directors. He mentioned her dedication in her role to the County and citizens and ensuring that each decision made was representative of her district. Mr. Stevens thanked Ms. Sadler for allowing him the opportunity to be the James City County Administrator five years ago. He expressed positive remarks about Ms. Sadler and his appreciation for their working relationship. Mr. Stevens mentioned Ms. Sadler's values and the importance of family. He extended his thanks and gratitude to Ms. Sadler's family for allowing her the opportunity to serve in the role as a James City County Board of Supervisor for the past several years. Mr. Stevens thanked Supervisor Sadler noting he would turn the discussion over to Mr. Doug Powell, General Manager of JCSA.

The Board and citizens applauded.

Mr. Powell addressed the Board and citizens stating most of the citizens knew the Elected Officials as the Board of Supervisors; however, by virtue of election as members of the Board of Supervisors the Board members also became members of the JCSA Board of Directors. He noted during Supervisor Sadler's eight years of public service she had served as Chairman of the JCSA Board of Directors for four of those eight years. Mr. Powell thanked Ms. Sadler for her guidance and support. He noted her positive impacts on the organization and that she would be deeply missed. Mr. Powell reiterated his thanks and extended best wishes to her and her family.

Mr. Hipple mentioned Ms. Sadler's commitment and devotion to her role as Supervisor. He complimented her decision-making process. Mr. Hipple noted Ms. Sadler had done an outstanding job and she would be deeply missed.

Ms. Sadler stated it had been an honor and privilege to serve over the last eight years. She thanked her Board colleagues for their professionalism and commitment to County citizens and working relationships and friendships. Ms. Sadler congratulated the newly elected Supervisor, Ms. Barbara Null. She extended positive remarks to Ms. Null in her new role serving the Stonehouse District. She thanked County staff for all of their efforts and support. Ms. Sadler recognized Mr. Jay Everson, a County citizen who participated, engaged, and provided an abundance of wisdom and knowledge on land use, policy, budgetary issues, etc. She extended her thanks to the citizens of the Stonehouse District for entrusting her as their representative. Ms. Sadler thanked her family for their unconditional help and support throughout this journey. She thanked the citizens of James City County for this opportunity and extended Happy Holiday wishes to the community.

The Board and citizens joined in a standing ovation.

F. PUBLIC COMMENT

1. Mr. Keith Sadler, 9929 Mountain Berry Court, addressed the Board and citizens noting he was the husband of Supervisor Sadler. He noted Ms. Sadler chose to run for Supervisor of the Stonehouse District to ensure a positive future in James City County, advocate and protect conservative values, rights, and the American Dream in James City County. Mr. Sadler expressed positive remarks on her role as a Board Supervisor. He thanked all who helped support her throughout this journey. Mr. Sadler extended his congratulations to the newly elected Board of Supervisor for the Stonehouse District Ms. Null. He requested that the new Board collaborate with professionalism and respect to continue to make James City County a better place. Mr. Sadler thanked the Board.

Mr. Hipple thanked Mr. Sadler.

2. Ms. Peg Boarman, 17 Settlers Lane, addressed the Board to talk trash. She mentioned the abundance of trash on County roadways. Ms. Boarman assured the Board that the trash was being picked up and disposed of; however, the trash continued to reappear. She reported at the Repair Fair & Recycling Expo a total of 3,170 lbs. of paper was shredded and 290 lbs. of soft plastic bags, 70 tires, and 113 pairs of shoes and an abundance of clothing was collected. Ms. Boarman stated The Junkluggers collected a partial truckload of electronic waste and Habitat ReStore collected a partial truckload of household and reusable items. She noted 31 items were repaired, four gallons of compost material was collected as well as 200 lbs. of glass for O-I Glass. Ms. Boarman thanked all participants and contributors of the event. She stated The Great American Cleanup would be held on March 22-23, 2024, and the Annual Litter Cleanup for James City County was April 27, 2024. Ms. Boarman mentioned C&F Bank in Norge was awarded the fourth quarter Clean Business Award. She added she had supplied Board members with cards to identify community businesses for next quarter nominations. Ms. Boarman mentioned for public notification purposes to remember to reuse, repurpose, or recycle. She extended Happy Holiday wishes to the Board.

3. Mr. Jay Everson, 6923 Chancery Lane, addressed the Board noting he was in attendance in support of Supervisor Sadler. He expressed positive remarks of Ms. Sadler. Mr. Everson noted he even moved out of the Berkeley District to be represented by Ms. Sadler in the Stonehouse District. He complimented Ms. Sadler on her role as a Board Supervisor and wished her the best in her retirement. Mr. Everson thanked the Board and extended Happy Holiday wishes.

4. Mr. Peter Mains, 5410 Beverly Lane, addressed the Board noting he was a volunteer for YIMBY Hampton Roads in relation to accessible and affordable housing. He stated he had been in contact with a couple of Board members regarding the 2019 Workforce Housing Report. Mr. Mains suggested reducing and/or adjusting parking minimums. He stated for a townhouse in James City County the requirement was two and a half vehicle parking spaces in relation to on-street parking. Mr. Mains expressed his belief that number came from a 1985 report: *Parking Generation Manual* publication of the Institute of Transportation Engineers. He discussed that point in further detail. Mr. Mains highlighted possible recommendations for the Board's consideration to allow more opportunity for individuals of all income levels.

Mr. Hipple closed the Public Comment.

G. CONSENT CALENDAR

Mr. Hipple asked the Board if any member wished to pull an item. As there were no requests, Mr. Hipple sought a motion on the Consent Calendar.

1. Amended and Restated Cooperative Service Agreement with the Williamsburg Area Transit Authority

A motion to Approve was made by Sue Sadler, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Sadler

2. Minutes Adoption

A motion to Approve was made by Sue Sadler, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Sadler

- November 28, 2023, Regular Meeting

H. PUBLIC HEARING(S)

1. SUP-22-0027. 3426 North Riverside Drive Family Subdivision Withdrawal Request

Mr. Hipple noted the applicant had notified County staff of the request to withdraw the application at this time.

Mr. Hipple closed the Public Hearing that was left open from the November 14, 2023, Regular Meeting.

2. An Ordinance to Amend and Reordain Chapter 20, Taxation, of the Code of the County of James City, Virginia, by Amending Article I, exemption of certain persons from real estate taxes, Section 20-10, qualifications for exemption.

Mr. Hipple stated this item would need to be readvertised for a later date. He noted he would open and close the Public Hearing with no current Board action on this matter.

Mr. Hipple opened the Public Hearing.

Mr. Hipple closed the Public Hearing.

3. An Ordinance to Amend and Reordain Chapter 22, Wetlands, of the Code of the County of James City, Virginia, by amending Article II, use permits, Sections 22-3, Permitted uses, 22-5, Applications, maps, documents to be open to public inspection, 22-6, Public hearing, 22-7, Wetlands board action, and 22-11, Permit to be in writing.

A motion to Approve was made by John McGlennon, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Sadler

Mr. Adam Kinsman, County Attorney, addressed the Board stating during the General Assembly there were several changes to the State's model Wetlands Ordinance was made, adding the changes were required to be adopted by the County prior to January 2024. He noted the revisions were in relation to notice procedures for public hearings. Mr. Kinsman spoke to that point in further detail. He recommended adoption of the attached Ordinance included in the Board's Agenda Packet and welcomed any questions the Board might have.

Mr. Hipple asked if any Board members had questions.

Mr. McGlennon asked if these changes were reflective of his collaborative efforts with the General Assembly over the past few years.

Mr. Kinsman confirmed yes.

Mr. McGlennon replied it was a worthwhile endeavor and thanked Mr. Kinsman.

Mr. Hipple opened the Public Hearing.

Mr. Hipple closed the Public Hearing as there were no speakers.

4. Readoption of a concurrent resolution with the City of Williamsburg and York County to create the Historic Triangle Recreational Facilities Authority, with the initial purpose of leasing property from the Colonial Williamsburg Foundation and the subsequent construction of an indoor sports facility on said property. The Authority will be governed by a board comprised of six (6) members with each participating jurisdiction appointing two (2) members as provided in the proposed resolution.

A motion to Postpone until January 2024 was made by James Icenhour, the motion result was not Passed.
AYES: 2 NAYS: 3 ABSTAIN: 0 ABSENT: 0
Ayes: Icenhour Jr, McGlennon
Nays: Hipple, Larson, Sadler

A motion to Approve the Readoption of the Concurrent Resolution with the City of Williamsburg and York County to create the HTRFA was made by Ruth Larson, the motion result was Passed.
AYES: 3 NAYS: 2 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Larson, Sadler
Nays: Icenhour Jr., McGlennon

A motion to Approve the Resolution Authorizing the County Administrator to Execute the Funding Agreement was made by Sue Sadler, the motion result was Passed.
AYES: 3 NAYS: 2 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Larson, Sadler
Nays: Icenhour Jr., McGlennon

Mr. John Carnifax, Director of Parks & Recreation Department, addressed the Board noting the reason for this discussion was to add all members of the Historic Triangle Recreational Facilities Authority (HRTFA) for readoption purposes prior to the public hearing. He mentioned for public purposes he would provide a discussion via PowerPoint presentation on the subject matter. Mr. Carnifax provided a brief overview of HRTFA and the project itself. He displayed a depiction of the indoor sports facility on the PowerPoint presentation. Mr. Carnifax highlighted the original scope of amenities for the indoor sports facility and noted additional amenities added on the PowerPoint presentation. He mentioned the uniqueness of this indoor sports facility as there were not many comparable, adding this type of facility was one of the first in the state of Virginia. Mr. Carnifax indicated the facility would be utilized by local users as well as out-of-state tournament users. He advised the facility would be located next to the Colonial Williamsburg Regional Visitor Center. Mr. Carnifax displayed various depictions of the facility on the PowerPoint presentation. He indicated the indoor sports facility would include 12 basketball courts which could be converted to 24 volleyball courts, 36 pickleball courts, and approximately 32 wrestling tournaments were also options. Mr. Carnifax touched on the Victus Advisors operating proforma which included financial information, the two operational scenario options, etc. He discussed the budget for the facility noting the initial budget was approximately $53 million; however, with the additional design scope changes increased the total cost to approximately $79 million. Mr. Carnifax touched on the locality financial commitments. He noted the City of Williamsburg would fund the construction costs for the building. Mr. Carnifax further noted James City County and York County would support the operational costs which could range from $400,000 to $800,000 annually depending on the revenue component. He highlighted the projected generated local tax dollars for the three localities on the PowerPoint presentation. Mr. Carnifax concluded the presentation and welcomed any questions the Board might have.

Mr. Icenhour referenced the two operational scenarios. He asked if he knew of the decision timeframe on the scenario aspect.

Mr. Carnifax replied HRTFA favored a scenario where the local citizens would utilize the facility Monday-Thursday through local programs at minimal to no charge. He mentioned an increased subsidy would occur if an operation management company were to operate those programs opposed to Parks & Recreation Departments within the local jurisdictions. Mr. Carnifax noted the objective was to allow local users to use the facility at similar costs as current Parks & Recreation programs utilized within the Historic Triangle jurisdictions. He spoke to that point in further detail noting current evaluation was being had on the two different scenarios and best approach.

Mr. Stevens stated the objective from the beginning was to ensure local users were able to use the facility Monday-Thursday and allow tournament opportunity on the weekends. He indicated from a consultant standpoint the differential scenarios were available for better understanding purposes. Mr. Stevens elaborated on the operational component in further detail.

Mr. Carnifax mentioned utilizing a number of the courts through the County's Parks & Recreation programs and the operator could utilize the other courts to generate revenue, adding that would be worked out in the contract with the management firm.

Mr. McGlennon inquired about the decision to further expand the size of the facility.

Mr. Carnifax replied when looking at facilities in the state and around the country the space between the courts and netting was a significant component. He noted tournament organizers desired more space. He added the turf was another component. Mr. Carnifax mentioned in these types of projects it was vital to include various amenities that were not already in surrounding areas.

Mr. McGlennon inquired of the size of other comparable facilities.

Mr. Carnifax stated during visiting other comparable facilities there were some much larger facilities.

Mr. Stevens mentioned that the additional space would make for a better play, bench, and visitor experience. He reiterated Mr. Carnifax's point of including amenities to allow a unique experience for visitors. Mr. Stevens provided examples such as rock walls, meeting space, turf system, etc. He added those were the types of amenities that would be included in the additional square footage. Mr. Stevens expressed his belief that this facility would bring a robust regional impact and provide versatility that most facilities do not have. He acknowledged Mr. Rick Hibbet, Business Development Manager with MEB General Contractors, Inc., was in attendance to elaborate in further detail if needed.

Mr. Hibbett addressed the Board to explain that the 12 basketball courts also significantly increased square footage; however, it allowed the versatility for a variety of different activities in addition to the demand for numerous courts regarding tournaments. He noted the proposed square footage was within standards for a facility with 12 courts. Mr. Hibbet further noted square footage for these facilities ranged from approximately 175,000 square feet to 215,000 square feet based on court size.

Mr. McGlennon inquired about renewal after the 30-year period, adding he understood there were two extension possibilities.

Mr. Stevens stated there were two agreements. He noted one agreement was a 30-year term agreement between the City of Williamsburg, James City County, and York County based on debt associated with the facility. Mr. Stevens further noted after that timeframe there was the ability for two extensions; however, it would still require Board participation consent. Mr. Stevens explained that point in further detail.

Mr. McGlennon asked about the ownership aspect after the 30-year period was up.

Mr. Stevens stated the County did not have a financial requirement moving forward nor any ownership of the building unless the agreement later changed.

Discussion ensued.

Ms. Larson referenced the City of Virginia Beach indoor sports facility and questioned the successful aspect. She asked if he could address that point.

Mr. Stevens replied that particular question came up numerous times. He stated the City of Virginia Beach indoor sports facility was very successful in terms of what it aimed to do. Mr. Stevens noted the City of Virginia Beach utilized Victus Advisors as well and noted the projected rooms nights exceeded those projections. He elaborated on that point and discussed the operational point in further detail. Mr. Stevens mentioned Mr. Brian Connolly, Founder and Managing Principal of Victus Advisors, was available by phone if further information was needed. He noted Henrico County recently opened up its indoor sports facility and was almost fully booked for the year for tournaments, adding he anticipated the same outcome here.

Mr. McGlennon inquired about the cost of breaking the contract regarding the operation management company selected pertaining to the City of Virginia Beach indoor sports facility.

Mr. Stevens replied $6.1 million to terminate the contract. He elaborated on the financial breakdown in further detail. Mr. Stevens advised James City County and York County would be purchasing the furniture, fixtures, and equipment versus attempting to obtain it through the operation management company.

Ms. Sadler requested further detail on the City of Williamsburg's responsibility regarding its commitment to the construction of the facility.

Mr. Stevens requested Mr. Connolly provide further insight into the City of Virginia Beach indoor sports facility experience.

Mr. Connolly addressed the Board noting that as Mr. Stevens mentioned there were a couple of key decisions that the City of Virginia Beach made regarding the operator selection and operation agreement, adding those decisions resulted in the financial losses. He noted from an economic impact standpoint the indoor sports facility exceeded expectations. Mr. Connolly further noted off-season lodging had increased from 30% to 45% since the indoor sports facility had opened. He added the City of Virginia Beach experienced a surplus in its tourism fund and were actively seeking ways to further invest. Mr. Connolly explained that the City of Virginia Beach was pleased regarding the performance aspect of the indoor sports facility. He stated as of December 1, 2023, the operation management agreement had been terminated, adding a new long-term operation management company was selected under a more traditional operation management agreement. Mr. Connolly anticipated a significant increase in financial performance within a six-month timeframe.

Mr. McGlennon expressed his desire to obtain as much data regarding the operation agreement prior to a decision. He inquired about how the lodging aspect was being audited.

Mr. Connolly explained the City of Virginia Beach had a Sports Market Unit that was responsible for booking events for the indoor sports facility and would initiate hotel room blocks for those events. He added that the event organizers directed attendees, teams, and families to book lodging through those established room blocks. Mr. Connolly indicated the City of Virginia Beach was able to audit that through the Sports Market Unit.

Mr. McGlennon replied thanks.

Mr. Connolly stated if the indoor sports facility did not have a Sports Market Unit most of the operation management companies offered software to accommodate a similar process.

Mr. Stevens requested Ms. Sadler to repeat her question.

Ms. Sadler mentioned in the PowerPoint presentation it indicated the City of Williamsburg was responsible for the capital. She asked if Mr. Stevens would provide further detail on that aspect.

Mr. Stevens noted the City of Williamsburg had offered to pay for the construction of the facility and fund the debt service associated with that. He further noted James City County and York County were asked to cover the operation deficit. Mr. Stevens mentioned while the facility costs had increased due to the additional design scope changes it had not increased in terms of operational costs for the facility. He elaborated on that point in further detail.

Ms. Sadler asked Mr. Stevens to address how this facility would accommodate the demand for gym space within the community.

Mr. Stevens deferred discussion to Mr. Carnifax.

Mr. Carnifax mentioned the demand for gym space since 2008 when a recession occurred. He noted the limited space to accommodate all activities and the continuous population growth. Mr. Carnifax further noted a few additional schools and gymnasiums had been added; however, he believed the current concern was the demand for coaches and the primetime aspect. He expressed his belief that the indoor sports facility would be beneficial to local participants in addition to athletic programs and schools.

Ms. Sadler thanked Mr. Carnifax.

Mr. Icenhour questioned the timeframe on a community need that was known for quite some time and the priority aspect.

Mr. Carnifax noted two current auxiliary gymnasiums, adding a third was being discussed at WJCC Schools. He noted it had helped; however, it did not meet the community need.

Mr. Icenhour mentioned the debt service to be approximately $1 million annually for a potential community gymnasium, adding that was a potential 20-year loan. He noted this indoor sports facility was a 30-year loan and questioned the loan timeframe.

Mr. Carnifax replied James City County typically did not exceed 20 years in relation to bonds. He expressed positive remarks regarding the potential indoor sports facility and the significance of three local jurisdictions collaborating to meet community needs in a cost-effective way.

Mr. Icenhour questioned the vague verbiage within the necessary document to eliminate any uncertainty regarding financial commitment.

Mr. Stevens clarified that point as he had asked that same question. He stated the necessary verbiage was under Annual Audit Paragraph No. 8. He explained that point in further detail.

Mr. Hipple opened the Public Hearing.

1. Mr. Robert Lund, 111 Swinley Forest, addressed the Board noting he was not in support of this proposal. He mentioned he and other constituents he spoke with had concerns regarding the uncertainty aspect of this project. Mr. Lund noted the questions Board members had asked were valid and needed answers prior to a commitment. He further noted other community needs such as the uncertainty of the WJCC School Division. Mr. Lund touched on traveling to another locality for amenities and services. He mentioned the Brickyard Landing Park and a possible recreation facility be added there. Mr. Lund thanked the Board and extended Happy Holiday wishes.

2. Mr. Patrick Rowe, 100 Royal Saint Georges, addressed the Board noting he was in support of this proposal. He mentioned he and his wife purchased their house in James City County in 2004. Mr. Rowe mentioned the County's positive long-term track record of sound financial decision-making and the potential of jeopardizing that reputation on a proposed regional indoor sports facility. He noted an unclear business case and the questionable beneficial aspect to County citizens. Mr. Rowe expressed his concern of this project becoming another failed study case on taxpayer dollars. He recommended this proposal be sent back to the drawing board and withhold all approvals until the project itself was proven to be viable and advantageous to James City County. Mr. Rowe thanked the Board.

3. Mr. Neal Chalkley, 477 Neck-O-Land Road, addressed the Board noting he served as the President of the Williamsburg Hotel & Motel Association (WHMA) and was a Board member for Visit Williamsburg and the Greater Williamsburg Chamber of Commerce. He indicated he was not in attendance to represent any organization, adding his director would be speaking on behalf of the Williamsburg Hotel & Motel Association later. Mr. Chalkley noted he was born and raised and a longtime resident of James City County, adding there was no disputing that the County was a tourism-based economy. He further noted sports was a growing demand and the facility would meet community needs. Mr. Chalkey referenced a transparent process regarding the indoor sports facility and encouraged support of this project.

4. Mr. Ron Kirkland, Executive Director of WHMA, 1001A Richmond Road, addressed the Board noting HMP Properties, LLC, who owned and operated the Holiday Inn Express in McLaws Circle in addition to the owner and operator of the Courtyard by Marriott in McLaws Circle and the Country Inn & Suites by Radisson on Pocahontas Trail, were in attendance. He

mentioned the shared vision for tourism in the area. Mr. Kirkland touched on the transparency aspect noting the idea of an indoor sports complex started in 2014 when James City County and the City of Williamsburg conducted a feasibility study for a field house and/or aquatic center. Mr. Kirkland noted there had been much discussion and participation on this topic over the past 10 years. He elaborated further on efforts regarding the subject matter. Mr. Kirkland discussed community needs and a new tourism generator at a cost-effective approach by partnering with the City of Williamsburg and York County. He touched on key factors and financial costs to building an independent recreation facility. Mr. Kirkland highlighted pros of the proposed regional indoor sports facility. He cited Section E6, Page No. 186 of the adopted James City County budget: Tourism Investment Fund. Mr. Kirkland pointed out that the Board of Supervisors could use lodging tax dollars to subsize 100% of the indoor sports facility providing an economic benefit to tourism and recreational opportunities for the citizens. He added this allowed the County to prioritize revenue in the General Fund and address other priorities. He encouraged support of this partnership and thanked the Board for its time.

5. Mr. Jon Krapfel, 106 Robert Cole Court, addressed the Board noting he was in attendance representing the Performance Venue Group which consisted of 12 organizations in Performing Arts. He noted he was in support of this proposal. Mr. Krapfel highlighted the current significant attractions within James City County and surrounding areas. He expressed his belief that this project would have national appeal and allow synergistic opportunity. He encouraged the support of this project.

6. Mr. Lewis De Seife, 5 Road Hole, addressed the Board noting he was not in support of this proposal. He expressed his concern of this project being at taxpayers' expense. Mr. De Seife questioned the success aspect of this project. He mentioned the lack of affordable housing currently noting it would only be further diminished if this project were to be approved. He questioned if a pandemic and/or recession occurred, what would happen then. Mr. De Seife noted the importance of diversifying the economy instead of relying solely on one revenue stream. He elaborated on his point in further detail and thanked the Board for its time.

7. Mr. Charles Mesick, 3061 Old Grove Lane, addressed the Board noting he was not in attendance in support or speak against the proposal; however, he hoped that the Board would evaluate all aspects of this proposal. He questioned a private equity investor opportunity and referenced the old Yankee Candle building as an example. Mr. Mesick expressed his concern that it seemed these types of facilities relied on government subsidies. He touched on the costs of this facility. Mr. Mesick questioned the rush on a vote for this proposal in addition the necessary documentation should be spelled out and leave nothing left to question. He agreed with Mr. De Seife's point on not relying strictly on tourism and questioned what would happen if another pandemic were to occur. He requested the Board further evaluate this proposal.

8. Mr. Mac Mestayer, 105 Gilley Drive, addressed the Board noting as a taxpayer he did not mind paying taxes for certain services and amenities; however, he did not support this proposal nor did he want his tax dollars to be used for this purpose. He expressed he did not want to live in an overdeveloped area as many County citizens had voiced and the importance of preserving the rural lands. Mr. Mestayer requested the Board further evaluate this proposal and/or reduce the scale of this project.

9. Ms. Carolyn Pyrek, 101 Doral, addressed the Board requesting this proposal not be rushed. She mentioned the primary focus of this proposal was to draw in out of state tourism not County citizens. She noted the facility would operate at a deficit, the costs are fixed; however, the revenue is an estimate pointing to the uncertainty factor. Ms. Pyrek further noted this facility would tie up funds and questioned future priorities and the ability to accommodate them. She referenced several comparable indoor sports complexes in surrounding areas. Ms. Pyrek questioned the beneficial aspect for the County after the 30-year contract was up. She mentioned the need for a more diverse economy in the County. Ms. Pyrek recommended bringing businesses to the community to add to the tax base which would allow the opportunity

for better paying jobs.

10. Mr. Kenneth Joss, 108 Dyke, addressed the Board noting his exposure to the public finance industry, adding from his experience sports facilities were notorious for revenue loss. He requested the Board allow public input to be the deciding factor of whether this proposal were to be approved or not.

11. Ms. Karen Lahive, 1801 Old Woods Court, addressed the Board noting she was a new resident to the County. She extended positive compliments to the Board regarding the County and its way of operation. Ms. Lahive mentioned there were various factors of this proposal that needed to be evaluated. She discussed the high expense for these traveling sports teams and the revenue expectations. Ms. Lahive thanked the Board for its time.

12. Ms. Carolyn Keurajian, 3235 Saint James Park, addressed the Board noting she was the President/CEO of the Williamsburg Symphony Orchestra and a Board member of the Greater Williamsburg Chamber of Commerce, adding she was in support of the proposal. She mentioned she trusted the Board to make the right decision for the community. Ms. Keurajian encouraged support for the proposal.

13. Ms. Morgan Cordle, 101 Branchs Pond Road, addressed the Board thanking the Board for its service to the community. She noted she was the Head Coach and CEO of 757swim, a year-round swim team who owned and operated an aquatic center in James City County. Ms. Cordle stated since purchasing the pool the organization had generated more than 3,000 hotel room nights totaling approximately $1 million in economic impact across four weekends per year. She noted 757swim was a nonsubsidized nonprofit organization. Ms. Cordle expressed her belief that the investment into sports tourism would positively impact the County. She thanked the Board.

14. Mr. Mickey Chohany, 129 Berkeley Lane, addressed the Board noting his support for the proposal. He mentioned he was co-owner of Second Street Bistro and President of Williamsburg Area Restaurant Association. Mr. Chohany expressed his belief that this indoor sports facility would provide positive economic impact and generate significant revenue through lodging and meals tax. He encouraged support of the proposal.

15. Ms. Christine Payne, 2689 Jockey's Neck Trail, addressed the Board noting she did not know enough about this proposal to make an informed decision, adding based on listening to the discussion this evening she felt the Board did not either. She touched on the County's current financial commitments. Ms. Payne mentioned the competitive aspect of these indoor sports facilities within surrounding areas. She requested the Board provide a more refined revenue stream breakdown for each locality opposed to an overall estimate. Ms. Payne remarked she understood the beneficial aspect of this proposal to the City of Williamsburg, hotels, and restaurants; however, she questioned the benefit to County taxpayers and the County itself. She referenced the uncertainty of the WJCC School Division and opportunities for Pre-K space, affordable housing, and other various priorities. Ms. Payne expressed her belief that additional information citizen input was needed prior to a decision. She requested the Board postpone action on this item (some of her discussion was inaudible).

16. Mr. Jorgen Berg, 3108 Hollow Oak Drive, addressed the Board noting his support of the proposal. He noted valid points had been addressed on both sides regarding the proposal. Mr. Berg stated he was a father of young children who played sports in the County. He mentioned the limited space for athletics especially at Warhill Sports Complex on the weekends. Mr. Berg expressed positive remarks and benefits of this proposal. He thanked the Board for its time.

Mr. Hipple closed the Public Hearing as there were no additional speakers.

Mr. Hipple noted he looked to the Board for discussion, adding there were two motions that would need to be addressed.

Mr. Icenhour expressed his belief that there were three motions.

Mr. Hipple clarified that point.

Mr. Icenhour thanked County citizens for their input. He noted the Board received a presentation on this proposal two weeks ago, adding he had more questions than answers regarding the subject matter. Mr. Icenhour further noted some of the questions had been answered; however, there were still questions that remained unanswered. He questioned the urgency on voting on this proposal. Mr. Icenhour recommended more time to allow citizen input and to gather additional information. He requested a motion to defer this proposal until a future meeting in January, adding he looked to the Board on agreement in regard to his request.

Mr. Hipple noted there had been discussion on this proposal for approximately two years. He further noted a year ago the Board met one-on-one to determine if there was a desire to proceed with this proposal, adding a unanimous yes vote was made. Mr. Hipple expressed his opinion that he did not feel rushed through this process. He mentioned a letter that Mr. Icenhour had sent out. Mr. Hipple referenced Mr. Chohany and the Second Street Bistro. He pointed out sometimes it was necessary to revamp, create new products, amenities etc. to ensure the desirability aspect. Mr. Hipple agreed with the cost-effective approach; however, there were tourism dollars that needed to be spent. He indicated the City of Williamsburg was responsible for the $79 million regarding the construction costs for the indoor sports facility. Mr. Hipple noted the County’s obligation to the facility could be supported by tourism tax dollars. He expressed the beneficial aspect of this proposal. He asked Mr. Stevens about the renewal opportunities.

Mr. Stevens stated it was a 30-year contract with two 25-year renewals on the agreement and on the lease with Colonial Williamsburg it was a 40-year contract plus two 10-year renewals.

Mr. Hipple noted by the end of those renewal opportunities the facility would need to be overhauled and/or revamped. He expressed his desire to allow other Board members to address the motion requested by Mr. Icenhour. Mr. Hipple noted if Mr. Icenhour’s motion passed then that would eliminate the need to vote on the original two motions.

Ms. Sadler asked what Mr. Icenhour’s motion pertained to.

Mr. Hipple confirmed a motion to defer until January 2024.

Mr. Icenhour desired to comment prior to proceeding with the motion. He explained his agreement to proceed with the process was not a commitment to move forward with the proposal but to ensure all the necessary information was provided to be able to make an informed decision. Mr. Icenhour expressed he felt many County citizens were not aware of the proposal and what it entailed. He noted his letter was not to blindside his fellow Board members nor did it address anything that was not already addressed at a previous meeting. Mr. Icenhour further noted the letter was an opportunity to allow County citizens to have a better understanding of the proposal. He elaborated on his point in further detail.

Ms. Sadler expressed she was disheartened by the actions taken regarding the letter. She mentioned it did not allow any fellow Board members to respond to the written correspondence sent out. Ms. Sadler mentioned the Board had spoken about this proposal at length for years and ultimately it was the public’s responsibility to stay engaged and informed in County business. She reiterated the point that James City County was not spending $79 million. Ms. Sadler touched on certain types of tax dollars and how those must be spent based on that particular tax. She expressed she did not feel rushed through the process and she would not be voting for a postponement on this proposal.

Mr. McGlennon expressed his desire to obtain additional information prior to making a decision on this proposal. He questioned if this proposal was the right priority and did it deliver what the County and Board wanted. Mr. McGlennon indicated there would be other tourism-related business that would be forthcoming. He highlighted various questions regarding the proposal, adding it would be helpful to allow additional time to gain answers to those specific questions. He expressed he felt overwhelmed with the amount of information he had received this week and did not feel comfortable making the decision at this time.

Ms. Larson expressed her disappointment regarding the actions taken and her inability to respond in a timely manner to the written correspondence. She mentioned she had remarks she would like to make; however, she noted she would wait until later on in the meeting to address those. Ms. Larson stated for the record she did not have any conflict of interest. She noted she collaborated with hotels; however, she mentioned she had no hotels in this area and the closest one was located in the City of Hopewell. Ms. Larson further noted she did not feel a postponement to January would make a significant difference; therefore, she would not be voting for a postponement on this proposal. Ms. Larson agreed to Ms. Sadler's point that this topic had been discussed numerous times in various communication forms.

Ms. Larson expressed her desire to speak prior to the vote on the second motion. She noted she was a bit taken back regarding pushback on the tourism industry, adding this industry that had supported this community for a long time. She stated she did not take the use of taxpayer funds lightly. Ms. Larson noted she was born and raised here in the community and she had been involved in the tourism industry her entire life. She noted the importance of sports tourism for localities that strictly relied on that industry. Ms. Larson spoke to that point in further detail. She expressed her disappointment that James City County did not have amenities such as an aquatic center, performance arts center, areas to hold convocations, etc. Ms. Larson mentioned the County was a wealthy community; however, there were no areas available for large gatherings to support these activities. She elaborated on that point in further detail. Ms. Larson noted this proposal allowed various opportunities that currently were not available. She discussed the 1% sales tax and noted half of that 1% went to marketing purposes. Ms. Larson stated there had not been an increase in visitation since 2007, adding in 2019 the County experienced an increase due to marketing efforts. She noted then the COVID-19 pandemic occurred. Ms. Larson added last year visitation significantly increased past 2019 numbers and the trend was on the same track for this year. Ms. Larson explained the marketing efforts had paid off tremendously. She touched on efforts to diversify the economy. Ms. Larson explained it was vital to support tourism as it was significant to this community. She noted it was imperative for children within this community to have the much-needed field space and additional opportunities. Ms. Larson thanked the County's Parks & Recreation Department and local sports teams who had exhausted all efforts to accommodate substantial number of individuals who play sports.

Mr. Kinsman clarified the second motion included both resolutions: 1) Main Funding Agreement; and 2) Subsidy Area Funding Agreement.

Mr. Icenhour expressed his desire to speak prior to the vote on the second motion. He noted his reservations regarding this proposal. Mr. Icenhour further noted his intent was to inform County citizens of his concerns which he had addressed at a previous meeting. He apologized to his fellow Board members if his actions upset them. Mr. Icenhour's expressed his hope to allow a public hearing to address some of those raised concerns. He touched on the Honorable Senator Norment's bill that was adopted which essentially set up the 1% sales tax in addition to \$2 million worth of maintenance of effort money. Mr. Icenhour stated prior to the adopted bill that those funds came out of the General Fund at the County's digression to provide those dollars to the tourism industry. He noted that digression was taken away from the County when the bill was adopted. Mr. Icenhour indicated those funds were still from County taxpayer General Fund revenues. He stated approximately \$542,000 of those funds would go to the indoor sports facility and would be used for capital for debt purposes. Mr. Icenhour added the City of Williamsburg contributed approximately $2.5 million and approximately $1.5 million of conjoined funds amongst the three jurisdictions. He advised those funds were in addition to the operational costs for the indoor sports facility. Mr. Icenhour spoke to the total funds the County would put forth to fund this project annually and questioned the return for the County. He expressed his concern on the justifiable aspect based on generated revenue, adding there was no exit strategy once this proposal was voted on. Mr. Icenhour expressed his belief that the benefits to the tourism industry far outweighed the benefits to County taxpayers, adding he felt it was not an adequate return on taxpayer investment.

Mr. Hipple noted he understood the concerns; however, there was a concern of potentially losing the tourism industry altogether. He noted that was not likely to happen; however, it was vital to support the tourism industry for tax revenue purposes. He referenced Ms. Larson's point of the ability to accommodate other opportunities that the County currently did not offer. Mr. Hipple welcomed any additional comments from the Board prior to voting.

Ms. Sadler expressed her belief that this proposal benefited more than just the tourism industry, adding it would benefit a substantial number of children who played sports.

At approximately 8:24 p.m., the Board recessed for a short break.

At approximately 8:33 p.m., the Board reconvened.

Ms. Sadler was not present for the reminder of the meeting.

5. An Ordinance to Amend and Reordain Chapter 17, Sewers and sewage, of the Code of the County of James City, Virginia, by amending and renaming Article I, reserved, Section 17-1 – 17-7, Reserved, to Article I, Alternative discharging sewer system, Section 17-1, definitions, Section 17-2, Limitations on the use of alternative discharging sewer systems, Section 17-3, James City County alternative discharging sewage system permit, Section 17-4, alternative discharging sewage system maintenance and testing, Section 17-5, availability of sanitary or other sewer; discontinuance of alternative discharging sewage system, and Sections 17-6-17-7, reserved.

A motion to Approve was made by Michael Hipple, the motion result was Passed.
AYES: 4 NAYS: 0 ABSTAIN: 0 ABSENT: 1
Ayes: Hipple, Icenhour Jr, Larson, McGlennon
Absent: Sadler

Mr. Kinsman addressed the Board noting at a recent Board meeting there were several citizens who spoke during Public Comment to request consideration on the use of Alternate Discharging Sewer System (ADSS) on properties located in the upper end of the County. He stated Supervisor Hipple met with these County citizens and requested staff to draft an Ordinance permitting the limited use of ADSS in the County for the Board's consideration. Mr. Kinsman noted the ADSS were highly regulated by the Commonwealth of Virginia through the Virginia Department of Health (VDH) and Virginia Department of Environmental Quality. He further noted localities were not required to permit ADSS but localities may do so, adding many localities do on a limited basis. Mr. Kinsman mentioned the proposed Ordinance before the Board limited the use of ADSS in only those situations where the property was located outside the Primary Service Area and VDH determined that an existing sewage system serving an existing structure had failed and there were no other alternatives to the homeowner. Mr. Kinsman highlighted various requirements regarding ADSS. He welcomed any questions the Board might have.

Mr. McGlennon asked if these measures prevented connection to the County's sewage system.

Mr. Kinsman replied he believed so or the continuation operation of failed septic systems. He added this would allow an alternative option other than a pump and haul which was only supposed to be conducted for a year's time.

Mr. Hipple noted if citizens were to leave the systems as-is then there would be no control of what was leaching out of the ground and going into County waterways. He further noted with ADSS it was acceptable to put the waste into the waterways without contamination and/or harm. Mr. Hipple elaborated on that point further.

Ms. Larson asked about the maximum number of people who could utilize this.

Mr. Kinsman stated the way the Code of Virginia was written there had to be a certain distance between the systems. He noted there was no maximum number and pointed out that this was a very limited use. He reiterated the eligibility requirements and discussed the extensive process for consideration of this alternative.

Mr. Hipple mentioned it had to be an existing structure.

Ms. Larson questioned if there were any environmental impacts regarding ADSS.

Mr. Kinsman explained the process for the ADSS noting yearly inspections would be a requirement to ensure these systems were working at its fullest potential.

Mr. McGlennon asked if there were better regulations in terms of restricting future development to avoid these sorts of circumstances.

Mr. Kinsman confirmed yes, adding most of these houses were platted and built long ago. He noted the County would not allow this now; however, this alternative allowed an exception for past approvals.

Mr. Hipple mentioned additional precautionary measures to ensure other avenues were not taken.

Discussion ensued.

Mr. Hipple opened the Public Hearing.

Mr. Hipple closed the Public Hearing as there were no speakers.

I. BOARD CONSIDERATION(S)

None.

J. BOARD REQUESTS AND DIRECTIVES

Mr. Icenhour mentioned he had a constituent ask him about people running red traffic lights and whether or not the County had the ability to use cameras. He stated the County had a Red Light Camera Ordinance; however, it had never been implemented. Mr. Icenhour requested that the County Attorney and staff review the Ordinance to ensure it was up to date with state laws. He requested a study be conducted on the most effective areas to utilize the cameras. Mr. Icenhour expressed his belief that the County was permitted a total of seven cameras. He requested various details on the subject.

Ms. Larson had a similar request to use that sort of technology in school zone areas. She mentioned it would eliminate the need for a Police Officer and from her understanding there were raised concerns regarding speed in school zones within the County.

Mr. Icenhour had one further item to discuss. He mentioned the Home for the Holidays Program and displayed a photo of the Award Ceremony at the United States (U.S.) Coast Guard Training Center Yorktown. Mr. Icenhour noted enough money was raised to provide 43 Enlisted service members at the Naval Weapons Station Yorktown and the U.S. Coast Guard Training Center Yorktown a $300 Christmas stipend. He thanked all participants and contributors involved.

Mr. McGlennon mentioned next year there would be several new Planning Commission members. He noted he had asked a couple of current Planning Commission members of ways to make the new Commissioners feel more connected, adding the Planning Commission members suggested a more formalized on-boarding process for Planning Commissioners. Mr. McGlennon suggested Board members meet with new Planning staff to become familiar and to provide guidance and insight. He extended Happy Holiday wishes.

Ms. Larson asked if the Planning Commission pay had been looked at.

Mr. Stevens replied it was a possible Retreat meeting topic. He noted there had not been a decision made on that point as of yet.

Ms. Larson expressed her belief that the Planning Commission had not received an adjustment in some time.

Mr. Stevens replied the Planning Commission was one of the few boards that did get compensation. He noted there had been discussion regarding other boards earning pay; however, he felt those topics were closely related.

Ms. Larson stated she attended a breakfast hosted by the Newport News Shipbuilding regarding the lack of qualified employees. She noted the Newport News Shipbuilding planned on hiring 21,000 people in the next five years. Ms. Larson encouraged the public if interested to look into this opportunity. She spoke to that point in further detail. Ms. Larson extended wishes for the Holiday Season.

Mr. Hipple also extended Happy Holiday wishes.

K. REPORTS OF THE COUNTY ADMINISTRATOR

Mr. Stevens noted he had no report. He mentioned Closed Session items could be deferred to the Board's January 9, 2023, Regular Meeting, if the Board desired to do so.

Mr. Hipple asked the Board if it chose to defer those Closed Session items until the Board's January 9, 2023, Regular Meeting.

The Board agreed.

L. CLOSED SESSION

A motion to Defer Closed Session Items until the January 9, 2023, Regular Meeting was made by Michael Hipple, the motion result was Passed.
AYES: 4 NAYS: 0 ABSTAIN: 0 ABSENT: 1
Ayes: Hipple, Icenhour Jr, Larson, McGlennon
Absent: Sadler

1. Consideration of a personnel matter, the appointment of individuals to County Boards and/or Commissions pursuant to Section 2.2-3711(A)(1) of the Code of Virginia

a. Appointments - VPPSA Board of Directors

b. Appointments - Historic Triangle Bicycle Advisory Committee

c. Appointments - Board of Equalization

2. Certification of Closed Session

M. ADJOURNMENT

1. Adjourn until 4 pm on January 9, 2024 for the Organizational Meeting

A motion to Adjourn was made by Ruth Larson, the motion result was Passed.
AYES: 4 NAYS: 0 ABSTAIN: 0 ABSENT: 1
Ayes: Hipple, Icenhour Jr, Larson, McGlennon
Absent: Sadler

At approximately 8:54 p.m., Mr. Hipple adjourned the Board of Supervisors.

MINUTES

JAMES CITY COUNTY BOARD OF SUPERVISORS

ORGANIZATIONAL MEETING

COUNTY GOVERNMENT CENTER BOARD ROOM

101 MOUNTS BAY ROAD, WILLIAMSBURG, VA 23185

January 9, 2024

4:00 PM

A. CALL TO ORDER

B. ROLL CALL

Barbara E. Null, Stonehouse District
James O. Icenhour, Jamestown District
John J. McGlennon, Roberts District
Ruth M. Larson, Vice Chairman, Berkeley District
Michael J. Hipple, Chairman, Jamestown District

Scott A. Stevens, County Administrator
Adam R. Kinsman, County Attorney

C. ORGANIZATIONAL MEETING

1. 2024 Organizational Meeting

Mr. Hipple sought a motion to nominate the Chair for the upcoming year.

A motion to Nominate Ruth Larson as Chair was made by James Icenhour, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Null

Ms. Larson thanked her colleagues for her nomination as Chair.

Ms. Larson sought a motion to nominate the Vice Chair for the upcoming year.

A motion to Nominate James Icenhour as Vice Chair was made by Michael Hipple, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Null

Ms. Larson sought a motion to adopt the Organizational Meeting resolution and any changes or times to the calendar.

Mr. McGlennon made a motion to amend the rules for the Board's first meeting of the month to 5 p.m. He noted work scheduling conflicts for the time request of an earlier meeting.

The motion was tabled and discussion ensued.

Mr. Hipple noted the possibility of earlier meeting times for other Boards and Commissions. He stated consideration of staff and their time as a factor in the time change request. Mr. Hipple noted staff was very supportive of the Board's needs and schedules, adding consideration of newer staff members and expectations regarding late meetings. He stated if the Board adhered to the 5 p.m. start time then consideration of other meeting times should be evaluated.

Mr. McGlennon agreed, adding sometimes meeting attendees had to wait long times to present or hear particular items.

Ms. Null noted the importance of a time that allowed working citizens to attend meetings.

Mr. Hipple addressed that point stating if people wanted to attend the meeting, then they would make a point to be there. He added the Board had found that point to be true when the meeting time had been changed previously. Mr. Hipple stated he was good with the current times.

Ms. Larson asked Mr. Stevens if he could review the other Boards and Commissions and a 5 o'clock start time.

Mr. Stevens noted if the Board was supportive of that point, he could encourage that time from the staff side.

Ms. Larson also addressed the possibility of some adjustments to the Agenda. She referenced when citizens attended meetings for Public Hearing items but had to wait until after Presentations or other items. Ms. Larson noted that point could be addressed at a later time. She further noted that citizens could leave recordings for Public Comments for some Boards and Commissions and questioned if that was an option for the Board of Supervisors. Ms. Larson stated voice mail messages had been used in the past.

Mr. Stevens stated with technology those messages should be available for the Board to access. He noted the potential challenge of timing prior to Public Hearings.

Ms. Larson noted she was referring more to citizen comments for Public Hearings, adding then those comments would be available to the Board if the person(s) were unable to attend a meeting.

Mr. Stevens stated he would review the options to Ms. Larson's point.

A motion to Adopt the Amended time to 5 p.m. for the first meeting was made by Barbara Null, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Null

Ms. Larson asked Mr. Stevens if he would address the other meeting times.

Mr. Stevens confirmed yes.

2. Supervisor Seats for Regional Boards and Commissions

Ms. Larson sought a motion for a Closed Session to address personnel issues regarding the appointment of individuals to Boards and/or Commissions.

A motion to Enter a Closed Session for the appointments was made by Michael Hipple, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Null

At approximately 4:08 p.m., the Board of Supervisors entered a Closed Session.

At approximately 4:19 p.m., the Board re-entered Open Session.

A motion to Certify the Board only spoke about those matters indicated that it would speak about in Closed Session was made by John McGlennon, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Null

Ms. Larson sought a motion on the appointment of Supervisors to Boards and/or Commissions.

A motion to make the following appointments was made by James Icenhour, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Null

Board/Commission Committee	**Board Member 2024**
Hampton Roads Military and Federal Facilities Alliance (HRMFFA)	Michael Hipple (with John McGlennon as alternate)
Hampton Roads Transportation Accountability Commission (HRTAC)	Michael Hipple (with John McGlennon as alternate)
Hampton Roads Planning District Commission (HRPDC)	Ruth Larson Alt. Jim Icenhour
Hampton Roads Transportation Planning Organization (HRTPO)	Ruth Larson Alt. Jim Icenhour
School Liaison Committee	Ruth Larson and John McGlennon
Agricultural and Forestal District (AFD) Advisory Committee	Barbara Null
Economic Development Authority Liaison	Barbara Null
Williamsburg Tourism Council	Ruth Larson
Hampton Roads Workforce Council	Jim Icenhour
Virginia Peninsula Regional Jail Authority	Barbara Null
Historic Virginia Land Conservancy	John McGlennon
Greater Williamsburg Chamber of Commerce Board of Directors	Jim Icenhour
High Growth Coalition	John McGlennon
Williamsburg Area Medical Assistance Corp (WAMAC)	John McGlennon

3. Seating Assignments

Ms. Larson noted seating assignments would be drawn for Seat Nos. 3-5.

The seating assignments were:

1. Larson

2. Icenhour
3. McGlennon
4. Hipple
5. Null

D. BOARD CONSIDERATION(S)

Mr. Icenhour stated he had an updated schedule for the WMBG Radio interviews. He noted all five Supervisors were scheduled for participation, adding each Supervisor was scheduled once every 10 weeks. Mr. Icenhour addressed several key points regarding the schedule and the station.

E. CLOSED SESSION

None.

F. BOARD REQUESTS AND DIRECTIVES

None.

G. ADJOURNMENT

1. Adjourn until 5 pm on January 9, 2024 for the Regular Meeting

A motion to Adjourn was made by Michael Hipple, the motion result was Passed.
AYES: 5 NAYS: 0 ABSTAIN: 0 ABSENT: 0
Ayes: Hipple, Icenhour Jr, Larson, McGlennon, Null

At approximately 4:23 p.m., Ms. Larson adjourned the Board of Supervisors.

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Michael D. Woolson, Section Chief - Resource Protection
Andrew Dean, Assistant County Attorney

SUBJECT: Chesapeake Bay Preservation Ordinance Violation - Civil Charge - Vasudev R. and Angelina M. Ananthram - 3520 Barrett's Ferry Drive

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Attached is a resolution for consideration by the Board of Supervisors (the "Board") involving a violation of the County's Chesapeake Bay Preservation Ordinance (the "Ordinance") on property located at 3520 Barrett's Ferry Drive and further identified as James City County Real Estate Tax Map Parcel No. 4310600006 (the "Property"). The case involved the clearing of vegetation and installation of turf grass within the Resource Protection Area (the "RPA") on the Property. This work was done without first obtaining an exception to the Ordinance.

On or about June 23, 2023, County staff received a report of unauthorized activity on the Property. Following the site visit, staff performed research on the Property using County records and discovered that there had not been an exception to the Ordinance for the work.

In accordance with provisions of the Ordinance, the owner and County mutually came to terms to resolve and settle the violation through the County's civil charge process. The owner voluntarily signed a Consent Agreement and entered into a Chesapeake Bay Restoration Agreement with the County on November 28, 2023.

The resolution and attachments present additional specific details of the violation. Under the provisions of the Ordinance, the Board may accept civil charges for each violation of up to $10,000. The owner has agreed to the recommended waiving of the civil charge for violation of Section 23-10 of the County's Chesapeake Bay Preservation Ordinance.

The Chesapeake Bay Preservation Ordinance Civil Penalty Procedures Policy, endorsed by the Board in August 1999, was used by staff as guidance in determining the civil charge amount. The Policy considers the degree of water quality impact and the degree of noncompliance involved in the case. The waiving of the civil charge amount is based on a minor water quality impact, a minor degree of noncompliance, and the voluntary restoration of a portion of the RPA.

Staff recommends adoption of the attached resolution, establishing the civil charge for the Chesapeake Bay Preservation Ordinance violation presented.

MDW/AD/ap
CBPAViol-3520BarrtFyDr-mem

Attachments:
1. Resolution
2. Notice of Violation
3. Location Map
4. Consent Agreement
5. Restoration Agreement
6. Restoration Plan
7. 1999 Civil Charge Policy

R E S O L U T I O N

CHESAPEAKE BAY PRESERVATION ORDINANCE VIOLATION - CIVIL CHARGE -

VASUDEV R. AND ANGELINA M. ANANTHRAM, 3520 BARRETT'S FERRY DRIVE

WHEREAS, Vasudev R. and Angelina M. Ananthram are the owners of a certain parcel of land commonly known as 3520 Barrett's Ferry Drive, Williamsburg, Virginia and designated as Parcel No. 4310600006 within the James City County Real Estate Tax Map system (the "Property"); and

WHEREAS, on or about June 23, 2023, Vasudev R. and Angelina M. Ananthram cleared vegetation and installed turf grass within a defined Resource Protection Area ("RPA") on the Property without prior approval of a Chesapeake Bay exception, impacting the RPA in violation of the County's Chesapeake Bay Preservation Ordinance; and

WHEREAS, Vasudev R. and Angelina M. Ananthram executed a Consent Agreement to remedy the violation of the County's Chesapeake Bay Preservation Ordinance; and

WHEREAS, Vasudev R. and Angelina M. Ananthram agreed to a Chesapeake Bay Restoration Agreement to restore vegetation on the Property to a condition that protects the natural resources of the Property, the County, and the Chesapeake Bay watershed; and

WHEREAS, Vasudev R. and Angelina M. Ananthram agreed to pay a total of $0 to the County as a civil charge pursuant to the County's Chesapeake Bay Preservation Ordinance; and

WHEREAS, the James City County Board of Supervisors accepts the civil charge in full settlement of the Chesapeake Bay Preservation Ordinance violation, in accordance with Section 23-18 of the Code of the County of James City.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby authorizes and directs the County Administrator to accept the $0 civil charge from Vasudev R. and Angelina M. Ananthram as full settlement of the Chesapeake Bay Preservation Ordinance violations at the Property occurring on or about June 23, 2023.

____
Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

____
Teresa J. Saeed
Deputy Clerk to the Board

	VOTES AYE	NAY	ABSTAIN	ABSENT
NULL	____	____	____	____
ICENHOUR	____	____	____	____
MCGLENNON	____	____	____	____
LARSON	____	____	____	____
HIPPLE	____	____	____	____

Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

CBPAViol-3520BarrtFyDr-res

James City County
VIRGINIA
Jamestown 1607

General Services
107 Tewning Road
Williamsburg, VA 23188
P: 757-259-4080
General.Services@jamescitycountyva.gov

jamescitycountyva.gov

Capital Projects	**Fleet**	**Stormwater and Resource Protection**	**Facilities & Grounds**	**Solid Waste**
107 Tewning Road	103 Tewning Road	101-E Mounts Bay Road	113 Tewning Road	1204 Jolly Pond Road
Williamsburg, VA 23188	Williamsburg, VA 23188	Williamsburg, VA 23185	Williamsburg, VA 23188	Williamsburg, VA 23188
757-259-4080	757-259-4122	757-253-6670	757-259-4080	757-565-0971

June 27, 2023

Vasudev and Angelina Ananthram
3520 Barretts Ferry Drive
Williamsburg, VA 23185

Re: Resource Protection Area, unauthorized vegetation removal and installation of lawn
SRP-23-0014

To Mr. and Mrs. Anathram:

On June 23, representatives of the James City County Stormwater and Resource Protection Division became aware of the removal of the entire understory and shrub layer and the installation of a lawn within the Resource Protection Area (RPA) at 3520 Barretts Ferry Drive. There is no active exception request on file in our office for this work on this property within the RPA.

Section 23-7 of the James City County Chesapeake Bay Preservation Ordinance (CBPO), which regulates activities within the RPA, prohibits the removal of vegetation without staff approval and only for a reasonable sightline. This activity is a violation of the CBPO, subject to a Civil Penalty of up to $5,000.00 for each day of the violation per property or a civil charge of up to $10,000.00 per property.

To remedy these violations, you must take the following actions:

1. Remove all non-permitted lawn within the RPA;
2. Restore and reestablish the RPA buffer in the area of the lawn. This includes:
    a. Restoring the lawn area with 500 shrubs and mulch, approximately 23,000 square feet of lawn in the RPA. Shrubs are defined as a woody plant smaller than 15 feet at maturity, usually having multiple permanent stems branching from or near the ground and may be evergreen or deciduous. Shrubs must be a minimum of 24" tall and a minimum of a 3-gallon pot when planted.
    b. A surety in the amount of $25,000.00 to guarantee the plantings.
    c. There shall be a minimum of 90% survivability of all planted material 1 year post planting before the surety would be returned.
3. Enter into a Chesapeake Bay Restoration Agreement with the County; and
4. Payment of a one-time $7,500.00 civil charge to the County.

Note that under Section 23-17 of the James City County Code, the "owner of property subject to an administrative decision, order or requirement under this chapter may appeal by submitting a written request for review to the [Chesapeake Bay] board no later than 30 days from the rendering of such decision, order or requirement."

Please contact our office at 757-253-6823 to discuss this matter within the next 30 days. After 30 days from the date of this letter, the matter is no longer appealable to the Chesapeake Bay Board.

Sincerely,

Michael Woolson
Section Chief, Stormwater and Resource Protection Division
757-253-6823
Michael.Woolson@jamescitycountyva.gov

cc: Toni Small, Stormwater and Resource Protection Division Director, via email
Liz Parman, Deputy County Attorney, via email
Paul Holt, Community Development Director, via email
Christy Parrish, Zoning Administrator, via email

James City County VIRGINIA Jamestown 1607

Legend

Parcels
Street Names
Resource Protection Area RPA

Feet
0 100 200 300 400
1:3,600 / 1"=300 Feet

Title: Location Map **Date: 8/16/2023**

DISCLAIMER:This drawing is neither a legally recorded map nor a survey and is not intended to be used as such. The information displayed is a compilation of records,information, and data obtained from various sources, and James City County is not responsible for its accuracy or how current it may be.

Chesapeake Bay Preservation Civil Charge Consent Agreement

THIS AGREEMENT, made on this__________ day of ______________, 20_____, by and between Vasudev and Angelina Ananthram ("Owners"), residing at 3520 Barrett's Ferry Drive, Williamsburg, VA 23185, and the COUNTY OF JAMES CITY, VIRGINIA ("County").

WHEREAS, a violation of the James City County Chesapeake Bay Preservation Ordinance, Chapter 23 of the James City County Code, exists on that certain parcel of land known and identified as 3520 Barrett's Ferry Drive, Parcel Identification No. 4310600006 ("Parcel"). Turf grasses exist beyond any approved plan of development on the Parcel ("Violation"). The County acknowledges that the Violation was not caused by the Owners, it having pre-existed the date on which the Owners acquired title to the Parcel.

NOW, THEREFORE, to resolve this Violation the parties hereto agree as follows:

1. The County waives the payment of any civil charge for the Violation of the Ordinance described above.
2. The Owners hereby agree to enter into the Chesapeake Bay Restoration Agreement ("Agreement") attached hereto as Exhibit A to address the Violation of the Ordinance described above.
3. In consideration of the Agreement, the County agrees to waive any civil charge and accept the Agreement as the final resolution of the Violation and in consideration of this executed agreement the County will not prosecute the Owners for the Violation pursuant to James City County Code Section 23-18.

Once the Agreement is executed, the County will proceed with scheduling the case on the Consent Calendar at an upcoming Board of Supervisors Regular Meeting for approval of this resolution of the Violation.

OWNER:

____
VASUDEV G. ANANTHRAM

____
ANGELINA M. ANANTHRAM

COUNTY OF JAMES CITY, VIRGINIA

By: __________________________
(signature)

Approved as to form:

____
County Attorney

Legend

- Parcels
- Street Names
- Resource Protection Area RPA

Planting Area

- 33 shrubs, minimum 24" tall, 5 gallon pot. Shrubs are defined as a woody plant smaller than 15 feet when mature, usually having multiple permanent stems branching from or near the ground and may be evergreen or deciduous.

- Shrubs shall be planted no closer than 5 feet from other plants.

- Area shall be mulched with a minimum of 3-inches of hardwood mulch.

- Shrubs may be planted in either Planting Area 1, Planting Area 2 or a combination of both.

- 90% plant survivability after one growing season.

Feet

0 50 100 150 200

1:1,200 / 1"=100 Feet

Title: 3520 Barretts Ferry Drive Restoration Plan **Date: 8/16/2023**

ADDENDUM TO RESTORATION PLAN; 3520 BARRETT'S FERRY DRIVE

In addition to the notes contained on the plan entitled: "3520 Barrett's Ferry Drive Restoration Plan" dated 8/16/2023, the following terms and provision shall apply to the Restoration Plan and the Chesapeake Bay Restoration Agreement between Vasudev and Angelina Ananthram ("Owners") and The County of James City, Virginia ("County"):

1. Shrubs and plantings, to include 13 liriope and 14 feathered pink dianthus, previously planted by the Owners shall be credited against the required 33 low-growing shrubs.

2. Plantings required by this plan may be placed in Planting Area 1 shown on the Restoration Plan, adjacent to the dock walkway.

3. The Owners or their landscaping contractor shall be permitted to enter the RPA with equipment (backhoe, bobcat, etc.) as necessary to perform soil amendment and planting required by the Restoration Plan, without further approvals by the County. Restabilization of soil disturbed by such equipment shall be performed by Owners; reseeding with grass seed shall be the approved restabilization method.

4. The County shall provide 48 hours advance notice to Landowner before entering upon the subject property for inspections.

5. Surety for $2,250 securing the Agreement and the Restoration Plan shall be in the form of the prior Chesapeake Bay Restoration Agreement between the Owners and the County pursuant to case no. SRP-23-0013.

Chesapeake Bay Preservation Ordinance Civil Penalty Procedures
(As adopted by the Board of Supervisors - August 19, 1999)

Principle

All violations of the Ordinance will be prosecuted to obtain an acceptable remedy. All RPAs and associated buffers that are disturbed without an exception or waiver granted in accordance with the provisions of the Ordinance will be restored on a 2:1 replacement basis.

Process

The process will be to document the violation with a Notice Of Violation that states the conditions necessary to bring their site into compliance with the Ordinance. If there is a failure to follow the terms stipulated in the Notice, the County will file suit to take the violator to court where civil penalties of up to $5000 per day can be assessed. However, if the violator cooperates with all provisions of the Notice and remedies the violation, we will not file suit. An exception would be if we can determine that the violation was intentional as would be the case if we had prior contact with the violator regarding the matter of the RPA restrictions.

Penalty

In order to serve as a deterrent, even in the event of a cooperative restoration settlement, civil charges will be sought. Under current state law, the Board of Supervisors must approve all civil charges. The amount of the civil charge recommended will be dependent on the violation's impact on water quality and the degree of non-compliance. Violations that are more severe and will take longer to be restored to an acceptable condition will have larger charges recommended by staff. Violations comprising less than 100 square feet of disturbance or the removal of no more than three trees will not have a civil charge recommended unless there have been prior violations by the violator. The maximum civil charge is $10,000 per violation.

The following table presents a matrix that will guide staff recommendations on the establishment of a civil charge for a specific violation. The amounts presented are not absolute and are intended to be a guide. Each violation will have several unique characteristics that will require the exercise of judgment in arriving at a civil charge. Charges in each case could vary by up to 100% depending on the specific circumstances involved.

Civil Charge Determination

Water Quality Impact	Significant	$5000	$7500	$10,000
	Moderate	$1500	$3000	$4500
	Minor	$500	$1000	$1500
		Minor	Moderate	Major
			Degree of Non-Compliance	

Water Quality Impact

The impact of a given violation will be determined based on several factors. It involves more than just the square footage of impact; it also addresses the relative environmental value of the resource lost. Factors that will be considered as they relate to the violation's impact on water quality include the size of the violation, the number of trees and other vegetation removed, the size and maturity of the vegetation removed, the amount of tree canopy removed, the amount of ground disturbance involved, etc. Mitigating factors that will be considered are whether the vegetation removed would have qualified for removal if a request was made in accordance with the Ordinance. The Ordinance allows for the removal of vegetation weakened by age, storm, fire or other natural causes or vegetation that is dead, diseased or dying. These factors will be used to determine how much of the functional value of the buffer was lost and how long it will take for the function to be recovered.

Degree of Non-compliance

This factor will be used to assess the motivation behind the violation. Factors that will be considered in assessing the degree of non-compliance are degree of willfulness, history of non-compliance, and cooperation. Unintentional violations that are cooperatively restored will not be charged the same as intentional violations that are difficult to resolve.

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Michael D. Woolson, Section Chief - Resource Protection
Andrew Dean, Assistant County Attorney

SUBJECT: Illicit Discharge Ordinance Violation - Civil Charge - CPT Settlers Market, LLC - 4540 Casey Boulevard

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Attached is a resolution for consideration by the Board of Supervisors (the "Board") involving a violation of the County's Illicit Discharge Ordinance (the "Ordinance") on property located at 4540 Casey Boulevard and further identified as James City County Real Estate Tax Map Parcel No. 3843300001B (the "Property"). The case involved a spill of used cooking oil from the used oil receptacle into a storm drain system in the parking lot.

On October 5, 2023, County staff received a report of a potential illicit discharge activity on the Property. During the site visit, staff confirmed that a large quantity of used cooking oil had spilled outside of the used oil receptacle in the parking lot. Additionally, given the location of the spill, several cars had tracked through the spill and spread the contaminant throughout the parking lot.

In accordance with provisions of the Ordinance, the owner and County mutually came to terms to resolve and settle the violation through the County's civil charge process. The owner voluntarily signed a Consent Agreement and entered into an Illicit Discharge Detection and Elimination Civil Charge Consent Agreement with the County on December 7, 2023.

The resolution and attachments present additional specific details of the violation. Under the provisions of the Ordinance, the Board may accept civil charges for each violation of up to $1,000. The owner has agreed to the recommended civil charge of $1,000 for violation of Section 18A-22(a)(2) of the County's Illicit Discharge Ordinance.

Staff recommends adoption of the attached resolution, establishing the civil charge for the Illicit Discharge Ordinance violation presented.

MDW/AD/ap
IllctDschgOrdViol-mem

Attachments:
1. Resolution
2. Location Map
3. Consent Agreement
4. Notice of Violation

R E S O L U T I O N

ILLICIT DISCHARGE ORDINANCE VIOLATION - CIVIL CHARGE -

CPT SETTLERS MARKET, LLC - 4540 CASEY BOULEVARD

WHEREAS, CPT Settlers Market, LLC, are the owners of a certain parcel of land commonly known as 4540 Casey Boulevard, Williamsburg, Virginia, designated as Parcel No. 3843300001B within the James City County Real Estate Tax Map system (the "Property"); and

WHEREAS, on or about October 5, 2023, CPT Settlers Market, LLC, had a spill of used cooking oil into the storm drain system ("System") on the Property, in violation of the County's Illicit Discharge Ordinance; and

WHEREAS, CPT Settlers Market, LLC, executed a Consent Agreement to remedy the violation of the County's Illicit Discharge Ordinance; and

WHEREAS, CPT Settlers Market, LLC, agreed to pay a total of $1,000 to the County as a civil charge pursuant to the County's Illicit Discharge Ordinance; and

WHEREAS, the James City County Board of Supervisors accepts the civil charge in full settlement of the Illicit Discharge Ordinance violation, in accordance with Section 18A-22(a)(2) of the Code of the County of James City.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby authorizes and directs the County Administrator to accept the $1,000 civil charge from CPT Settlers Market, LLC, as full settlement of the Illicit Discharge Ordinance violation at the Property occurring on or about October 5, 2023.

____
Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

____
Teresa J. Saeed
Deputy Clerk to the Board

VOTES	AYE	NAY	ABSTAIN	ABSENT
NULL	____	____	____	____
HIPPLE	____	____	____	____
MCGLENNON	____	____	____	____
ICENHOUR	____	____	____	____
LARSON	____	____	____	____

Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

IllctDschgOrdViol-mem

James City County VIRGINIA Jamestown 1607

General Services
107 Tewning Road
Williamsburg, VA 23188
P: 757-259-4080
General.Services@jamescitycountyva.gov

jamescitycountyva.gov

Capital Projects	**Fleet**	**Stormwater and Resource Protection**	**Facilities & Grounds**	**Solid Waste**
107 Tewning Road	103 Tewning Road	101-E Mounts Bay Road	113 Tewning Road	1204 Jolly Pond Road
Williamsburg, VA 23188	Williamsburg, VA 23188	Williamsburg, VA 23185	Williamsburg, VA 23188	Williamsburg, VA 23188
757-259-4080	757-259-4122	757-253-6670	757-259-4080	757-565-0971

October 26, 2023

CPT Settlers Market LLC
c/o Madison Marquette Real Estate Services LLC
1615 South Congress Avenue Suite 103
Delray Beach, Florida 33445

Re: Illicit Discharge Detection and Elimination Violation – 4540 Casey Boulevard
SRP-23-0020

To Whom it May Concern:

Upon receipt of a complaint submitted on October 5, 2023 to the Stormwater and Resource Protection (SRP) Division, staff investigated a potential spill of cooking oil on property located at 4540 Casey Boulevard. Staff found a large quantity of used cooking oil on the pavement surrounding the dumpsters on the property. Additionally, traffic throughout the parking lot was spreading the oil across the pavement and into the roadways as cars drove through it. Staff located the receptacle for used cooking oil, which appeared to have been knocked over, causing the spill of oil.

This activity is a violation of the James City County Illicit Discharge Detection Ordinance, James City County Code Section 18A-20 et seq, and subject to a Civil Penalty of up to $1,000.00 for each day the violation continues. To remedy this violation, please contact our office to enter into a civil charge agreement and pay the civil charge of $1,000.00. Remediation of the contaminated area will also be required.

In order to resolve this situation, please contact our office at 757-253-6781 at your earliest convenience.

Sincerely,

Robin Benedict

Robin Benedict
Watershed Planner II
Stormwater and Resource Protection Division
757-253-6781

Cc:
Toni Small, Director Stormwater and Resource Protection
Liz Parman, Deputy County Attorney

Commented [MW1]: Do we want to state that this is a violation letter?

Commented [TS2R1]: I agree, maybe use the violation header like we do with other types of cases

Commented [TS3]: Do we change this to "may" since we are not sure if any remediation can take place?

Commented [MW4]: Has it been cleaned up? If so, should we mention that? If not, we should state what exactly we want them to do.

Commented [TS5R4]: Under 18A-23(b) they shall be liable to the county for all costs of monitoring, containment, cleanup, abatement, removal and disposal of any substance unlawfully discharged into the storm sewer system.

Commented [TS6R4]: However, all evidence of this spill is probably gone from the recent rain events so not sure there is more they can do.

Commented [MW7]: Should we give them 30 days, like CBPA violations?. Its not in the ordinance that I can find.

Commented [TS8R7]: I couldn't find anything in the ordinance either

Illicit Discharge Detection and Elimination Civil Charge Consent Agreement

THIS AGREEMENT, made on this 7th day of December, 2023, by and between CPT Settlers Market, LLC, residing at 2 Seaport Lane, Boston, MA 02210, ("OWNER") and the COUNTY OF JAMES CITY, VIRGINIA, ("COUNTY").

WHEREAS, the Owner owns that certain parcel of land located at 4540 Casey Boulevard, Williamsburg, VA 23188 and also identified as James City County Tax Map Parcel Identification Number 3843300001B; and

WHEREAS, the Owner has violated or has caused a violation of the James City County Code, Chapter 18A, Article II, by spilling of used cooking oil in the common dumpster area of the shopping center and common parking areas and drive isles; and

WHEREAS, the Owner and the County wish to resolve this matter without resorting to litigation.

NOW, THEREFORE, the County and the Owner agree as follows:

1. The Owner agrees to pay a civil charge in the amount of $1,000.00 for the above-described violation of Chapter 18A of the James City County Code.
2. In consideration of the Owner's payment of the civil charge, the County agrees to accept the civil charge payment as the final resolution of this violation; in consideration of this executed consent agreement, the County will not prosecute the Owner under the civil penalty provision of Chapter 18A of the James City County Code.

Once this consent agreement is executed, the County will proceed with processing the civil charge in accordance with the provisions of Section 18A-24 of the James City County Code. This includes scheduling the case on the consent calendar at an upcoming Board of Supervisors regular meeting.

OWNER:

NATASCHA BONDAR-ESTRELLA
MADISON MARQUETTE, AS AGENT
FOR LANDLORD, CPT SETTLERS, LLC

COUNTY OF JAMES CITY, VIRGINIA

By: ______________________

Approved as to form:

____
County Attorney

Solid Waste Consolidation

Preparing the County for Solid Waste Consolidation

Current Free-Market System

- Benefit:
  - Homeowner has ultimate freedom of choice:

    Current Cost: $30.00-$50.00/month for weekly trash service
- Drawbacks:
  - Homeowners vs. Corporations in negotiations
  - Overlapping service areas – 5 haulers serve County
  - Lower service density = Higher collection costs
  - Remote Call Centers = No Familiar Voice
  - No 'Standard of Service' and limited alternatives
  - Additional services ala carte = Higher Cost
  - Limited regulation of open burning

WASTE MANAGEMENT

GFL environmental

REPUBLIC SERVICES

WASTE CONNECTIONS, INC.

Suburban Disposal Co.

What Does ‘Solid Waste Consolidation’ Mean?

Think of it as ‘Bundling’

Collection pricing decreases as hauler efficiency increases:

- Higher Housing Density = Lower Costs/Rates and Less Truck Traffic
- Uniform Collection Methods = Lower Costs/Rates
- Single Area Hauler = Single Point of Contact
- Entire Neighborhoods Serviced on the Same Day
- Haulers Must be More Responsive to Desires of Customers
- Decreased Pricing = Ability to Include Additional Services

Why Hasn't the County Done this Sooner?

Virginia Regulations Protect Waste Haulers from Displacement

- VA Code 15.2-934 Creates a 5-Year Process that the County **<u>MUST</u>** Fulfill:
  - The County must hold a Public Hearing
  - The County must Notify **<u>All</u>** Affected Haulers 45 Days prior to Hearing
  - The County Issues its Findings Based on the Public Hearing
  - The Board Adopts a Resolution to Manage its Solid Waste within 5 Years and Notify Haulers
  - The County would Develop and Adopt a Solid Waste Management Ordinance

- Possible Penalties for Failure to Follow VA Code 15.2-934:
  - Private Haulers could Challenge the Authority of the County to Manage Solid Waste
  - Private Haulers could Claim Damages equal to the Previous 12 Months Gross Revenue
  - Could Set the County Back 5 Years

The Affect of Delaying Solid Waste Consolidation

- Continued Rate Hikes for Homeowners
- Little Negotiating Power
- Uneven Pricing throughout the County
- Multiple Haulers Operating in the Same Neighborhoods
- Separate Charges for Additional Services
- Limited Ability to Regulate Open Burning
- Illegal Dumping will Remain an Issue
- Growth in the County, along with annual rate hikes and inflation, continually increase the Buy-Out penalty.
    - The Buy-Out penalty in 2024 is estimated to be as high as $7.5M-$11M
    - The Buy-out penalty in 2028 is estimated to climb to as high as $10.2M-$16.1M

Benefits to Solid Waste Consolidation

Neighboring Localities that Manage Solid Waste have an Average Rate of Less than **$28/month/house** for Weekly Trash Service and Bi-Weekly Recycling!

Why?

- Maximize Density for Best Pricing
- Act as a Single Point of Contact for Residents and Haulers
- Negotiate Terms and Conditions for Contracts
- Ensure Uniform Service to Residents
- Provide the Best Pricing for <u>**All**</u> Residents
- Investigate Alternatives for Solid Waste Management
- Provide for Enforcement for Nonperformance
- Create Minimum Standards for Collection and Equipment
- Lower Trash Prices Allows for ‘Bundling’ of Services:
    - Bi-Weekly Curbside Recycling
    - Periodic Bulk Pick-Ups
    - Minor Storm Debris Collection
    - Solid Waste Relief

Actions Items after the County Acts on Consolidation

Public Outreach (1-2 years):

- Communicate with neighborhoods and HOA's to explain the impact of the Ordinance
- Determine any areas currently lacking service options
- Assess County-owned convenience centers and transfer station

Hauler Outreach (1 year):

- Communicate with private haulers to explain the effect of the Ordinance
- Create a relationship between County and hauler representatives
- Establish final disposal destinations and pricing

Data Collection (1-2 years):

- Compile detailed collection data:
  - Current Service Areas and Service Days for Both Trash and Curbside Recycling
  - Percentage of Homeowners without Weekly Service (use Convenience Centers)
  - Detail Current Pricing throughout the County
- Assess collection and disposal options (both internally and externally)
- Determine the services that the County can 'bundle' as part of solid waste consolidation

Steps to Starting the Clock

How does the County start the 5-year clock?

Today:

- **Act to Schedule a public hearing.**
- **Authorize County Attorney to notify all potentially affected haulers as well as the public at least 45 days prior to the public hearing.**

Actions after the Public Hearing:

- Within one year of the hearing, the County must determine:
  a) Adequate or sufficient privately-owned refuse collection and disposal services are not available;
  b) The use of privately-owned and operated services has substantially endangered the public or created a public nuisance;
  c) Privately-owned services, although available, are not able to provide needed services in a reasonable and cost-effective manner; or,
  d) Displacement is necessary to provide for the development or operation of a regional system of refuse collection or disposal for two or more localities.
- Once the County determines that one of the above applies, and adopts a resolution to that effect, the County must notify the private haulers that displacement will occur in 5 years. The County must also take measures necessary to provide waste collection services (order equipment, draft bid documents, etc.) within one year of the hearing.
- After 5 years, the Board may draft and adopt enabling ordinance(s) requiring the use of County-authorized waste collection services and excluding the use of private haulers for waste management within its borders.

James City County
VIRGINIA
Jamestown 1607

Questions

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Toni E. Small, Director of Stormwater and Resource Protection Division
Michael D. Woolson, Section Chief, Stormwater and Resource Protection Division

SUBJECT: Yarmouth Creek Watershed Management Plan - Board Adoption

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In 1998, James City County began watershed management efforts in response to concerns about rapid development within the County and along the Yarmouth Creek, in particular. In James City County, the watershed planning process identifies environmentally sensitive areas and develops specific protection, restoration and infrastructure retrofit recommendations. This information guides development within the watersheds and identifies prioritized capital projects for the County's Capital Improvement and Maintenance Programs.

Plans for Powhatan (2002, updated 2023), Yarmouth (2003), Mill (2011), Gordon (2011), Ware (2016), and Skimino (2020) Creeks are complete and have been adopted by the Board of Supervisors. Since then, staff have continued to work with consultants to update and revise the original Yarmouth Creek plan. The updated Yarmouth Creek Watershed Management Plan is ready for the Board's consideration and adoption at the November 28, 2023, meeting.

The Yarmouth Creek Watershed Management Plan is similar to other watershed management plans in that it encourages improved management of the County's resources through development and private property owner incentives. Second, data collection and mapping technologies have improved since the adoption of the original Yarmouth plan and this update provides information that is more detailed. Staff started work on the updated Yarmouth Creek Plan in 2022, held stakeholder meetings in May and July 2023, provided an online survey in May, June, and July 2023, a Planning Commission update in November 2023, provided a 30-day public comment period in October and November 2023, and the final plan has been prepared. Yarmouth Creek has unique challenges and opportunities, and this is reflected in the resulting watershed goals and strategies.

Staff recommends adoption of the attached resolution.

TES/MDW/ap
YrmthCrkWMPln-mem

Attachment

R E S O L U T I O N

YARMOUTH CREEK WATERSHED MANAGEMENT PLAN -

BOARD ADOPTION

WHEREAS, the Yarmouth Creek is a resource of local and regional significance; and

WHEREAS, the Board authorized staff to prepare management plans to help the County and landowners protect and restore the watersheds and their natural resources; and

WHEREAS, stakeholders, staff, and consultants have met over a period of 14 months to share information, set goals, and develop the watershed management plan.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby adopts the updated Yarmouth Creek Watershed Management Plan dated November 2023.

____
Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

____
Teresa J. Saeed
Deputy Clerk to the Board

	VOTES AYE	NAY	ABSTAIN	ABSENT
NULL	____	____	____	____
HIPPLE	____	____	____	____
MCGLENNON	____	____	____	____
ICENHOUR	____	____	____	____
LARSON	____	____	____	____

Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

YrmthCrkWMPln-res

EXECUTIVE SUMMARY

INTRODUCTION

James City County (JCC, "the County") is surrounded on three sides by the James, Chickahominy, and York Rivers. There are several watersheds—areas which all drain to a common point of confluence to the surrounding rivers. The Yarmouth Creek Watershed is central to James City County and is one of the less developed, maintaining a large portion in forested and rural conditions. It drains west to the Chickahominy River, which in turn drains south to the James River. The Yarmouth Creek Watershed is the second largest within the County, stretching between Lightfoot to the south and Toano to the north, and between the Chickahominy River to the west and Route 60 to the east. For purposes of this Watershed Management Plan, a subwatershed called the Chickahominy Subwatershed is also included which is situated between the Yarmouth Creek and Diascund Creek confluences with the Chickahominy River and to the west of the Little Creek Reservoir. This subwatershed, as the name suggests, drains directly to the Chickahominy River. When referring to the Yarmouth Creek Watershed as a whole within this document, this subwatershed is incorporated by reference.

In 2003, the Center for Watershed Protection (CWP) completed a Watershed Management Plan for JCC consisting of various assessment methods and analyses, followed by establishment of goals, strategic actions, and recommended restoration projects. As part of an ongoing effort to protect the watersheds in the County, JCC has been updating the Watershed Management Plans within the County. Much has changed in the County since the original Yarmouth Creek Watershed Plan in both the character of the County and the science and methods behind watershed protection and stormwater management. The Yarmouth Creek Watershed has seen some development and associated impacts, but not nearly to the same degree as those closer to Williamsburg, such as the Powhatan Creek and Mill Creek Watersheds. Development has largely occurred along the Route 60 corridor. This plan should be considered a foundation and framework for planning and management purposes, with the flexibility to take new information and add, subtract, change, and generally improve the plan and direction as appropriate.

This Executive Summary attempts to distill the Plan into a high-level overview. For detailed information, full-sized graphics, data tables, and more thorough analysis, please see the main body of the Watershed Management Plan report. Sections 1 and 2 cover much of the background, purpose, and findings associated with the desktop and field-level reviews. Sections 3, 4, and 5 describe various recommended actions on how the goals of the Plan could be better achieved and an implementation strategy for future activities. Section 6 summarizes the results and recommendations at the subwatershed-scale.

PURPOSE AND PROGRESS

Since the original 2003 Plan, the Yarmouth Creek Watershed has seen some increased development to accommodate a growing population, and the associated impacts on the natural environment. To help balance those impacts, a better understanding of the science behind the interactions between the built environment and natural environments is needed to identify better management techniques and baseline requirements for mitigation and protection. The process of identifying current conditions and the factors that influence them, establishing or revising goals for future conditions, and developing plans and actions to get from the former to the latter is a dynamic process. This updated Watershed Management Plan is part of that process.

Since the 2003 Plan, the Virginia Stormwater Management Program has evolved and improved, establishing new standards for stormwater capture and management to protect downstream waterways; JCC has implemented some of the projects and programmatic recommendations from the original Plan; the Chesapeake Bay Program has directly and indirectly brought about programs and projects that affect watershed management in the County broadly; and several local and independent initiatives and efforts have been developed in concert with or parallel to these.

Among the drivers for these conservation, preservation, and restoration efforts are:

- Water quality impairments (formal declarations of problems requiring mitigation).
- Environmental impacts from increased urbanization, including the potential for adverse effects to stream habitat quality, fragmentation and development within natural habitat cores and corridors, and associated threats to wildlife (including rare, threatened, and endangered species) and human-wildlife conflicts.
- Increased flood risk due to combination of more intense rainfall events and increased runoff from urbanized lands, and the associated risks with service interruptions, and direct safety risks for residents.
- An established regulatory threshold for bacteria in streams which has been exceeded in several streams within the County. This threshold, a Total Maximum Daily Load (TMDL), is a primary driver for various programs which will be detailed later, but including septic system maintenance programs, pet and wild goose waste management practices, and others.
- Similar regional-scale TMDL thresholds for sediment and nutrient pollution for the entirety of the Chesapeake Bay Watershed, which applies to Yarmouth Creek.

The ultimate goals of the County are to protect, preserve, and restore to the degree possible, the health of the waterways and natural areas, and to bring its waterways into regulatory compliance with standards set for various pollutants. It is possible not only to minimize or eliminate the negative effects of development of the built environment, but also to reverse some of the damage already done. Viewed holistically, these efforts are not quick, easy, or inexpensive, but they are worthwhile for the health of our community. There are still a wide variety of natural ecosystems throughout the Watershed that both host abundant wildlife and provide much potential recreational value to the residents of the County. Offsetting the negative impacts to these ecosystems can preserve their presence for future generations. This Watershed Management Plan is a complementary report to others aimed at achieving the same and other similar goals.

METHODS AND RESULTS

The methods for developing this Watershed Management Plan included review of earlier material, review of JCC data and efforts since the original Plan, research on best methods and approaches and the changes to those since the original Plan, and some additional research and data reviews based on professional experience and judgment – all part of the desktop analyses. The 2003 Watershed Plan and other reports addressing the Yarmouth Creek Watershed and its waterways were examined and expanded upon. Following and based upon the desktop analyses, field reconnaissance was also performed. Each of the components of the watershed assessment are summarized below, each contributing to a high-level understanding of the conditions throughout the Watershed and informing recommendations in terms of subwatershed focus areas and specific actions that could be taken.

While a watershed can and should be viewed holistically, for many analytical purposes, it serves to divide the watershed into subwatersheds, each with their own character and potentially their own receiving stream point. Just as the Yarmouth Creek Watershed is a useful division of the Chickahominy and James River Watersheds, and in turn the James River Watershed a useful division of the Chesapeake Bay Watershed, so are the subwatersheds within the Yarmouth Creek Watershed. Most analyses are done by subwatershed for the purposes of this report, as shown in Figure 1 in Section 1.1.

Impervious Cover Model

The initial desktop assessment included reviewing land cover data from JCC to determine current amounts and proportions of impervious cover—surfaces from which stormwater runs off without infiltrating—and comparing those to the framework established within the Impervious Cover Model (ICM). The development of the ICM involved broad data review across watersheds throughout the country and found that the more impervious cover is in a watershed, the lower the habitat quality of the streams within that watershed will be. There is some range and variability based on many nuanced factors, but generally, more impervious cover means worse stream health.

A review of past, present, and future predicted impervious cover was performed using the ICM, associated with data from the years 2000, 2008, 2022, and projected future cover conditions. General assumptions for future buildout conditions in the Yarmouth Creek Watershed were conservative to a degree, assuming the development of any currently undeveloped lands in zoning areas where additional buildout is allowed, as well as other known potential re-development activities as identified through preliminary plans submitted to the County. While the ICM helps identify generalized trends, the extent of actual impacts to the receiving stream habitat quality is not clearly defined by this analysis alone, requiring additional desktop and field-level corroboration.

The ICM has four “zones” or categories of stream habitat quality based on impervious cover percentage, Sensitive (0-10%), Impacted (10-25%), Non-Supporting (25-60%), and Urban Drainage above 60%. The trend for all subwatersheds is increasing impervious cover, though most subwatersheds are expected to stay largely undeveloped. Those subwatersheds along Route 60 are expected to see enough increased development to have a potential adverse impact on downstream habitat quality. In 2000, all subwatersheds were characterized as Sensitive. In 2008, Subwatershed 104 had moved into the Impacted zone. In 2022, Subwatersheds 104 and 105 were both Impacted. Future buildout projections suggest Subwatersheds 102 and 103 will also become Impacted, and 105 will transition into Non-Supporting, with the rest remaining as Sensitive. The extensive undeveloped conditions in the other subwatersheds help to balance the existing and future development in the subwatersheds along Route 60, maintaining a Sensitive classification for the Watershed as a whole, even under future full buildout projections. See Section 1.2.6 for additional discussion on these trends.

Watershed Treatment Model

The Watershed Treatment Model (WTM) was used for a more granular look at the pollutant loading, both current and future, for bacteria, total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS). The WTM provides a more precise look at the subwatersheds' current and expected future conditions than the high-level view provided by the Impervious Cover Model (ICM). Each has its strengths and weaknesses, and both are models offering insight but not necessarily accurately representing true conditions and processes.

TN, TP, and TSS are the pollutants of concern for the Chesapeake Bay TMDL and its tributaries since they cause low dissolved oxygen, algal blooms, and other aquatic life concerns. Each land use, such as open water, forest, medium-density residential, commercial, and several others, have associated loading rates—essentially how much of each particular pollutant is released per acre of land per year. In addition, other factors such as failing septic systems, stormwater treatment best management practices (BMP) and the land areas they treat, and programmatic best practices such as proper lawn care and pet waste education affect the overall pollutant loads and loading rates accounted for in the WTM. Like any model, the WTM has its limitations and built-in assumptions, but it can be an excellent high-level tool for analysis, improving on some of the limitations of the ICM.

Tables 13 and 14, and Figures 21-24 offer a distilled view of the results of the WTM review, comparing existing load estimates against future predictions. While the modeling results show increases in pollutant loads, they also demonstrate a significant amount of pollutant loads being controlled by stormwater BMPs within the subwatersheds that have experienced development (Figures 17-20). For the future predictions, BMPs were incorporated into the future development estimates to represent the degree of stormwater treatment that may be required by stormwater regulations. However, since the WTM assumes long-term BMP performance could decrease over time, a modest increase in pollutant loading rates is still depicted in the results for the subwatersheds with the greatest future development potential.

Pollutant loading rates are generally highest in Subwatersheds 102, 103, 104, and 105. High bacterial loading rates are largely associated with Subwatersheds 104 and 105, and to a lesser extent Subwatersheds 102 and 103, where most past development has been located. Total loads from the other subwatersheds are quite variable due to the large variation in size, but overall loading rates per acre are significantly less than those in Subwatersheds 102-105. Increases to pollutant loads with future buildout conditions are also anticipated in Subwatersheds 102-105, with the rest of the Watershed depicting relatively good water quality conditions. It should also be noted that these four subwatersheds are located in the headwaters, with pollutants discharging downstream through the undeveloped portions of the Watershed. While the undeveloped subwatersheds help to balance the conditions upstream, some downstream decrease in in-stream water quality conditions would also be anticipated through these areas. However, much of this adverse effect appears to be limited to the channels upstream of Cranston's Mill Pond due to the water quality treatment that this large pond provides.

Field Assessments

To help corroborate the desktop analyses and identify other observed conditions affecting the watershed health, field reviews were also performed of both the receiving channels and upland sources of pollution.

Stream and Riparian Areas

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GOALS, ACTIONS, RECOMMENDATIONS

The original goals from the 2003 Yarmouth Creek Watershed Plan were revised to reflect the activities and changes over the past 20 years and stakeholder input during the process of creating this updated Plan. The following are the nine overarching goals to be supported by the Strategic Actions:

1. Improve water quality in Yarmouth Creek to satisfy Local Bacteria TMDLs, and work to remove impairments.
2. Maintain and build biological and habitat diversity and connectivity by protecting the Conservation Areas, Habitat Cores, and wildlife corridors, as identified within the conservation priorities of this Plan, the County's Natural and Cultural Assets Plan, and other relevant Virginia data sets.
3. Refine the County stormwater requirements and Code of Ordinances to not only offset the effects of further development but create opportunities to improve upon existing degraded areas.
4. Continue the tracking and prioritization of existing stormwater maintenance.

5. Promote watershed awareness and active stewardship among residents, community associations, businesses, and seasonal visitors through educational programs, recreational opportunities, and participatory watershed activities.

6. Restore degraded streams where possible and reasonable, and continue to protect high-quality streams and wetlands.

7. Collaborate with the Virginia Department of Forestry to assess the health of silvicultural activities within the watershed, and with the Colonial Soil and Water Conservation District to identify opportunities for additional agricultural management needs or water quality improvements.

8. Initiate development of a flood preparedness plan to understand current and future flood risks and identify a phased implementation approach for effective and practical long-term community flood-risk reduction.

9. Preserve and improve equitable public access to meaningful and safe outdoor recreation throughout the watershed, including "Blueway Trail" development support, while increasing stewardship opportunities to address litter and shoreline management issues.

To address the goals of the Plan, the proposed Strategic Actions are many and various, but have all been categorized into the following five categories. Brief explanatory examples for each are also provided below. More detail on the various recommended actions can be found within Sections 3 and 4, with Section 5 presenting a Strategic Action Plan that includes a timeline and approach to implementing the recommendations.

1. **Programmatic** – Examples include Land Conservation/Purchase of Development Rights, wildlife management programs, and continued septic system inspections and clean-out and repair support programs. (Section 3.1)

2. **Regulatory/Enforcement** – Examples include expanding Special Stormwater Criteria for New Development and Redevelopment and similar ordinance changes. (Section 3.2)

3. **Floodplain Management** – Examples may include increased coordination with Newport News Waterworks regarding potential hazards downstream of Little Creek Reservoir and encouraging private residences to elevate homes and/or employ other floodproofing measures. (Section 3.3)

4. **Education/Awareness** – Examples include increasing engagement with schools/students, pet waste disposal and litter prevention campaigns, and public education on the presence and protection of rare, threatened, and endangered species. (Section 3.4)

5. **Watershed Restoration Projects** – Examples include the following subcategories. Section 4.5 provides the scoring and ranking rubric used to prioritize the different project options, described in detail in Appendix C. (Section 3.5, Section 4, and by subwatershed in Section 6)

   <u>Streams</u> – A total of 17,300 linear feet (3.3 miles) of stream channels were identified across 22 reaches which have the potential for enhancement (8 reaches) or restoration (14 reaches). Table 23 in Section 4.1.1 provides a full list.

Localized Projects – Seven (7) other localized project recommendations were also identified within the stream and riparian areas, to address isolated issues that were not prevalent across a whole stream reach. Table 24 in Section 4.2 provides the list.

Retrofit of Existing BMPs – These include four types: bioretention (11 locations), outfall enhancement (2 locations), rehabilitation or upgrade (15 locations), and retrofit to constructed wetland or wet pond (7 locations). A full list of retrofit opportunities is in Table 25 in Section 4.3.1.

New BMPs – These include six types: conservation landscaping (3 locations), constructed wetlands (5 locations, with 4 of them representing larger, regional ponds), retention or detention (19 locations), step pool stormwater conveyance (6 locations), swale (19 locations), and 6 locations with the potential for other types of treatment practices. Table 26 in Section 4.4 provides a full list.

CONCLUSION

Based on the assessments contained within this Watershed Management Plan, some issues are present with pollutants of concern and stream habitat quality within the Yarmouth Creek Watershed, mainly within the eastern subwatersheds with past development along the Route 60 corridor. However, most of the Watershed is very healthy, and there is significant opportunity to conserve, preserve, and restore the watershed conditions. If current and future development is undertaken with great care and intent, additional land conservation efforts expanded in the more pristine subwatersheds, and other strategic actions are executed in a purposeful and coordinated manner, the goals of this Plan can be better achieved.

Broadly speaking, a complementary approach implementing all types of actions and projects, from programmatic actions to regulatory structures to stormwater practices and stream restorations, is the most robust and durable approach to watershed protection and restoration. Due to the size and complexity of the Watershed, all efforts can be expected to take time and resources, but a good plan involving best current and ever-evolving practices and approaches can significantly affect ultimate outcomes. Goals for watershed protection and management ideally are SMART – Specific, Measurable, Achievable, Relevant, and Time-bound. To a degree, all of these factors are dynamic, especially the S(pecific) and T(ime-bound). For this reason, it is important to continually revisit both this Plan and the efforts undertaken following this Plan to make any necessary course corrections, and add, revise, remove, or otherwise evolve the framework behind the goals.

November 2023

Yarmouth Creek

Watershed Management Plan

Prepared for:

James City County
Stormwater & Resource
Protection Division

Photo Credit: WYDaily/Courtesy Commonwealth Commercial

Prepared by:

Stantec

Contract Number:
20221086

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EXECUTIVE SUMMARY

INTRODUCTION

James City County (JCC, "the County") is surrounded on three sides by the James, Chickahominy, and York Rivers. There are several watersheds—areas which all drain to a common point of confluence to the surrounding rivers. The Yarmouth Creek Watershed is central to James City County and is one of the less developed, maintaining a large portion in forested and rural conditions. It drains west to the Chickahominy River, which in turn drains south to the James River. The Yarmouth Creek Watershed is the second largest within the County, stretching between Lightfoot to the south and Toano to the north, and between the Chickahominy River to the west and Route 60 to the east. For purposes of this Watershed Management Plan, a subwatershed called the Chickahominy Subwatershed is also included which is situated between the Yarmouth Creek and Diascund Creek confluences with the Chickahominy River and to the west of the Little Creek Reservoir. This subwatershed, as the name suggests, drains directly to the Chickahominy River. When referring to the Yarmouth Creek Watershed as a whole within this document, this subwatershed is incorporated by reference.

In 2003, the Center for Watershed Protection (CWP) completed a Watershed Management Plan for JCC consisting of various assessment methods and analyses, followed by establishment of goals, strategic actions, and recommended restoration projects. As part of an ongoing effort to protect the watersheds in the County, JCC has been updating the Watershed Management Plans within the County. Much has changed in the County since the original Yarmouth Creek Watershed Plan in both the character of the County and the science and methods behind watershed protection and stormwater management. The Yarmouth Creek Watershed has seen some development and associated impacts, but not nearly to the same degree as those closer to Williamsburg, such as the Powhatan Creek and Mill Creek Watersheds. Development has largely occurred along the Route 60 corridor. This plan should be considered a foundation and framework for planning and management purposes, with the flexibility to take new information and add, subtract, change, and generally improve the plan and direction as appropriate.

This Executive Summary attempts to distill the Plan into a high-level overview. For detailed information, full-sized graphics, data tables, and more thorough analysis, please see the main body of the Watershed Management Plan report. Sections 1 and 2 cover much of the background, purpose, and findings associated with the desktop and field-level reviews. Sections 3, 4, and 5 describe various recommended actions on how the goals of the Plan could be better achieved and an implementation strategy for future activities. Section 6 summarizes the results and recommendations at the subwatershed-scale.

PURPOSE AND PROGRESS

Since the original 2003 Plan, the Yarmouth Creek Watershed has seen some increased development to accommodate a growing population, and the associated impacts on the natural environment. To help balance those impacts, a better understanding of the science behind the interactions between the built environment and natural environments is needed to identify better management techniques and baseline requirements for mitigation and protection. The process of identifying current conditions and the factors that influence them, establishing or revising goals for future conditions, and developing plans and actions to get from the former to the latter is a dynamic process. This updated Watershed Management Plan is part of that process.

Since the 2003 Plan, the Virginia Stormwater Management Program has evolved and improved, establishing new standards for stormwater capture and management to protect downstream waterways; JCC has implemented some of the projects and programmatic recommendations from the original Plan; the Chesapeake Bay Program has directly and indirectly brought about programs and projects that affect watershed management in the County broadly; and several local and independent initiatives and efforts have been developed in concert with or parallel to these.

Among the drivers for these conservation, preservation, and restoration efforts are:

- Water quality impairments (formal declarations of problems requiring mitigation).
- Environmental impacts from increased urbanization, including the potential for adverse effects to stream habitat quality, fragmentation and development within natural habitat cores and corridors, and associated threats to wildlife (including rare, threatened, and endangered species) and human-wildlife conflicts.
- Increased flood risk due to combination of more intense rainfall events and increased runoff from urbanized lands, and the associated risks with service interruptions, and direct safety risks for residents.
- An established regulatory threshold for bacteria in streams which has been exceeded in several streams within the County. This threshold, a Total Maximum Daily Load (TMDL), is a primary driver for various programs which will be detailed later, but including septic system maintenance programs, pet and wild goose waste management practices, and others.
- Similar regional-scale TMDL thresholds for sediment and nutrient pollution for the entirety of the Chesapeake Bay Watershed, which applies to Yarmouth Creek.

The ultimate goals of the County are to protect, preserve, and restore to the degree possible, the health of the waterways and natural areas, and to bring its waterways into regulatory compliance with standards set for various pollutants. It is possible not only to minimize or eliminate the negative effects of development of the built environment, but also to reverse some of the damage already done. Viewed holistically, these efforts are not quick, easy, or inexpensive, but they are worthwhile for the health of our community. There are still a wide variety of natural ecosystems throughout the Watershed that both host abundant wildlife and provide much potential recreational value to the residents of the County. Offsetting the negative impacts to these ecosystems can preserve their presence for future generations. This Watershed Management Plan is a complementary report to others aimed at achieving the same and other similar goals.

METHODS AND RESULTS

The methods for developing this Watershed Management Plan included review of earlier material, review of JCC data and efforts since the original Plan, research on best methods and approaches and the changes to those since the original Plan, and some additional research and data reviews based on professional experience and judgment – all part of the desktop analyses. The 2003 Watershed Plan and other reports addressing the Yarmouth Creek Watershed and its waterways were examined and expanded upon. Following and based upon the desktop analyses, field reconnaissance was also performed. Each of the components of the watershed assessment are summarized below, each contributing to a high-level understanding of the conditions throughout the Watershed and informing recommendations in terms of subwatershed focus areas and specific actions that could be taken.

While a watershed can and should be viewed holistically, for many analytical purposes, it serves to divide the watershed into subwatersheds, each with their own character and potentially their own receiving stream point. Just as the Yarmouth Creek Watershed is a useful division of the Chickahominy and James River Watersheds, and in turn the James River Watershed a useful division of the Chesapeake Bay Watershed, so are the subwatersheds within the Yarmouth Creek Watershed. Most analyses are done by subwatershed for the purposes of this report, as shown in Figure 1 in Section 1.1.

Impervious Cover Model

The initial desktop assessment included reviewing land cover data from JCC to determine current amounts and proportions of impervious cover—surfaces from which stormwater runs off without infiltrating—and comparing those to the framework established within the Impervious Cover Model (ICM). The development of the ICM involved broad data review across watersheds throughout the country and found that the more impervious cover is in a watershed, the lower the habitat quality of the streams within that watershed will be. There is some range and variability based on many nuanced factors, but generally, more impervious cover means worse stream health.

A review of past, present, and future predicted impervious cover was performed using the ICM, associated with data from the years 2000, 2008, 2022, and projected future cover conditions. General assumptions for future buildout conditions in the Yarmouth Creek Watershed were conservative to a degree, assuming the development of any currently undeveloped lands in zoning areas where additional buildout is allowed, as well as other known potential re-development activities as identified through preliminary plans submitted to the County. While the ICM helps identify generalized trends, the extent of actual impacts to the receiving stream habitat quality is not clearly defined by this analysis alone, requiring additional desktop and field-level corroboration.

The ICM has four “zones” or categories of stream habitat quality based on impervious cover percentage, Sensitive (0-10%), Impacted (10-25%), Non-Supporting (25-60%), and Urban Drainage above 60%. The trend for all subwatersheds is increasing impervious cover, though most subwatersheds are expected to stay largely undeveloped. Those subwatersheds along Route 60 are expected to see enough increased development to have a potential adverse impact on downstream habitat quality. In 2000, all subwatersheds were characterized as Sensitive. In 2008, Subwatershed 104 had moved into the Impacted zone. In 2022, Subwatersheds 104 and 105 were both Impacted. Future buildout projections suggest Subwatersheds 102 and 103 will also become Impacted, and 105 will transition into Non-Supporting, with the rest remaining as Sensitive. The extensive undeveloped conditions in the other subwatersheds help to balance the existing and future development in the subwatersheds along Route 60, maintaining a Sensitive classification for the Watershed as a whole, even under future full buildout projections. See Section 1.2.6 for additional discussion on these trends.

Watershed Treatment Model

The Watershed Treatment Model (WTM) was used for a more granular look at the pollutant loading, both current and future, for bacteria, total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS). The WTM provides a more precise look at the subwatersheds' current and expected future conditions than the high-level view provided by the Impervious Cover Model (ICM). Each has its strengths and weaknesses, and both are models offering insight but not necessarily accurately representing true conditions and processes.

TN, TP, and TSS are the pollutants of concern for the Chesapeake Bay TMDL and its tributaries since they cause low dissolved oxygen, algal blooms, and other aquatic life concerns. Each land use, such as open water, forest, medium-density residential, commercial, and several others, have associated loading rates—essentially how much of each particular pollutant is released per acre of land per year. In addition, other factors such as failing septic systems, stormwater treatment best management practices (BMP) and the land areas they treat, and programmatic best practices such as proper lawn care and pet waste education affect the overall pollutant loads and loading rates accounted for in the WTM. Like any model, the WTM has its limitations and built-in assumptions, but it can be an excellent high-level tool for analysis, improving on some of the limitations of the ICM.

Tables 13 and 14, and Figures 21-24 offer a distilled view of the results of the WTM review, comparing existing load estimates against future predictions. While the modeling results show increases in pollutant loads, they also demonstrate a significant amount of pollutant loads being controlled by stormwater BMPs within the subwatersheds that have experienced development (Figures 17-20). For the future predictions, BMPs were incorporated into the future development estimates to represent the degree of stormwater treatment that may be required by stormwater regulations. However, since the WTM assumes long-term BMP performance could decrease over time, a modest increase in pollutant loading rates is still depicted in the results for the subwatersheds with the greatest future development potential.

Pollutant loading rates are generally highest in Subwatersheds 102, 103, 104, and 105. High bacterial loading rates are largely associated with Subwatersheds 104 and 105, and to a lesser extent Subwatersheds 102 and 103, where most past development has been located. Total loads from the other subwatersheds are quite variable due to the large variation in size, but overall loading rates per acre are significantly less than those in Subwatersheds 102-105. Increases to pollutant loads with future buildout conditions are also anticipated in Subwatersheds 102-105, with the rest of the Watershed depicting relatively good water quality conditions. It should also be noted that these four subwatersheds are located in the headwaters, with pollutants discharging downstream through the undeveloped portions of the Watershed. While the undeveloped subwatersheds help to balance the conditions upstream, some downstream decrease in in-stream water quality conditions would also be anticipated through these areas. However, much of this adverse effect appears to be limited to the channels upstream of Cranston's Mill Pond due to the water quality treatment that this large pond provides.

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GOALS, ACTIONS, RECOMMENDATIONS

The original goals from the 2003 Yarmouth Creek Watershed Plan were revised to reflect the activities and changes over the past 20 years and stakeholder input during the process of creating this updated Plan. The following are the nine overarching goals to be supported by the Strategic Actions:

1. Improve water quality in Yarmouth Creek to satisfy Local Bacteria TMDLs, and work to remove impairments.

2. Maintain and build biological and habitat diversity and connectivity by protecting the Conservation Areas, Habitat Cores, and wildlife corridors, as identified within the conservation priorities of this Plan, the County's Natural and Cultural Assets Plan, and other relevant Virginia data sets.

3. Refine the County stormwater requirements and Code of Ordinances to not only offset the effects of further development but create opportunities to improve upon existing degraded areas.

4. Continue the tracking and prioritization of existing stormwater maintenance.

5. Promote watershed awareness and active stewardship among residents, community associations, businesses, and seasonal visitors through educational programs, recreational opportunities, and participatory watershed activities.

6. Restore degraded streams where possible and reasonable, and continue to protect high-quality streams and wetlands.

7. Collaborate with the Virginia Department of Forestry to assess the health of silvicultural activities within the watershed, and with the Colonial Soil and Water Conservation District to identify opportunities for additional agricultural management needs or water quality improvements.

8. Initiate development of a flood preparedness plan to understand current and future flood risks and identify a phased implementation approach for effective and practical long-term community flood-risk reduction.

9. Preserve and improve equitable public access to meaningful and safe outdoor recreation throughout the watershed, including “Blueway Trail” development support, while increasing stewardship opportunities to address litter and shoreline management issues.

To address the goals of the Plan, the proposed Strategic Actions are many and various, but have all been categorized into the following five categories. Brief explanatory examples for each are also provided below. More detail on the various recommended actions can be found within Sections 3 and 4, with Section 5 presenting a Strategic Action Plan that includes a timeline and approach to implementing the recommendations.

1. **Programmatic** – Examples include Land Conservation/Purchase of Development Rights, wildlife management programs, and continued septic system inspections and clean-out and repair support programs. (Section 3.1)

2. **Regulatory/Enforcement** – Examples include expanding Special Stormwater Criteria for New Development and Redevelopment and similar ordinance changes. (Section 3.2)

3. **Floodplain Management** – Examples may include increased coordination with Newport News Waterworks regarding potential hazards downstream of Little Creek Reservoir and encouraging private residences to elevate homes and/or employ other floodproofing measures. (Section 3.3)

4. **Education/Awareness** – Examples include increasing engagement with schools/students, pet waste disposal and litter prevention campaigns, and public education on the presence and protection of rare, threatened, and endangered species. (Section 3.4)

5. **Watershed Restoration Projects** – Examples include the following subcategories. Section 4.5 provides the scoring and ranking rubric used to prioritize the different project options, described in detail in Appendix C. (Section 3.5, Section 4, and by subwatershed in Section 6)

   <u>Streams</u> – A total of 17,300 linear feet (3.3 miles) of stream channels were identified across 22 reaches which have the potential for enhancement (8 reaches) or restoration (14 reaches). Table 23 in Section 4.1.1 provides a full list.

Localized Projects – Seven (7) other localized project recommendations were also identified within the stream and riparian areas, to address isolated issues that were not prevalent across a whole stream reach. Table 24 in Section 4.2 provides the list.

Retrofit of Existing BMPs – These include four types: bioretention (11 locations), outfall enhancement (2 locations), rehabilitation or upgrade (15 locations), and retrofit to constructed wetland or wet pond (7 locations). A full list of retrofit opportunities is in Table 25 in Section 4.3.1.

New BMPs – These include six types: conservation landscaping (3 locations), constructed wetlands (5 locations, with 4 of them representing larger, regional ponds), retention or detention (19 locations), step pool stormwater conveyance (6 locations), swale (19 locations), and 6 locations with the potential for other types of treatment practices. Table 26 in Section 4.4 provides a full list.

CONCLUSION

Based on the assessments contained within this Watershed Management Plan, some issues are present with pollutants of concern and stream habitat quality within the Yarmouth Creek Watershed, mainly within the eastern subwatersheds with past development along the Route 60 corridor. However, most of the Watershed is very healthy, and there is significant opportunity to conserve, preserve, and restore the watershed conditions. If current and future development is undertaken with great care and intent, additional land conservation efforts expanded in the more pristine subwatersheds, and other strategic actions are executed in a purposeful and coordinated manner, the goals of this Plan can be better achieved.

Broadly speaking, a complementary approach implementing all types of actions and projects, from programmatic actions to regulatory structures to stormwater practices and stream restorations, is the most robust and durable approach to watershed protection and restoration. Due to the size and complexity of the Watershed, all efforts can be expected to take time and resources, but a good plan involving best current and ever-evolving practices and approaches can significantly affect ultimate outcomes. Goals for watershed protection and management ideally are SMART – Specific, Measurable, Achievable, Relevant, and Time-bound. To a degree, all of these factors are dynamic, especially the S(pecific) and T(ime-bound). For this reason, it is important to continually revisit both this Plan and the efforts undertaken following this Plan to make any necessary course corrections, and add, revise, remove, or otherwise evolve the framework behind the goals.

1 INTRODUCTION

This document is a Watershed Management Plan ("Plan") developed for the Yarmouth Creek Watershed ("Watershed") to guide James City County ("JCC") and stakeholders on the current status of different characteristics of the Watershed, past conditions, trends, future estimates and the actions that can be taken moving forward to both protect as well as enhance and restore the Watershed to the extent possible. Assessment and analytical information, and subsequent recommendations, are provided both at the entire Watershed-scale but also at Subwatershed scales (Figure 1) to support successful implementation of actions. After this introductory section the remainder of this management plan is broken into the following sections:

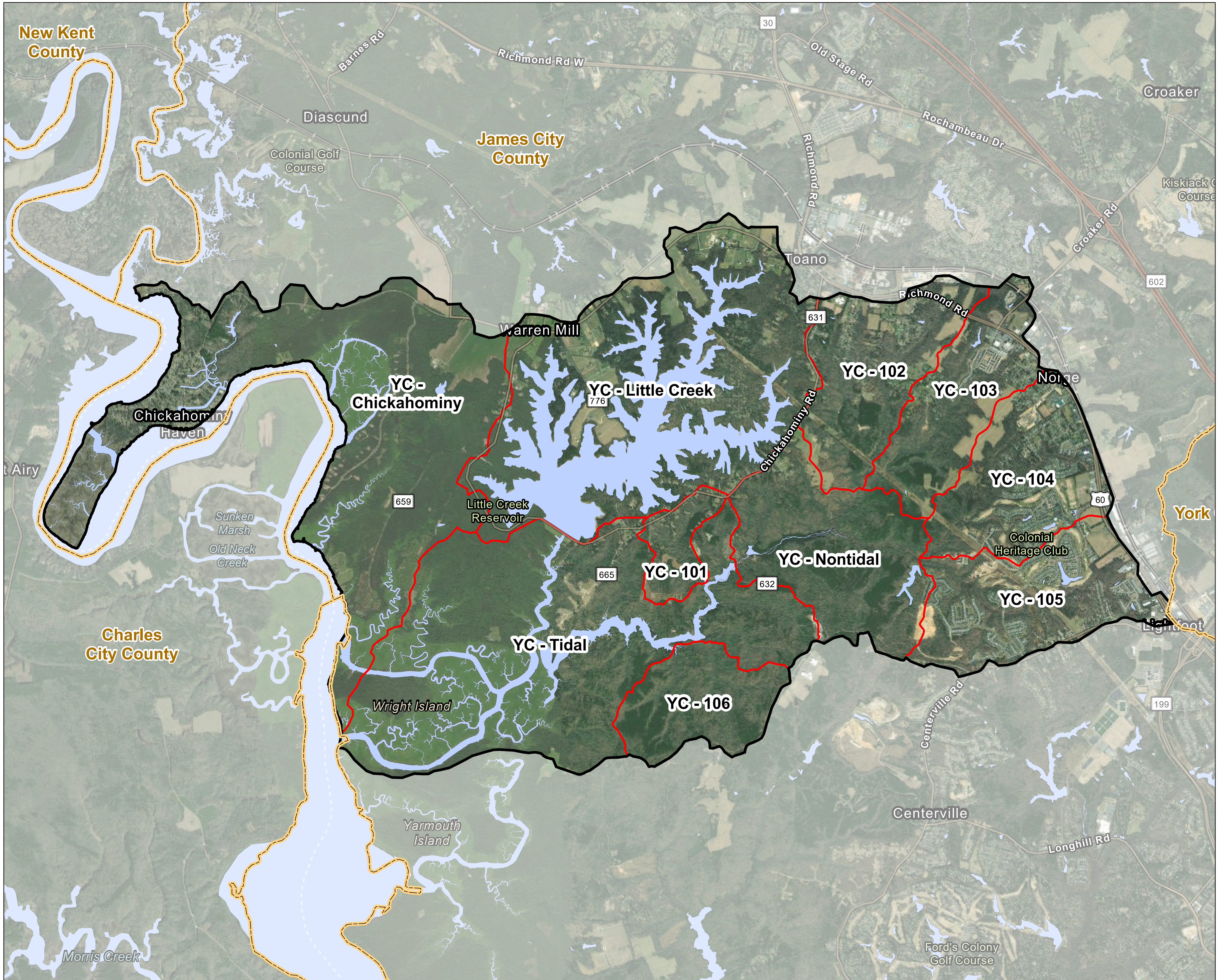
- **Section 2 - Watershed Assessment |** Summarizes both desktop and field analyses of current conditions within the Watershed.
- **Section 3 - Watershed Goals and Strategic Actions |** Describes the steps taken to develop current Watershed Goals and the associated recommended Strategic Actions.
- **Section 4 - Watershed Restoration Projects |** Details the methods used to identify the various types of site-specific stormwater treatment or stream restoration projects across the Watershed.
- **Section 5 - Strategic Action Plan |** A plan for the implementation of proposed Strategic Actions with prioritization and estimated costs and project timelines.
- **Section 6 - Subwatershed Management Plans |** Smaller scale exhibits of findings and recommended actions for each subwatershed serving as easy reference for sub regions of the larger Watershed.

1.1 Watershed Overview

The Yarmouth Creek Watershed is centrally located within James City County, Virginia (JCC), extending from Lightfoot to Toano, generally bordered by Centerville Road to the south, Route 60 to the east, Forge Road to the north, and the Chickahominy River to the west. It is the second largest watershed within JCC with approximately 11,042 acres, the majority of which is classified as forested (~40%) or rural (~30%). An additional 2,807 acres of drainage is captured by the Chickahominy River that does not drain directly into Yarmouth Creek, but does reach the confluence of the Chickahominy River and Yarmouth Creek. The entire Watershed drains from land area within JCC municipal boundaries (Figure 1).

The most recent Yarmouth Creek Watershed Plan (CWP 2003) addressed the contributing drainage area to the Yarmouth Creek and Shipyard Creek delta. This Plan also addresses the additional 2,807-acre subwatershed that drains directly into the Chickahominy River, west of Little Creek Reservoir and north of the Yarmouth Creek confluence at the Chickahominy River, just downstream of the Diascund Creek confluence. This subwatershed is called Chickahominy herein.

The mainstem subwatershed of Yarmouth creek is divided into two main segments. The transition from tidal to non-tidal occurs just downstream of the Cranston's Mill Pond impoundment.



Title

Figure 1 - Yarmouth Creek Watershed and Subwatersheds Location within James City County

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-08-16
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

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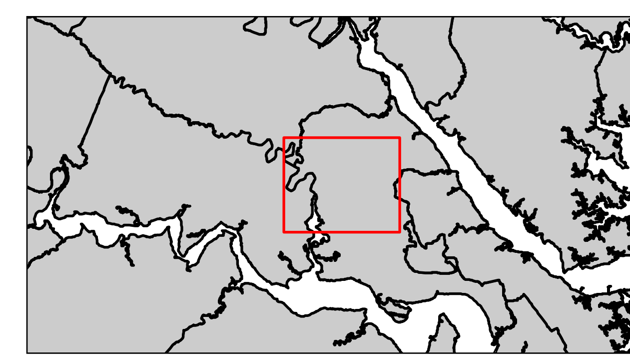
Water Feature

Yarmouth Creek Watershed Boundary

Subwatershed Boundary

Municipal Boundary



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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1.2 The Need for Watershed Management and Goals

The Yarmouth Creek Watershed is largely rural and undeveloped, with commercial and residential areas located along primary arterial roadways (e.g. Rt. 60) surrounded by dense forest, wetlands, and agriculture. The Watershed is already undergoing new development leading to increased impervious cover, and will continue to develop following JCC's 2045 Comprehensive Plan. These pressures of land development and increasing population density are correlated with downstream water quality impacts, often leading to designated impairments and other ecosystem degradation.

An initial Watershed Plan was finalized for the Yarmouth Creek Watershed in July 2003 by the Center for Watershed Protection (CWP). But the past 20 years have seen significant changes throughout the Watershed since this original plan was developed. There have also been implementation successes within the Watershed since 2003 and continued studies (e.g., Impervious Cover Model updates in 2008) that sought to help improve the state of the Yarmouth Creek Watershed and its natural resources on land and aquatic habitats. However, there are still several challenges as well as increased and new stressors on the Watershed that need to be addressed (e.g. continued development, changes in frequency and magnitude of storm events, and sea level rise). This plan builds on the original plan, its implementation successes over the past two decades, and items that still need attention while assessing the status of continued and new challenges for the restoration of a balanced and healthy watershed ecosystem.

Progress since the last plan was finalized in 2003 include several programmatic efforts such as:

- Creation of Special Stormwater Criteria
- JCC adoption of a Chesapeake Bay Preservation ordinance better defining Resource Protection Area (RPA) features and associated boundaries
- Zoning Ordinance Inclusion of Incentives for Environmentally Friendly Development Approaches
- PRIDE Program Funded Projects (renamed Clean Water Heritage in 2012)
- Review of areas and practices identified and recommended in subwatershed studies

Also, site-specific projects have been implemented throughout the Watershed. Two stream restoration projects have been implemented:

- Oakland Estates (YC002 in JCC database)
- Yarmouth Creek (YC010 in JCC database)

And, some stormwater Best Management Practices (BMPs) have been installed to better treat runoff, including:

- Infiltration trench opportunity identified in Kristiansand study as #47, now BMP-YC016
- Norge Elementary School Bioretention, now BMP-YC075

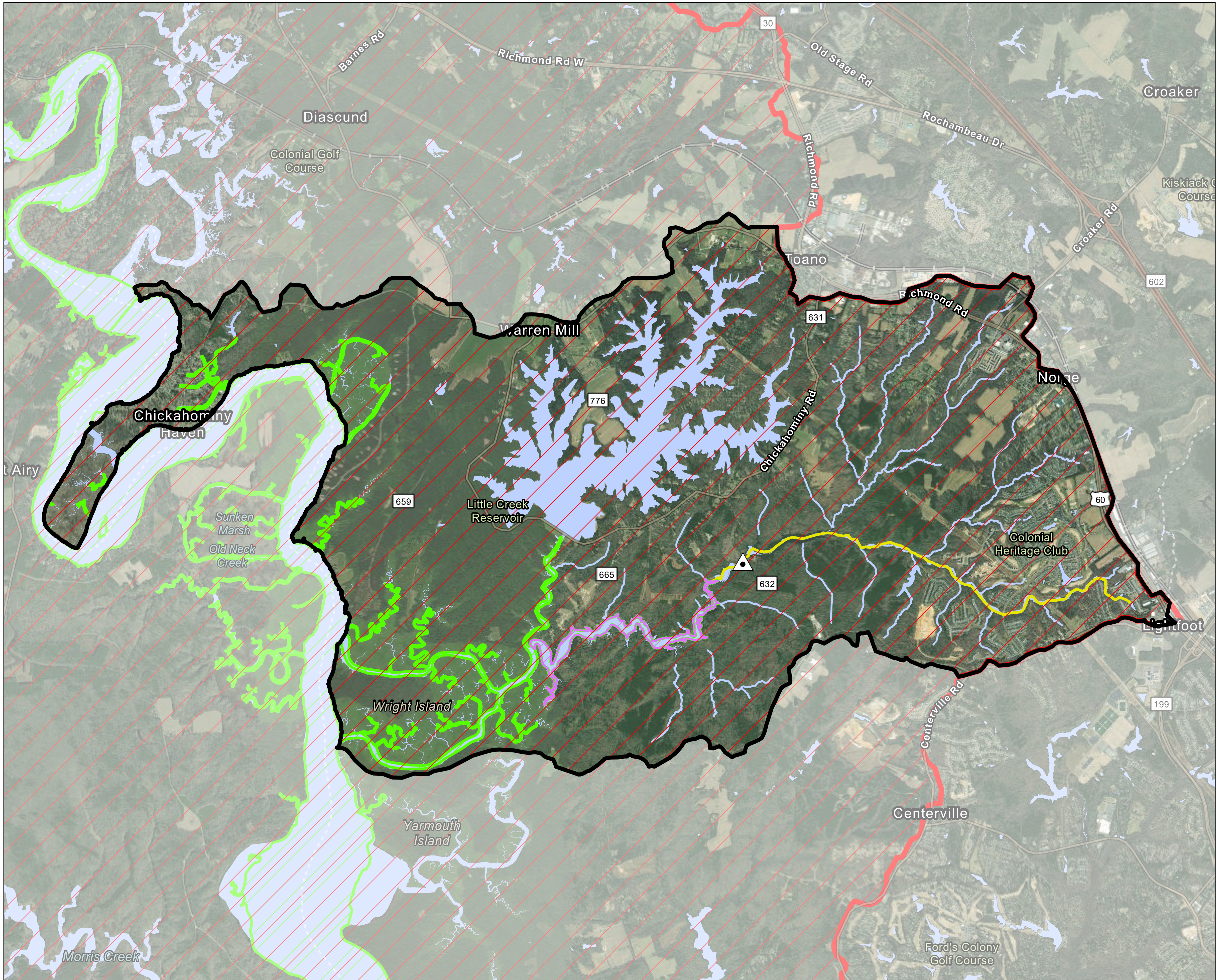
Other projects and BMPs have also been implemented outside of JCC Capital projects. However, even with the progress made since the last plan in 2003, some challenges to the watershed have remained, and new ones have emerged. These challenges can be grouped into three overall categories:

- Water Quality Impairments
- Environmental Effects of Increased Urbanization
- Continued Decline of Stream Habitat Quality

1.2.1 WATER QUALITY IMPAIRMENTS

Yarmouth Creek flows directly into the Lower Chickahominy River, stretching from the Diascund Creek confluence downstream to the James River. Bacterial and dissolved oxygen impairments are present in the Lower Chickahominy River (Figure 2). The Bacterial Total Maximum Daily Load (TMDL) for the Lower Chickahominy River and associated tributary waterbodies (such as the nontidal portion of Yarmouth Creek) was developed in 2017. Dissolved oxygen impairments pertain to the Chesapeake Bay TMDL, most recently updated in December 2010. The Chesapeake Bay TMDL governs large-scale implementation plans to reduce loading of total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS), collectively “pollutants of concern” (POC), often simplified as “nutrients (TN and TP) and sediment (TSS).”

Lower Chickahominy has significant inflow from Yarmouth Creek, and therefore the TMDL plans to address the Chickahominy impairments that apply to the Yarmouth Creek watershed. There are currently no specific Implementation Plans (IPs) for Yarmouth Creek, though the general approach taken in the JCC TMDL Action Plans for Powhatan Creek, Mill Creek, and Skiffes Creek will share foundations with TMDL action plans developed for the watersheds and subwatersheds yet to be addressed.



Title
Figure 2 - Yarmouth Creek Watershed Boundary, TMDL Impairments, and Monitoring Station Location

Client/Project 203408987
James City County
Yarmouth Creek WSMP

Project Location
James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

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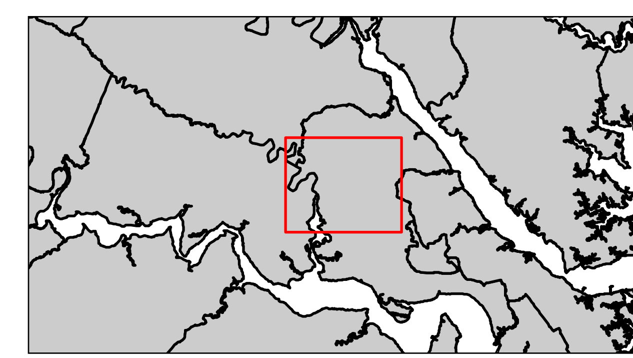
VDEQ WQ Monitoring Station
Yarmouth Creek Watershed Boundary
Chickahominy Bacteria TMDL Boundary
Yarmouth Creek Tidal Impairment
Chickahominy River Tidal Impairment
Yarmouth Creek Non-Tidal Impairment
Major Creek/Stream



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, VADEQ, Stantec
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Table 1 shows the assessed waterbodies within or systemically connected to the Yarmouth Creek watershed that are impaired. The Little Creek Reservoir (Assessment Unit ID: VAP-G-8L_LTL01A06) is fully supporting (in good water quality condition), and a large number of small or unsegmented rivers and streams (Assessment Unit ID: VAP-G08R_ZZZ01C14) which are in unknown condition also feed the Chickahominy. Most major waterbodies in this watershed are in some way impaired, with bacteria and/or dissolved oxygen as markers. Additional impairments and pollutants of emerging concern include Perfluoroalkyl and Polyfluoroalkyl Substances (PFAs), Polychlorinated Biphenyls (PCBs), and other long-term residual chemicals from human sources.

Table 1 – Impaired Waterbodies Related to the Yarmouth Creek Watershed

Waterbody Name	Assessment Unit ID	Type	Length (mi) / Area (sq mi)	Impaired	303(d) list	Impairment Type	Notes
XAC - Chickahominy River, UT	VAP-G08E_XAC01A10	Estuary	0.0167 sm	Yes	Yes	Dissolved oxygen	This is a short channel through a marsh known as The Thorofare
Yarmouth Creek (nontidal)	VAP-G08R_YRM01A12	River	4.09 mi	Yes	Yes	E. coli bacteria, Dissolved oxygen	Lightfoot to downstream of Cranston's Mill Pond (Rte 632)
Yarmouth Creek (tidal)	VAP-G08E_YRM01A04	Estuary	0.1185 sm	Yes	No	Dissolved oxygen	Top of tidal portion to confluence with Little Creek
Unsegmented estuaries in G08	VAP-G08E_ZZZ01C14	Estuary	0.4777 sm	Yes	No	Dissolved oxygen	Including Little Creek, Shipyard Creek, Lower Yarmouth Creek
Chickahominy River	VAP-G08E_CHK02A00	Estuary	5.468 sm	Yes	Yes	Enterococci bacteria, Dissolved oxygen	From Diascund River confluence to James River. Excludes ~0.5 miles upstream and downstream of station 2CCHK002.40. CHKOH
Chickahominy River	VAP-G08E_CHK02B18	Estuary	0.4516 sm	Yes	Yes	Enterococci bacteria, Dissolved oxygen	Near/at confluence of Gordon Creek. ~0.5 miles upstream and downstream of station 2CCHK002.40. CHKOH

1.2.2 ENVIRONMENTAL EFFECTS OF INCREASED URBANIZATION

Historically, the Yarmouth Creek Watershed has been lightly developed. Based on historical impervious cover estimates for 2000 used in JCC's 2008 modeling effort (JCC, 2008), all subwatersheds were previously considered "Sensitive" (<10% impervious cover) as classified by the Impervious Cover Model (ICM). Decades of research led to the development of the ICM which serves as a categorization schema for aquatic ecosystem health based on an upstream watershed's level of development along a continuum of urbanization and the impact of its resultant increase in impervious surfaces (Klein, 1979, Jones and Clark, 1987, Schueler, 1994, Arnold and Gibbons, 1996, Gergel, et al., 2002, CWP, 2003, Schueler, et al., 2009, Arfan and Sutjiningsih, 2018). Most recently, the ICM approach has been revised in the past several years (Schueler, et al., 2009) to address limitations of the original ICM. For example, transition zones like those in Figure 3 below were adopted as opposed to distinct thresholds found within the original ICM, where each ICM category is described in more detail below:

- **Sensitive**: Waterways that have upstream drainage areas with impervious cover totaling 10 percent or less. These are often higher quality streams with more stable channels, appropriate habitat structure, and good to excellent water quality with diverse communities of fish and aquatic insects. Watersheds of these streams are not considered urbanized.

- **Impacted**: Having a drainage area with a percent impervious cover greater than 10% up to 25% - there are usually clear signs of habitat loss and physical and chemical degradation of the stream ecosystem.
- **Non-Supporting**: When watersheds have 25% or more of its area covered in impervious surfaces waterways tend to have minimal stable habitat and aquatic biodiversity and are more apt to be serving as stormwater conveyances for upstream development rather than a natural stream ecosystem. Streams above 60% were considered "Urban Drainage" channels with poor stream ecosystem functions. For purposes of this study, both poorer categories have been grouped together.

Many developed areas in the Watershed were constructed before current stormwater regulations were implemented. More recent development has been required to meet stormwater management requirements over time—starting first in 1988 with the Chesapeake Bay Preservation Act encoded in Virginia Law, then increasingly in 1998 when the Virginia Stormwater Management Program (VSMP) was passed at the state-level, finally to the current VSMP regulations that began in 2011— however, there is still expected to be downstream impacts caused by development, especially those that pre-date 1998.

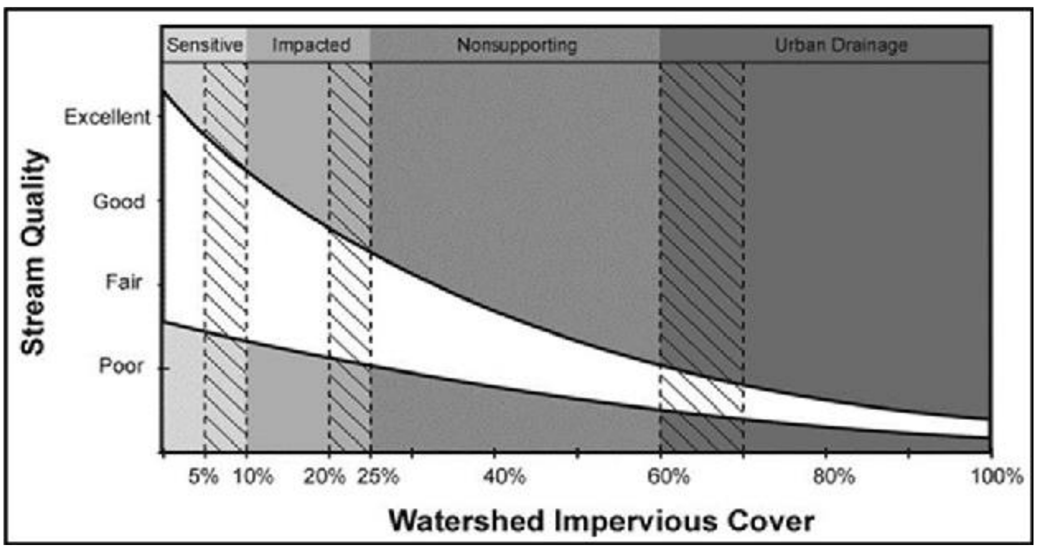


Figure 3 – Revised Impervious Cover Model (source: Schueler, et al., 2009)

In the past two decades since the original Yarmouth Creek Watershed Management Report was developed by CWP, the total impervious surface areas within the Watershed have increased from 3.9% to 5.4%. While these new impervious surfaces have been treated to the VSMP regulation standards, the hydrologic (quantity and timing of flows, as well as overall increase in runoff volume) and water quality impacts of the past 20 years of land development may still have had impacts on the natural aquatic ecosystems within the Watershed. The current percent impervious area estimated for the Watershed is 5.4 percent, with subwatersheds 102 and 103 already in the transition to the Impacted ICM category, and subwatersheds 104 and 105 already Impacted and close to the transition zone to Non-Supporting.

Characteristics and age of the stormwater infrastructure as well as age of stormwater management measures also play an important role in the treatment and conveyance of stormwater from these impervious surfaces. They can lessen, or increase, impacts on the downstream aquatic habitats into which they drain. This plan endeavors to identify locations and ways to improve the stormwater infrastructure system including BMPs to minimize and decrease downstream impacts thus providing opportunity for functional uplift of the aquatic ecosystems across the Watershed. The degrees to which various stormwater and other water quality measures are implemented and successful has a significant impact on how much influence impervious surfaces and development have on receiving waters, thereby moving the “needle” on watershed health up and down at any given impervious cover proportion. The intent of implementing good preservation, conservation, and restoration efforts is to mitigate or eliminate negative impacts of inevitable development, and perhaps limit how much occurs.

Table 2 – Percent Impervious Surface Area Trend Analysis

Subwatershed		Area (acres)	Percent (%) Impervious Surface Area		
			2000	2008	2022
101		221	2.2	6.3	4.0
102		855	7.3	7.8	7.6
103		738	5.1	6.3	9.2
104		862	9	14	18.7
105		941	5.5	9.6	19.7
106		552	0.4	0.5	0.7
Chickahominy		2,806	-	-	4.0
Little Creek		2,887	2.0	2.2	3.5
Nontidal		1,082	1.1	1.11	2.0
Tidal		2,902	0.3	0.34	0.9
Watershed-wide totals:		**13,846**	2.9	3.9	5.4
Impervious Model Cover Zone	**Sensitive**		9	8	8
	Impacted		0	1	2
	Non-Supporting		-	-	-

(Note: The Chickahominy Subwatershed wasn’t assessed in 2000 or 2008. Watershed-wide averages omit the Chickahominy Subwatershed in those years. See discussion in Section 1.2.6 about impervious cover trends outlined in red.)

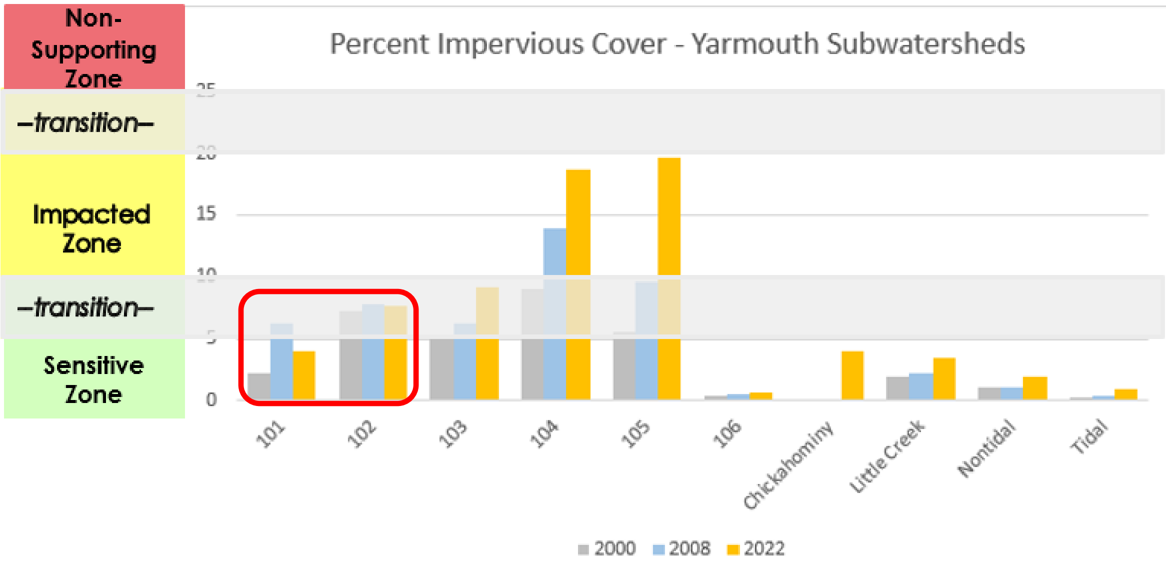
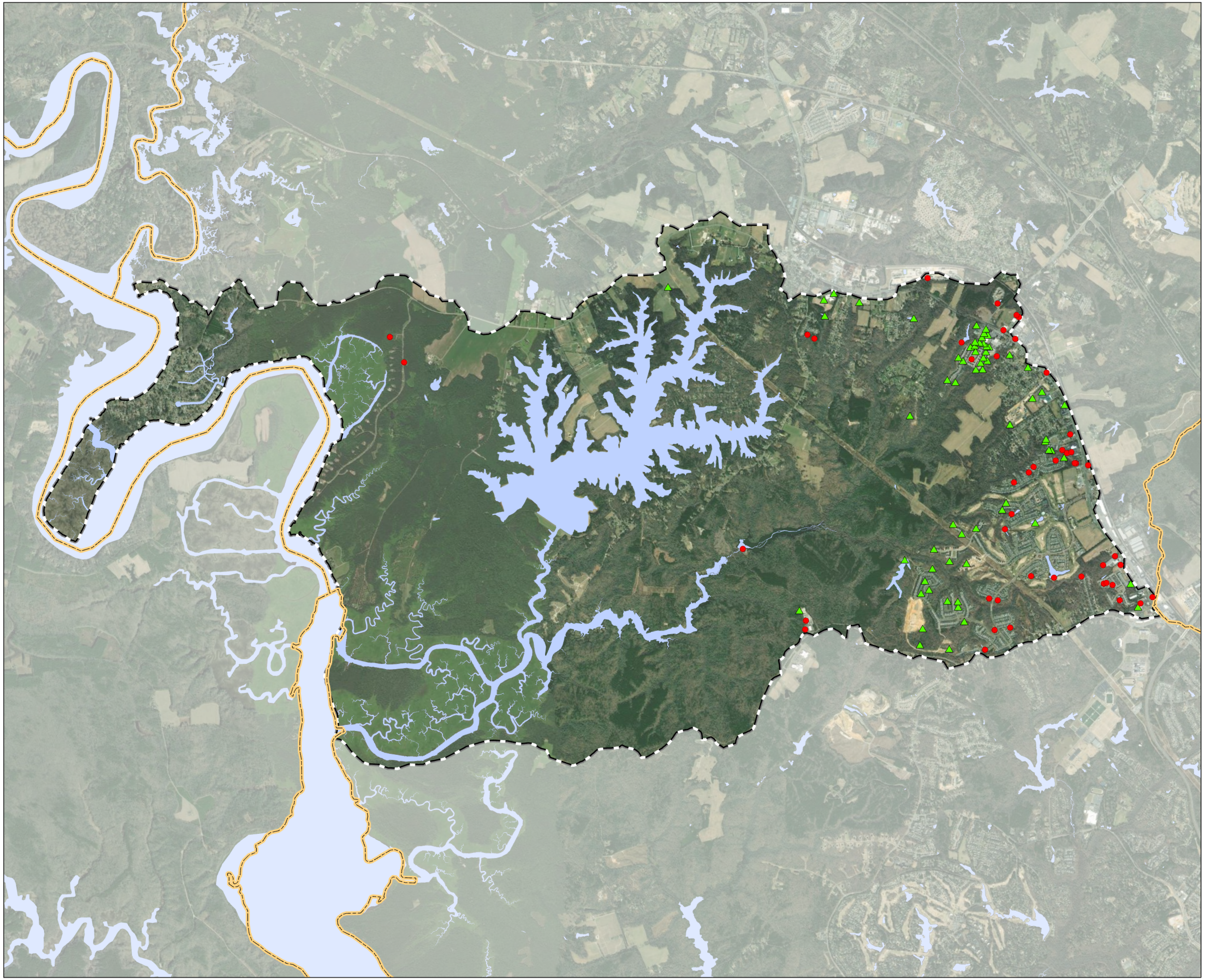


Figure 4 – Percent Impervious Cover Analysis of Yarmouth Creek Subwatershed Areas

(Note: No impervious cover quantities are provided for the Chickahominy Subwatershed in 2000 or 2008. See discussion in Section 1.2.6 about impervious cover trends outlined in red.)

1.2.3 EXISTING STORMWATER INFRASTRUCTURE AND WATERSHED CONDITIONS

Over the past few decades, increasingly effective stormwater management regulations have theoretically improved the effectiveness of stormwater treatment for the most recent development. However, even with recent regulations, developed areas can still be delivering an increased volume of runoff, erosive flows, and pollutants suspended in water flows (e.g., bacteria, sediment, nutrients) downstream of the stormwater infrastructure as it discharges directly into the natural aquatic ecosystems of the Watershed. This can occur because: (1) the original design of the stormwater infrastructure does not meet the current needs; (2) that the infrastructure has failed or has not been maintained appropriately over time; and/or (3) that the original design standards were not conducive to the most effective stormwater management systems. Currently there are 111 active stormwater BMPs within the Watershed with most of the types including dry ponds, wet ponds, bioretention areas, constructed wetlands, grass swales and infiltration trenches, along with a variety of proprietary BMP types (Figure 5).



Title

Figure 5 - Existing Stormwater Best Management Practice (BMP) Locations

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-19
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

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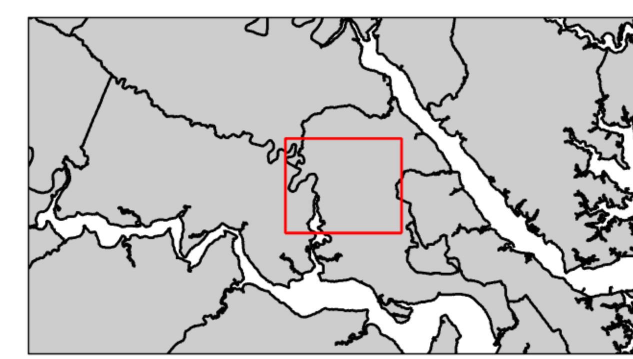
- Field Inspected Existing Stormwater BMP
- Existing Stormwater BMP
- Yarmouth Creek Watershed
- Municipal Boundary



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
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James City County Virginia Jamestown 1607

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1.2.4 Water Quality Summary

While water quality (WQ) monitoring has occurred in the Yarmouth Creek Watershed since as early as 1946, most monitoring locations/stations have represented fleeting efforts with data collection time ranges spanning either single sampling dates or very short time spans in the context of WQ monitoring. The one monitoring station that has enough relevant and recent data to observe potential trends within the Watershed is named "Yarmouth Creek at Rt. 632" (identifier 21VASWCB-2-YRM004.96). This station is located just upstream of the tidal and nontidal transition point of Yarmouth Creek, shown previously in Figure 2.

1.2.4.1 Yarmouth Creek at Rt. 632 Monitoring Station

Table 3 below shows the range of data available from the Virginia Department of Environmental Quality (DEQ) monitoring station Yarmouth Creek at Rt. 632. The blue-highlighted rows are those for which graphs are also presented following the summary table. The graphs for individual, or groups of, metrics are located in the accompanying sections below. Gaps in data indicate a lack of sampling data on a particular date.

Table 3 – Water Quality Monitoring Data Summary – Yarmouth Creek at Rt. 632 (DEQ)

Characteristic Name	Units	Start Date	End Date	Count of Sampling Events	Minimum Reported Value	Average Reported Value	Maximum Reported Value
Nitrogen	mg/L	2/9/2009	11/16/2022	58	0.02	0.64	1.01
Phosphorus	mg/L	2/9/2009	12/15/2022	68	0.003	0.08	0.23
pH	None	2/9/2009	12/15/2022	59	6.4	7.3	8.4
Specific conductance	uS/cm	2/9/2009	12/15/2022	59	26	257	363
Temperature, water	deg C	2/9/2009	12/15/2022	59	2.10	17.06	31.08
Escherichia coli	cfu/100mL	4/8/2009	12/9/2013	26	25	153	2,000
Escherichia coli	MPN/100mL	1/10/2018	12/5/2018	14	10.00	352	2,064
Enterococcus	cfu/100mL	2/9/2009	11/8/2010	11	25	95	700
Fecal Coliform	cfu/100mL	12/3/2009	12/3/2009	1	120	120	120
Dissolved oxygen (DO)	mg/L	2/9/2009	12/16/2014	35	0.30	7.81	16.40
Kjeldahl nitrogen	mg/L	1/8/2014	12/16/2014	12	0.40	0.78	1.60
Nitrate	mg/L	1/8/2014	12/16/2014	12	0.01	0.10	0.36
Nitrite	mg/L	1/8/2014	12/16/2014	12	0.004	0.01	0.03
Ammonia	mg/L	1/8/2014	12/16/2014	12	0.01	0.09	0.36
Orthophosphate	mg/L	1/8/2014	12/16/2014	12	0.01	0.03	0.10

1.2.4.1.1 Bacterial Counts

While there is bacteria testing and data available, there is not consistent, long-term, or recent data. Other monitoring stations also have microbiological data, but similarly do not have enough data to establish trends; therefore no plots are presented.

Following a review of all the monitoring data from the Yarmouth Creek at Rt. 623 monitoring station, the current magnitude or presence of a true bacterial impairment on the nontidal Yarmouth is unclear. Virginia Department of Environmental Quality's (DEQ) Environmental Data Mapper (EDM) shows, for the nontidal section of the Yarmouth Creek (Assessment Unit ID: VAP-G08R_YRM01A12), the following note:

> *During the 2020 cycle, Yarmouth Creek was impaired of the Recreation Use due to an E. coli exceedance rate of 5/24 at 2-YRM004.96, which is located at Rt. 632. The creek is located within the study area for the Lower Chickahominy River Bacteria TMDL, which was approved by the SWCB on 7/19/2017 and by the EPA on 8/11/2017. The impairment is considered nested (Category 4A). New bacteria criteria were implemented in the 2022 cycle. No new data were collected but a review of the older data confirms the impairment due to two or more statistical threshold value (STV) exceedances in the same 90-day period with <10 samples.*

The E. coli data from 2009 to 2018 were analyzed for this station. Out of 40 measurements, four (10%) were exceedingly high, all listed with notes about high flows and/or turbidity. Of those four, three do not appear on EPA's How's My Waterway Monitoring Report, suggesting that they are significant outliers. One of those three specifically states that the sample was immeasurable, so the test's maximum threshold value was inserted. Also of note, many of the samples over the years had low colonization in test results that they did not register on the tests, so a minimum, non-zero value was inserted, artificially raising the mean.

Using the TMDL Endpoint criteria listed in the aforementioned Lower Chickahominy River Bacteria TMDL (2017), overall, there are 15% of the measurements that exceed the threshold in criterion #3 (235 cfu/100mL), but as mentioned, three of the points appear to be true outliers. This leaves three data points exceeding the threshold but still applying, which is below the 10% threshold stated in criterion #3. The overall arithmetic mean of the E. coli measurements across the 2009-2018 range was 223 cfu/100mL (or MPN/100mL), if data points with unmeasurable or outlier values are removed, the mean is reduced to 55 cfu/mL. Of note, the Lower Chickahominy River Bacteria TMDL report does not list Yarmouth Creek as impaired.

Monitoring for current bacterial loads and trends and coordination with DEQ to better understand the magnitude of the impairment is highly recommended before significant efforts are implemented to address the TMDL.

1.2.4.1.2 Dissolved Oxygen (DO)

Water temperature, shown on the graph below in Figure 6, is related to Dissolved Oxygen (DO) potential. The warmer the water temperature, the less gas solubility it has. In other words, the warmer the water, the less oxygen it can hold at maximum. Biochemical oxygen demand (BOD) is what typically drives reductions in DO, but as mean water temperatures rise, it becomes more difficult to reach target DO levels. One degree Celsius difference at the mean temperature observed in the monitoring data will change the maximum DO concentration by 0.2 mg/L. Note that the temperature measurements were taken two months apart in the first group of data between February 2009 and November 2010, so the curves show interpolation based on pure average between adjacent points. The general trend is, as expected, related to seasonal outdoor air temperatures and solar radiation, though the temperature trend is not as smooth as it appears below.

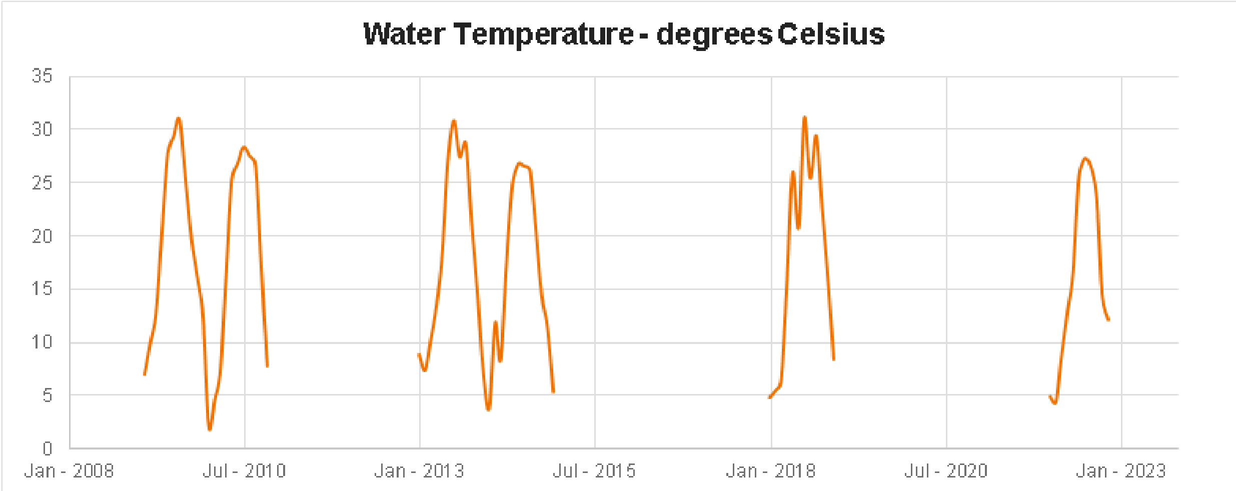


Figure 6 – Water Temperature – Yarmouth Creek at Rt. 632 (DEQ)

1.2.4.1.3 Nitrogen and Phosphorus

The specific pollutants and metrics in the Chesapeake Bay TMDL are Total Nitrogen (TN), Total Phosphorus (TP), and Total Suspended Solids (TSS). Collectively, nitrogen and phosphorus are nutrients and often simply referred to as such. In the context of water quality, the word “nutrients” typically bears negative connotation since they feed algae which, when overfed and overgrown, have a negative impact on aquatic life. Sediment is a separate pollutant of concern, and though it does not function in the same way, it also has a potential negative impact on aquatic life (both plant and animal) and water quality due to the increased turbidity, habitat degradation, and reduced flooding capacity.

Figure 7 and Figure 8 show nitrogen and phosphorus data over time. No trendlines are presented because the strength of confidence in them was low. However, a slight decrease in nitrogen appears to be a trend. Phosphorus concentrations seem to present no discernable trend. Total suspended solids were not included due to lack of data.

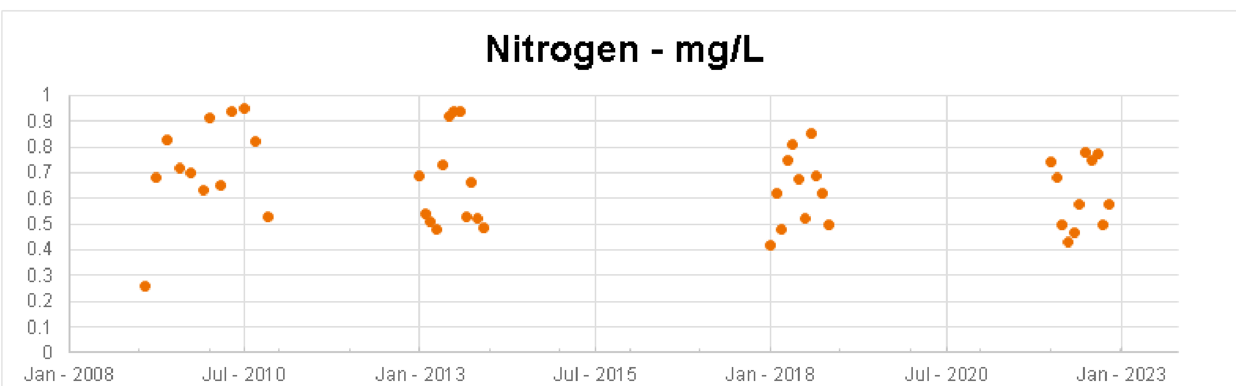


Figure 7 – Total Nitrogen (TN) – Yarmouth Creek at Rt. 632 (DEQ)

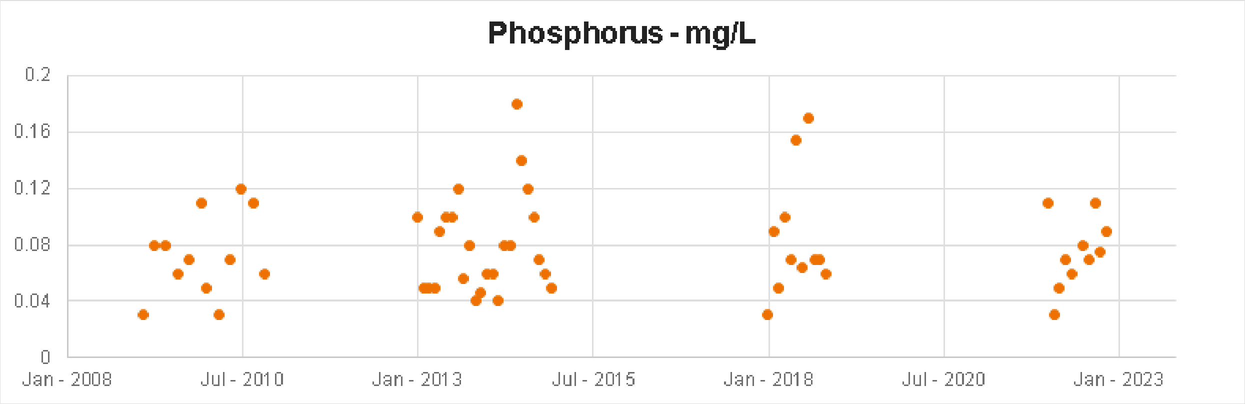


Figure 8 – Total Phosphorus (TP) – Yarmouth Creek at Rt. 632 (DEQ)

1.2.5 TMDL ACTION/IMPLEMENTATION PLANS

There is no current watershed implementation plan (WIP) for the Yarmouth Creek Watershed. WIPs are prepared by DEQ to address findings from TMDL studies in a given watershed, and are therefore specific to certain areas. They typically include measures such as BMPs in specific locations, and general actions that apply perhaps in one watershed but not another. For example, the Powhatan Creek TMDL Implementation Plan will generally not apply to the Yarmouth Creek watershed. Elements will be similar, or will transfer well, such as broader management strategies – outreach and education about certain citizen activities that can have an impact, types of actions that will apply at facilities that can be found in any watershed, general approaches to land use and management, development and construction regulation and oversight, and more. For the types of actions and strategies that will benefit the Yarmouth Creek watershed goals, the Powhatan Creek Implementation Plan (IP) is a good resource. However, it is important to remember that the two watersheds are very different in makeup (land use and land cover) with Powhatan being much more developed.

For the upcoming five-year Chesapeake Bay TMDL permit cycle, and other TMDL efforts, developing a Yarmouth-specific IP will be important. Elements one may reasonably expect to see therein would include:

- Public sanitary sewer and private septic system upgrade/improvement plans
- Stormwater management programs (general)
- Stormwater best management practices (BMPs) for water quality treatment
- Ecosystem restoration/environmental uplift efforts
- Land use management programs
- Pet waste programs

1.2.6 THREATS TO OTHER UTILITIES AND INFRASTRUCTURE

Stream and drainage channel erosion (both the bed and banks) is often the source of threats to utilities and infrastructure in the Watershed. When channels go through changes in response to more powerful storm runoff events, the bed (bottom) of channels can incise rapidly, exposing any infrastructure that was once thought safely deep enough under the channel. Lateral erosion to the stream banks can also expose utilities and/or infrastructure that runs proximal or parallel to the channel. Additionally, these migrations of stream banks to the sides of a channel can begin to threaten other infrastructure like buildings and roadways.

1.2.7 FUTURE TRENDS AND CONSIDERATIONS

For this report, 2000 and 2008 impervious cover estimates were obtained from JCC's Impervious Cover modeling effort (JCC 2008 report) and compared to current estimates to show trends over time. Existing impervious cover (2022) was provided by the JCC GIS staff. This layer was reviewed and appeared to be accurate and current relative to most recently available aerial imagery. Therefore, no changes were made to impervious surfaces data provided by JCC.

For the future impervious cover estimates, a zoning-based estimate was utilized to predict future build out using best professional judgement aided by information from the county's comprehensive plan, satellite imagery, as well as email communications from the JCC Planning Division. An area representative of each land use category was used to derive an average impervious cover assumption to be used for future, full build out projections (See Figure 9 and Table 4 below). These assumptions derived from representative areas were applied to those areas where land use changes were expected.

Figure 9 – Representative Commercial Sample, Existing Impervious Surface Area (Purple Area)

Table 4 – Impervious Cover Estimates by Land Cover

Land Cover	Estimated Percent (%) Impervious Surface Area
Forest	0
Open Water	0
Rural	3.12
Low Density Residential	11.71
Medium Density Residential	21.45
Industrial	63.65
Roadway	72.95
Commercial	73.12

Based on the impervious cover estimates from the JCC 2008 report, all subwatersheds contained waterways categorized as "Sensitive" in 2000, although four subwatersheds were already in the transition zone from "Sensitive" to "Impacted", having greater than 5% impervious in those areas (102, 103, 104, and 105). JCC 2008 impervious cover estimates led to Subwatershed 101 being moved into the transition zone from “Sensitive” to “Impacted,” while Subwatershed 104 was re-classified as “Impacted,” with more than 10% impervious cover. Subwatersheds 102, 103, and 105 remained in the transition zone from “Sensitive” to “Impacted,” and all remaining subwatersheds retained “Sensitive” status.

With the current impervious cover model effort (2022 impervious), two subwatersheds are categorized as “Impacted” (104 and 105) and the remaining subwatersheds are categorized as “Sensitive” or in a transitional state.

Based on projected Future, Full Build Out estimates, Subwatershed 105 would move from “Impacted” to “Non-Supporting” classification (>25% impervious), and Subwatershed 104 would move from “Impacted” into the transition zone between “Impacted” and “Non-Supporting” (20-25% impervious). Subwatersheds 102 and 103 would move out of the transition zone between “Sensitive” and “Impacted” and become “Impacted” (10-20% impervious).

Current estimates of impervious surface areas (2022) are slightly less for Subwatersheds 101 and 102 than the estimate from the 2008 study (see red outlined areas in Figure 10 and Table 5). It is our understanding that the 2008 approach may not have used a spatially explicit approach to impervious surface estimation for the entire watershed, but instead relied on incomplete impervious surface boundaries where available and supplemented that with representative percent impervious area for different groups of existing land use/land cover classifications. This appears to have led to an overestimation of the existing impervious cover in JCC’s 2008 study. A real “on-the-ground” reduction in existing impervious surfaces from 2008 to 2022 is not expected to be the case, rather the current estimate is considered to be a more accurate method. For other subwatersheds, zoning changes in the Comprehensive Plan provided by JCC (“Comp Plan”) included more future development impervious coverage than the 2008 Comp Plan, leading to a future buildout with higher impervious percentage than the future buildout that was analyzed in 2008.

Subwatersheds 103, 104, and 105 show some of the greatest increases in existing impervious cover between 2008 and 2022. Looking forward, Subwatersheds 102, 103, 104, and 105 have the greatest potential for future increases from 2022 into the Future, Full Build Out estimates. A summary table and figures are shown below, highlighting these kinds of increases in impervious surfaces over time from 2000 to 2008, to 2022, and what it might look like at Future, Full Build Out.

Final development plans, types of development, and how stormwater runoff is treated is important to consider for each action recommended, with more detail on these characteristics in following sections. Also, it is important to note that since approximately one half of recent development was required to comply with the Virginia Stormwater Management Program (VSMP) regulations due to the timing of the land disturbing activities, the effects on downstream resources may not be as significant as the ICM may suggest.

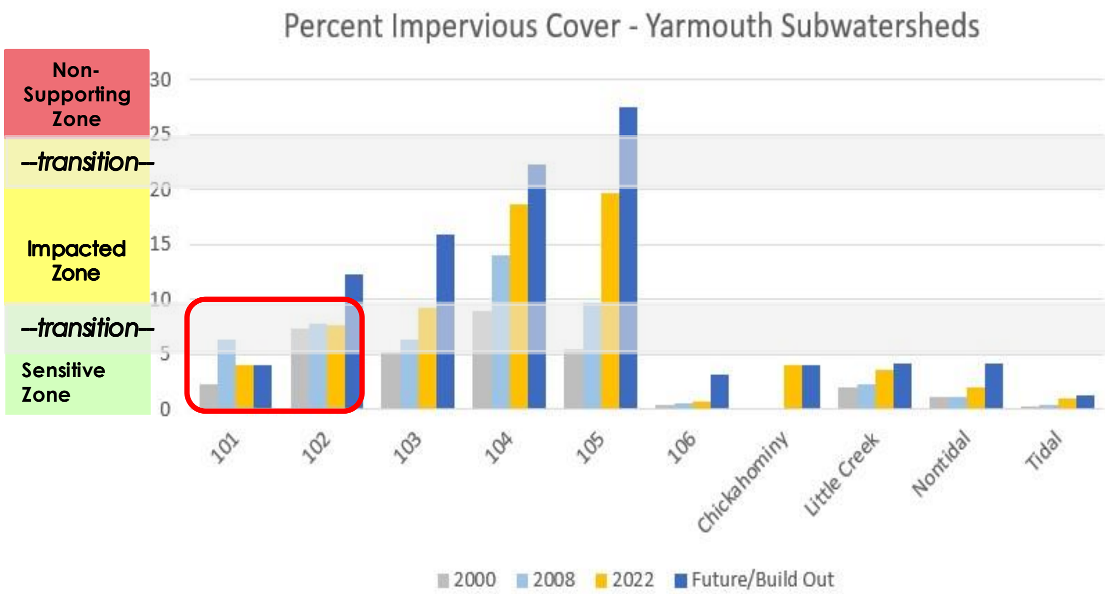


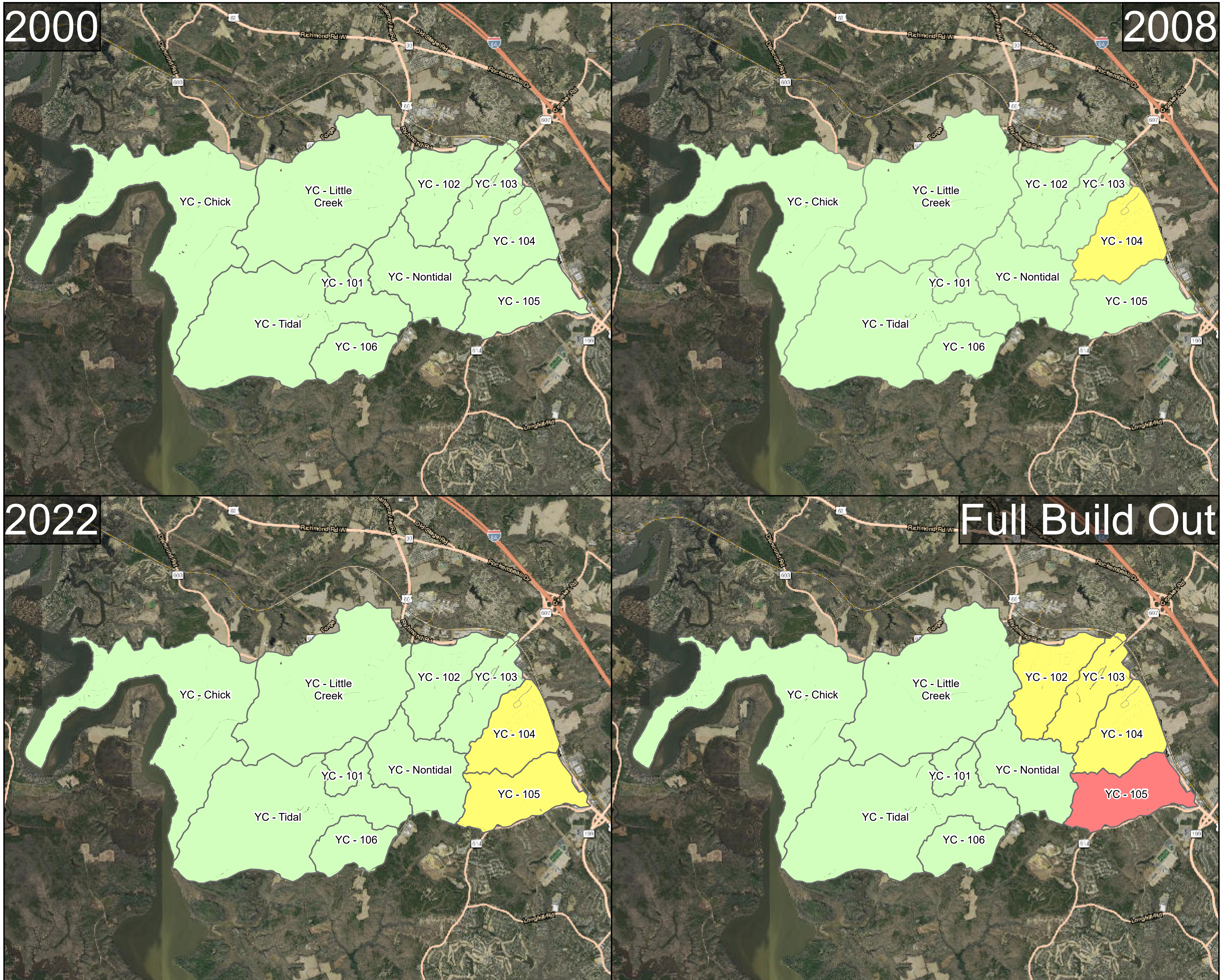
Figure 10 – Percent Impervious Cover by Subwatershed (Past, Current, and Future, Full Build Out)

(Note: The red outlined areas highlight decreases in impervious cover from 2008 to 2022 due to differences in impervious cover estimation methods. See Section 1.2.6 for additional discussion.)

Table 5 – Impervious Cover Estimates by Subwatershed (Past, Current, and Future, Full Build Out)

Subwatershed	Area (acres)	Percent (%) Impervious Surface Area			
		2000	2008	2022	Future/Build-Out
101	221	2.2	6.3	4.0	4.0
102	855	7.3	7.8	7.6	12.3
103	738	5.1	6.3	9.2	15.9
104	862	9	14	18.7	22.3
105	941	5.5	9.6	19.7	27.5
106	552	0.4	0.5	0.7	3.2
Chickahominy	2,806	-	-	4.0	4.0
Little Creek	2,887	2.0	2.2	3.5	4.3
Nontidal	1,082	1.1	1.11	2.0	4.2
Tidal	2,902	0.3	0.34	0.9	1.3
Watershed-wide totals:	**13,846**	2.9	3.9	5.4	7.4
Impervious Model Cover Zone	**Sensitive**	9	8	8	6
	Impacted	0	1	2	3
	Non-Supporting	-	-	-	1

(Note: The Chickahominy Subwatershed wasn't assessed in 2000 or 2008. Watershed-wide averages omit the Chickahominy Subwatershed in those years.)



Title

Figure 11 - Subwatershed ICM Impervious Cover Zones

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-08-16
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

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(At original document size of 11x17)
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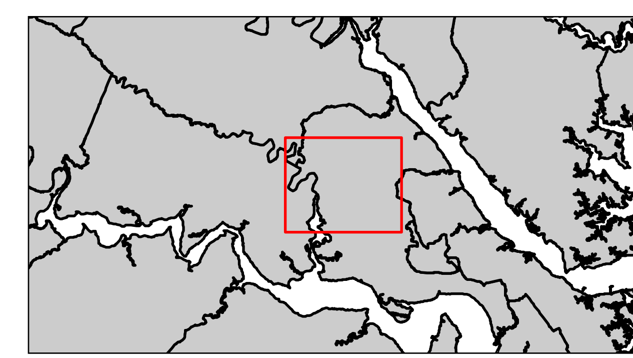
Yarmouth Subwatershed Boundaries

Impervious Cover Model Zones

Sensitive (<10%)

Impacted (10-25%)

Non-Supporting (>25%)



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

Stantec

James City County Virginia Jamestown 1607

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1.3 Overarching Watershed Goals

JCC has revised the overarching goals originally created under the 2003 Watershed Management Report effort and created the following updated goals to address challenges to the Watershed:

1. Improve water quality in Yarmouth Creek to satisfy Local Bacteria TMDLs, and work to remove impairments.
2. Maintain and build biological and habitat diversity and connectivity by protecting the Conservation Areas, Habitat Cores, and wildlife corridors as identified within the conservation priorities of this Plan, the County's Natural and Cultural Assets Plan, and other relevant Virginia data sets.
3. Refine the County stormwater requirements and Code of Ordinances to not only offset the effects of further development but create opportunities to improve upon existing degraded areas.
4. Continue the tracking and prioritization of existing stormwater maintenance.
5. Promote watershed awareness and active stewardship among residents, community associations, businesses, and seasonal visitors through educational programs, recreational opportunities, and participatory watershed activities.
6. Restore degraded streams where possible and reasonable, and continue to protect high-quality streams and wetlands.
7. Collaborate with the Virginia Department of Forestry to assess the health of silvicultural activities within the watershed, and with the Colonial Soil and Water Conservation District to identify opportunities for additional agricultural management needs or water quality improvements.
8. Initiate development of a flood preparedness plan to understand current and future flood risks and identify a phased implementation approach for effective and practical long-term community flood-risk reduction.
9. Preserve and improve equitable public access to meaningful and safe outdoor recreation throughout the watershed, including "Blueway Trail" development support, while increasing stewardship opportunities to address litter and shoreline management issues.

Many stakeholders were contacted and engaged during the process of developing this Watershed Management Plan. The goals above will require continuous engagement from stakeholders, JCC, and other organizations to ensure that strategic actions are initiated and completed.

1.4 Realizing Watershed Goals Through Strategic Actions

The achievement of watershed goals to address the different challenges for the Yarmouth Creek Watershed will involve five (5) general types of Strategic Actions. The recommended actions found within this management plan can be grouped into these categories:

1. **Programmatic** – Efforts such as Land Conservation/Purchase of Development Rights, wildlife management (e.g. goose exclusion from ponds), development of an incentivized public stewardship program, and continued septic system inspections/clean-out/repair support programs.

2. **Regulatory/Enforcement** – For example, expand Special Stormwater Criteria for new development and re-development, increase stormwater controls for infill development, restrict inter-watershed nutrient credit trading.

3. **Floodplain Management** – Consider an enhanced flood modeling effort, coordinating on Dam Break Inundation Zone planning, floodproofing or elevating at-risk sanitary sewer pump stations, drainage upgrades, and elevating road crossings.

4. **Education/Awareness**– Increasing engagement with schools/students, additional public events, public waste disposal and litter prevention campaigns, and small-scale runoff reduction education and encouragement.

5. **Watershed Restoration Projects** – Explore the retrofitting of existing Stormwater Best Management Practices (BMPs) to increase treatment effectiveness of stormwater runoff, construction of new BMPs in areas that are currently not served by existing BMPs, and stream enhancement and/or restoration projects.

The remainder of this management plan is broken into the following Sections:

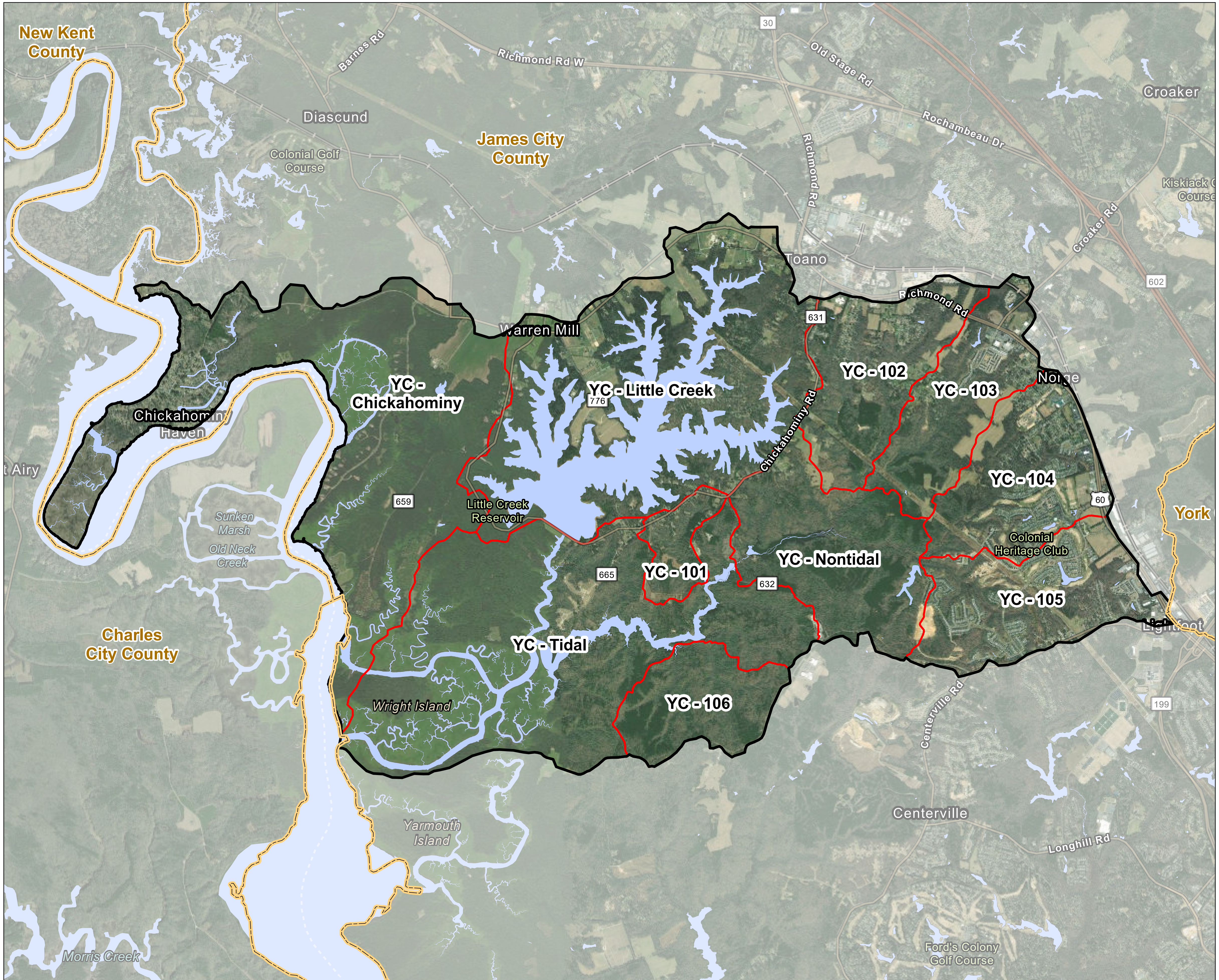
- Section 2 - Watershed Assessment
  - Summarizes both desktop and field analyses of current conditions within the Watershed.
- Section 3 - Watershed Goals and Strategic Actions
  - Describes the steps taken to develop current Watershed Goals and the associated recommended Strategic Actions.
- Section 4 - Watershed Restoration Projects
  - Details the methods used to identify the various types of site-specific stormwater treatment or stream restoration projects across the Watershed.
- Section 5 - Strategic Action Plan
  - A plan for the implementation for realizing the success of proposed Strategic Actions with prioritization and estimated costs and project timelines.
- Section 6 - Subwatershed Management Plans
  - Smaller scale exhibits of findings and recommended actions for each subwatershed serving as easy reference for sub regions of the larger Watershed.

2 WATERSHED ASSESSMENT

This section details the desktop and field analyses that were performed to better understand the historic and current trends of conditions in both upland and aquatic environments and how upland area analyses can inform next steps.

2.1 Subwatershed Designations and Limits of The Assessment

As seen in previous figures and tables, the Yarmouth Creek Watershed has been divided into smaller planning-level geographic units based on contributing drainage area boundaries. These subwatershed boundaries were first introduced in the 2003 Yarmouth Creek Watershed Management Report (CWP, 2003), with the exception of the Chickahominy Subwatershed, which was not analyzed in prior studies.



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Title

Figure 12 - Subwatershed Boundaries used for Assessments and Recommendations

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-08-16
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

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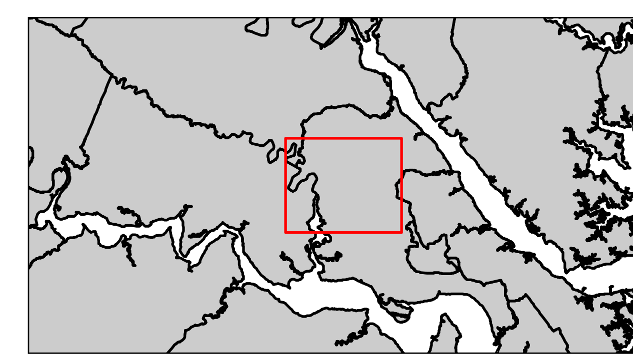
Water Feature

Yarmouth Creek Watershed Boundary

Subwatershed Boundary

Municipal Boundary



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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2.2 Desktop Assessments

2.2.1 LAND USE AND IMPERVIOUSNESS

Land Use composition across a contributing drainage area is one of the biggest drivers of the downstream waterways' health. Exposure of soil under certain land uses can increase the amount of wind and rain erosion of sediment, along with the pollutants that can be attached to the soils eroded (e.g., nutrients, metals, bacteria). Additionally, some land uses may not have large areas of exposed soil, but they do have large areas of impervious surface—areas where rainwater cannot infiltrate into the ground. Increased impervious area can lead to concentrated flows that are routed quickly and in larger amounts to downstream waterways via surface ditches or underground via pipes. The change in the timing (faster) and amount of surface water running off (runoff) to downstream waterways can disturb and damage natural aquatic and riparian ecosystems. Additionally, pollutants in suspension in the runoff (e.g., metals, nutrients, sediment) are delivered to the downstream ecosystems leading to biogeochemical issues in the habitats.

A data layer of Existing Land Use and Land Cover was created using JCC parcel data in GIS for subsequent input into the Watershed Treatment Model (WTM) discussed further below in Section 2.2.3. Residential areas were assigned WTM Land Use/Cover Types using each parcel's approximate number of dwelling units per acre. Existing parcel data was used to determine the remaining areas of commercial, roadway, industrial, rural, forest, open water, and vacant land use types as defined by CWP for use in the WTM. For each land use type, the impervious coverage percentage was provided in the WTM and used to calculate the approximate acreage of impervious area. The land cover and impervious composition of the Yarmouth Creek Watershed is presented in Table 6 and a map of the land cover in Figure 13.

Table 6 – Existing Land Use and Land Cover WTM Inputs - Overall Summary

WTM Land Use Type	Area	Impervious Area	
		Area	Percentage
	(ac)	(ac)	(%)
Low Density Residential	575	63	11.0%
Medium Density Residential	1,347	283	21.0%
High Density Residential	-	-	33.0%
Commercial	217	157	72.0%
Industrial	37	19	53.0%
Roadway	418	334	80.0%
Forest	5,662	57	1.0%
Rural	4,108	205	5.0%
Open Water	1,386	1,386	100.0%
Vacant Lots	99	5	5.0%
Total	13,849	2,509	18%

Title

Figure 13 - Existing Land Use and Land Cover

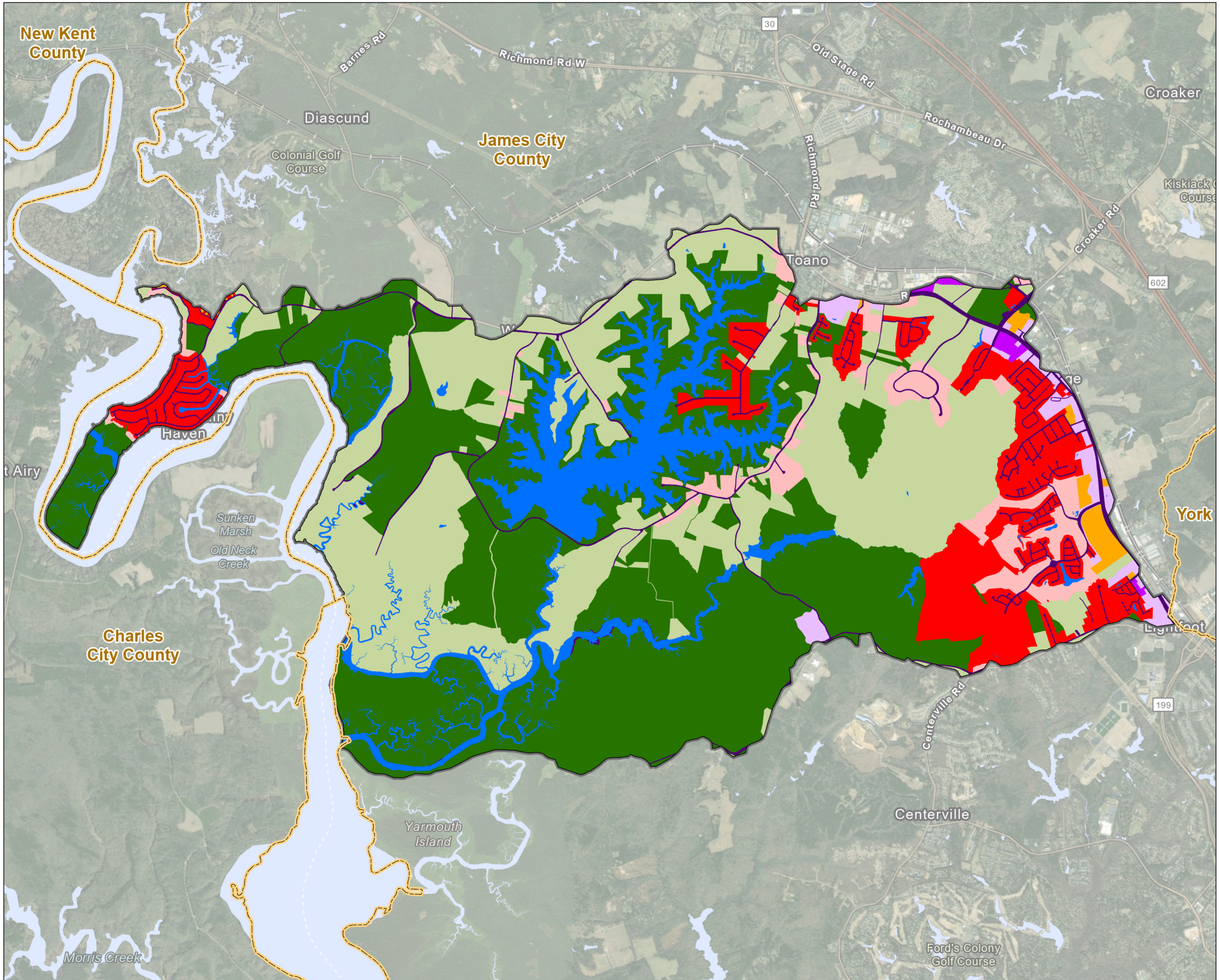
Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-19
TR by JMH on 2023-08-16
IR by DP on 2023-08-31



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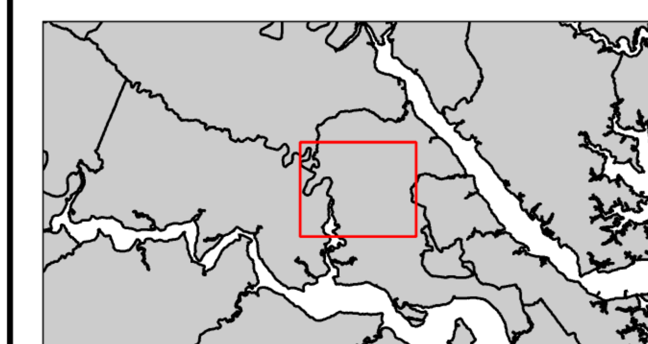
Watershed Boundary

WTM Inputs - Existing Land Cover/Use

- Open Water
- Forest
- Rural
- Vacant Lots
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Roadway



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec, VADEQ
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2.2.2 CONSERVATION AREAS

To review areas previously proposed for conservation planning within the Yarmouth Creek watershed, several documents were consulted. These include the *Yarmouth Creek Watershed Plan*, the *Conservation Areas for Yarmouth Creek (Draft Report)*, and the C*onservation Planning for the Natural Areas of the Lower Peninsula of Virginia Final Report*. The *James City County Natural & Cultural Assets Plan* was also reviewed to further inform the evaluation of areas for potential conservation within the Yarmouth Creek watershed.

Based upon the review of the above-mentioned documents, conservation areas were originally evaluated in 2002 through assessments of orthophoto maps; reviewing rare, threatened, endangered species (RTE) information; and performing field surveys of natural resource areas in the watershed. Eight conservation areas were identified, totaling approximately 3,710 acres (Figure 14). In addition, the *James City County Natural & Cultural Assets Plan*, completed October 2022, maps the location and extent the County's natural assets. The natural assets are classified as Heightened Priority Habitat Cores, Habitat Cores, and various Corridor types. Habitat Cores were considered "heightened" if in addition to natural assets, there were cultural assets also identified in that area. There are 5,388 acres of Heightened Priority Habitat Cores and 3,219 acres of Habitat Cores within the Yarmouth Creek watershed. There are 2,279 acres of Heightened Priority Habitat Cores and 3,114 acres of Habitat Cores outside of the eight conservation areas. Please note that the Chickahominy Subwatershed was not assessed herein as it was not considered in the original Yarmouth Creek Watershed Plan. Large undeveloped areas are present within the Chickahominy Subwatershed that overlap with Habitat Cores and Wildlife Corridors (shown in Figure 14 below) that should also be considered in future conservation planning decisions.

The following sections focus on the methods used to evaluate the potential presence of RTE species within the Yarmouth Creek watershed, the current status of the eight conservation areas identified in the *Yarmouth Creek Watershed Plan* and the *Conservation Areas for Yarmouth Creek (Draft Report)*, and the location and extent of the habitat cores identified in the *James City County Natural & Cultural Assets Plan.* In addition, this Plan presents a proposed re-ordering of the eight conservation areas and recommendations for conservation.

2.2.2.1 RTE and Conservation Review Methods

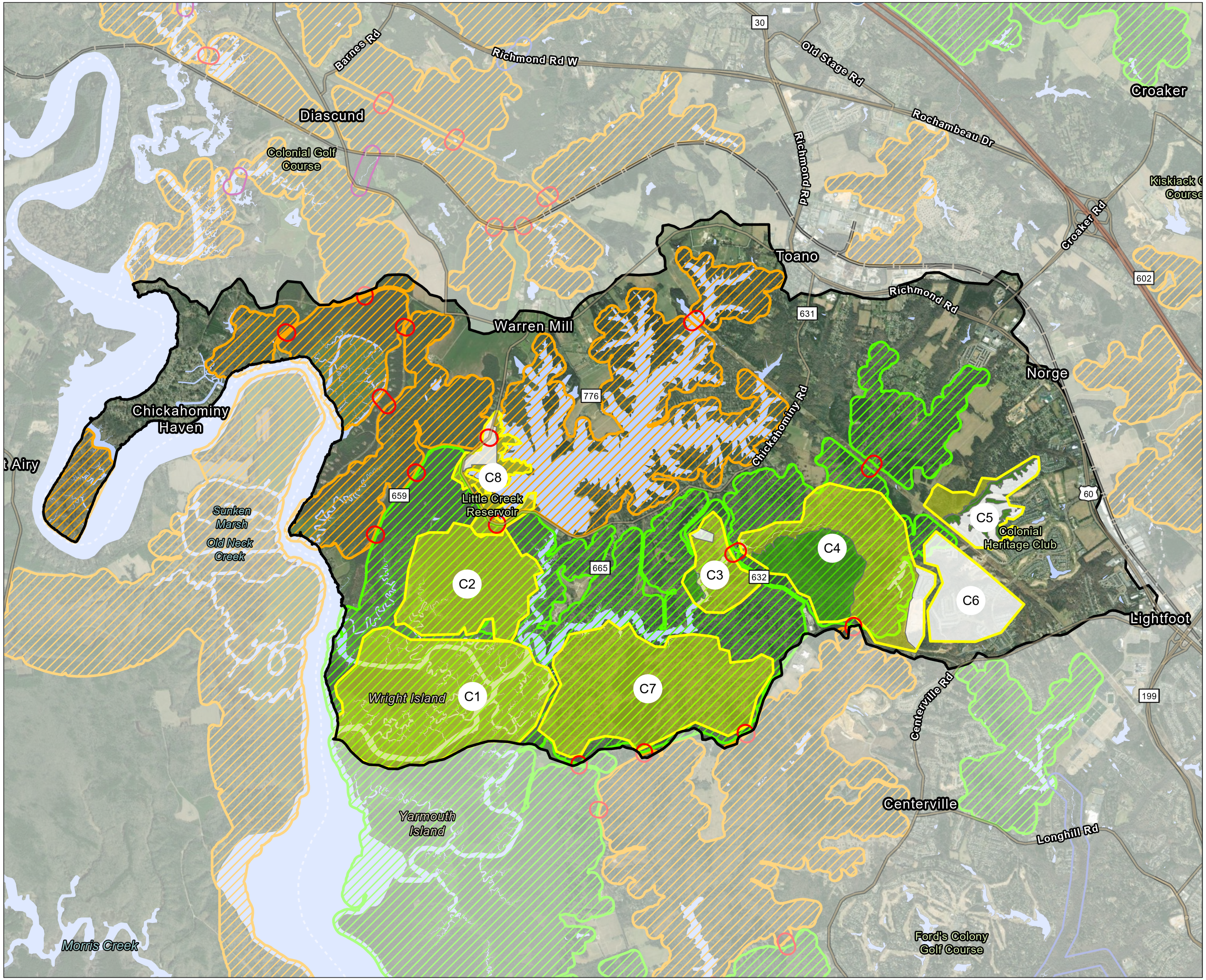
Online database searches for federal and state listed RTE species were completed with specific attention to the eight conservation areas. The purpose of conducting these searches was to generate a current list of species with the highest need of conservation planning and management and, to the extent possible, correlate the location of any documented RTE species to the conservation areas for evaluation. The databases searched included the following:

- U.S. Fish & Wildlife (USFWS) Information, Planning, and Conservation (IPaC) Trust Resource List and Official Species List
- The Virginia Department of Wildlife Resources (DWR) Virginia Fish and Wildlife Information Service (VAFWIS) Database
- Virginia DWR Wildlife Environmental Review Map Service (WERMS)
- Virginia DWR Northern Long-eared Bat (NLEB) Winter Habitat and Roost Trees Map

- Virginia DWR Little Brown Bat (MYLU) and Tri-colored Bat (PESU) Winter Habitat and Roosts Application
- Virginia Department of Conservation and Recreation (DCR) Natural Heritage Data Explorer (NHDE)
- Center for Conservation Biology (CCB) Bald Eagle Nest Locator for Virginia

In addition to generating an updated list of RTE species, the seven scoring parameters that were used to prioritize the original conservation areas identified in the *Conservation Areas for Yarmouth Creek (Draft Report)* were evaluated for each of the 8 priority conservation areas. A review of available online imagery was also conducted to evaluate the extent to which the observable changes to land use may have impacted any of the priority conservation areas. The scoring parameters with brief descriptions shown below were used in the original Draft Report effort, and used again in this 2023 effort. Scores were assigned for each parameter, with a lower number assigned for areas with less value for that particular parameter and a higher number assigned for high-value areas. For example, an area with no known RTE species and low potential for future habitat may be assigned a 0 for the RTE Species parameter, while an area with a significant known RTE species population may be assigned a 10 for the same parameter. A total score was computed for each conservation area as a sum of each of the seven parameters.

- Environmental Significance/Environmental importance of the area/Presence of RTE species, mature contiguous forest, blue heron rookeries
    - High (12-15)
    - Medium (7-11)
    - Low (<7)
- Development Pressure
    - Very Recent development or expected in the near future (9-10)
    - Future development (6-8)
    - Possibility (3-6)
- Resource Protection Area (RPA) Protection
    - No potential for RPA protection (8-10)
    - Some potential for RPA protection (5-7)
    - Sufficient protection by RPA (0-4)
- RTE Species
    - Presence of RTE species (8-10)
    - High potential for RTE species (5-8)
    - Low potential for RTE species (0-4)
- Invasive Species Potential
    - High potential for invasive species due to extensive disturbance (8-10)
    - Medium potential (5-7)
    - Low potential (0-4)
- Stormwater Hydrology
    - Significant current or future hydrology changes i.e., increased flooding, increased stream erosion (9-10)
    - Medium potential for hydrology changes (5-8)
    - Low potential for hydrology changes (0-4)
- Land Ownership
    - Owned by county, land trust or public institution (8-10)
    - Private ownership in relatively large tracts (5-7)
    - Private ownership slated for development (0-4)



Title

Figure 14 - Location of Conservation Areas, and Habitat Cores and Corridors

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

0 4,000 8,000 Feet

(At original document size of 11x17)
1:48,000

Yarmouth Creek Watershed Boundary

Corridor Type

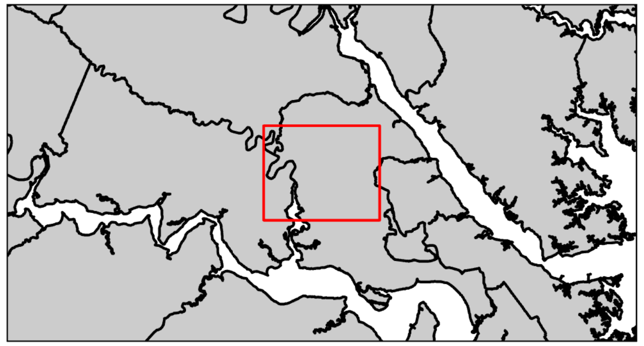
- Local connection - Small road or train track
- Route
- Route requiring tunnel/bridge

Habitat Core Ranking Priority

- Heightened Priority Habitat Core
- Habitat Core

Priority Conservation Areas

- Conservation Areas Identified by JCC
- Opportunity for Conservation
- Already Conserved
- Developed / No Further Action



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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James City County Virginia Jamestown 1607

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The review of each of the conservation areas, including the evaluation of the scoring parameters, aerial imagery, ecological cores, Forest Conservation Value (FCV) models, and updated RTE list, allows for an informed re-ordering of the eight conservation areas. It should be noted that no fieldwork has been conducted in support of this effort. Rather, all assessments have been conducted using available online resources and desktop analysis methods.

2.2.2.2 Results of RTE and Conservation Review

While the Ecological Cores and FCV models show a range of ecological integrity and conservation value categories within the conservation areas, the majority are High to Outstanding. Exceptions to this are associated with areas that have been developed. Conservation Areas C1, C2, C3, and C7 are all situated entirely within Heightened Priority Habitat Cores while C8 is situated entirely within a Habitat Core. Conservation Area C4 is mostly within a Heightened Priority Habitat Core, C6 is partially within Heightened Priority Habitat Core, and C5 does not overlap any habitat cores. The results of the online database searches for RTE indicate numerous rare, threatened, and endangered species may be present within the Yarmouth Creek watershed. Some species have the potential to be present throughout the watershed while others appear to be localized to specific conservations areas. Two Great Blue Heron rookeries were documented within the Yarmouth Creek watershed (C2 and C3) in 2013 and for the purposes of this evaluation, habitat is assumed to remain present. Four bald eagle nests are documented in conservation areas C1, C2, and C4.

A review of the priority conservation areas has yielded a variety of observations leading to a preliminary re-ordering. Some of these observations include:

- Development/land disturbance has diminished the natural value of some conservation areas and has eliminated the opportunity for additional conservation.
- Previously documented RTE species are no longer documented as being present.
- Previously proposed management recommendations appeared to have been extended, thereby reducing the priority for additional conservation measures. For example, numerous locations where RPA extensions were called for appear to have been modified and are now protected within RPA buffers. These modifications follow the adoption of revised ordinance in 2004 clarifying the definition of RPAs.

Landowner stewardship, additional conservation, or land acquisition were other management recommendations for several conservation areas. Based upon a review of the recorded easements, portions of several conservation areas are protected through the conservation easements. Table 7 presents the Yarmouth Creek watershed conservation area priority scoring, as depicted in the *Yarmouth Creek Watershed Plan* and the *Conservation Areas for Yarmouth Creek (Draft Report).* Table 8 presents the preliminary results of the re-ordering of the priority conservation areas. Table 9 presents the conservation area (C6) that requires no further action.

While the focus of this Plan has been the eight priority conservation areas, a variety of tools for evaluating and managing conservation areas are available and recommended in the *James City County 2045 Comprehensive Plan* and the *James City County Natural and Cultural Asset Plan*. These tools can be applied within the habitat cores and throughout the watershed.

Table 7 – Yarmouth Creek Watershed Conservation Area Priority Scoring (2003)

Rank	Conservation Areas #	Description	Environmental Significance (0-15, high)	Development Pressure (0-10, high)	RPA Protection (0-10)	RTE (0-10)	Invasive Species Potential (0-10)	Stormwater Hydrology Threats (0-10, high)	Land Ownership (0-10)	Total Score (0-75)
1	C2	Located on tidal mainstem; mature contiguous forest; historic bald eagle nesting.	14	7	9	9	9	8	7	**63**
2	C1	Outstanding tidal freshwater marsh; rated by VDCR as highly significant biodiversity; 3 RTE species known.	15	6	5	10	9	7	6	**58**
3	C4	Contiguous forest, historic RTE location, potential heron rookery.	12	9	9	8	6	9	4	**57**
4	C3	Heron rookery located in top portion of tidal mainstem. Bald cypress swamps, beaver ponds, surrounded by mature forest cover.	14	7	6	6	7	7	7	**54**
5	C5	Contiguous forest in Subwatershed 104.	12	9	6	8	6	9	4	**54**
6	C6	Contiguous forest in Subwatershed 105.	13	10	7	5	5	9	3	**52**
7	C7	Contiguous forest within tidal mainstem and Subwatershed 106.	11	7	7	6	5	7	5	**48**
8	C8	Mature forest in Little Creek Reservoir watershed.	10	6	9	5	5	5	7	**47**

Table 8 – Yarmouth Creek Watershed Conservation Area Revised Priority Scoring

Revised Rank	Conservation Areas #	Previous Rank	Revised Description	Current Protection Status	Env. Signif. (1-15, high)	Development Pressure (0-10, high)	RPA Protection (0-10)	RTE (0-10)	Invasive Species Potential (0-10)	Stormwater Hydrology Threats (0-10, high)	Land Ownership (0-10)	Total Score (75)	Summary of Key Changes
1	C2	1	Large mature contiguous forest situated on tidal mainstem with non-tidal wetlands and stream in headwaters. RTE potential in tidal and upland portions. Potential RTE species include sensitive joint-vetch, northern long-eared bat, and bald eagles. Situated entirely within a Heightened Priority Habitat Core.	RPA present per JCC (12% of CA). Ownership is private with no recorded conservation easements.	14	7	7	9	8	8	7	60	Decrease to Protection due to RPA extension and Invasive Species Potential due to likelihood of invasive species encroachment over time.
2	C7	7	Large contiguous forest situated on tidal mainstem with non-tidal wetlands and streams in headwaters. RTE potential in tidal and upland portions. Potential RTE species include northern long-eared bat, sensitive joint vetch, and small whorled pogonia. Situated entirely within a Heightened Priority Habitat Core. Recent increase in pressure associated with approved master plan for low-density residential development.	RPA present per JCC (14% of CA). Ownership is private with no recorded conservation easements.	13	9	7	8	7	7	7	58	Increase in Environmental Significance due to RTE potential; RTE due to additional species based upon database results; Invasive Species Potential due to likelihood of invasive species encroachment; and Land Ownership due to private ownership in large tracts with no recorded easements. Increased development pressure.
3	C4	3	Large contiguous forest along non-tidal mainstem above Cranston Mill Pond. Potential RTE species include small whorled pogonia, northern long-eared bat, tri-colored bat, and bald eagles. Approximately 43 acres has been developed. Situated entirely within a Heightened Priority Habitat Core.	RPA present per JCC (14% of CA). Ownership is private with approximately 38% in of CA in recorded conservation or PDR easements.	12	8	6	8	7	9	5	55	Increase to Invasive Species Potential due to likelihood of invasive species encroachment and Land Ownership due to private ownership in large tracts with a portion in recorded easements. Decreases to Development Pressure due to significant portion of CA in conservation easement and Protection due to extension of RPA buffers.
4	C3	4	Heron rookery located in top portion of tidal mainstem (last documented in 2013). Bald cypress swamps, beaver ponds, surrounded by mature forest cover. Potential RTE species include northern long-eared bat, sensitive joint vetch, and small whorled pogonia. Situated entirely within a Heightened Priority Habitat Core.	RPA present per JCC (12% of CA). Ownership is private with approximately 10% in of CA in recorded conservation easements.	14	7	5	8	7	7	7	55	Increase to RTE due to additional species based upon database results. Decrease to Protection due to presence of conservation easement and extension of RPA buffers.
5	C1	2	Outstanding tidal freshwater marsh community rated by DCR as highly significant biodiversity. RTE potential for northern long-eared bat, sensitive joint vetch, and bald eagle. Situated entirely within a Heightened Priority Habitat Core.	RPA present per JCC (81% of CA). Ownership is private with no recorded conservation easements.	15	3	4	10	9	5	7	53	Increase to Land Ownership due to CA being in private ownership in a large tract with no conservation easement. Decrease to Development Pressure as nearly entire CA is within federally protected wetlands and RPA; Protection as nearly entire CA is protected by federal, state, and local regulation; Stormwater Hydrology Threats as the potential for additional development is limited.
6	C5	5	Majority of CA has been developed and/or eased as part of the Colonial Heritage community. Undeveloped portions combination of mixed hardwood/pine RTE potential for northern long-eared bat and small whorled pogonia. Not within a designated habitat core.	RPA present per JCC (10% of CA). Ownership is private with approximately 24% in of CA in recorded conservation or open space easements.	10	9	7	8	4	9	4	51	Increase to Protection due to the partially protected status and potential for development in remaining portions of CA. Decreases to Environmental Significance due to majority of CA being developed and Invasive Species due to likelihood of invasive species encroachment associated with disturbance.
7	C8	8	Mixed age forest in Little Creek Reservoir watershed. RTE potential for northern long-eared bat. Situated entirely within a habitat core.	RPA present per JCC (5% of CA). Ownership is a combination of private and public with NN Waterworks owning a majority including lands immediately adjacent to reservoir. No recorded conservation easements.	11	6	7	6	5	5	7	47	Increases to Environmental Significance due to increased potential for RTE and RTE due to increased potential based upon results of database searches. Decrease to Protection due to partially protected status within RPA and partial ownership in public institution.

*RPA quantities include approximate RPA buffers and features.

Blue Cells Represent Increases in Scoring Parameters from 2002 Conservation Areas for Yarmouth Creek.

Yellow Cells Represent Decreases in Scoring Parameters from 2002 Conservation Areas for Yarmouth Creek.

Table 9 – Yarmouth Creek Watershed Conservation Areas Requiring No Further Action

Conservation Areas #	Previous Rank	Revised Description	Current Protection Status
C6	6	Majority of conservation area has been developed as part of the Colonial Heritage community. Very small overlap with a designated habitat core.	Remaining greenspace in conservation easements. No Further Action Required.

2.2.2.3 Conclusions of Conservation and RTE Review

Findings and recommendations from our Conservation and RTE review have resulted in a reprioritization of conservation areas to be considered moving forward. Further discussion of how these recommendations can be incorporated with other Watershed Restoration Efforts can be found in Sections 3 and 5.

2.2.3 Pollutant Load Modeling

As a part of desktop assessment efforts for the Watershed, Stantec modeled pollutant loads and existing stormwater practices using the most current version of the Watershed Treatment Model (WTM, 2013) created by the Center for Watershed Protection (CWP). The WTM is a relatively simple, Excel-based approach to rapidly assess and quantify various watershed pollutant loading and treatment options (CWP, 2013). These results are meant to provide a closer look at pollutant loading by subwatershed, guiding JCC's planning efforts.

All inputs for the WTM were created using JCC-sourced GIS data. JCC's stormwater BMP locations along with attributes were obtained from publicly available GIS data downloaded from JCC's ESRI Data Hub. In a few cases, adjustments were made for input into the WTM using best professional judgement.

Pollutant loading was calculated for existing and future land use scenarios with BMP load reductions included. Changes expected under future buildout (future conditions land use) were created by Stantec using future development plans and other information provided by JCC. Other future changes were assumed using best professional judgement.

Pollutant loading was calculated for all subwatersheds of Yarmouth Creek, numbered 101 to 106, with one subwatershed each for tidal and non-tidal areas, and an additional subwatershed for areas draining to the Little Creek Reservoir. A portion of the Tidal Subwatershed consisting of areas with direct discharge into the Chickahominy River, including but not limited to Chickahominy Haven, was analyzed separately to provide a more detailed look of where the isolated areas of development are located and to not skew results for the overall Tidal Subwatershed.

2.2.3.1 WTM Inputs

2.2.3.1.1 Primary Sources of Pollutants

The WTM calculates pollutant loading by considering the areas and imperviousness of different land use and land cover types across a given watershed. Land use inputs were created using JCC parcel data in GIS. Residential areas were assigned WTM Land Use Types using each parcel's approximate number of dwelling units per acre. Because there is not a separate WTM Land Use Type category for managed golf courses, these areas were assigned to the surrounding Residential Type (Low or Medium as appropriate). It is important to note that loading characteristics of managed golf courses were not included with WTM and so loading from golf courses may be underestimated. Existing parcel data were used to determine the remaining areas of commercial, roadway, industrial, rural, forest, open water, and vacant land use types. Default impervious cover percentages come with the model preset for each land use type.

After assigning existing WTM land use types to JCC parcels, the Future Land Use assignments were developed to depict future development potential within the watershed. JCC parcel data included information on potential future land use types as part of the Comp Plan, which was used to select the proper future land use assignments. Other supplementary information provided by JCC included future development plans for areas within the watershed. These specific areas were identified and assigned to a more highly developed land use type for future pollutant load calculations. The Comp Plan and future development plan information was used to upgrade land types from existing to future when the future land use type has a higher percent of impervious cover to create the most conservative pollutant loading estimates, e.g. changing Forest to Low Density Residential. Existing roadway parcels were supplemented by VDOT ROW boundaries to create more consistent roadway areas.

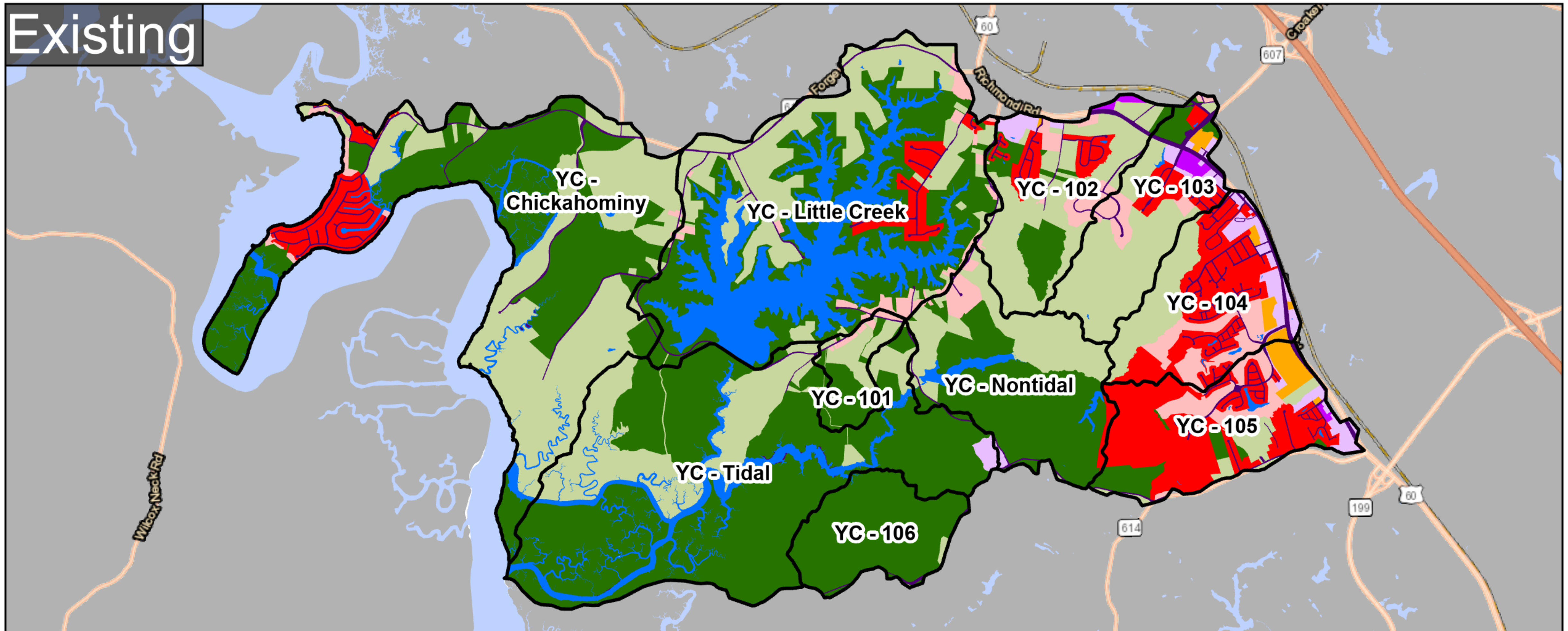
Table 10 provides a breakdown of land use type totals under each land use scenario. Figure 15 provides a spatial view of the existing and future land use scenario inputs.

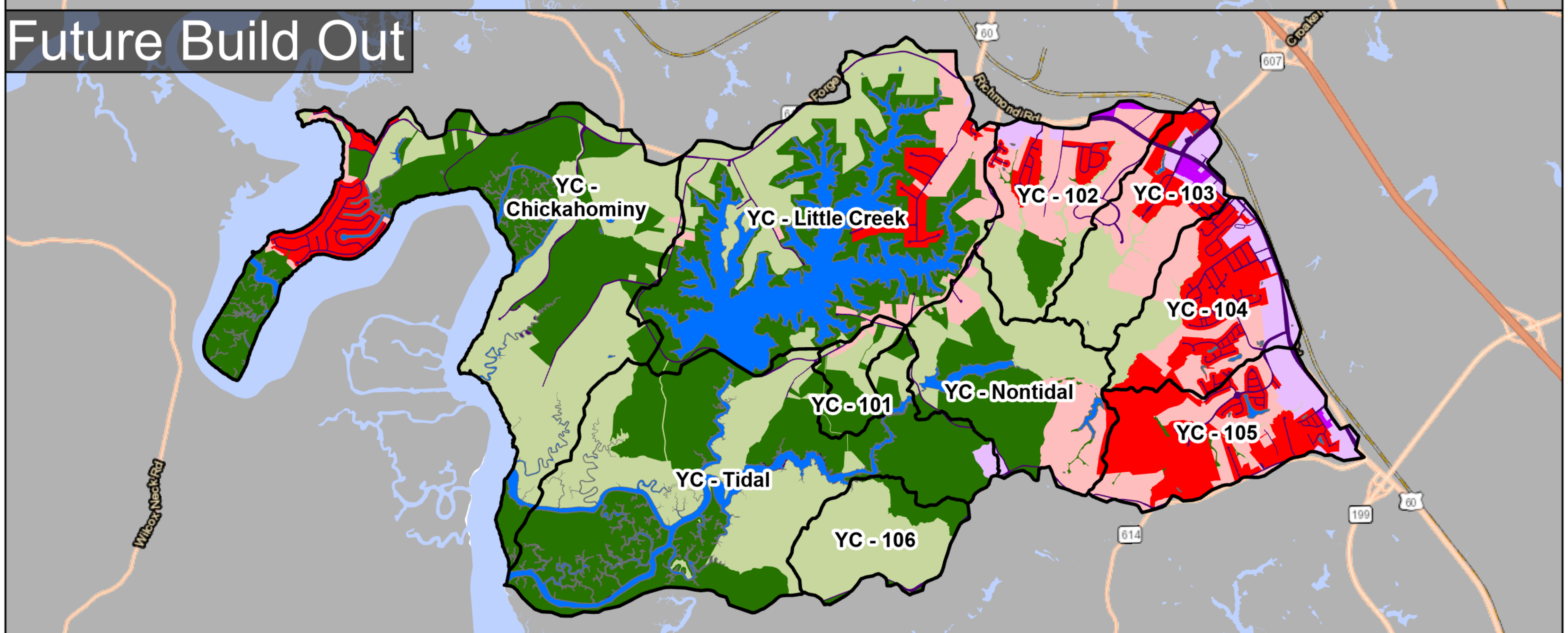
Table 10 – WTM Land Use Inputs Overall Summary

WTM Land Use Type	Existing Land Use		Future Land Use		Existing to Future Estimates - Percent Change	Change in Imp. (ac)
	Area (ac)	Percentage (%)	Area (ac)	Percentage (%)		
Low Density Residential	575	4.1%	1,634	11.8%	184	116.5
Medium Density Residential	1,347	9.7%	1,409	10.2%	4.6	13.0
High Density Residential	-	0.0%	-	0.0%	-	-
Commercial	217	1.6%	352	2.5%	62	96.9
Industrial	37	0.3%	37	0.3%	-	-
Roadway	418	3.0%	418	3.0%	-	-
Forest	5,662	40.9%	4,443	32.1%	-22	12.2
Rural	4,108	29.7%	4,171	30.1%	2	3.2
Open Water	1,386	10.0%	1,386	10.0%	-	-
Vacant Lots	99	0.7%	-	0.0%	-100	5.0
Total	13,849		13,849			

Note: the darker the red shading, the higher the increase in impervious area

It should be noted that a significant amount of the Watershed is classified as Rural land use type (~30%). The primary sources of pollutants for rural lands vary from other urban development types, and most notably include pollutants from agriculture/livestock areas that are grouped into the Rural land use type. The WTM Model makes assumptions associated with the nature of these lands, and typical pollutant loadings are applied accordingly.





Title

Figure 15 - Land Use Inputs for WTM Scenario Runs

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

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0 1,000 2,000 Feet
(At original document size of 11x17)
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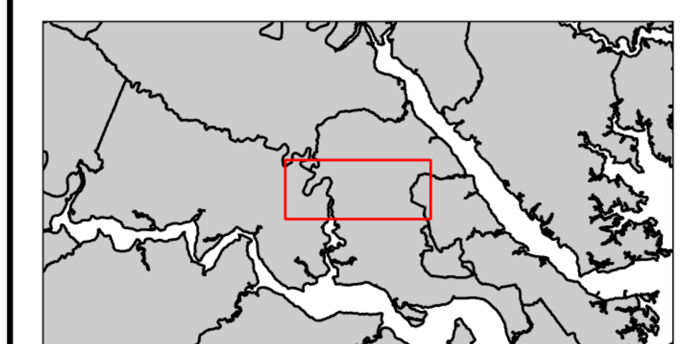
WTM Model Subwatershed Boundary

WTM Inputs - Land Cover/Use

- Open Water
- Forest
- Rural
- Vacant Lots
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Roadway



Notes
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2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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2.2.3.1.2 Secondary Sources of Pollutants

Other pollutant loading in a watershed can come from sources not driven by land use. The WTM considers multiple secondary sources when estimating a final pollutant load. Secondary source loads considered as part of the Yarmouth Creek WTM are septic tank failures, illicit connections, subsurface runoff from lawns, and runoff from vacant lots. Inputs used for these WTM secondary sources were developed using JCC-sourced GIS data.

Secondary pollutant loading from septic tank failures is calculated using the number of septic tanks in each watershed. The WTM uses a default 30% failure rate and default effluent rates for TN, TP, TSS, and Fecal Coliform bacteria to calculate specific pollutant loading rates. Table 11 below shows the percentage of total pollutant loading that comes from septic tank failures in each watershed. Due to the large number of septic tanks in the Watershed, this source of pollution is predicted to be a relatively large portion of the total pollutant loading, especially for Total Nitrogen (25.7% of total TN loading for the Watershed). Figure 16 shows the locations of all septic tanks within the Watershed.

Table 11 – WTM Septic Failure Pollutant Loading

Subwatershed	TN (lbs/year)			Subwatershed	TP (lbs/year)		
	Existing Loads	Load from Septic Failure	%		Existing Loads	Load from Septic Failure	%
YC-101	819	631	77.1%	YC-101	95	8	8.3%
YC-102	4,576	1,250	27.3%	YC-102	582	16	2.7%
YC-103	3,999	1,156	28.9%	YC-103	496	15	2.9%
YC-104	5,834	2,446	41.9%	YC-104	619	31	5.0%
YC-105	5,469	802	14.7%	YC-105	506	10	2.0%
YC-106	1,499	14	0.9%	YC-106	128	0	0.1%
YC-Little Creek	19,013	3,981	20.9%	YC-Little Creek	1,304	50	3.8%
YC-Nontidal	4,162	619	14.9%	YC-Nontidal	420	8	1.8%
YC-Tidal	11,988	453	3.8%	YC-Tidal	1,049	6	0.5%
YC-Chickahominy	12,528	6,620	52.8%	YC-Chickahominy	1,396	83	6.0%
Watershed Totals	69,887	17,971	25.7%	**Watershed Totals**	6,594	226	3.4%
Subwatershed	**TSS (lbs/year)**			**Subwatershed**	**Fecal Coliform Bacteria (10^9 cfu/year)**		
	Existing Loads	**Load from Septic Failure**	**%**		**Existing Loads**	**Load from Septic Failure**	**%**
YC-101	23,440	317	1.4%	YC-101	11,111	720	6.5%
YC-102	107,109	628	0.6%	YC-102	107,542	1,424	1.3%
YC-103	76,411	580	0.8%	YC-103	82,201	1,317	1.6%
YC-104	111,629	1,228	1.1%	YC-104	181,736	2,787	1.5%
YC-105	94,969	403	0.4%	YC-105	164,663	914	0.6%
YC-106	57,679	7	0.0%	YC-106	12,205	16	0.1%
YC-Little Creek	338,288	1,999	0.6%	YC-Little Creek	84,917	4,536	5.3%
YC-Nontidal	110,805	311	0.3%	YC-Nontidal	34,204	705	2.1%
YC-Tidal	316,413	227	0.1%	YC-Tidal	73,812	516	0.7%
YC-Chickahominy	316,479	3,324	1.1%	YC-Chickahominy	167,090	7,544	4.5%
Watershed Totals	1,553,223	9,023	0.6%	**Watershed Totals**	919,481	20,480	2.2%

2.2.3.1.3 Existing Stormwater Management Practices

Programs and practices used to control pollutant loading are included in the WTM as existing management practices. The WTM quantifies the effectiveness of pollution prevention programs such as pet waste education and residential lawn care education. Information on JCC pollution prevention programs was used to choose the factor of effectiveness. Structural stormwater practices (BMPs) are also considered in the WTM through the impervious acreage treated by each type of practice. Treatment information was not provided in JCC GIS data for two large impoundments in the watershed – Little Creek Reservoir and Cranston's Mill Pond, since they are not considered stormwater BMPs. Yet, significant pollutant load reductions are expected from these features, so they have been added herein. Approximate drainage areas were multiplied by the WTM-calculated impervious percentage for their respective subwatersheds to assume an impervious treatment area, which was then included as a Wet Pond under existing stormwater management practices. Since the WTM calculates a different impervious acreage of a subwatershed using default zoning percentages, the total impervious acreage calculated by WTM can be higher than the sum of impervious acreage treated by all BMPs in a subwatershed. In these cases, the difference must be subtracted from the BMP inputs for the WTM to calculate pollutant load reduction. Figure 16 also provides the locations of all identified existing structural stormwater practices.

2.2.3.1.4 Future Development Stormwater Management Practices

For any land use changes from future development, the WTM assumes that new stormwater management practices will be built to address water quality in accordance with Virginia Stormwater Management Program (VSMP) standards. To best emulate these standards, nutrient load reductions from a combination of BMP types were calculated for future development land use and included in the Future scenarios. The mix of BMPs applied to future development was 40% Dry Extended Detention, 40% Wet Ponds, 10% Constructed Wetlands, and 10% Infiltration Practices. A corroborative check using the Virginia Runoff Reduction Method (VRRM) computations spreadsheet associated with the current VSMP standards showed such a mix of BMPs would meet water quality regulatory requirements for an example watershed. Discount factors are applied to these reductions based on the selected Program Option per the WTM documentation, accounting for the potential for less BMP performance over time versus design assumptions due to lack of maintenance and other factors. Program Option 3 was selected as it best represented the design and maintenance standards of new development BMPs within James City County. Program Option 3 requires maintenance and inspection of all BMPs, and it also requires that net stormwater load is reduced to pre-development levels. These requirements result in a higher discount factor for the proposed future development BMPs.

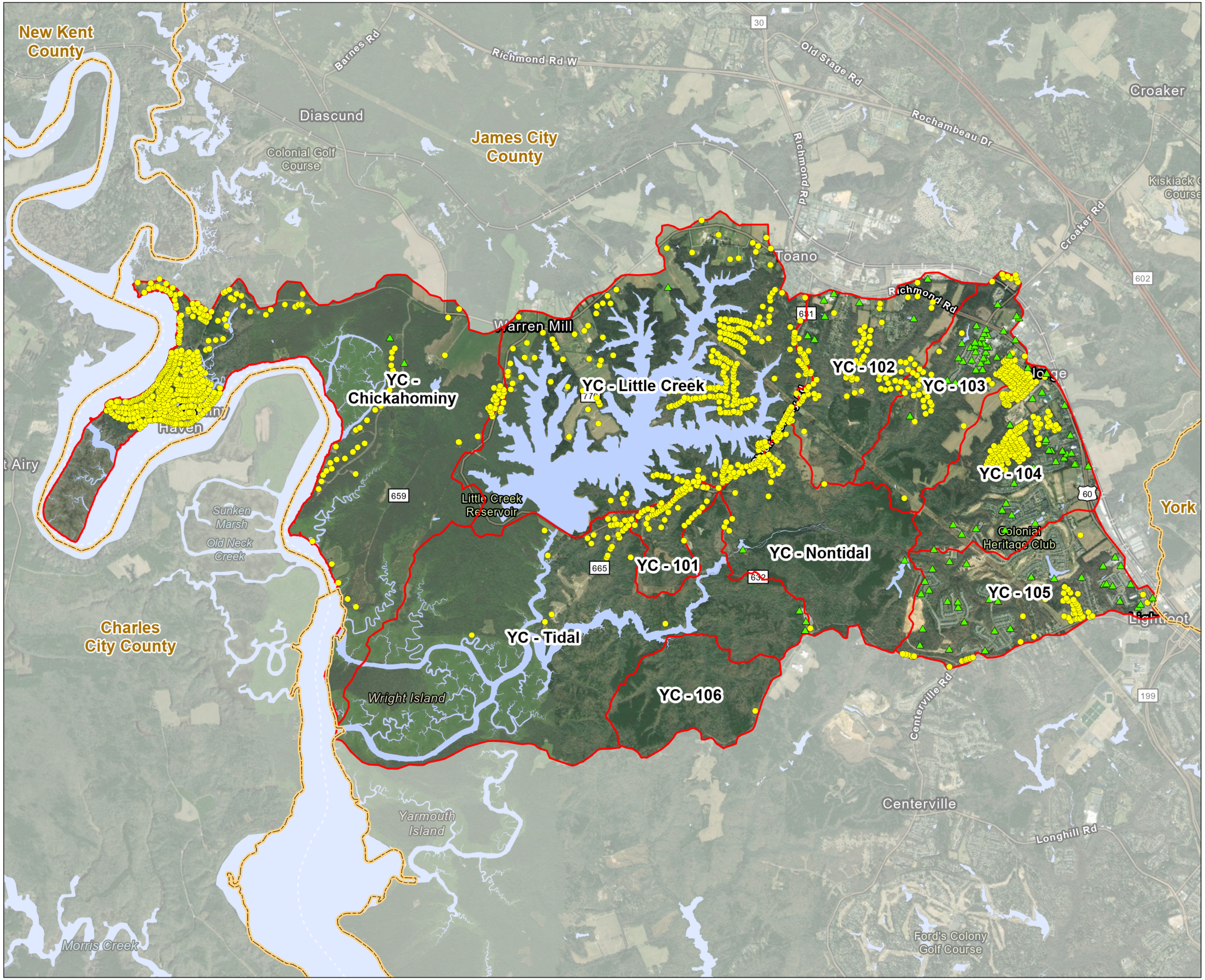

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Figure 16 - Other Spatial Data Used to Derive WTM Inputs

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-08-16
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IR by DP on 2023-08-31

N

0 4,000 8,000 Feet

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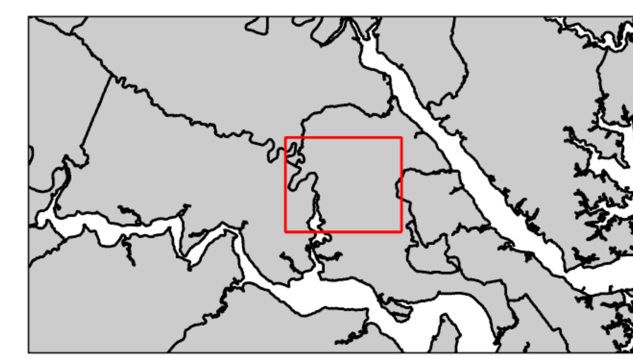
- Stormwater BMP Location
- Septic Tank Parcel Centroid
- Subwatershed Boundary
- Municipal Boundary



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
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2.2.3.2 WTM Outputs

The WTM provides pollutant loading estimates for Total Nitrogen (TN), Total Phosphorus (TP), Total Suspended Solids (TSS), and Fecal Coliform Bacteria (FC). Pollutant loading rates per acre for each land use type were given for primary sources in the WTM. Pollutant loading rates for secondary sources were also given in the WTM, but final pollutant loads include more than those determined by land use area inputs (i.e., septic systems as point inputs in a given watershed). Pollutant reduction rates by BMP type were provided by WTM and used to calculate overall pollutant load reductions based on impervious treatment areas. Reductions from other existing management practices were calculated in the WTM using pre-defined factors based on the existence and effectiveness of certain pollution prevention programs and infrastructure. Please refer to the CWP Model Documentation for further details and assumptions on how the WTM estimates these four pollutants' dynamics and loading (CWP, 2013).

The WTM is a great tool for watershed managers and other interested parties but there are limitations Stantec identified during review of modeling outputs. The model assumes a total sediment load for a given drainage area based on watershed size only—not accounting for the composition of Land Use and Land Cover (LULC) types. When TSS loads from primary sources (LULC) change (i.e., increase) into the future the total assumed sediment load from the drainage area does not increase but simply shifts some load from primary sources (upland loading) to secondary sources (channel erosion). This amounts to a "Zero-Sum" effect where expected TSS from a drainage area does not increase regardless of how developed the drainage area happens to be. Because of this model characteristic only upland loading (i.e., Primary Source Loads) of TSS output estimates is included below.

Table 12 provides total pollutant load estimates for each subwatershed, from just that subwatershed, within the Yarmouth Creek Watershed for the existing and future land use scenarios. Table 13 provides cumulative (total) pollutant load estimates expected at the outlet of each subwatershed for existing and future land use scenarios. These cumulative loads can be used to identify if and where surface water loads might exceed certain thresholds for water quality standards or goals. Table 14 provides annual loading rate per acre of land per subwatershed (shown on Figure 21, Figure 22, Figure 23, and Figure 24). Note that Table 12 and Table 13 provide annual load estimates, and Table 14 provides annual loading rates per acre of land. The cumulative loading rates provided in Table 13 are shown as stream lines with their associated colors in Figure 21, Figure 22, Figure 23, and Figure 24 to visually present the cumulative effects of upstream pollutant loads on downstream waterways.

Table 12 – WTM Pollutant Load Estimates Summary

Subwatershed	TN (lbs/year)				Subwatershed	TP (lbs/year)			
	Existing Load (No BMPs)	Load removed by BMPs	Existing Load (w/ BMP Removal)	Future Load		Existing Load (No BMPs)	Load removed by BMPs	Existing Load (w/ BMP Removal)	Future Load
YC-101	819	0	819	819	YC-101	95	0	95	95
YC-102	4,650	75	4,576	4,871	YC-102	599	17	582	567
YC-103	4,375	376	3,999	4,457	YC-103	574	77	496	509
YC-104	6,204	370	5,834	6,146	YC-104	698	79	619	640
YC-105	6,052	582	5,469	6,261	YC-105	631	126	506	585
YC-106	1,499	0	1,499	2,441	YC-106	128	0	128	352
YC-Little Creek	19,453	440	19,013	19,174	YC-Little Creek	1,394	90	1,304	1,301
YC-Nontidal	4,289	127	4,162	4,620	YC-Nontidal	446	26	420	466
YC-Tidal	11,989	1	11,988	12,678	YC-Tidal	1,049	0	1,049	1,213
YC-Chickahominy	12,529	1	12,528	12,536	YC-Chickahominy	1,397	0	1,396	1,397
Watershed Totals	71,860	1,973	69,887	74,002	**Watershed Totals**	7,010	416	6,594	7,125

Subwatershed	TSS (lbs/year)				Subwatershed	Fecal Coliform Bacteria (10^9 cfu/year)			
	Existing Load (No BMPs)	Load removed by BMPs	Existing Load (w/ BMP Removal)	Future Load		Existing Load (No BMPs)	Load removed by BMPs	Existing Load (w/ BMP Removal)	Future Load
YC-101	23,440	0	23,440	23,440	YC-101	11,111	0	11,111	11,111
YC-102	111,756	4,647	107,109	107,108	YC-102	114,693	7,151	107,542	121,322
YC-103	100,838	24,427	76,411	77,194	YC-103	114,661	32,460	82,201	99,024
YC-104	135,285	23,656	111,629	113,706	YC-104	216,191	34,455	181,736	193,471
YC-105	134,579	39,610	94,969	98,921	YC-105	220,248	55,585	164,663	188,421
YC-106	57,679	0	57,679	57,763	YC-106	12,205	0	12,205	24,299
YC-Little Creek	369,546	31,258	338,288	338,289	YC-Little Creek	128,966	44,049	84,917	92,866
YC-Nontidal	120,004	9,198	110,805	110,805	YC-Nontidal	46,901	12,697	34,204	44,385
YC-Tidal	316,501	88	316,413	316,559	YC-Tidal	73,924	112	73,812	82,665
YC-Chickahominy	316,493	13	316,479	316,480	YC-Chickahominy	167,163	73	167,090	167,337
Watershed Totals	1,686,120	132,898	1,553,223	1,560,267	**Watershed Totals**	1,106,064	186,583	919,481	1,024,901

Table 13 – Cumulative WTM Pollutant Load Rate Estimates Summary

Subwatershed	TN (lbs/ac/year)			Subwatershed	TP (lbs/ac/year)		
	Existing Loads	Future Loads	% Change		Existing Loads	Future Loads	% Change
YC-101	3.71	3.71	0.0%	YC-101	0.43	0.43	0.0%
YC-102	5.35	5.70	6.4%	YC-102	0.68	0.66	-2.6%
YC-103	5.42	6.04	11.5%	YC-103	0.67	0.69	2.6%
YC-104	6.77	7.13	5.4%	YC-104	0.72	0.74	3.3%
YC-105	5.81	6.65	14.5%	YC-105	0.54	0.62	15.6%
YC-106	2.72	4.42	62.8%	YC-106	0.23	0.64	175.4%
YC-Little Creek	6.59	6.64	0.8%	YC-Little Creek	0.45	0.45	-0.2%
YC-Nontidal	5.37	5.89	9.6%	YC-Nontidal	0.59	0.62	5.5%
YC-Tidal	5.20	5.57	7.2%	YC-Tidal	0.47	0.52	10.2%
YC-Chickahominy	4.46	4.47	0.1%	YC-Chickahominy	0.50	0.50	0.0%
Watershed Totals	5.05	5.34	5.9%	**Watershed Totals**	0.48	0.51	8.0%

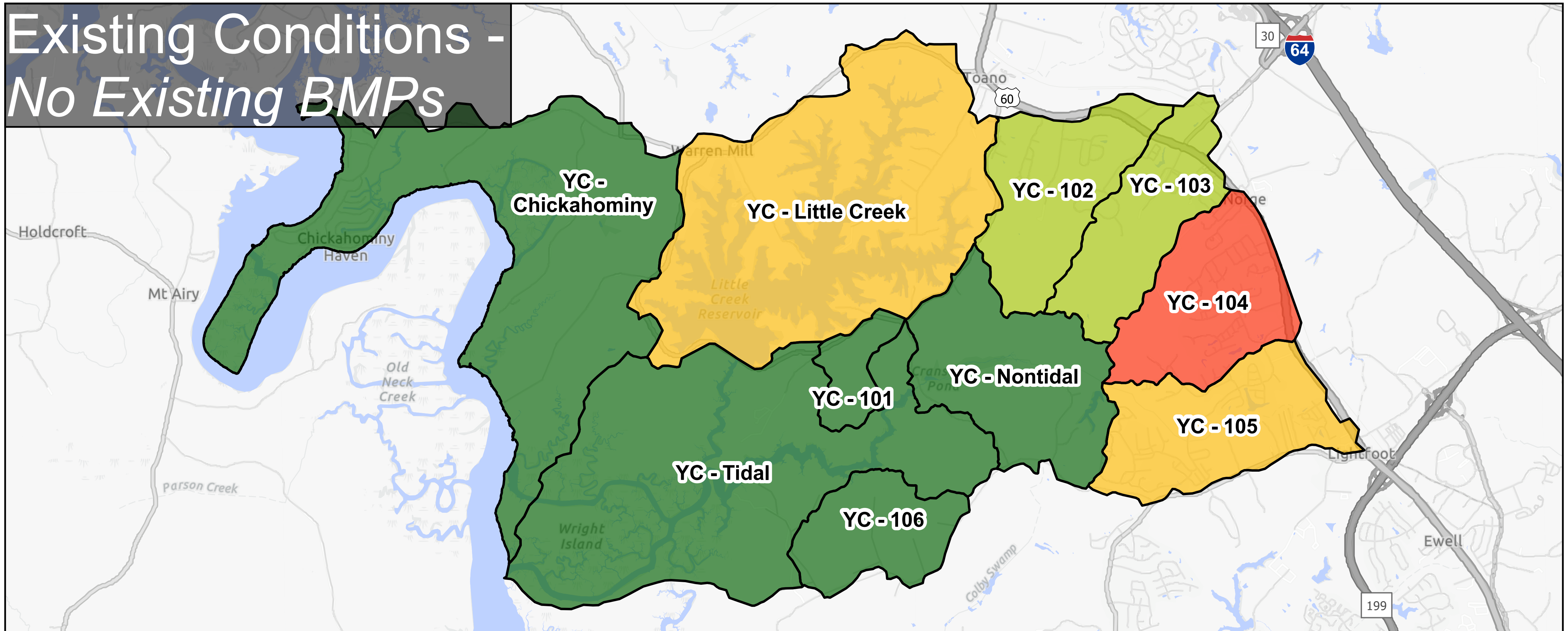
Subwatershed	TSS (lbs/ac/year)			Subwatershed	Fecal Coliform Bacteria (10^9 cfu/ac/year)		
	Existing Loads	Future Loads	% Change		Existing Loads	Future Loads	% Change
YC-101	106.10	106.10	0.0%	YC-101	50.29	50.29	0.0%
YC-102	125.34	125.34	0.0%	YC-102	125.85	141.98	12.8%
YC-103	103.51	104.57	1.0%	YC-103	111.35	134.14	20.5%
YC-104	129.56	131.97	1.9%	YC-104	210.93	224.55	6.5%
YC-105	100.87	105.07	4.2%	YC-105	174.90	200.14	14.4%
YC-106	104.53	104.68	0.1%	YC-106	22.12	44.04	99.1%
YC-Little Creek	117.19	117.19	0.0%	YC-Little Creek	29.42	32.17	9.4%
YC-Nontidal	111.87	113.39	1.4%	YC-Nontidal	127.38	144.41	13.4%
YC-Tidal	112.03	112.67	0.6%	YC-Tidal	68.15	77.68	14.0%
YC-Chickahominy	112.78	112.78	0.0%	YC-Chickahominy	59.54	59.63	0.1%
Watershed Totals	112.18	112.69	0.5%	**Watershed Totals**	66.41	74.02	11.5%

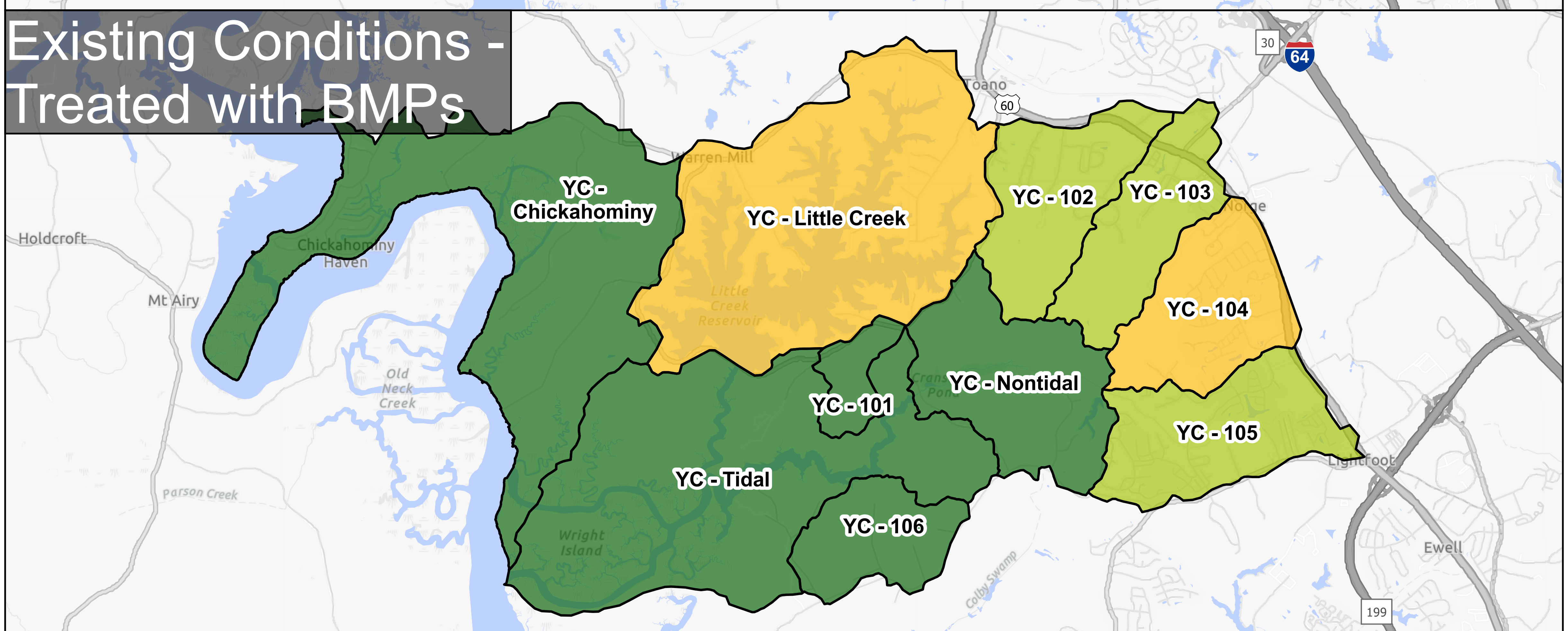
Table 14 – Individual WTM Pollutant Load Rate Estimates Summary

Subwatershed	TN (lbs/ac/year)			Subwatershed	TP (lbs/ac/year)		
	Existing Loads	Future Loads	% Change		Existing Loads	Future Loads	% Change
YC-101	3.71	3.71	0.0%	YC-101	0.43	0.43	0.0%
YC-102	5.35	5.70	6.4%	YC-102	0.68	0.66	-2.6%
YC-103	5.42	6.04	11.5%	YC-103	0.67	0.69	2.6%
YC-104	6.77	7.13	5.4%	YC-104	0.72	0.74	3.3%
YC-105	5.81	6.65	14.5%	YC-105	0.54	0.62	15.6%
YC-106	2.72	4.42	62.8%	YC-106	0.23	0.64	175.4%
YC-Little Creek	6.59	6.64	0.8%	YC-Little Creek	0.45	0.45	-0.2%
YC-Nontidal	3.85	4.27	11.0%	YC-Nontidal	0.39	0.43	11.0%
YC-Tidal	4.13	4.37	5.8%	YC-Tidal	0.36	0.42	15.6%
YC-Chickahominy	4.46	4.47	0.1%	YC-Chickahominy	0.50	0.50	0.0%
Watershed Totals	5.05	5.34	5.9%	**Watershed Totals**	0.48	0.51	8.0%

Subwatershed	TSS (lbs/ac/year)			Subwatershed	Fecal Coliform Bacteria (10^9 cfu/ac/year)		
	Existing Loads	Future Loads	% Change		Existing Loads	Future Loads	% Change
YC-101	106.10	106.10	0.0%	YC-101	50.29	50.29	0.0%
YC-102	125.34	125.34	0.0%	YC-102	125.85	141.98	12.8%
YC-103	103.51	104.57	1.0%	YC-103	111.35	134.14	20.5%
YC-104	129.56	131.97	1.9%	YC-104	210.93	224.55	6.5%
YC-105	100.87	105.07	4.2%	YC-105	174.90	200.14	14.4%
YC-106	104.53	104.68	0.1%	YC-106	22.12	44.04	99.1%
YC-Little Creek	117.19	117.19	0.0%	YC-Little Creek	29.42	32.17	9.4%
YC-Nontidal	102.43	102.43	0.0%	YC-Nontidal	31.62	41.03	29.8%
YC-Tidal	109.02	109.07	0.0%	YC-Tidal	25.43	28.48	12.0%
YC-Chickahominy	112.78	112.78	0.0%	YC-Chickahominy	59.54	59.63	0.1%
Watershed Totals	112.18	112.69	0.5%	**Watershed Totals**	66.41	74.02	11.5%

Note: The color scheme of this table is the same seen in Figures 17 – 20 as well as Figures 21 - 24; individually scaled for each pollutant but with all scenarios grouped together.





Title

Figure 17 - WTM Total Nitrogen Loading Rates – Existing Conditions Comparison

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

0 5,000 10,000 Feet

(At original document size of 11x17)
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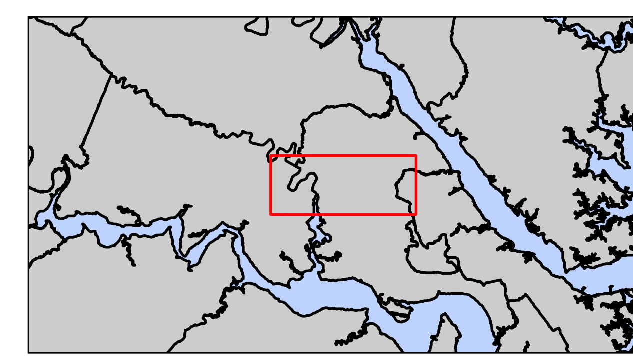
Subwatershed Boundary

Total Nitrogen Areal Loading Rates
(lbs / acre / year)

- < 5
- 5 - 6
- 6 - 7
- > 7



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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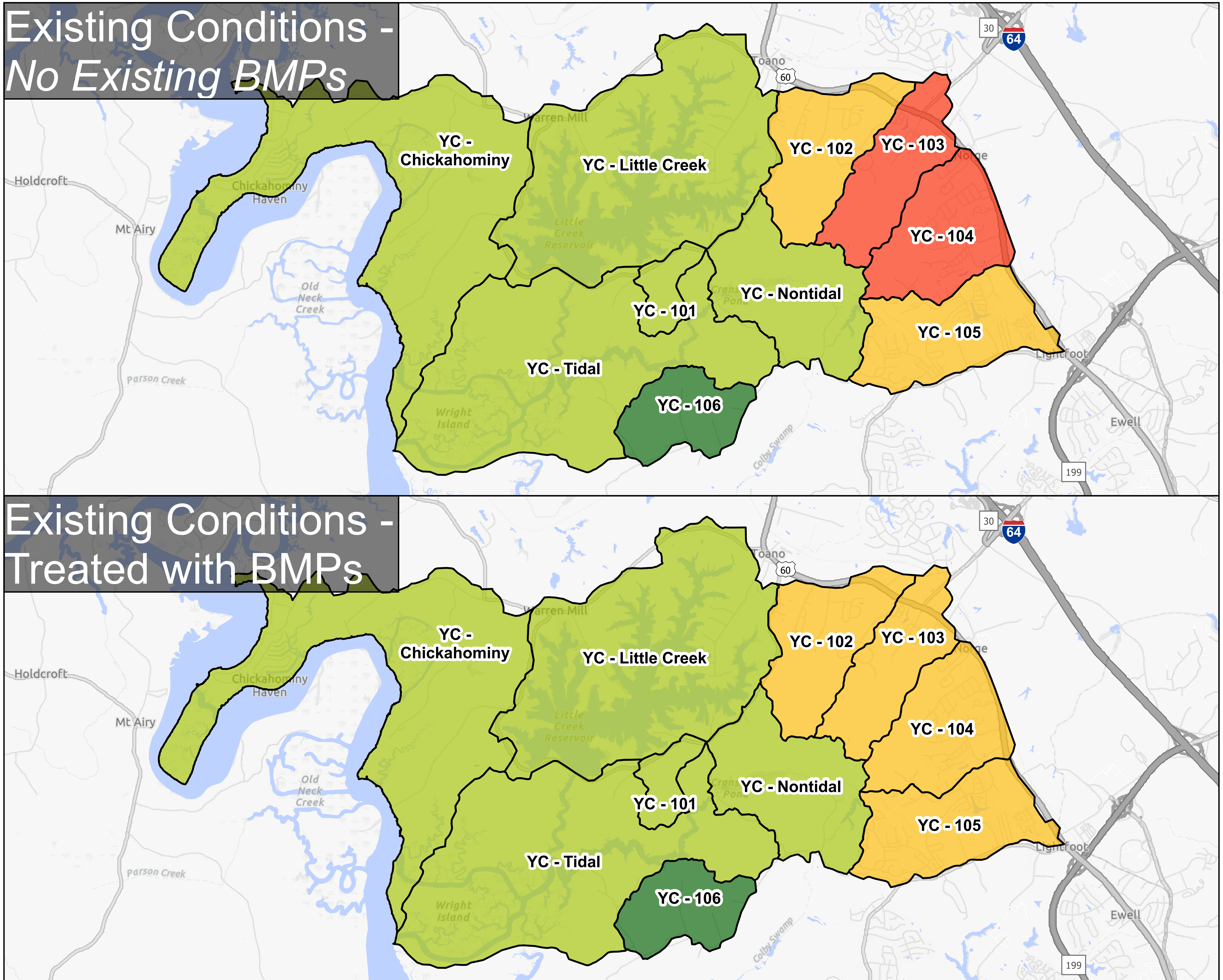
James City County Virginia Jamestown 1607



Title

Figure 18 - WTM Total Phosphorus Loading Rates – Existing Conditions Comparison

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

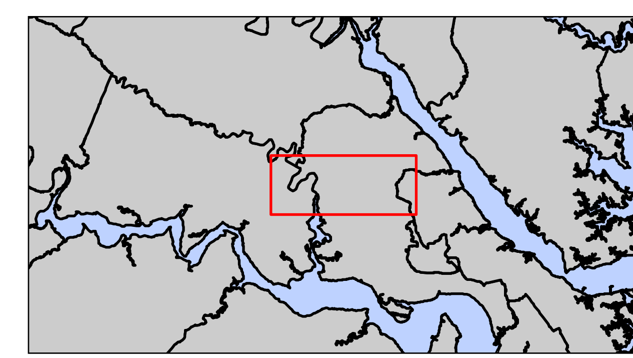
0 5,000 10,000 Feet

(At original document size of 11x17)
1:60,000

Subwatershed Boundary

Total Phosphorus Areal Loading Rates
(lbs / acre / year)

- < 0.25
- 0.25 - .05
- 0.5 - 0.75
- > 0.75



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
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James City County Virginia Jamestown 1607

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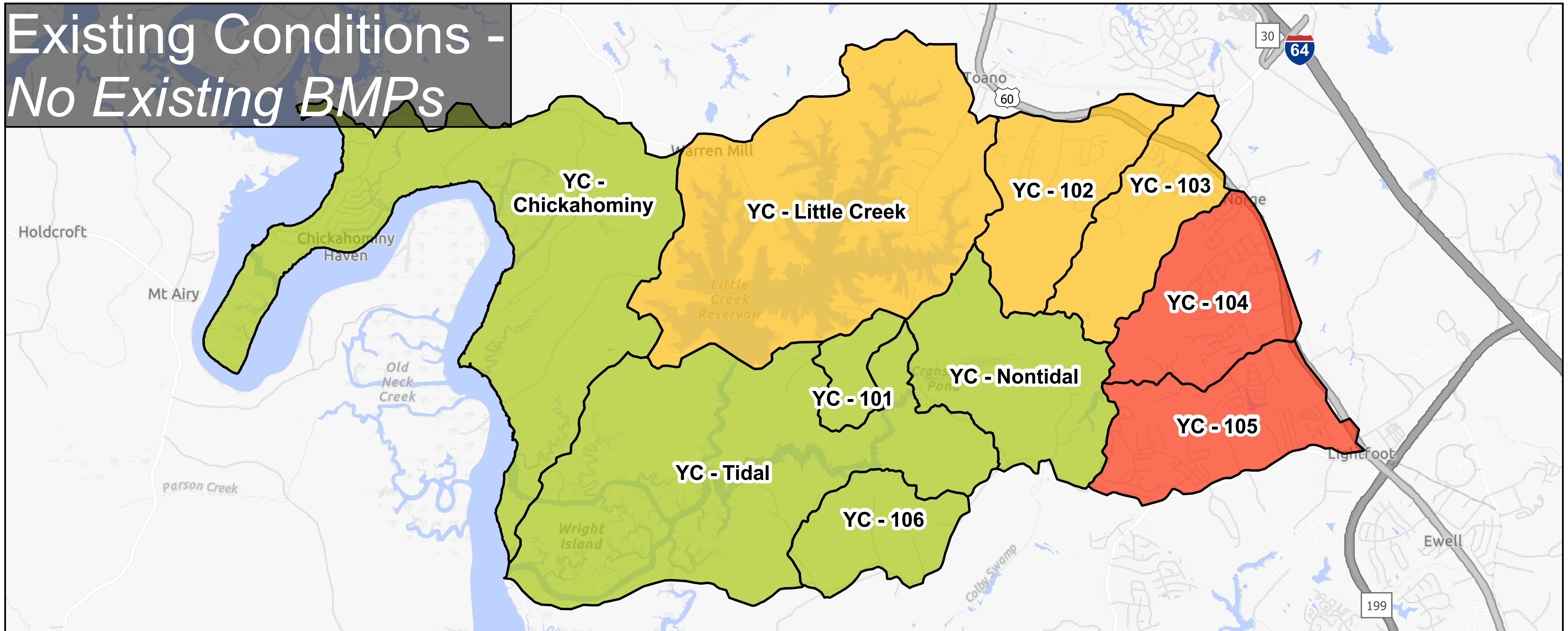
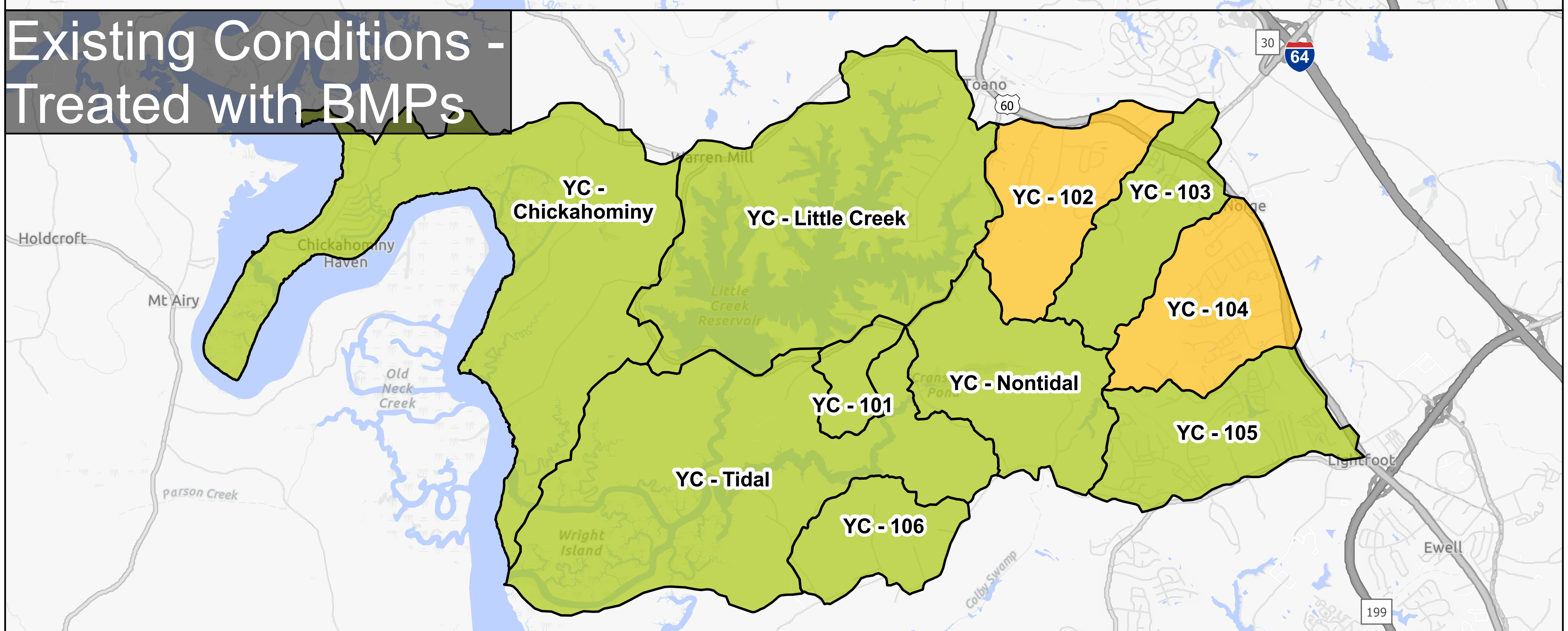




Title

Figure 19 - WTM Total Suspended Solids Loading Rates – Existing Conditions Comparison

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

0 5,000 10,000 Feet

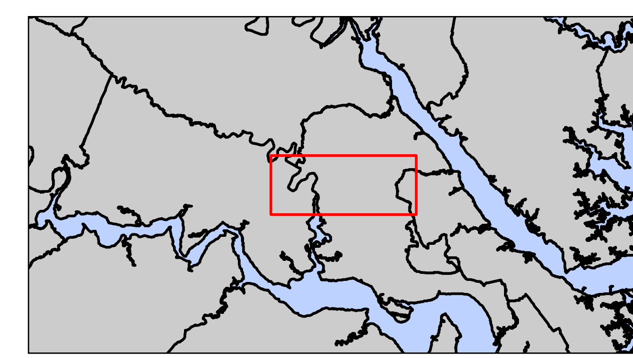
(At original document size of 11x17)
1:60,000

Subwatershed Boundary

Total Suspended Solids Areal Loading Rates

(lbs / acre / year)

- 100 - 120
- 120 - 140
- > 140



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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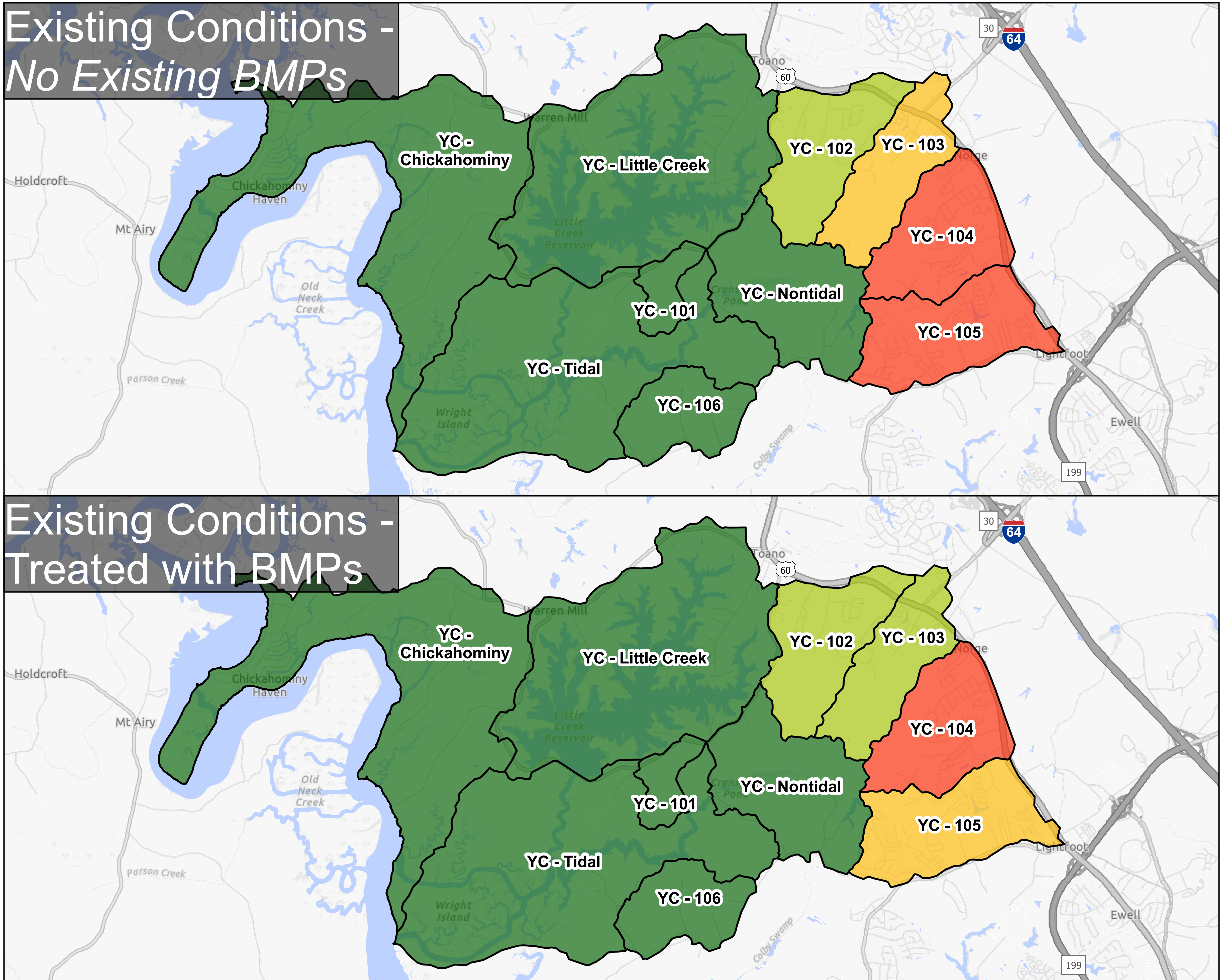


Title

Figure 20 - WTM Fecal Coliform Bacterial Loading Rates – Existing Conditions Comparison

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

0 5,000 10,000 Feet

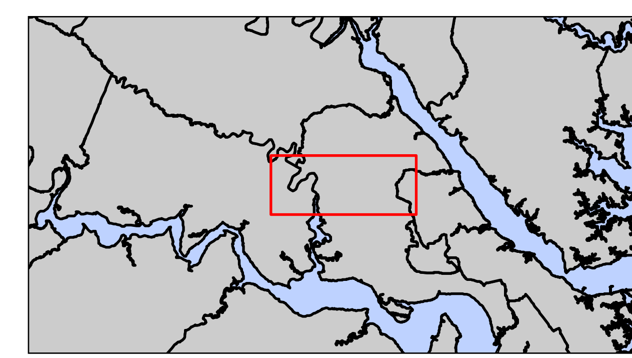
(At original document size of 11x17)
1:60,000

Subwatershed Boundary

Total Bacterial (Fecal Coliform) Areal Loading Rates

(billions / acre / year)

- < 100
- 100 - 150
- 150 - 200
- > 200



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
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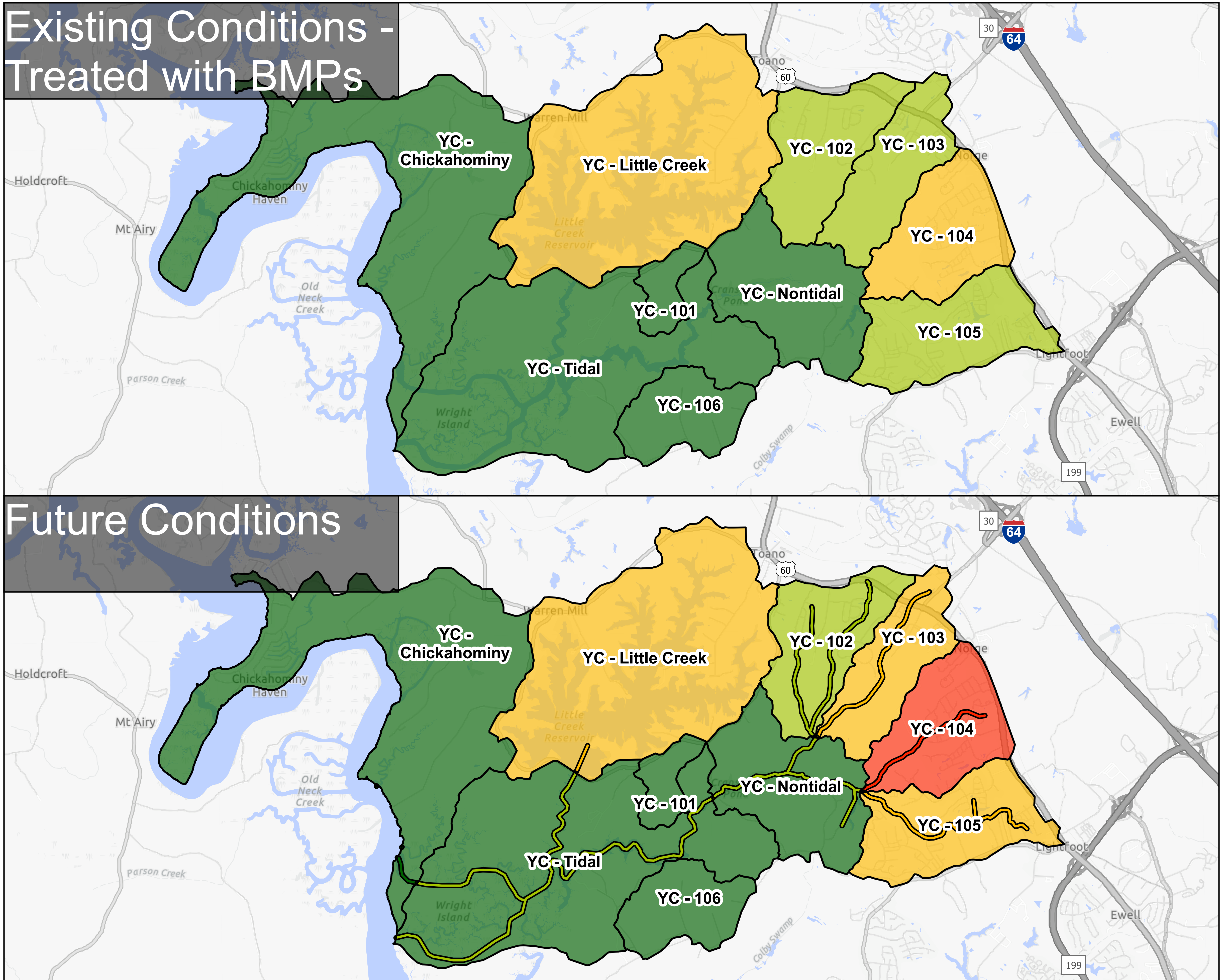


Title

Figure 21 - WTM Total Nitrogen Loading Rates – Future Conditions Comparison

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

0 5,000 10,000 Feet

(At original document size of 11x17)
1:60,000

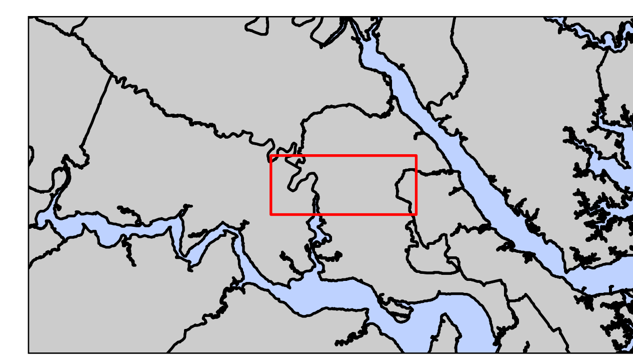
Subwatershed Boundary

Total Nitrogen Areal Loading Rates
(lbs / acre / year)

- < 5
- 5 - 6
- 6 - 7
- > 7

Downstream Cumulative TN Loading Rate
(lbs / acre / year)

- < 5
- 5 - 6
- 6 - 7
- > 7



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
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James City County Virginia Jamestown 1607

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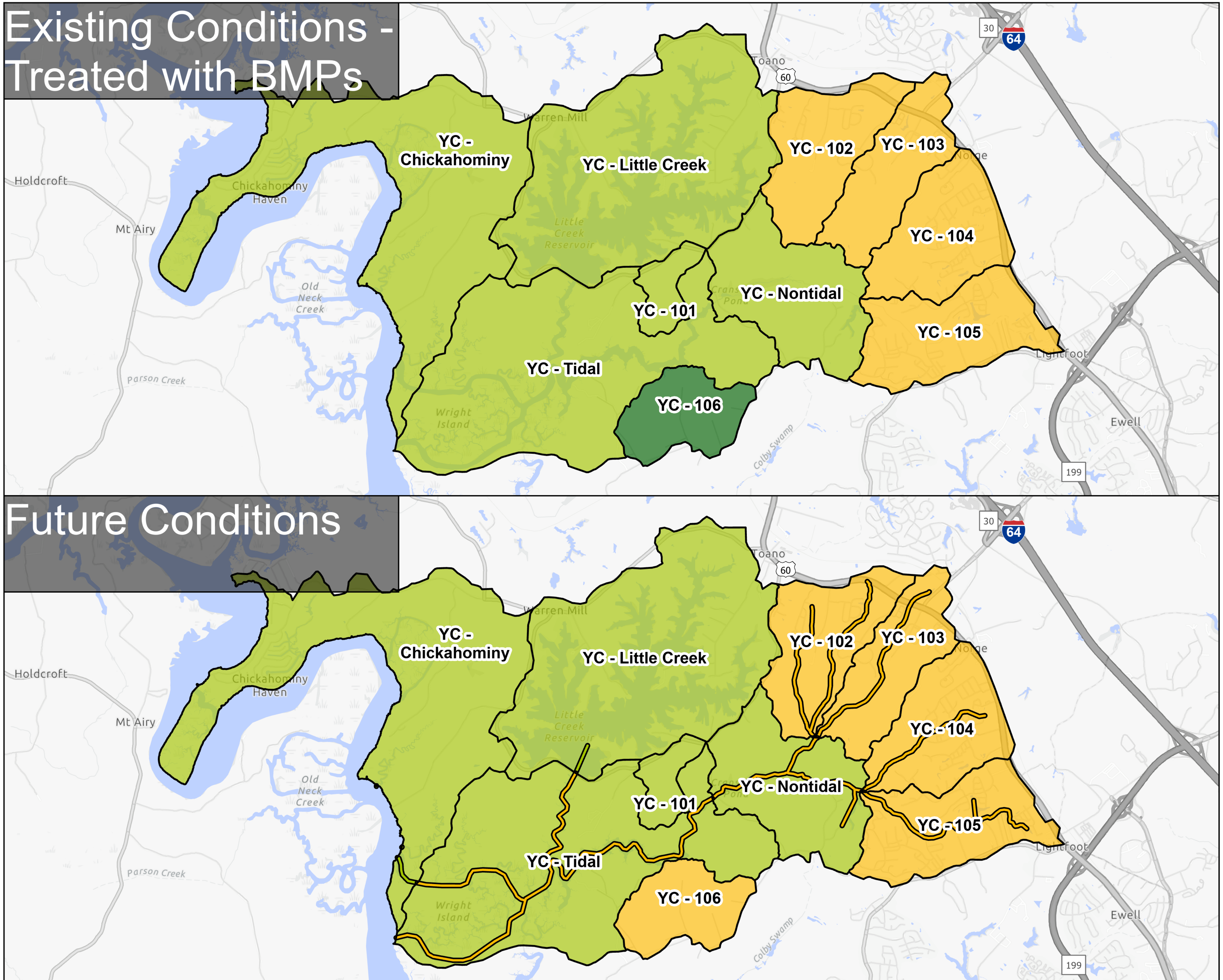


Title

Figure 22 - WTM Total Phosphorus Loading Rates – Future Conditions Comparison

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by PC on 2023-XX-XX
IR by DP on 2026-XX-XX

N

0 5,000 10,000 Feet

(At original document size of 11x17)
1:60,000

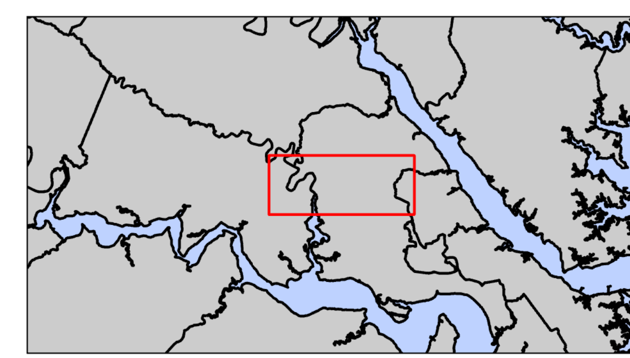
Subwatershed Boundary

Total Phosphorus Areal Loading Rates
(lbs / acre / year)

- < 0.25
- 0.25 - 0.5
- 0.5 - 0.75

Downstream Cumulative TP Loading Rate
(lbs / acre / year)

- 0.25 - 0.5
- 0.5 - 0.75



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1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
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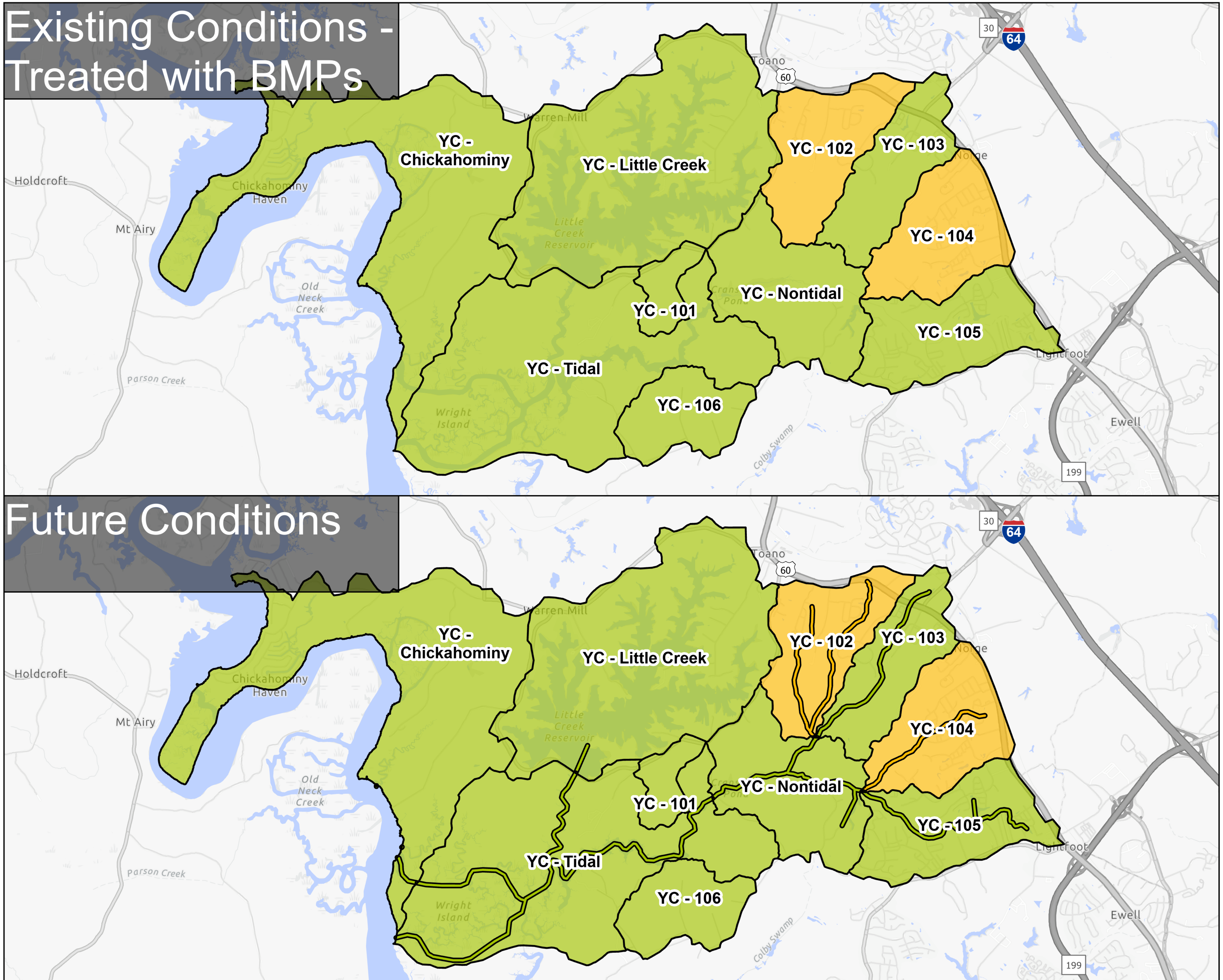

Title

Figure 23 - WTM Total Suspended Solids Loading Rates – Future Conditions Comparison

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

0 5,000 10,000 Feet

(At original document size of 11x17)
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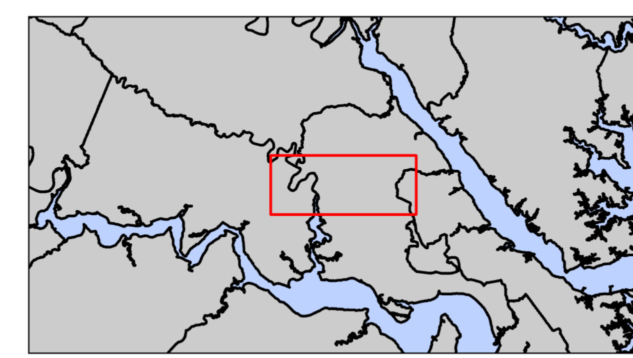
Subwatershed Boundary

Total Suspended Solids Areal Loading Rates
(lbs / acre / year)

- 100 - 120
- 120 - 140

Downstream Cumulative TSS Loading Rate
(lbs / acre / year)

- 100 - 120
- 120 - 140



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1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
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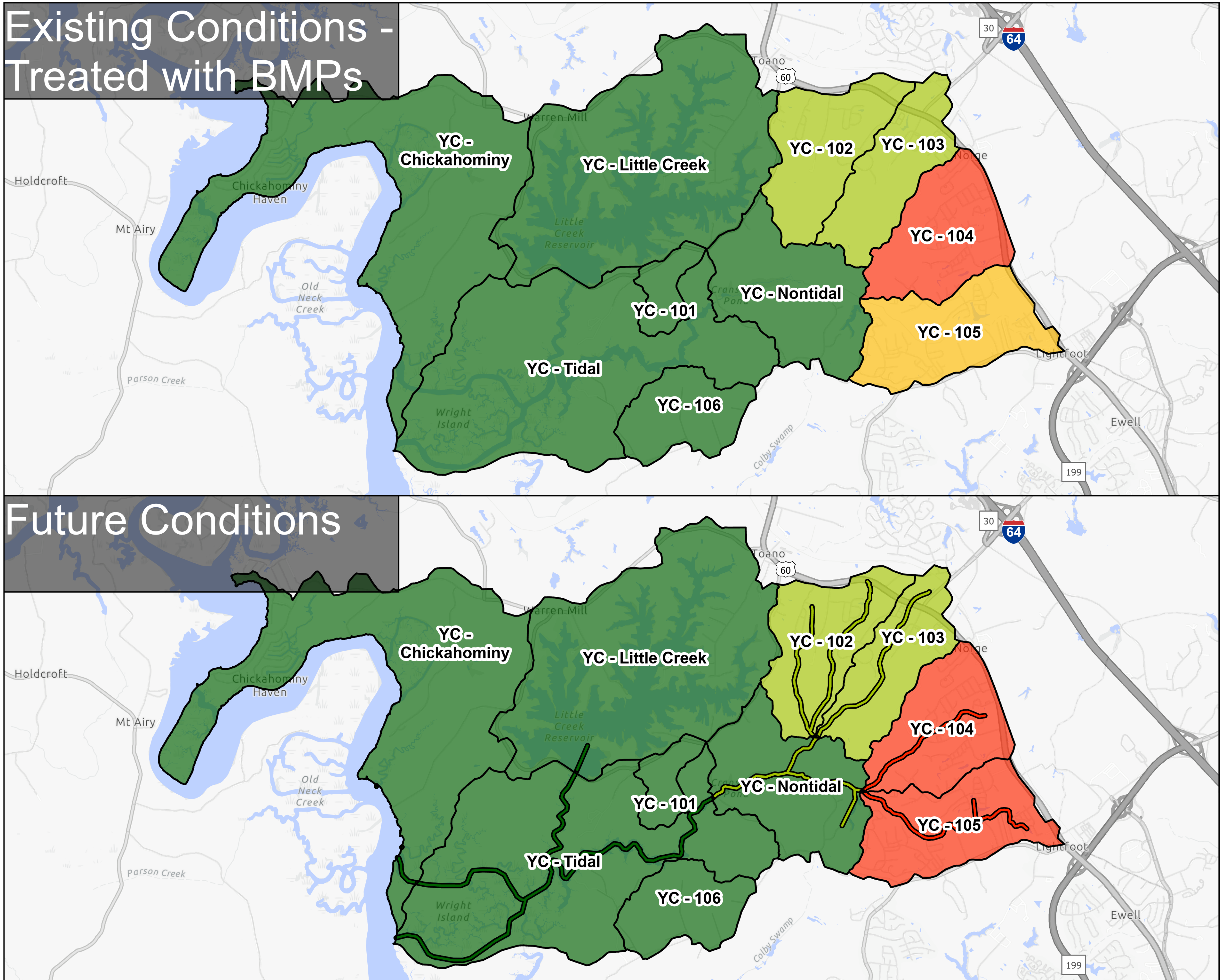


Title

Figure 24 - WTM Fecal Coliform Bacterial Loading Rates – Future Conditions Comparison

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-07-20
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

0 5,000 10,000 Feet

(At original document size of 11x17)
1:60,000

Subwatershed Boundary

Total Bacterial (Fecal Coliform) Areal Loading Rates

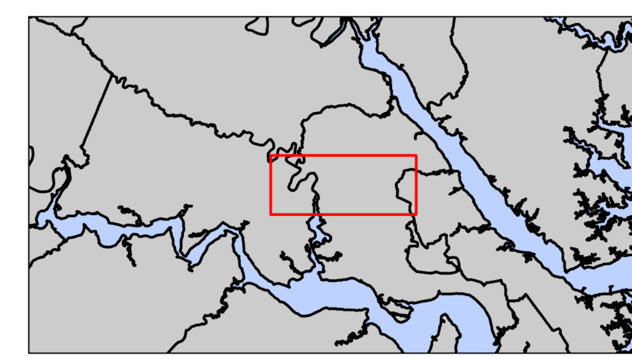
(billions / acre / year)

- < 100
- 100 - 150
- 150 - 200
- > 200

Downstream Cumulative Bacterial (Fecal Coliform) Loading Rate

(billions / acre / year)

- < 100
- 100 - 150
- > 200



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
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Generally, trends observed from the WTM outputs show an increase for all 4 modeled pollutants in several subwatersheds—with a correlation with existing developable land that is forecasted to be developed into the future. Subwatersheds 102, 103, 104, and 105 are already the most developed within the Watershed, but are still expected to see increases in pollutant loads despite the relative lack of area left to be developed in future projections. Subwatershed 101 does not see any future development, and therefore does not show any increase in pollutant loads. Subwatershed 106 sees the highest percent change of loading rate due to the relative lack of existing development, but the pollutant loads are comparatively low due to the smaller size of the watershed. The Little Creek and Chickahominy Subwatersheds did not have large areas of future development, leading to relatively small increases in loading rates in the future scenario. The Nontidal and Tidal Subwatersheds show small increases in TN, TP, and Bacteria loading rates due to land use changes in the future projection, but TSS loading rates associated with those land use changes stay the same due to the selected land use types having similar TSS loading rates in the WTM.

Cumulative downstream effects of future land use changes are only present in the Tidal and Nontidal Subwatersheds due to the natural confluences of Yarmouth Creek and its tributaries. All other subwatersheds do not experience cumulative pollutant loading effects. While the Nontidal and Tidal Subwatersheds do not show large increases in pollutant loads individually, they do experience the cumulative effects of upstream future development, most notably in Subwatersheds 102, 103, 104, and 105. These cumulative effects were taking into consideration when developing goals and recommended actions for each subwatershed.

These WTM loading estimates provided can be used to assist future pollutant load management efforts. To prevent increases in future pollutant loading, new stormwater management practices can be constructed to account for loading differences, or existing practices can be retrofitted in areas where new BMP construction is not feasible. This information was used to inform Watershed Restoration Projects and their prioritization detailed in Sections 5 and 6.

2.2.4 FLOOD RISK STUDY

Flooding events that affect our infrastructure, homes, and lives are becoming increasingly noticeable and so any Watershed Management Plan should incorporate some level of flood risk analysis to cover this important topic. Therefore, flood preparedness has become one of the Goals for the Yarmouth Creek Watershed Management effort.

To understand the various flood risks that are present in the Yarmouth Creek Watershed, a review of existing floodplain conditions associated with the regulated floodplain defined by the Federal Emergency Management Agency (FEMA) was performed. At-risk areas have been identified within the FEMA floodplain to help guide floodplain management efforts JCC may want to pursue. Additionally, potential increased risks associated with future increased flooding predictions were also performed.

Since no hydrologic or hydraulic models were available, the evaluation herein is limited to an overlay of the base floodplain mapping. The base floodplain limits were derived from the FEMA Flood Insurance Rate Maps (FIRM) for James City County. The 100-year regulated FEMA floodplain was used for this evaluation, representing the storm conditions with 1% chance of occurrence each year.

2.2.4.1 Evaluation of Projected Sea Level Rise

In October 2018, the Hampton Roads Planning District Commission (HRPDC) approved a resolution that encourages the region to consider incorporating Sea Level Rise (SLR) into engineering and planning decisions. This resulted in the Sea Level Rise Planning Policy and Approach. Figure 25 displays the projected sea level change, specifically at Sewell's Point, Virginia which indicates a projected sea level rise between 2 feet and 11 feet by the year 2100. The figure also denotes the recommended sea level rise to assume in making decisions based on near term, mid-term, and long-term planning purposes. Specifically:

- 1.5 ft above the current mean high water for near term projects (2018-2050)
- 3 ft above the current mean high water for mid-term projects (2050-2080)
- 4.5 ft above current mean high water for long-term projects (2080-2100)

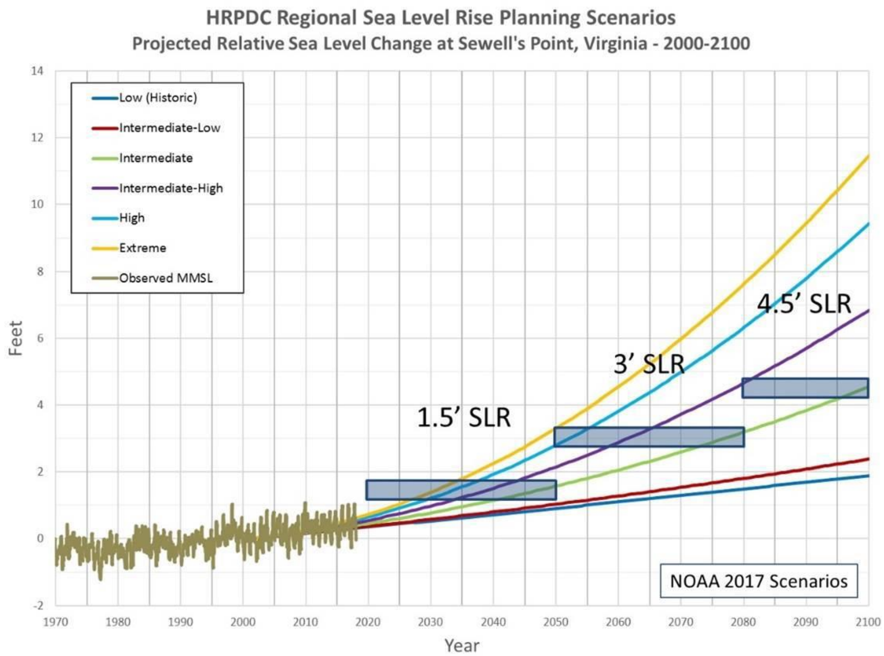


Figure 25 – Projected Relative Sea Level Change at Sewell's Point, Virginia - 2000-2100

Source: Hampton Roads Planning District Commission – Policy Guidance, Regional Sea Level Rise Policy

A range of options exist on how SLR can be incorporated into a flood risk analysis. A few things to consider are:

1) The hazard level associated with the infrastructure at risk (i.e., potential loss of life versus cost of damages) with respect to the probability of exceedance;

2) The projected time period between completion of the Watershed Management Plan and when a future update would be anticipated – the time frame of SLR may not need to greatly exceed the time in which an update would be expected, allowing for adaptive management in future updates;

3) The industry approaches being taken by others in the region and potential consistency with other activities.

In the Virginia Beach Design Standards Manual update, they elected to adopt design requirements consistent with the HRPDC guidance, assuming future sea level rises of 1.5 feet and 3 feet over the tidal base flood elevations for the design of non-critical and critical infrastructure, respectively.

2.2.4.2 Future Floodplain

The FEMA FIRM indicates that the tidal base flood elevation in the Chickahominy River along the limits of the Yarmouth Creek Watershed study area varies from 7 to 9 feet (NAVD 88). The flood elevation is primarily driven by the predicted storm surge with some areas exhibiting moderate wave action, hence the variation in the floodplain. For future potential flood elevations reflective of sea level rise, two scenarios were considered: an increase in water surface elevation by 1.5 feet and 3.0 feet. This is consistent with the aforementioned HRPDC guidance and recent design changes used by the City of Virginia Beach to assume a 1.5-foot and a 3.0-foot increase in tidal base flood elevations to measure the future effects on non-critical and critical infrastructure, respectively. It should be noted that the future flood limits shown herein are approximate in nature and do not account for discrete variations and potential changes due to increased wave action that could occur in some locations. Details of the FEMA base flood elevations can be found in the James City County, Virginia and Independent City of Williamsburg Flood Insurance Study, Revised 2015.

2.2.4.3 Inundation Mapping and Results

To best visualize the extents of the flooding for Yarmouth Creek, the FEMA FIRM was imported into a Geographic Information System (GIS) environment. The water surface elevations were overlaid on a digital elevation model (DEM) of the terrain of the entire watershed. The DEM was obtained from the Virginia Geographic Information Network (VGIN) Geospatial Data Services with elevations referencing the NAVD 88 Datum, the same datum referenced in the flood hazard map.

The impacts of rising sea levels on existing infrastructure were assessed by including shapefiles of existing buildings and critical infrastructure within the Yarmouth Creek Watershed. Location of existing buildings was obtained from statewide buildings shapefile provided by VGIN. Only primary buildings within the Yarmouth Creek watershed were considered. Critical infrastructure describes the physical and cyber systems and assets that are so vital to the community that their incapacity or destruction would have a debilitating impact on the physical or economic security or public health or safety. They include assets, systems, networks, and functions (physical or virtual) vital to the County. Information regarding critical infrastructure was compiled and provided by James City County.

In this analysis, structures were considered "impacted" by the floodwaters if any part of the structures came in contact with the floodwater. Any flood mitigation measures, or elevated structure conditions were not known, so have not been considered. A roadway or bridge was considered impacted if the road was shown to be overtopped at any point. Depths and water velocities were not considered. Figure 26 shows the overall inundation extents of the Yarmouth Creek watershed for the existing and future conditions. Existing conditions assume no increases to sea level. Impacted critical infrastructure and structures that were found to be impacted in future conditions, but not in the existing conditions, are highlighted in the figures. The following subsection further summarizes the results of this analysis for existing and future conditions.

Title

Figure 26 - Overall Inundation Extents for Existing and Future Conditions

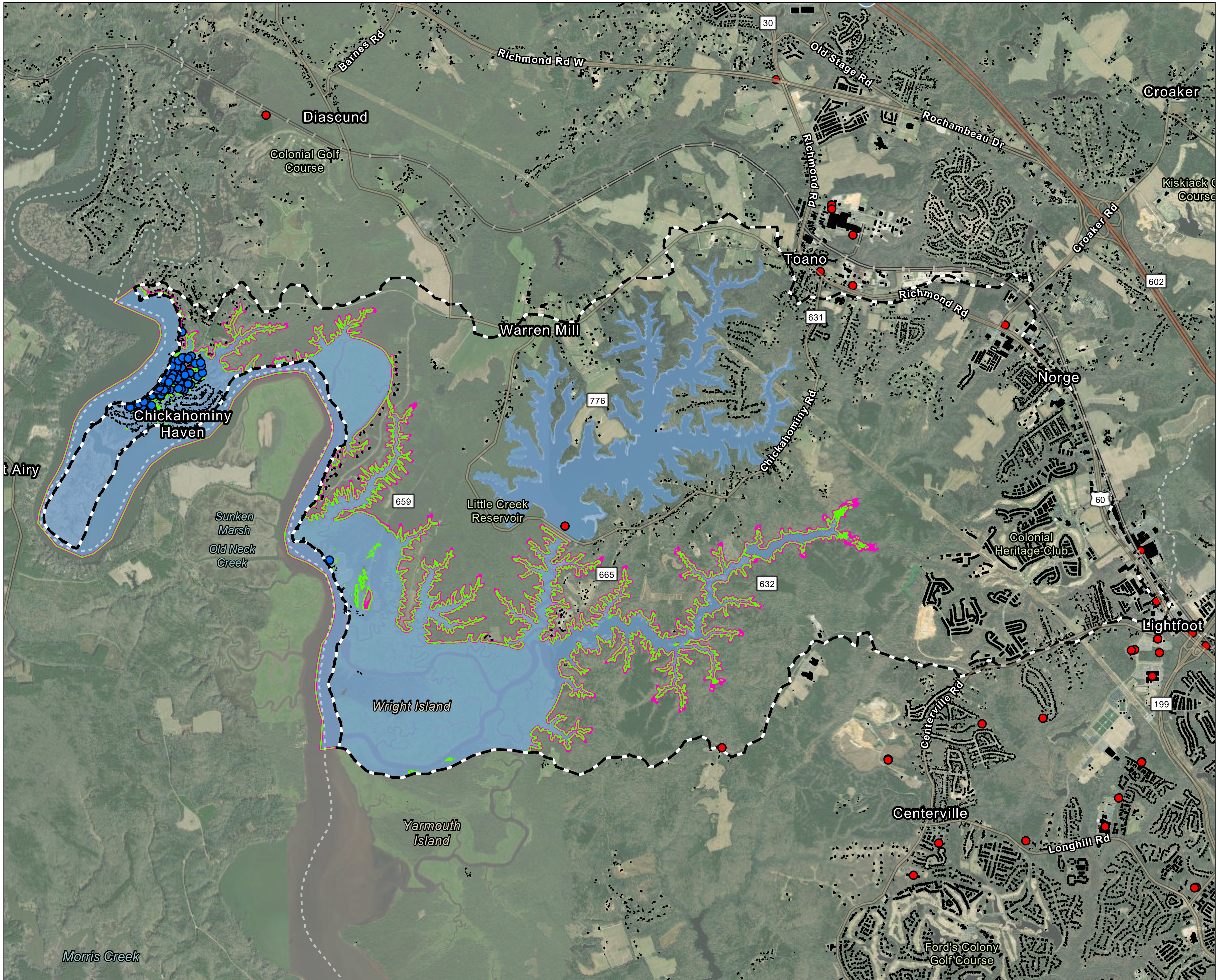
Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

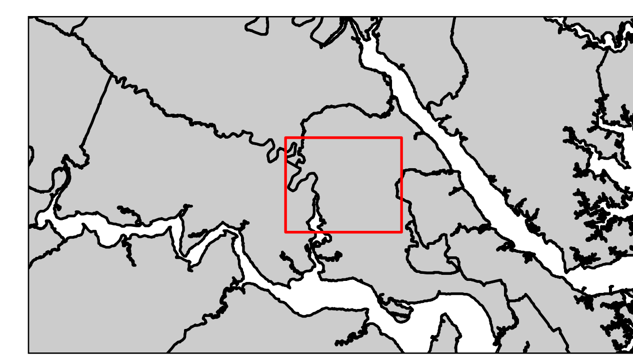
James City County, Virginia

Prepared by MGS on 2023-08-15
TR by JMH on 2023-08-17
IR by DP on 2023-08-31



Base Tidal Level elevations were obtained from the FEMA Flood Insurance Rate Maps. This map measures potential future impacts in the tidal region with assumed increases to those sea level elevations by 1.5 feet and 3.0 feet for non-critical and critical infrastructure.

All elevations reference the NAVD 88 Vertical Datum.



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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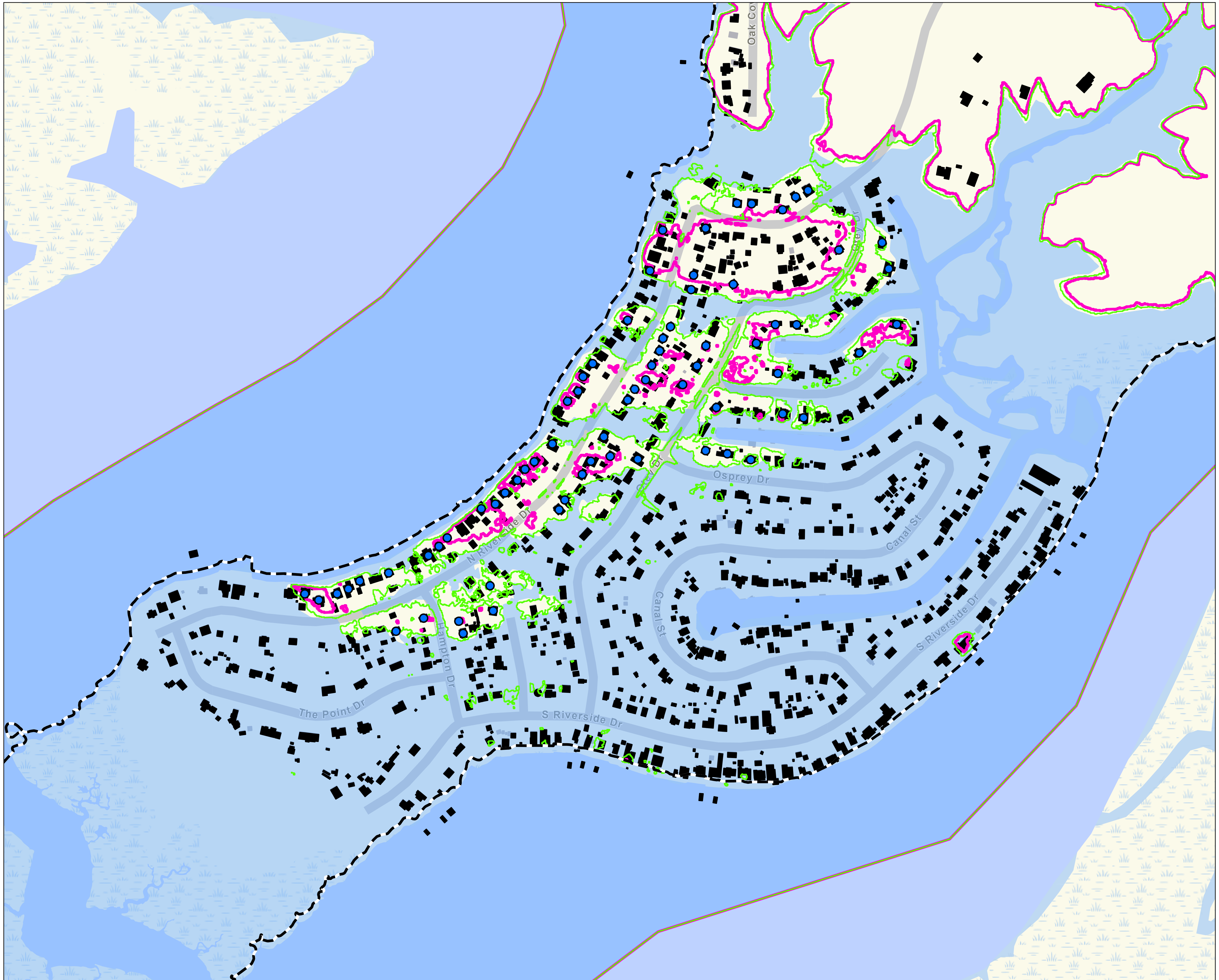
2.2.4.3.1 Existing Conditions

The analysis identified 322 structures within the existing floodplain. Most of these structures are residential. Only one critical infrastructure was located within the Yarmouth Creek existing floodplain, a pump station at Little Creek Dam.

There were two identified neighborhoods that showed to be affected due to access roads into the neighborhood being inundated, potentially obstructing vehicular access in or out of those areas. Where these dead-end conditions were observed by the floodwaters are listed below:

1. All of the Chickahominy Haven Neighborhood was isolated due to North Riverside Dr overtopping, potentially affecting access to a large number of residences. See Figure 27.
2. Residences located north of Yarmouth Creek along the east bank of the Chickahominy River were isolated due to Menzels Rd overtopping, potentially affecting access to residences along the Chickahominy River. See Figure 28.



Title

Figure 27 - Chickahominy Haven Inundation Extents, Critical Infrastructure

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location
James City County, Virginia

Prepared by MGS on 2023-08-15
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

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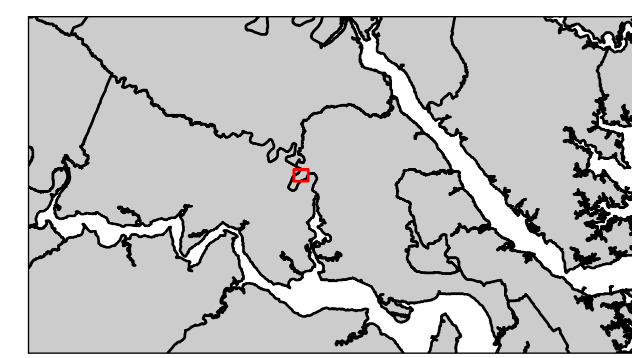
- Critical Infrastructure
- New Structure in the Future Floodzone
- Existing Building
- Future Floodzone (3 ft SLR)
- Future Floodzone (20% Rainfall Increase)
- Existing Floodzone
- Yarmouth Creek Watershed

Base Tidal Level elevations were obtained from the FEMA Flood Insurance Rate Maps. This map measures potential future impacts in the tidal region with assumed increases to those sea level elevations by 1.5 feet and 3.0 feet for non-critical and critical infrastructure.

All elevations reference the NAVD 88 Vertical Datum.



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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James City County VIRGINIA Jamestown 1607

7LWOH

Figure 28 - Menzels Road Inundation Extents, Critical Infrastructure

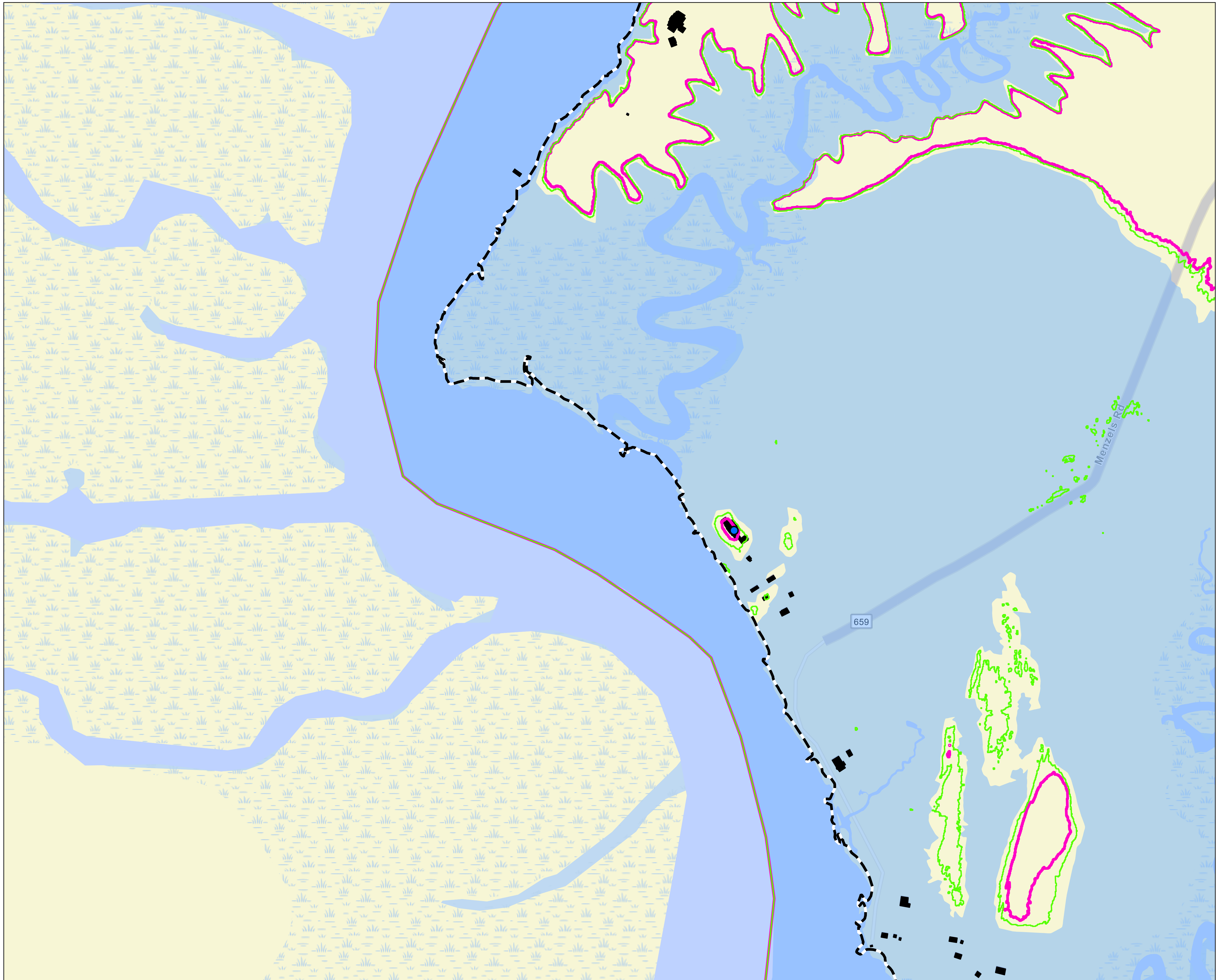
&OLHQW 3URMHFW 203408987

James City County
Yarmouth Creek WSMP

3URMHFW /RFDWLRQ

James City County, Virginia

Prepared by MGS on 2023-08-15
TR by JMH on 2023-08-17
IR by DP on 2023-08-31



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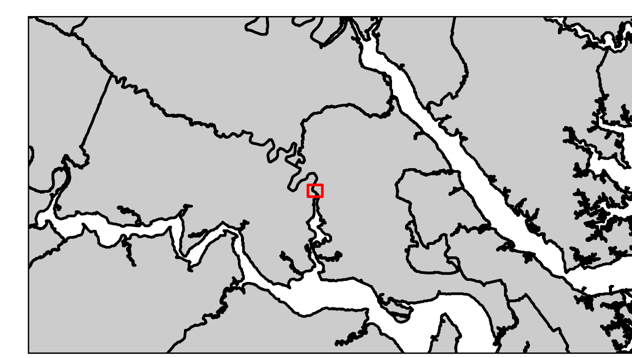
- Critical Infrastructure
- New Structure in the Future Floodzone
- Existing Building
- Future Floodzone (3 ft SLR)
- Future Floodzone (20% Rainfall Increase)
- Existing Floodzone
- YarmouthCreek Watershed
- critical_features
- VirginiaBuildingFootprint_yarmouth
- Major Creek/Stream

Base Tidal Level elevations were obtained from the FEMA Flood Insurance Rate Maps. This map measures potential future impacts in the tidal region with assumed increases to those sea level elevations by 1.5 feet and 3.0 feet for non-critical and critical infrastructure.

All elevations reference the NAVD 88 Vertical Datum.



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

Stantec

James City County VIRGINIA Jamestown 1607

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2.2.4.3.2 Future Conditions

In general, the effects of sea level rise were limited to areas along the Chickahominy River upstream of the Yarmouth Creek confluence. The analysis identified 72 additional structures predicted to be within a flood zone that are not currently considered to be within the floodplain and no additional critical infrastructures. Each of those structures are identified as residential buildings, most of which were located within the Chickahominy Haven Neighborhood. No additional neighborhoods were isolated due to a road overtopping.

2.2.4.4 Dam Break Flooding Potential

In addition to flood risks associated with tidal flooding, increased risks may be present in the watershed due in part to the presence of high hazard dams. Depending on the conditions, dam failures can result in a larger downstream inundation zone than the 100-year floodplain, which may result in the potential for other infrastructure to be affected. Specifically, the effects of Little Creek Reservoir, a high hazard dam, and Cranston's Mill Pond, a significant hazard dam, have been reviewed here.

Dam break scenarios were reviewed using the City of Newport News Waterworks (NNWW) Emergency Action Plan (EAP) for the Little Creek Dam (2016) and the Chesapeake Bay Nutrient Land Trust EAP for Cranston's Mill Pond (2011). As is consistent with high hazard dams, the inundation maps within the EAPs showing the probable maximum flood (PMF), the largest flood that could reasonably occur in this area, with dam failure were used for this analysis. Adjustments were made to the existing maps to account for distortions that may have occurred during scanning. The Little Creek Dam inundation zone extends from the dam to just west of Menzels Road and south of Blackstump Creek. Tributaries upstream of Cranston's Mill Pond were not considered to be affected by discharge from Little Creek Reservoir. The Cranston's Mill Pond inundation zone begins at the dam and ends about 3,000 feet downstream. It should be noted that dam breach inundation maps typically end when either the breach or non-breach scenarios converge to within 1 foot or when there are no further impacts to structures or property. For this analysis, the mapping of flooded areas is approximate as no new modeling was performed and the EAP inundation maps were not adjusted for sea level rise.

The EAPs identified three structures impacted within the Little Creek Dam break scenario and zero within the Cranston's Mill Pond Dam break. Upon further review of information contained in the Little Creek EAP, there may be two additional affected properties not noted in the EAP and the potential for additional dwellings within the previously identified affected properties. Note that these additional properties are a result of new construction, or an assumption made when the EAP was developed in which some impacted buildings may not be inhabited. The inundation extents were not modified from those in the EAPs for this analysis. These inundation maps are expected to be updated by the dam owners on a routine basis as required by the Virginia Department of Conservation and Recreation (DCR) Dam Safety Division. Below is a description of properties which may have structures impacted by a Little Creek Dam breach:

1. Property on Wright Island - Identified as an affected property in the EAP. Additional buildings may be present that weren't accounted for in the EAP structure numbers, pending confirmation of current usage and building types.

2. Property closest to Little Creek Dam - Identified as an affected property in the EAP. Additional buildings may be present that weren't accounted for in the EAP structure numbers, pending confirmation of current usage and building types.

3. Property off Turners Neck Rd - Two buildings with relatively new construction dates which may not have been in the structures database utilized by NNWW at the time of the EAP development. Confirmation of building types and numbers should be obtained, and the property added into the EAP.

4. Property off Menzel Rd - Both the EAP and current review identifies one affected home, with other out-buildings.

5. Property off Little Creek Dam Rd - New construction following the EAP. The primary residence appears to be outside of the inundation zone, but another residential structure identified within the inundation zone. Confirmation of whether it is a dwelling or an uninhabited out-building should be sought.

2.2.4.5 Exclusions and Limitations of this Study

As JCC's floodplain management efforts continue, it is recommended that the general flood risk study results summarized herein continue to be refined with further coordination, modeling, and analysis to address some of the notable limitations listed below.

The purpose of this flood risk analysis was to gain a general understanding of the potential impacts to existing infrastructure within the Yarmouth Creek watershed due to potential increases to the 100-year floodplain elevation and projected sea level rise estimates, as well as to consider other risks associated with potential dam failures. However, limitations to the methods used in this analysis should be understood such as:

- The mapping procedures identify impacted structures in the floodplain of the Yarmouth Creek and its tributaries due to sea level rise. Increases to rainfall intensity were not considered but may cause further impacts that are not captured in this analysis. For example, flooding in Little Creek Reservoir may cause significant impacts to the surrounding infrastructure.

- Additional interior drainage issues or flash flooding may be present within the watershed, but not captured herein due to lack of existing models.

- The effects of erosion are not measurable in this analysis. During large storm events, erosion in the floodplain is likely to occur which may worsen impacts to adjacent structures.

2.2.4.6 Flood Risk Study Conclusions & Recommendations

Based on the results of the flood risk analysis for the Yarmouth Creek Watershed, the following are recommended next steps:

- Consider potential flood mitigation or other access to neighborhoods which may become inaccessible to traffic due to large flooding events, with specific emphasis on North Riverside Drive and Menzels Road. Cooperation with emergency management personnel will be imperative to identify how these areas may be addressed or prioritized in an emergency. Further evaluation in these locations may be warranted to determine the projected flood depth and flow velocity to determine if these areas really are inaccessible.

- Encourage private residences within the floodplain (especially the Chickahominy Haven neighborhood, where limited other options exist) to raise the elevation of the homes and/or employ other floodproofing measures. Perform a benefit-cost analysis (BCA) on such improvements to aid in FEMA funding assistance or other grant programs to help subsidize the costs. Consider property buyouts and conversion to natural areas for select structures with the greatest risks and/or low BCA ratio.
- Perform hydrologic and hydraulic modeling to better understand riverine flood risks outside of the tidal areas, especially for the main Yarmouth Creek contributions.
- Identify areas susceptible to flash flooding which are outside of the floodplains. These areas may become more susceptible to flooding due to insufficient size of the existing infrastructure and/or limited maintenance efforts. Additional information on the location and elevation of stormwater infrastructure assets throughout the watershed would be required. A two-dimensional modeling platform should be considered in order to better integrate the riverine flooding with the interior stormwater infrastructure systems and overland flow conditions.
- Coordinate with Newport News Waterworks (NNWW) and the Chesapeake Bay Nutrient Land Trust regarding the buildings located within the dam break inundation zones to ensure EAP activities capture all affected properties, including recently constructed homes and/or the potential additions noted herein.

2.3 Field Assessments

Description of the work performed for both the stream inventory and assessment as well as the assessment of existing stormwater management practices and upland watershed conditions are provided on the following pages.

2.3.1 STREAM INVENTORY AND ASSESSMENT

In February of 2023, Stantec performed a field assessment in the Yarmouth Creek Watershed to quantify and classify the condition of each stream. Stantec assessed streams as identified through the desktop analyses using GIS and in consultation with JCC. As part of the field surveys, each representative stream segment was designated a unique reach ID, scored using the EPA's Rapid Bioassessment Protocol (RBP) (Barbour et. al., 1999), and a Rosgen Natural Stream Classification channel type (Rosgen, 1994) based on visual observations (Figure 29). This information was used to help identify stream reaches that may require some degree of proactive management—restoration or enhancement—to stabilize active erosion, headcutting, or degradation, reconnect channels to their floodplains, increase in-stream and floodplain habitat, and/or protect exposed utilities.

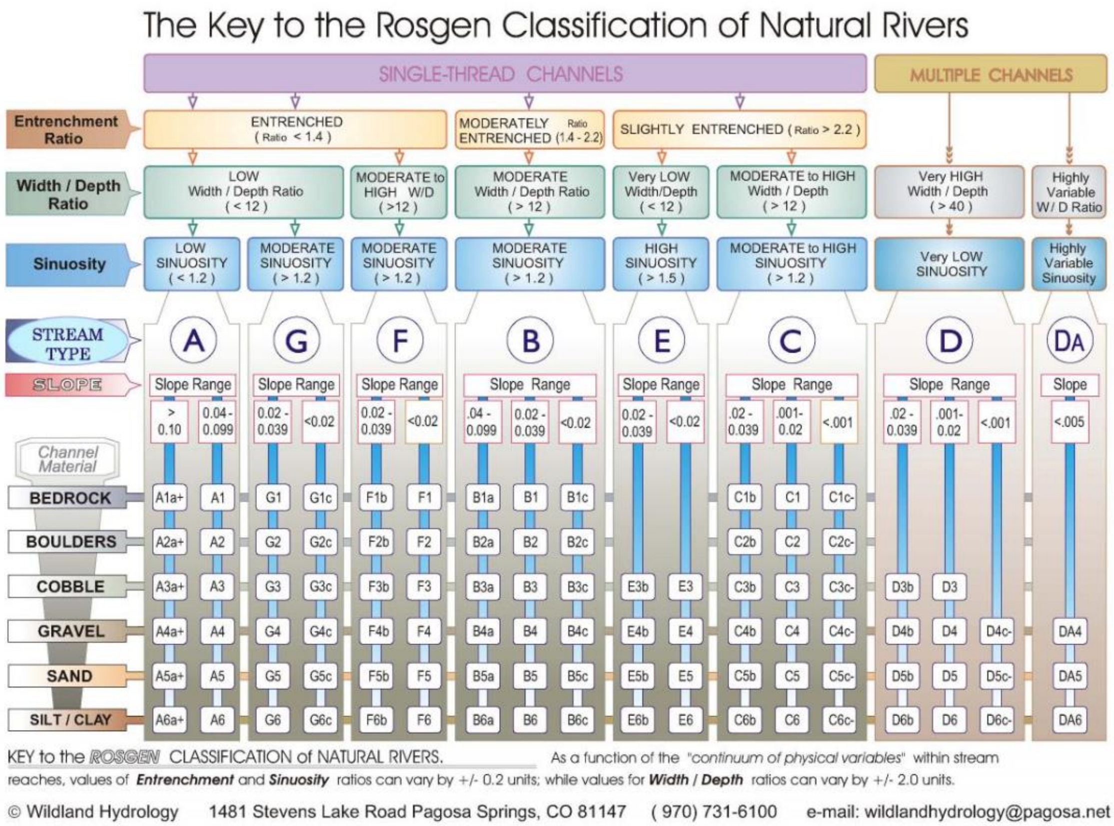


Figure 29 – Rosgen Classification Approach

2.3.1.1 Rosgen Stream Classification and the Stream Evolution Model

The majority of streams assessed in the Yarmouth Creek watershed appear to be well connected to the floodplain, exhibit in-stream habitat, and typically are in good condition. A total of 101 stream reaches totaling 26 miles were assessed across the entire watershed and are classified as the following Rosgen stream types:

Table 15 – Stream Reach Assessment Summary

Stream Type	A	G	F	B	E	C	D	D_A
Reaches Assessed	4	21	2	19	2	47	6	-
Miles Assessed	0.4	4.6	0.8	2.4	0.3	15.5	2.2	-

The Rosgen stream classifications were based solely on visual inspection and professional judgement, qualitatively classified without collecting detailed survey or geomorphic data. These reaches were further classified by using the Stream Evolution Model (Cluer and Thorne, 2013)—a model which recognizes that streams may naturally be multi-threaded prior to disturbance and represents stream evolution as a cyclical, rather than linear phenomenon. This model recognizes an evolutionary cycle within which streams advance through the common sequence, skip some stages entirely, recover to a previous stage or even repeat parts of the cycle (Figure 30). This Stream Evolution Model helps to inform whether a particular stream is trending towards stability or degradation based on hydrologic, hydraulic, morphological, and/or vegetative attributes of a particular reach.

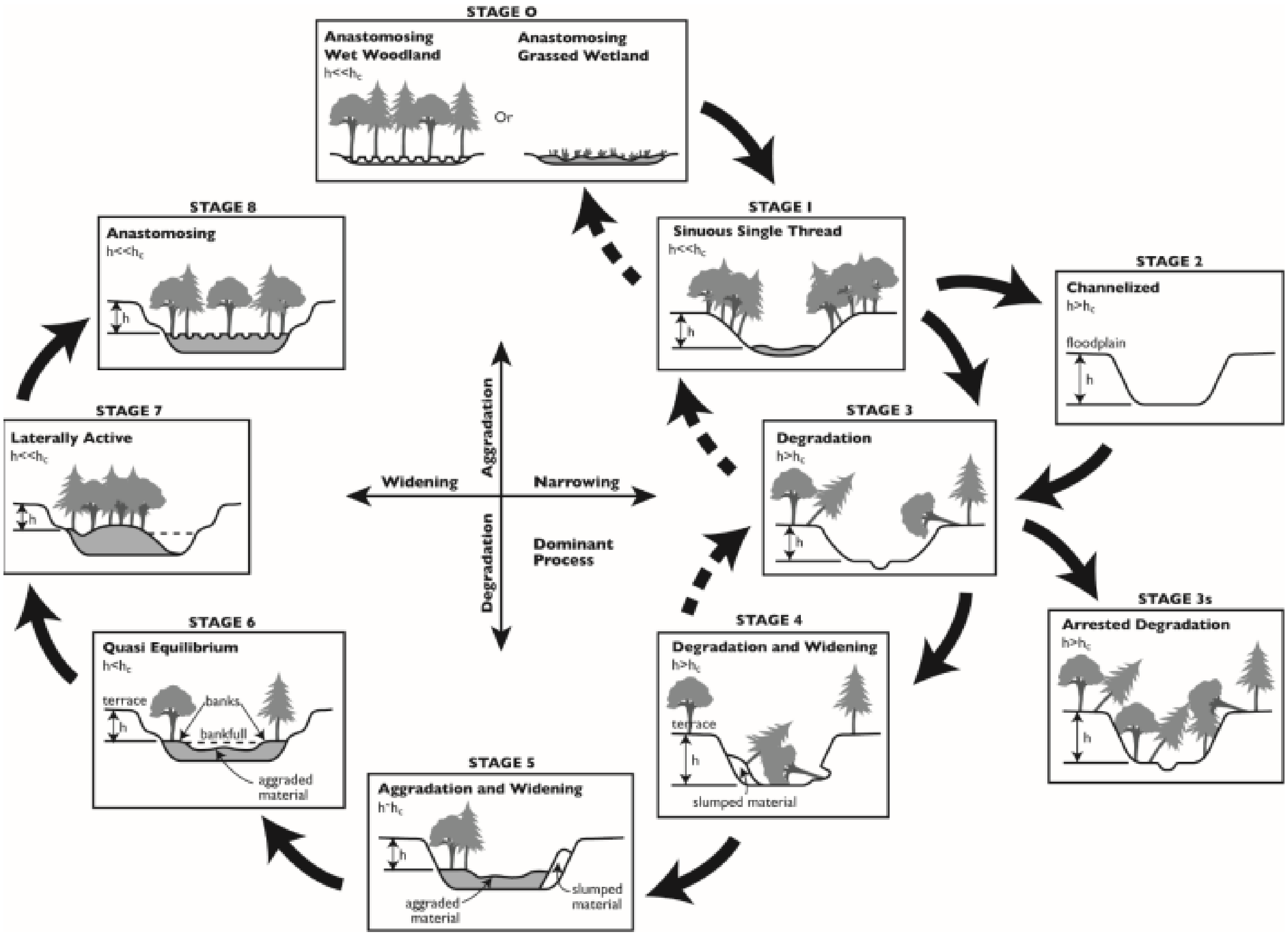


Figure 30 – Stream Evolution Model Diagram

Photo 1 – View of stable C type channel. Subwatershed 105

Overall, C-type channels dominated the channel types. C-type channels are slightly entrenched with channel slopes that vary between 0.01-2.00%. These channels typically have bend pools with steeper outer banks and point bars. C-type channels are dynamic in nature and will remain stable with an adequate buffer and good vegetative bank protection. However, these channels are especially susceptible to destabilization and over-widening as a result of upstream development and concentrated inputs. Stable C-type channels will typically be found in Stages 1, 2, 3, 6, and 7.

G-type channels are typically found in Stage 3 or 4 Stream Evolution Model. G-type channels are deeply incised with little access to the floodplain due to downcutting, resulting from unattenuated stormwater, inadequately designed infrastructure or lack of stabilizing riparian vegetation. Typical G-type channels in the Watershed are disconnected from the adjacent floodplain and experience heavy degradation from concentrated flows within the channel. This results in very limited benthic habitat embeddedness of available benthic habitat. G-stream types represent 36.5% of the reaches that are recommended for restoration or enhancement (See Section 4).

Photo 2 – View of down-cut G type channel. Little Creek Subwatershed

2.3.1.2 In-Stream, Riparian, and Floodplain Habitat

As part of the stream assessment, Stantec utilized the Environmental Protection Agency's Rapid Bioassessment Protocol (EPA RBP) index to quantify the quality of local in-stream benthic and riparian habitat for each representative reach. The RBP individually scores several individual metrics into condition categories, which are then summed to produce an overall habitat score (optimal, suboptimal, marginal, and poor) to classify the reach overall habitat score. The EPA RBP Habitat Assessment for Low Gradient Streams metrics are as follows:

- Epifaunal Substrate (available cover)
- Pool Substrate Characterization
- Pool Variability
- Channel Flow Status
- Channel Alteration
- Channel Sinuosity
- Bank Stability
- Bank Vegetative Protection
- Riparian Vegetative Zone Width

In general, 70% of the streams assessed with the RBP Low Gradient methodology exhibited suboptimal to optimal scores (53% of all reaches were assessed as Suboptimal and 17% as Optimal condition). These Optimal and Suboptimal streams would typically be found in Stage 0, 1, 2, or 6 of the Stream Evolution Model, and generally classified as stable B, Bc, C, or E Rosgen stream types. The remaining 30% of assessed streams were scored as follows: 23% of all reaches scored as Marginal and 7% as Poor, which suggest that these streams are actively degrading and would likely be classified between Stages 3 and 5 in the Stream Evolution Model. Streams that were observed to have good connection to an adjacent floodplain, relatively wide mature riparian buffers, and exhibited Stream Evolution Model stages trending towards stability generally scored as Optimal to Suboptimal habitat scores. Overall, the trend throughout the Watershed is that stream habitat health is declining, particularly in those watersheds with increased development pressures over the past two decades (See Section 1.2.2 for more details).

2.3.1.3 Outfalls, Utilities, And Other Point Impacts

Many of the streams in Subwatersheds 102, 103, 104 and 105 are headwater streams and have been affected by development. Most of the stream reaches in those Subwatersheds that were assessed come directly from a stormwater outfall, with other outfall-type inputs along the reaches. These outfalls vary from stable and appropriately sized to undersized and associated subsequent erosion or failure. The remaining Subwatersheds are more rural in nature (101, 106, Chickahominy, Nontidal, Tidal) and exhibit stable natural conditions with little impact from outfalls or utilities.

2.3.2 UPLAND WATERSHED AREAS ASSESSMENT

2.3.2.1 Existing Stormwater Management Facilities

As previously mentioned, many developed areas (impervious surfaces) in the Watershed were constructed before current stormwater regulations were implemented. These areas were prioritized for field review efforts since they would likely present the best opportunities for new stormwater treatment or retrofit of older BMPs to more efficient conditions. Newer development areas have stricter standards of on-site treatment, but in addition to the older development areas they also may have opportunities to protect and restore downstream aquatic ecosystems through new BMPs, retrofitting of existing BMPs, and in some cases in conjunction with stream restoration or enhancement projects.

As of the publication of this report, JCC's BMP inventory had 111 active BMPs within the Watershed. Table 16 presents the characteristics and composition of existing BMPs tracked by JCC within the Watershed.

Table 16 – Stormwater Best Management Practices in Yarmouth Creek Watershed

BMP Type	Treatment Provided	Number of BMPs	Impervious Area (ac)
Bioretention	Quality	31	11
Constructed Wetland	Quantity and Quality	1	2
Dry Pond	Quantity	33	97
Dry Swale	Quality	5	3
Infiltration Basin	Quantity and Quality	8	10
Infiltration Trench	Quality	4	8
Permeable Pavement	Quality	1	1
Urban Infiltration Practices	Quality	1	1
Urban stream restoration	Quality	2	6
Water Quality Inlet	Quality	4	<1
Wet Pond	Quantity and Quality	17	342
Wet Swale	Quantity and Quality	1	1
No type data	-	3	0
Grand Total		**111**	**483**

A pre-field work desktop assessment was performed to rank all BMPs within the Watershed for consideration of field work. Data and location for existing BMPs were obtained from JCC for this desktop assessment. Four characteristics of BMPs were used to rank the 111 BMPs within the Watershed and help focus efforts in the field:

1. BMP Practice Type
2. BMP Treatment Drainage Area
3. Age of BMP (since construction)
4. Date of Last Inspection

The next several subsections describe these four BMP characteristics and how they were used to develop a desktop-based BMP Index informing which BMPs were then ranked for field assessment. Figure 31 provides a map with all BMPs shown spatially across the Watershed. The highest ranking BMPs were visited in the field and considered for possible retrofit or rehabilitation.

2.3.2.1.1 BMP Practice Type

Different types of BMPs have a higher potential for retrofit opportunities. Those existing BMPs with more potential to treat water quality or quantity (or both) rank higher under this first BMP characteristic. The Scoring Matrix for this BMP characteristic is provided in Table 17 below, where Dry Pond types (33 each) have the highest potential, with a score of 10, followed by Wet Pond (17) and Infiltration Basin (8), BMP types considered to have a moderate retrofit potential, with a score of 3. All other BMP types (142) were scored one or zero for retrofit potential based on their BMP type.

Table 17 – Desktop Assessment Scoring Rubric for BMP Practice Type Characteristic

Scoring Rubric		Scoring Legend	
BMP Type	**Score**	**Retrofit Potential**	**Score**
Bioretention	1	High	10
Constructed Wetland	1	Moderate	3
Dry Pond	10	Low	1
Dry Swale	1		
Infiltration Basin	3		
Infiltration Trench	1		
Permeable Pavement	1		
Urban Infiltration Practices	1		
Urban Stream Restoration	1		
Water Quality Inlet	1		
Wet Pond	3		
Wet Swale	1		

2.3.2.1.2 BMP Treatment Drainage Area

Estimates of drainage area that contribute to a BMP were provided with the JCC GIS data set. The larger the contributing area being treated by the BMP, the higher it scored, since it would have a higher potential for improvements to water quality and/or quantity. Table 18 shows the breakdown of Drainage Areas and scores. If no drainage area information was available, it was scored zero (0).

Table 18 – Desktop Assessment Scoring Rubric for BMP Drainage Area Characteristic

Scoring Rubric		Count in Watershed
Drainage Area (acres)	Score	
< 1	0	17
1 - 10	2	42
10 - 20	3	11
> 20	4	16
Not Scored (no information – no acreage in database)	0	25

2.3.2.1.3 Age of BMP

The age of the BMP (based on installation or construction date, as provided by JCC) is informative as it conveys what stormwater design standards for which it may have been designed. With stormwater design standards and regulations changing in 1998 from the original standards with VSMP implementation and 2011 (adoption of current standards) Stantec was able to assign scores as found in Table 19. Older BMPs ranked higher since there is a greater chance that they could be improved via retrofit to current standards for improved water quality and/or quantity.

Table 19 – Desktop Assessment Scoring Rubric for BMP Age Characteristic

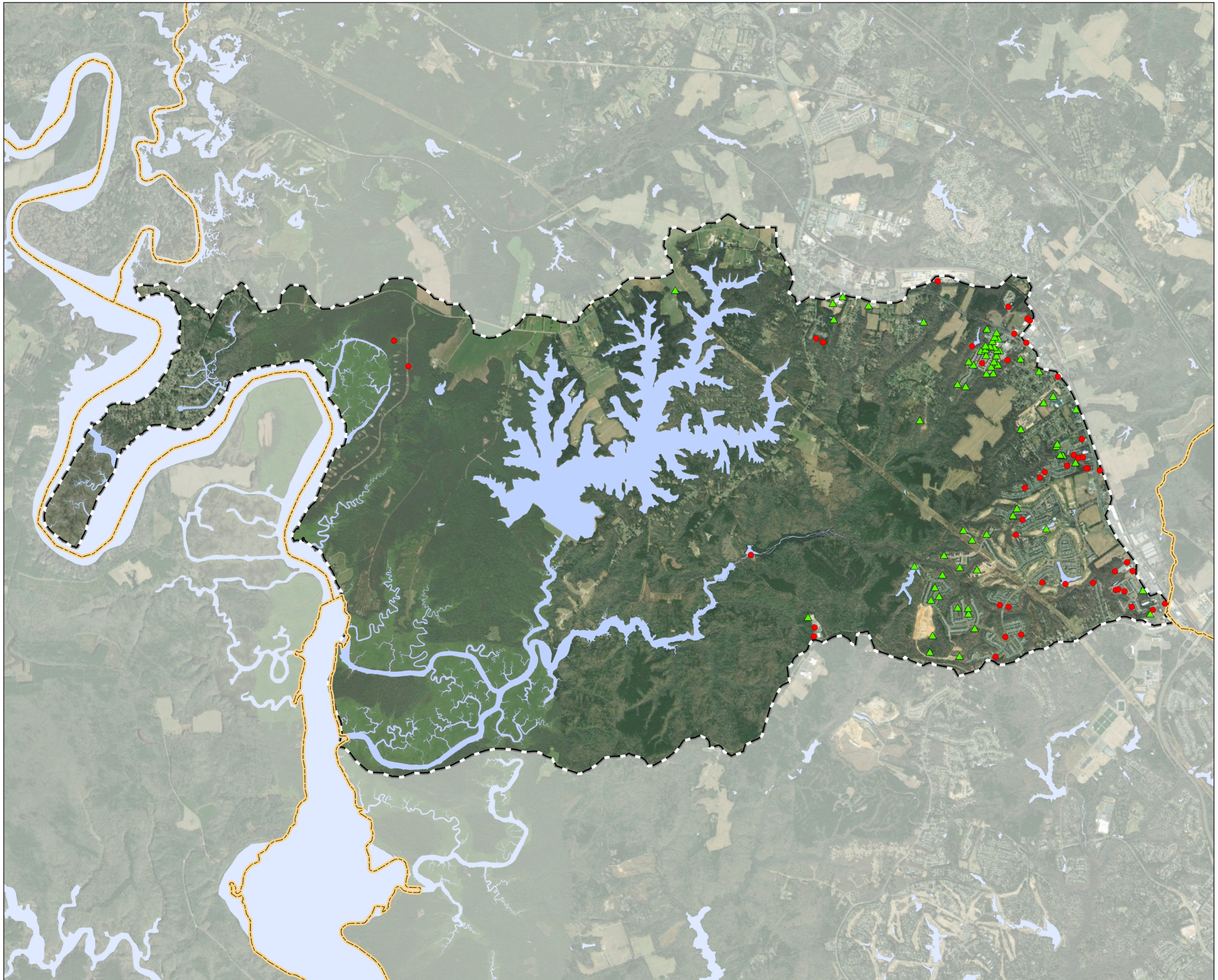
Scoring Rubric		Count in Watershed
BMP Age	Score	
Before 1998 (older standards)	10	4
1998 to 2011 (initial VSMP standards)	6	47
2011 and later (current standards)	1	40
Not Scored (no information)	0	20

2.3.2.1.4 Date of Last Inspection

Active BMPs are inspected on a semi-annual basis, and private BMPs are inspected by JCC every five years. Those not inspected since the start of 2020 are unknown to their capabilities to meet original designs and the standards it was meant to satisfy, deserving of a higher score. Table 18 provides the scoring rubric and count of scores for this BMP characteristic type.

Table 20 – Desktop Assessment Scoring Rubric for BMP Last Inspection Characteristic

Scoring Rubric		Count in Watershed
Last Inspection Date	Score	
2019 and earlier	2	26
2020 and later	0	38
Not Scored (no information)	0	47



Title

Figure 31 - Existing Stormwater Best Management Practice (BMP) Locations

Client/Project
James City County
Yarmouth Creek WSMP

203408987

Project Location
James City County, Virginia

Prepared by MGS on 2023-07-19
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

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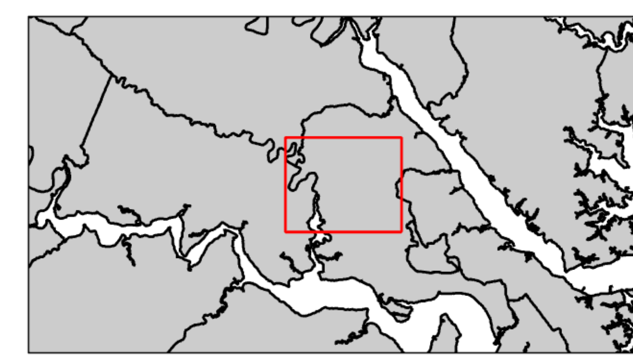
- Field Inspected Existing Stormwater BMP
- Existing Stormwater BMP
- Yarmouth Creek Watershed
- Municipal Boundary



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

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James City County Virginia Jamestown 1607

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2.3.2.1.5 Field Assessment Findings

After ranking all 111 BMPs within the Watershed, Stantec visited the highest ranking BMPs identified in Figure 31 with an eye towards how it might benefit from retrofitting to meet the local drainage area needs and that of the Yarmouth Creek Watershed as a whole. For each BMP visited in the field there were several considerations as they were assessed for potential retrofit opportunities. These were:

- Area available for retrofit actions within BMP footprint and its surrounding areas.
- Adjacent land use in surround areas.
- Construction access to the BMP.
- Potential utility conflicts for permanent expansion of BMP footprint as well as for temporary construction access requirements.
- Permitting factors that may make the retrofit less efficient and costly for a given BMP location.

This information and data from the field assessments played an integral role in deciding if, how, and where recommendations for BMP retrofits were made. Section 4.3 below details these next steps and the list of recommended BMP retrofit locations and types.

2.3.2.2 Upland Area Reconnaissance

Stantec leveraged two of the CWP's Unified Subwatershed and Site Reconnaissance (USSR) for field exploration of possible pollutant sources within the Watershed. The Neighborhood Source Assessment (NSA) is used to evaluate residential developments and the Hot Spot Investigation (HSI) for commercial and industrial areas of development. Larger concentrations of livestock and other observed concerns were also evaluated using the HSI scoring. These surveys were performed across most or all of an area of interest, and provided an indicator of the pollution potential throughout various locations in the Watershed.

2.3.2.2.1 Neighborhood Source Assessment (NSA)

The NSA was performed at most of the residential developments within the Watershed to identify land uses and land management practices by residences or homeowners' associations (HOAs) or their contractors that might lead to pollution or degradation of downstream aquatic habitats. NSAs are generally focused on four specific source types that might be found in most neighborhoods:

- **Yards/Lawns** - Rated on condition, maintenance levels, and general upkeep.
- **Driveways, Sidewalks, and Curbs** - Rated on condition, drainage, staining, and debris or litter.
- **Rooftop Surfaces** - Estimate amount of runoff directly connected to storm drains/infrastructure.
- **Common Areas -** Investigated for evidence of possible pet waste management, and other resident stewardship, signage, or activities, e.g., stormwater inlet stenciling, pollinator habitat, etc.

There are several individual neighborhood characteristics under these four types that get totaled up to an NSA "Pollution Severity Index". Based on field observations from the NSA, sites get classified into one of four categories of Pollution Source Potential (Table 21):

- Low – No NSA characteristics observed.
- Moderate – Between 1 and 4 NSA characteristics observed.
- High – Between 5 and 10 NSA characteristics observed.
- Severe – 11 or more NSA characteristics observed.

Table 21 – Neighborhood Source Assessment (NSA) Field Assessment Summary

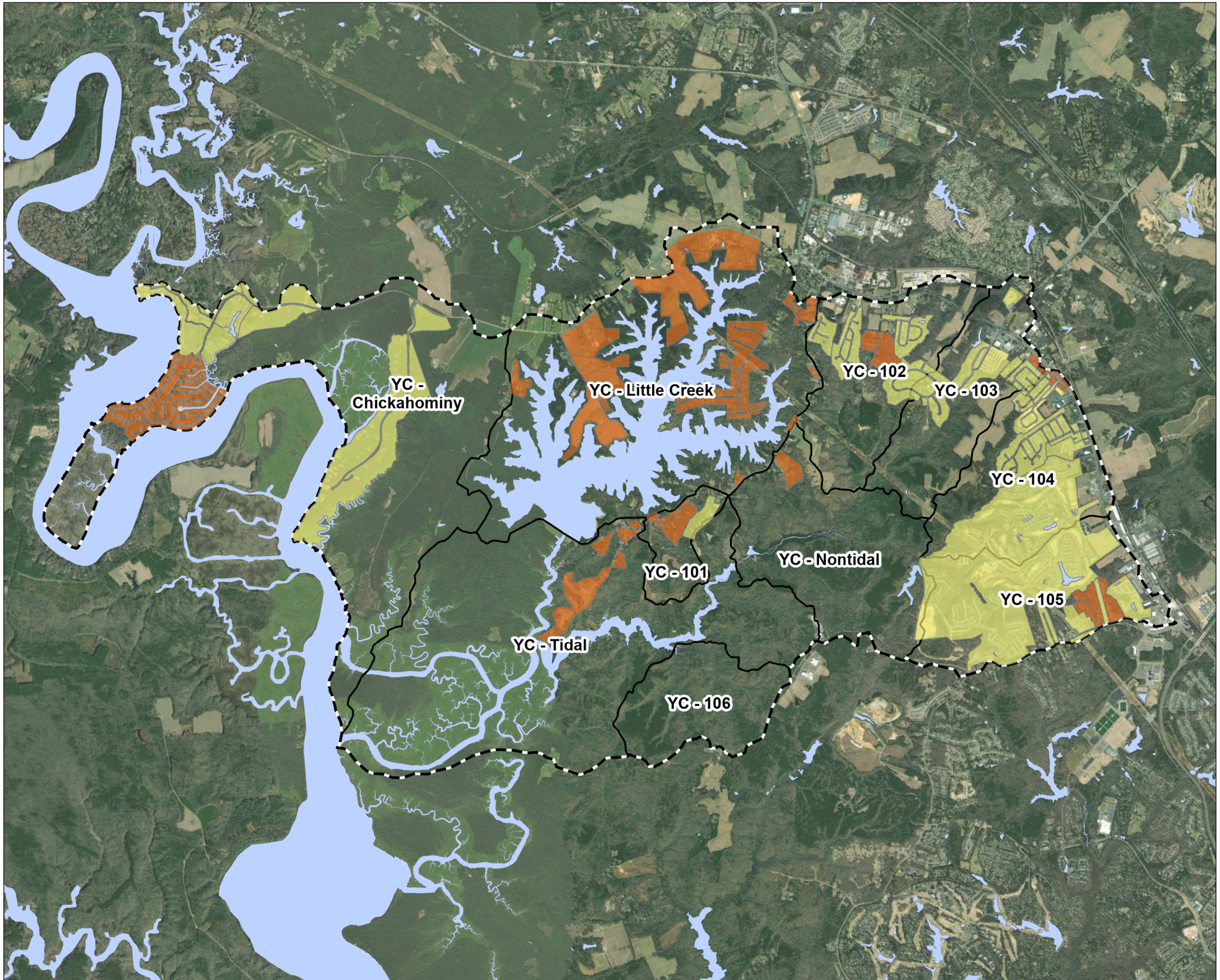
Subs	Neighborhood Source Assessment Results			
	Total Assessed Area (Acres)	Percent with Moderate NSA Scoring	Percent with High NSA Scoring	Highest NSA Score (12 is max possible)
101	60	38%	62%	6
102	203	56%	44%	6
103	148	66%	34%	5
104	218	98%	2%	5
105	688	93%	7%	7
106	0	0	0	0
Little Creek	449	0%	100%	6
Chickahominy	713	76%	24%	5
Nontidal	42	46%	54%	7
Tidal	99	3%	97%	6
Watershed	**2920**	**67%**	**33%**	**7**

Note: No neighborhood boundaries are present in Subwatershed 106.

Based on the NSA results, it is noticeable that the Little Creek Subwatershed has the highest relative scores, with 100% of the assessed acreage scoring as “High.” This is largely driven by more spread-out residential development with no noticeable stormwater infrastructure and a high percentage of residential parcels devoted to livestock and agriculture. Similar watershed features also affected the scoring of NSA boundaries within the Tidal Subwatershed, where the lack of stormwater infrastructure and other features normally present in larger, newer developments led to higher scores.

Another noticeable NSA boundary is that of Chickahominy Haven, located in the Chickahominy Subwatershed. Chickahominy Haven is an older development with few stormwater controls that is prone to flooding. Besides the lack of stormwater infrastructure, the neighborhood’s roads, driveways, and lawns are not as well maintained, and a high percentage of residential parcels store multiple automobiles and boats with no coverage, leading to a higher score.

Neighborhoods in the more developed subwatersheds 102-105 contain a mixture of old and new development, where stormwater infrastructure is normally present and well-maintained, leading to generally more Moderate scoring across the areas. None of the reviewed neighborhoods scored low, but the high standards employed by the NSA would be difficult to achieve in most residential development types. Additionally, none of the reviewed neighborhoods scored severe suggesting that the existing development within the Yarmouth Creek Watershed does not cause major downstream impacts.



Title

Figure 32 - Neighborhood Source Assessment (NSA) Field Assessment Results

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location
James City County, Virginia

Prepared by MGS on 2023-08-16
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

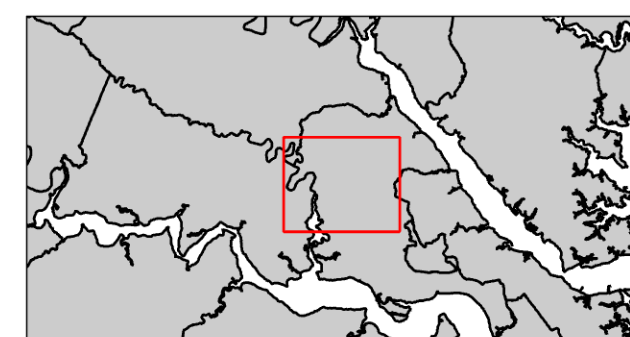
0 4,000 8,000 Feet
(At original document size of 11x17)
1:48,000

Yarmouth Creek Watershed
Subwatershed Boundary

Neighborhood Source Assessment

Score

- Severe
- High
- Moderate
- Low



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

Stantec

James City County Virginia Jamestown 1607

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2.3.2.2.2 Hot Spot Investigation (HSI)

Stantec performed Hot Spot Investigations on all major commercial and industrial areas within the Watershed, as well as other areas with the potential for large point source contribution of pollutants. Specific activities are investigated such as vehicle operations and/or storage, other outdoor materials storage, trash/grease/waste management, building and parking lot conditions, turf and landscaping if present, visible private stormwater infrastructure from buildings, parking lots, etc. and into downstream conveyances. Observed polluting activities as well as potential sources of pollution are both noted for recommendation development. Based on field observations from the HSI sites are classified into one of four categories:

- Not a hotspot – no observed pollution, 1 to 4 potential pollutant sources identified.
- Potential hotspot – no observed pollution, 5 to 10 potential pollutant sources identified. Potential hotspot was also assigned if conditions are uncertain, and warrant further investigation.
- Confirmed hotspot – pollution observed, 11 to 15 potential pollutant sources identified.
- Severe hotspot – Multiple polluting activities directly observed.

Field HSI assessment effort results are presented in Table 22 and Figure 33. Subwatersheds 102, 103, 104, and 105 have the highest number of confirmed or potential hotspots, as well as the highest scores. This is an expected result as these subwatersheds have the greatest concentration of commercial development, mostly along Rt. 60.

Generally, potential or confirmed hot spots would benefit from management such as:

- Increased review and inspection of materials storage at outdoor facilities. They pose a potential pollutant source, such that proper housekeeping practices and pollution prevention practices could be employed in these areas.
- Review of vehicle storage at facilities across the watershed. Vehicles stored outdoors without cover are present at multiple HSI locations across the watershed, which could be of particular concern in high concentrations or with older vehicles/farm equipment.
- Review of dumpster status and locations. Dumpsters that are left open or leaking pose a pollution threat, especially when dumpsters are not located within designated areas where tainted runoff is captured and treated separately.
- Review of areas with high concentration of livestock to determine if better waste management or other controls could be warranted.

Table 22 – Hot Spot Investigation (HSI) Field Assessment Summary

Subs	Hot Spot Investigation Results		
	Count of Confirmed Hot Spots	Count of Potential Hot Spots	Highest Hot Spot Score (28 is max possible)
101	0	0	0
102	1	3	11
103	2	5	13
104	0	9	10
105	0	6	10
106	0	0	0
Little Creek	0	1	6
Chickahominy	0	0	0
Nontidal	0	0	0
Tidal	0	2	6
Watershed	**3**	**26**	**13**

Title

Figure 33 - Hot Spot Investigation (HSI) Field Assessment Results

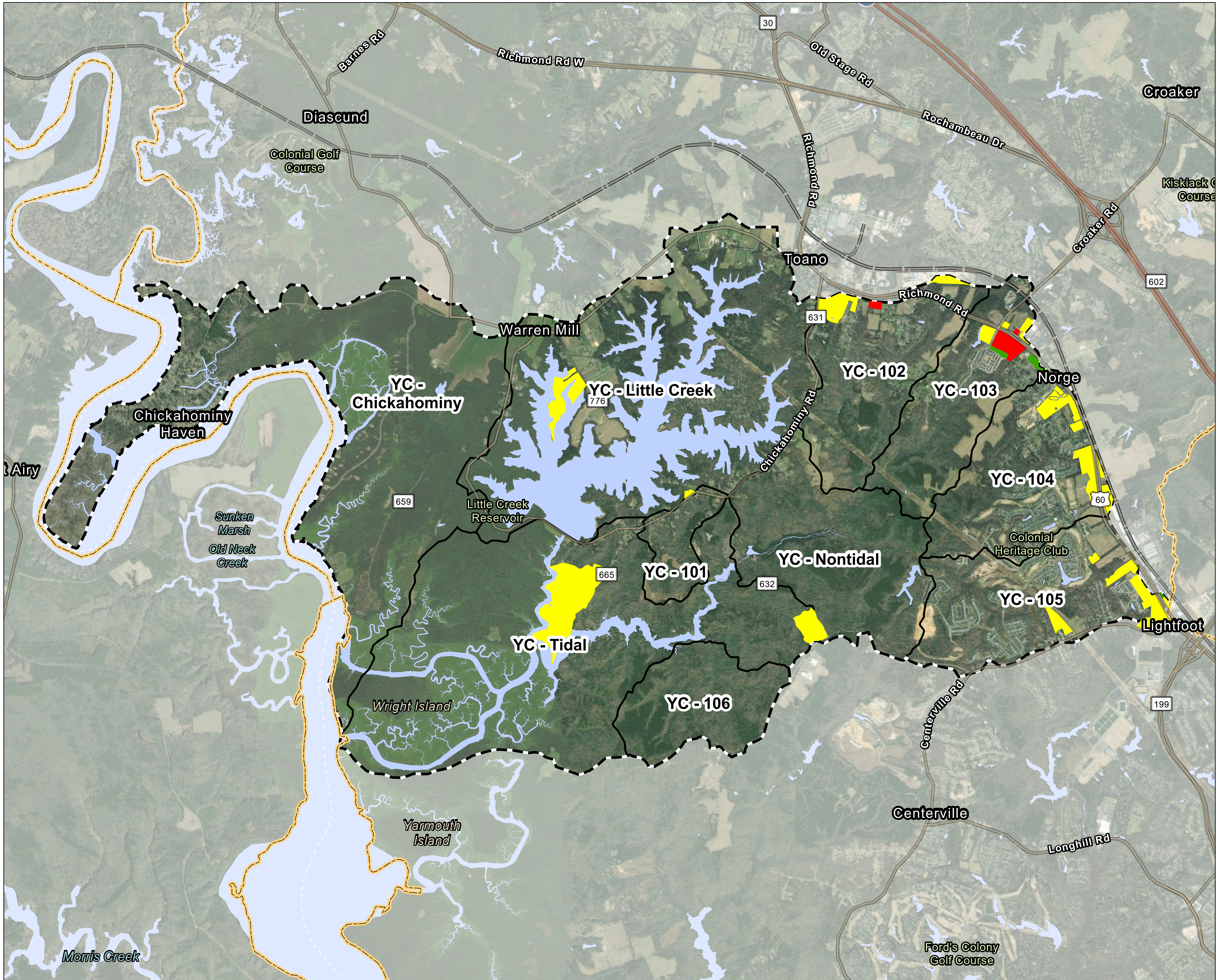
Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-08-16
TR by JMH on 2023-08-17
IR by DP on 2023-08-31



N

0 4,000 8,000 Feet

(At original document size of 11x17)
1:48,000

Yarmouth Creek Watershed

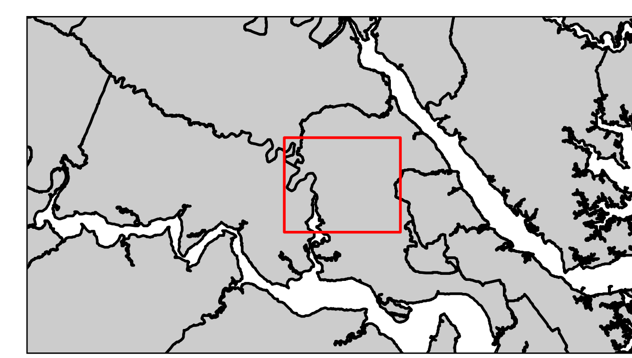
Subwatershed Boundary

HSI Scores

Not a Hotspot

Potential Hotspot

Confirmed Hotspot



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec
3. Orthoimagery © ESRI

Stantec

James City County VIRGINIA Jamestown 1607

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3 WATERSHED GOALS AND STRATEGIC ACTIONS

3.0.1 Watershed Goals

As previously noted, the following nine Goals have been revised from the original 2003 Yarmouth Creek Watershed Plan to reflect the activities over the past 20 years and the stakeholder engagement performed as part of this Watershed Management Plan. The categories of Strategic Actions which will help support and achieve these Goals are all interrelated to some degree and in various ways. For example, Education and Awareness supports all other Action categories. The Goals, and the supporting Strategic Action categories (see below, and Section 5) most closely associated with them are:

1. Improve water quality in Yarmouth Creek to satisfy Local Bacteria TMDLs, and work to remove impairments.

    All of the Strategic Action categories (see below) support this Goal to varying degrees, with particular focus on Watershed Restoration Projects for improvement, while the others more meaningfully support preservation of existing quality.

2. Maintain and build biological and habitat diversity and connectivity by protecting the Conservation Areas, Habitat Cores, and wildlife corridors, as identified within the conservation priorities of this Plan, the County's Natural and Cultural Assets Plan, and other relevant Virginia data sets.

    This Goal can be achieved primarily through Programmatic actions.

3. Refine the County stormwater requirements and Code of Ordinances to not only offset the effects of further development but create opportunities to improve upon existing degraded areas.

    Strategic Actions to implement this lie within the Regulatory/Enforcement category.

4. Continue the tracking and prioritization of existing stormwater maintenance.

    This is part of the Regulatory/Enforcement, and to a degree Watershed Restoration action categories.

5. Promote watershed awareness and active stewardship among residents, community associations, businesses, and seasonal visitors through educational programs, recreational opportunities, and participatory watershed activities.

    This is the stated goal of the Education/Awareness category.

6. Restore degraded streams where possible and reasonable, and continue to protect high-quality streams and wetlands.

    Watershed Restoration Projects include degraded stream reach restoration, and the continued protection is quite broadly addressed in others, perhaps with particular focus on Regulatory/Enforcement and a combination of Programmatic and Education/Awareness.

7. Collaborate with the Virginia Department of Forestry to assess the health of silvicultural activities within the watershed, and with the Colonial Soil and Water Conservation District to identify opportunities for additional agricultural management needs or water quality improvements.

    This is in the Programmatic and Regulatory/Enforcement categories primarily.

8. Initiate development of a flood preparedness plan to understand current and future flood risks and identify a phased implementation approach for effective and practical long-term community flood-risk reduction.

   This is supported by comprehensive Floodplain Management efforts.

9. Preserve and improve equitable public access to meaningful and safe outdoor recreation throughout the watershed, including "Blueway Trail" development support, while increasing stewardship opportunities to address litter and shoreline management issues.

   This is part of, and support for, the Education/Awareness category, and supported by Programmatic actions.

Many stakeholders were contacted and engaged during the process of developing this Watershed Management Plan. The goals above will require continuous engagement from these and other stakeholders, JCC, and other organizations to ensure that strategic actions are initiated and completed. Strategic actions for the Yarmouth Creek Watershed follow the same approach as previous JCC Watershed Management Plans (most recently for the Skimino Creek Watershed, just across Route 60 from the Yarmouth Creek Watershed) where the identified strategic actions will:

- Be cost-effective and capable of being readily executed by JCC Staff,
- Encourage responsible land development, or discourage land development where that is the most responsible course,
- Promote transparent interactions between JCC and stakeholders fostering a sense of community and shared responsibility in the stewardship of the Watershed, and
- Address known problem areas with effective and long-term solutions.

3.0.2 Strategic Actions

In a shift from the previous JCC Watershed Management Plans, we have regrouped the recommended Strategic Actions into the following five categories to more specifically address the challenges encountered within the Yarmouth Creek Watershed and the public input received. Descriptions and details of these categories can be found in Section 5 - Strategic Action Plan

1. **Programmatic**
2. **Regulatory/Enforcement**
3. **Floodplain Management**
4. **Education/Awareness**
5. **Watershed Restoration Projects**

3.1 Programmatic Actions

3.1.1 TARGETED BACTERIAL REDUCTIONS

With bacteria being the primary designated impairment of the Watershed, it is important to identify achievable actions to help bring the tidal (estuaries) and non-tidal (streams) waterbodies back into compliance with state standards.

Recommended Strategic Actions:

- Septic Systems
  - Continue existing septic inspection requirements through JCC's Septic Smart program and seek ways to refine its activities in coordination with the Virginia Department of Health. Change County ordinance to eliminate the potential loophole where systems can be pumped out every 3-5 years without any true inspection and/or identification of drainfield issues that may be present.
  - Analyze number of failed septic systems over time, date of install, and project potential future failures that may be anticipated.
  - Expand existing Pump-out Grant Program to also help subsidize the cost of replacing failed drainfields.
  - Evaluate grant opportunities and alternative funding mechanisms towards potential future extension of public sanitary sewer lines within the existing Public Service Area (PSA).
  - Consider requiring any new infill development within vacant lots without access to sanitary sewer service to employ enhanced septic designs to higher-than-base level effluent treatment, including Alternative Onsite Sewage Systems (AOSS).
    - If full coverage of such a requirement is not desired, this could be reduced to defined high priority areas such as those areas within close proximity to surface receiving waters, very low elevations, or other known very high/shallow groundwater.
- Water Quality Monitoring
  - Part of the "targeted bacterial reductions" is targeting the sources. While knowing the sources of bacterial contamination allows for focus on those sources and areas, it is also valuable to know where the actual pollution/contamination is, since unknown sources and unknown mitigating factors (such as natural biological treatment in wetland) contribute to the condition of the waterbodies. We recommend, to the extent practical, setting up a monitoring program for any pollutants of concern, but particularly those causally related to the specific impairments in the watershed, such as bacteria, and those pollutants which lead to dissolved oxygen depletion (nutrients, and others possible).

    Components of a robust monitoring program may include:

    - Locations: Monitoring locations at various points from headwaters down to tidal estuaries. The locations which have the potential to tell the most useful and informative story following data analysis are just upstream of confluences of streams (or farther upstream of confluences but downstream of probable loading sources like developments), thus capturing the stream above with better resolution. Note that this offers a more reliable picture in nontidal streams than tidal/estuarine streams and waterbodies.

        - Timeline: Monitor for as long as possible, but at least one year, to capture one full cycle of the seasons and the relative change in impacts across those seasons.

        - Timing: Monitor frequently, but ideally monthly or more, weekly even better. Timing of specific sampling would be best to try to capture rainfall events and any anticipated flooding events in particular. Before, during, and after a storm with runoff potential may provide a lot of insight, but particularly if monitoring occurs in well-distributed locations. The same thing applies for any event where some localized flooding occurs, since this type of event may circumvent many of the BMPs, and give insight into watershed or subwatershed efforts that are more programmatic than structural.

- Livestock/Poultry

    - For agricultural properties in the Watershed, collaborate with the Colonial Soil & Water Conservation District to work with landowners to employ best practices to limit pollution.

    - In areas with larger concentrations of livestock, work with landowners to evaluate installation of waste composters or sufficiently sized refuse containers and proper management procedures.

    - Explore Zoning Ordinance amendments that would incorporate recommendations of the Colonial Soil and Water Conservation District as it pertains to equine and other animal stocking rates.

    - Employ similar landowner education materials to the current “scoop the poop” program that is more focused on smaller scale agricultural activities such as hobby livestock or poultry (including but not limited to backyard chickens).

- Pet Waste Program

    - Identify neighborhoods that have not currently installed the pet waste stations that JCC provides for free to close any gaps in overall coverage across the Watershed.

    - Evaluate locations of pet waste stations along public trails to identify where large gaps between stations may be present and install additional stations as warranted.

    - Evaluate appropriate spacing and availability of pet waste stations. The number of available stations may need to be significantly increased to elicit desired behavior from residents. See Disney World study and actions surrounding placement of trash cans for example of human behavioral engineering.

    - Increase landowner awareness that they should “scoop the poop” in their own yards too, and not just along public spaces like the general sentiment appears to be. Similarly, increase awareness of the desired frequency with respect to anticipated rainfall, etc.

        - Provide pet waste composters for individual use or information on pick-up services.

3.1.2 EVALUATE WILDLIFE MANAGEMENT NEEDS

Wildlife populations are a well-documented source of bacterial contamination of surface waters across the nation. Understanding the scope of these populations and magnitude of the issue is another way that the bacteria pollution can be addressed. In addition to bacterial loading, geese also eat and damage vegetative cover which results in greater erosion and sedimentation.

Recommended Strategic Actions:

- Further coordinate with the James River Association (JRA) and Hampton Roads Sanitation District (HRSD) on the potential to extend their ongoing bacteria source tracking into the Yarmouth Creek Watershed to better pinpoint specific sources of bacteria pollution, species involved, and refine the recommended actions contained herein based upon the findings.
- Perform appropriate wildlife surveys to understand size and health of existing wildlife populations (including but not limited to deer). Assess if new game management activities could be warranted to reduce population size to healthier levels.
    - If surveys suggest additional population control is warranted, explore increased public access to lands for hunting purposes. This could be grouped with other land conservation efforts (see later recommendations).
    - Coordinate with DWR to assess whether feral swine population spread is or is becoming a contemporary issue.
- Identify locations and size of permanent/resident geese populations and develop goose exclusion and/or removal measures to reduce amount of concentration in or local and downstream waterways.
    - Implement passive controls such as do-not-feed geese signs and buffer plantings between turf areas and edge of water.
    - Consider more targeted active controls such as wild goose chase/harassment programs (often employing the use of trained herding dogs) or USFWS permitted round-up/removal for golf courses, waterways/waterbodies, and stormwater basins of greatest concern.
    - Within regulatory constraints, possibly evaluate and implement depredation measures.

3.1.3 JAMES CITY SERVICE AUTHORITY (JCSA) BACTERIAL REDUCTIONS

James City Service Authority (JCSA) was created in the late 1960's with the objective of providing safe, reliable, and affordable water and wastewater services. It is a legally separate entity from James City County (JCC) and is self-supporting and receives no share of any local or property taxes. Extreme weather events can lead to localized or larger, riverine flooding which can create conditions where untreated sewer water is released into the environment before being treated.

Recommended Strategic Actions:

- Collaborate with JCSA and the Hampton Roads Sanitation District (HRSD) to track status of the ongoing Regional Wet Weather Management Plan implementation and advocate for prioritization of projects within the Yarmouth Creek Watershed.

- Review rim (top of manholes) elevations and status of waterproofing of sanitary sewer manholes in flood prone areas. Continue to perform inspections on waterproofing efficacy to ensure proper function and employ similar mitigatory measures for other manholes not yet addressed.

3.1.4 LAND CONSERVATION

As detailed in Section 2.2.2, there are several designated Conservation Areas, and much of the County's land area is covered by functional contiguous habitat cores, with the majority of those being classified as heightened priority cores. The following programmatic action recommendations and options pertain to preserving what is there, conserving to the extent practicable where full preservation is not feasible, and mitigating any unavoidable damages.

<u>Recommended Strategic Actions:</u>

- Continue to pursue and explore additional methods for expansion of the County's Purchase Development Rights (PDR) Program, as well as permanent or long-term fee simple land or easement acquisition in conservation areas and cores/corridors by the County or other organizations. Funding streams may include (but not be limited to) the Capital Improvement Fund, General Fund, grant programs, and independent land trusts.

- For designated/specified corridors and perhaps additional areas where a roadway crosses through a habitat core, evaluate options for wildlife crossings which would reduce or eliminate vehicle conflicts.

3.2 Regulatory/Enforcement Actions

3.2.1 SPECIAL STORMWATER CRITERIA

The JCC Board of Supervisors first approved (by resolution) a Special Stormwater Criteria (SSC) on December 14, 2004, and revised it most recently on July 1, 2014. The original intention of the SSC had two primary goals; (1) Preserve pre-development hydrology for high quality streams, and (2) Provide enhanced water quality treatment of stormwater runoff.

Objectives of the SSC are as follows:

- Protection of specific stream reaches from accelerated channel erosion events due to changes in stormwater runoff amounts and intensity.

- Protection of conservation areas from the impacts of stormwater runoff.

- Protection of high-quality wetlands from the effects of altered water level fluctuations.

- Development of more effective criteria and locations for stormwater practices for new development in watersheds.

- Retrofit actions of existing facilities and to treat areas with uncontrolled runoff in the watershed to improve water quality.

Many of these same objectives of the SSC are addressed by standard stormwater compliance through the most recent VSMP regulations and improved VRRM method for water quality and quantity controls.

However, based on the conditions of the watershed and continued need for heightened treatment to reach water quality goals, reliance on VSMP compliance alone is considered inadequate. Refinements to the SSC have been considered herein to reconcile redundancy between the previous SSC and what is inherently provided under the VRRM, as well as provide opportunities to improve overall watershed conditions beyond minimum compliance.

<u>Recommended Strategic Actions:</u>

- Expand the SSC to apply to the entirety of all County watersheds for any new development and re-development (not limited to select types, as is currently the case).
- Consolidate the SSC into a more simplified number of options that supplement the current VRRM requirements. All projects shall comply with VRRM minimum standards, then employ one or more of the following options as determined by the size of the development like presently included in the SSC.
  - Water Quality SSC
    - When the VRRM baseline compliance accommodates a Level 1 BMP, increase the BMP design to Level 2, or the runoff reduction volume requirement to some yet-to-be-determined percentage above the VRRM requirement.
    - Restoration of existing eroded channels onsite and downstream of proposed outfalls.
    - Implementation of at least one of the recommended Watershed Restoration Project recommendations from the WSMP.
  - Water Quantity SSC
    - Instead of 10-yr attenuation of post-development flows to pre-development flows for baseline flood control compliance, increase the level of attenuation to an established percentage below existing flows.
    - Require new development quantity calculations to use NOAA MARISA-adjustments of a pre-set time horizon and emissions level for all post-development numbers but keep with existing Atlas 14 for pre-development numbers/targets. Re-evaluate after Atlas 15 and/or other industry guidance is established.
- Instead of refining the SSC as noted above, consider an alternative overall shift in the focus of the SSC to establish an Offsite Contribution Program as described below:
  - Require new development to still comply with minimum VSMP standards onsite, but also contribute funds towards offsite improvements to be implemented elsewhere in the Watershed at a unit cost per volume of runoff or per acre of impervious cover.
  - For example, a One-for-One program where for every acre of new development, one acre of historical development is also offset through JCC-implemented retrofits paid for by the offsite contributions.

- Alternatively, such an Offsite Contribution Program could be woven into the SSC as another water quality criteria option above if complete replacement of the SSC framework is not preferred by JCC.

3.2.2 OTHER COUNTY ORDINANCE CHANGES

In addition to JCC's SSC there are other opportunities to improve how ordinances can minimize impacts of stormwater runoff on downstream ecosystems, and continue to maintain and even improve existing conservation areas, habitat cores, and corridors. The following recommendations are targeted to do this for the Yarmouth Creek Watershed.

Recommended Strategic Actions:

- Continue existing and explore additional zoning and subdivision ordinance tools to require or encourage preservation of potential Conservation Areas and Habitat Cores/Corridors (CA/HC/C). Specifically, where practical:
  - Limit additional development within potential Conservation Areas.
  - Increase focus on Low Impact Development (LID) and Better Site Design (BSD) in potential development areas immediately upstream or adjacent to CA/HC/C.
  - If a roadway crosses through CA/HC/C, examine options for wildlife-safe crossings, with particular focus on those rare, threatened, and endangered (RTE) species.
- The current VSMP regulations allow for the use of offsite nutrient credit purchases in lieu of onsite water quality treatment for some or all required treatment depending on development size. This could result in declining local water quality within the watershed if the offsite practices associated with the nutrient credits are located in a different watershed. To avoid the effects this could have on Yarmouth Creek, restrict the use of offsite nutrient credits to only those credits/banks within the watershed and do not allow outside-of-watershed nutrient banks. Similar restrictions could be employed across the entire county for all watersheds:
  - Review statewide nutrient trading laws and regulations (including 9VAC25-900-91 and DEQ Guidance Memo No. GM21-2007) to confirm such an ordinance change is acceptable and refine language accordingly. Most notably ensuring that such a restriction is justified in the content of a documented TMDL study or impairment.
  - Review similar action by the City of Harrisonburg (harrisonburgva.gov) and/or others to refine ordinance language before adoption.
- Smaller-scale, single-home renovations and infill development often results in less disturbance than would be required to trigger VSMP compliance. Whereas isolated cases of this would not be a concern, collective untreated single-home development activities across multiple sites could result in a significant increase in pollutant loading or flows. To help avoid such a scenario, establish requirements for any building permit, regardless of disturbance size, to offset any increases in runoff volume from existing conditions. This could help avoid some of the issues that other urbanized communities have experienced when older, smaller homes are purchased and replaced with new

homes that have much larger footprints, resulting in downstream conveyance system flooding since the existing drainage infrastructure was sized for the previous less intense development

  - Compare with the new DEQ “agreement in-lieu of plan” language to ensure acceptable local regulation approach (i.e., heightened stormwater ordinance versus Special Use Permit (SUP) or building permit requirement).

3.2.3 REZONING AND SPECIAL USE PERMIT REVIEWS

It is acknowledged that Watershed Management Plan considerations have been part of legislative case (rezoning or SUP) review since adoption of the prior Plan, and they have helped County staff work with applicants to achieve adjustments in development design and/or the provision of enhanced environmental protection measures by the developer. Continuation of this process would be beneficial.

Recommended Strategic Actions:

- Consult the additional assessment results and recommendations contained herein when future rezoning and SUP decisions are made.
- Use proffers or SUP conditions to exceed minimum requirements in areas of concern to better protect the watershed health.

3.2.4 ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

An illicit discharge is an illegal discharge of any substance (liquid or solid) other than stormwater. It can be as simple as a direct connection of a washing machine to the stormwater system, discharge from unauthorized activities not having a permit to do so, disposal of grass clippings or leaf litter, and include accidental discharge characterized as such. The County has an illicit discharge reporting program where concerned residents can communicate observations or concerns related to a potential illicit discharge for review by JCC. The number of illicit discharges tracked by JCC is limited by the number of reports received. Further refinements to this program could include the following.

Recommended Strategic Action:

- Targeted, proactive IDDE inspections in older developments to identify potential cross-connections that would need to be separated.
- Periodic follow-up inspections at previously reported illicit discharge locations to determine if the concerns continue to be addressed or if repeat incidents are occurring that could require additional education, improvements, or ultimately enforcement action.
- Additional review of potential or confirmed hot spots noted in the Watershed Management Plan to better understand conditions and engage property owners on the appropriate actions needed to reduce pollution potential.

3.3 Floodplain Management Recommendations

Localized flooding, larger-scale riverine flooding, and tidally-driven flooding have all become more of an issue over time. While it is a complex challenge to people and infrastructure within the watershed, there is an increasing public-awareness of the issue and what it will take to plan ahead for these events.

Recommended Strategic Actions:

- Perform quantitative flood modeling to better understand both interior drainage flash flooding risks and riverine flooding risks outside of the tidal areas currently reviewed, especially for the headwater tributaries surrounded by more development.
- Expand flood risk analysis to countywide review and overall resilience plan development to understand how risks to inter-watershed transportation routes might further affect access to isolated communities.
- Incorporate dam break inundation zone modeling of the regulated dams within the Watershed, to understand other existing & future flood risks associated with dam failures.
- Engage owners of dams in need of rehabilitation to meet Virginia Dam Safety regulations to ensure:
    - Downstream risks in storms below the Spillway Design Flood are also considered (i.e., avoid 10-yr to 100-yr storm increases) during the rehabilitation design.
    - Implement County grant program to incorporate low-flow orifice for water quality and channel protection benefits into the rehabilitation design, or other retrofit potential at the impoundment (including but not limited to forebays, aeration, and polishing treatment).
        - The Clean Water Heritage Grant program (or similar) could be employed for private BMP maintenance not for regulated dams, incorporating betterments into the BMP during non-routine maintenance.
- Coordinate with Newport News Waterworks (NNWW) and Chesapeake Bay Nutrient Land Trust (CBNLT) regarding the buildings located within the dam break inundation zones of Little Creek Reservoir and Cranston's Mill Pond to ensure Emergency Action Plan (EAP) activities capture all affected properties, including recently constructed homes and/or potential additional affected structures not previously identified in the EAP.
- Share flood risk findings with County Emergency Management, compare to their action plans, and identify if any adjustments are needed to their evacuation zone prioritization and/or emergency access routes.
- Consider potential flood mitigation or other access to neighborhoods which may become inaccessible to traffic due to large flooding events or buried utilities, with specific emphasis on North Riverside Drive and Menzels Road.
- Encourage private landowners within the floodplain (especially areas of high concentration such as Chickahominy Haven) to raise the elevations of the first finished floors, HVAC systems, critical utility features, etc. of their buildings and/or employ other floodproofing measures.

    - Perform a benefit-cost analysis (BCA) on such improvements to aid in FEMA funding assistance or other grant programs to help subsidize the costs.
    - Consider property buyouts and conversion to natural areas for select structures with the greatest risks and/or low BCA ratio.

3.4 Education & Awareness

3.4.1 CONTINUED COMMUNITY ENGAGEMENT AND PARTICIPATION

JCC has an excellent track record with community participation and engagement to encourage and facilitate citizen engagement and feedback. Continuing this effort to promote the actions described in this WSMP ensures successful implementation of recommended actions. These actions are mentioned elsewhere in this section but are related to Education and Awareness and bear repeating here.

Student engagement within the school system is also an important action, incorporating introductions to science, outdoor activity and field trips, and the first exposures to environmentalism and awareness.

Recommended Strategic Actions:

- Support the conservation and protection priorities of the Lower Chickahominy Watershed through membership in the Lower Chickahominy Watershed Collaborative. Recommendations:
    - Communicate and coordinate with other members of the collaborative regarding land conservation, land protection and economic opportunity issues important to James City County.
    - Actively participate in the steering committee and work groups to improve physical recreational infrastructure; support sustainable economic development; enhance river advocacy, education, and marketing; promote land conservation and landowner education; ensure protection of sites and traditions that are sacred and historic to the tribes; and increase ecological restoration and stewardship in the watershed.
- Engage students early in watershed awareness. Hands-on activities conveying stormwater concepts (such as runoff, pollution, general watershed concepts and characteristics), and opportunities to get out and see and experience conditions in different parts of a watershed and how they differ from heavily developed or poorly-protected, to undeveloped or well-protected areas, often lay the foundation for very active and involved young adults. There really is no minimum age for engaging children.
- Find, engage, and support local watershed stewardship organizations. These may be watershed- and county- specific, or they may be focused more broadly on the Chesapeake Bay. There may be participants of a broader Chesapeake Bay group, or an unrelated volunteer environmental organization, from which a locally focused branch may spring, or locally focused efforts may be established.
- Pet waste program education is most successful when it is much more than simply fact-based. Look to public relations and marketing campaigns that have met great success for examples in how messaging can be most effective. Seattle, WA and surrounding counties have seen tremendous success and garnered national recognition over that success. Simply telling people that they should

also scoop poop within their own yards may be an easily defensible action, but not a particularly effective one.

- With respect to the conservation areas, and habitat cores and corridors, adding opportunities to educate the public on the presence of the rare, threatened, and endangered species present in the watershed and neighboring watersheds, and how to minimize human impacts on natural spaces and processes can be a broadly effective measure, though impossible to measure.

- Septic system maintenance involves more than merely pumping tanks periodically, and repairing or replacing once failure occurs. Consider public information campaign with regular outreach regarding such maintenance and care activities and factors such as:

  - Garbage disposals in kitchen sinks, utility sinks, outdoor wash areas connected to septic drains, and other sources of undigestible solids can clog and permanently incapacitate drainfield lines. Inexpensive (~$50) sediment screens installed (perhaps $100-150 not including location and any necessary excavation of access port) in effluent line of septic tank, cleaned annually, can prevent expensive failure. Consider establishing a discounted annual service contract arrangement taking advantage of the economy of scale, where homeowners provide the filter/screen at their cost, and have either free or discounted service for installation from a plumbing or septic maintenance contractor. Initial setup for this might be a significant effort, given locations and depths of existing septic systems. And any new development employing onsite sewage treatment should include strong recommendation for effluent sediment screens where applicable.

  - Not all household chemicals and products are safe for onsite septic systems. What to, and not to, flush is important knowledge for residents.

3.5 Watershed Restoration Projects

Methodologies for the identification and subsequent ranking of project candidates to address stormwater and general ecosystem health across the Watershed are discussed in the next section, Section 4, Watershed Restoration Projects, with a subset of projects within each Subwatershed and additional subwatershed-scale detailed information in Section 6, Subwatershed Management Plans.

Recommended Strategic Actions:

- Continue investigating the current best practices in conjunction with the ongoing refinement and reevaluation of the County's priorities. For example, for areas where bacterial impairments are the top priority, consider incorporation of biochar into stormwater retention practices, and evaluate the best plant communities and design parameters for constructed wetlands to maximize bacterial reductions.

- Review and revise as necessary the JCC BMP database, as there are some values which appear to warrant correction. Good, accurate data help to better inform other actions. Also, treated area (total and impervious) is very good information, but where practical, adding probable treatment volume of the practice better informs performance evaluation.

- Conduct a more refined value assessment on restoration projects in target areas. A concept-level design and brief investigation into certain projects, or all of those within certain high-priority areas, will allow cost estimates (currently very high-level) to be better accounted for in cost/benefit analyses.

4 WATERSHED RESTORATION PROJECTS

The projects detailed in this Section were identified and prioritized in such a way as to restore functions lost or diminished across the Watershed. They are important but are not the only actions that should be taken to bring the Yarmouth Creek Watershed to a more functioning, resilient, and healthy watershed ecosystem with thriving aquatic, riparian, and upland habitats.

Generally and broadly speaking, a combination of all types of actions and projects, from programmatic actions to regulatory structures to stormwater practices and stream restorations, is the most effective big-picture approach to watershed protection and restoration. Specifically within the projects detailed in this section, a combination of upland stormwater treatment practices and stream restoration projects is very strongly recommended, with the upland BMPs really providing the basis for the durability or longevity of downstream stream restoration projects. If the conditions that caused the degradation of a stream are not addressed before, or in concert with a stream restoration, the newly restored stream will be much less likely to stay in good condition. Therefore, it is highly recommended to look at stormwater BMPs and stream projects in a holistic way, as components of a program, rather than as distinct and discrete projects. If undertaking a particular stream restoration project, it is advisable to heighten the priority or adjust the schedule earlier for upland BMPs in the contributing drainage area, and to evaluate priorities such as water quantity and flow attenuation versus water quality and pollutant removal in the greater context.

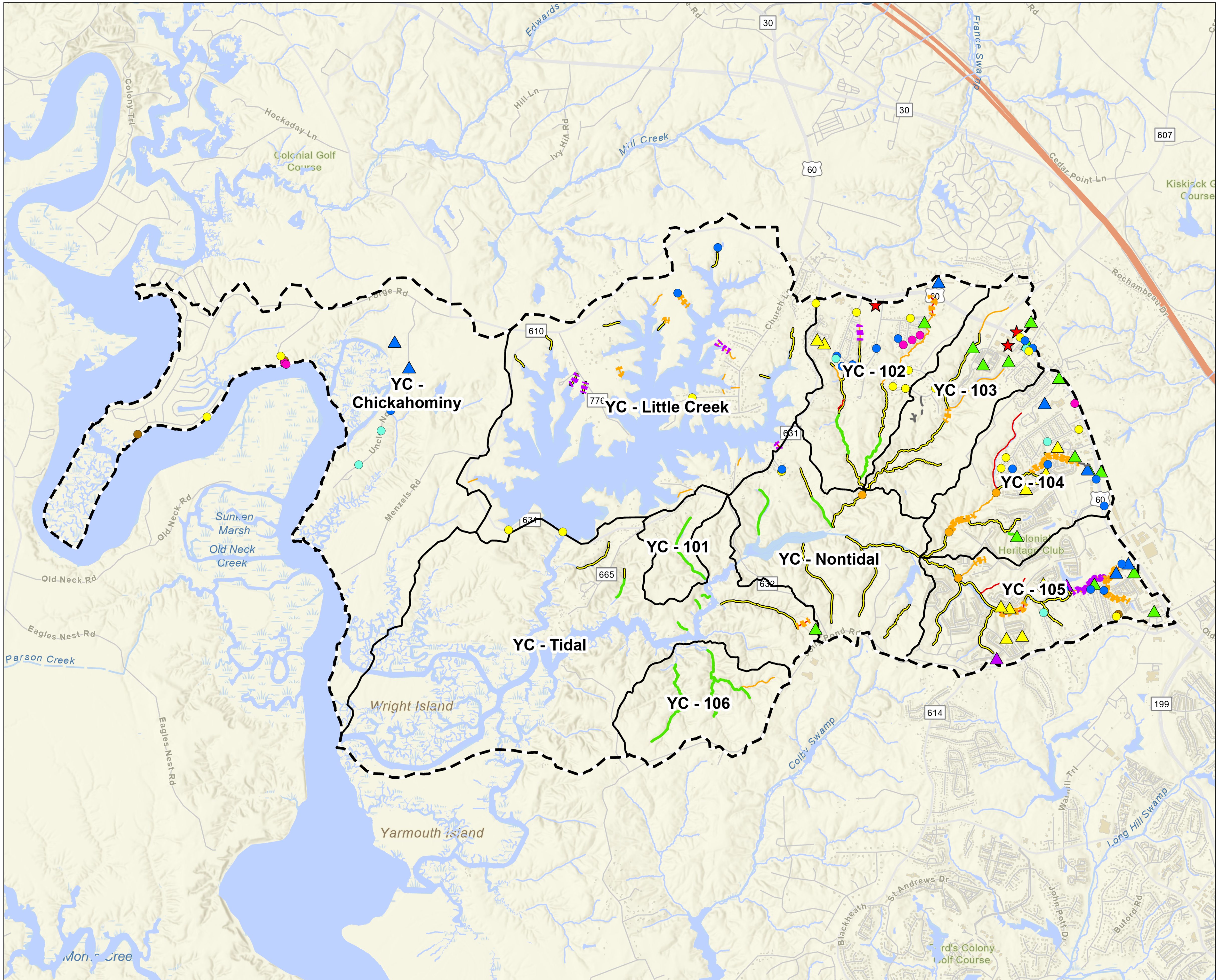
Field data collected during both stream and stormwater field assessments informed each recommended action or project and, in some cases, informed one another when appropriate. The following sections describe the results of the field assessment efforts with a prioritization effort following the field assessment results. Figure 34 provides an overall view of the types and locations of different Watershed Restoration Projects recommended in the following pages. Descriptions of these project types are provided below.

- **Stream Project Types:**
    - **Enhancement** – Targeted changes in stream morphology and vegetation to uplift existing functions within a reach.
        - **8** recommended locations, 1.16 miles
    - **Restoration** – A full reconstruction of a reach's morphology to 'reset' conditions.
        - **14** recommended locations, 2.13 miles
- **Localized Projects** to address isolated issues that were not prevalent across a whole stream reach, such as repairing headcuts or eroded and unstable outfalls, or potentially cleaning up dumping sites.
        - **7** recommended locations

- **Stormwater BMP Retrofit Types:**
  - **Bioretention** – A basin designed to capture runoff, constructed with special soil media and appropriate native plants to allow some of that runoff to infiltrate into the surrounding soils and be taken up by the plants, reducing the overall runoff passing through. Where feasible (pending onsite investigation and analysis), these can be incorporated into other detention practices offering additional water quality and hydrologic benefits.
    - **11** recommended locations
  - **Outfall Enhancement** – Outlet structures can be modified to improve extended detention for water quantity and/or water quality benefits.
    - **2** recommended locations
  - **Rehabilitate/Upgrade** – In some cases it is a repair or long-term maintenance issue that needs to be addressed (rehabilitate – berm erosion/failure, outlet structure failing). Most of the actions recommended have to do with optimizing the existing BMP for some combination of water quality treatment and outflow attenuation for flood mitigation and channel protection (upgrade).
    - **15** recommended locations
  - **Retrofit – Constructed Wetland, or Wet Pond** - Existing BMPs that could be reconfigured to become either a constructed wetland or wet pond providing increased pollutant load removal opportunities. In some cases, these are originally dry detention ponds that have very wet conditions. Additional investigations are needed to determine if a constructed wetland versus a wet pond is feasible or appropriate for each location, since each has unique constraints and benefits/applications.
    - **7** recommended locations
- **New Stormwater BMP Types:**
  - **Conservation Landscaping** – Conversion of existing land cover/use to more natural cover such as pollinator habitat plantings, rain garden if wetter, etc.
    - **3** recommended locations
  - **Constructed Wetland (CW)** – A wetland with pools and a sinuous main channel or multiple channels, which serves as water quality and quantity treatment feature. Several configuration options exist.
    - **1** recommended location
    - **4** recommended locations described as **regional stormwater facility (constructed wetland treatment system, or wet pond)**. The intent here is to focus on constructed wetland systems or potentially wet ponds that are scale- and location-appropriate for priorities to be identified and refined later. At the suggested locations, several different priorities may be selected, such as treatment of bacteria and other pathogens, hydraulic control (flow attenuation), dissolved oxygen (DO), or other parameters, and design should follow accordingly.

- **Re/Detention** – A basin to capture and at least temporarily hold runoff address water quality issues, but also so that more natural hydrologic responses (timing and amount) of runoff events are attained. Detention refers to a wet or dry pond to capture surface water runoff. Retention refers to practices such as bioretention and infiltration basins which also allow more runoff to soak into the soil, further reducing outflow.
  - **19** recommended locations
- **Other** – These may include any BMPs not covered by one of the more common categories, including permeable pavement, manufactured treatment devices (MTD), shoreline stabilization, or other types.
  - **6** recommended locations
- **Stepped Pool Stormwater Conveyance (SPSC)** – A series of small pools with small waterfall/drops between each that minimizes bed and bank erosion of drainage conveyances (e.g., ditches). This is often used in areas where the slopes are higher, area is limited, or the length of conveyance from higher levels to waterways is too short for other potential management types. These are sometimes referred to as Regenerative Stormwater Conveyances (RSC) elsewhere. Alternately, a more simplified approach with less stormwater treatment benefits could simply entail outfall stabilization.
  - **6** recommended locations
- **Swale** – A drainage conveyance approach that attempts to slow runoff timing and lower downstream volumes while at the same time provides potential pollutant removal action. Dry swales are akin to linear bioretention, and wet swales are essentially ditches which have some similar function to wet ponds in terms of water quality.
  - **19** recommended locations

Further details about the recommended projects are provided by Subwatershed in Section 6, Subwatershed Management Plans, at subwatershed-scales.



Title

Figure 34 - Recommended Projects for the Yarmouth Creek Watershed

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location
James City County, Virginia

Prepared by MGS on 2023-08-28
TR by JMH on 2023-08-17
IR by DP on 2023-08-31

N

0 4,000 8,000 Feet

(At original document size of 11x17)
1:48,000

- Yarmouth Creek Watershed
- Yarmouth Creek Subwatershed

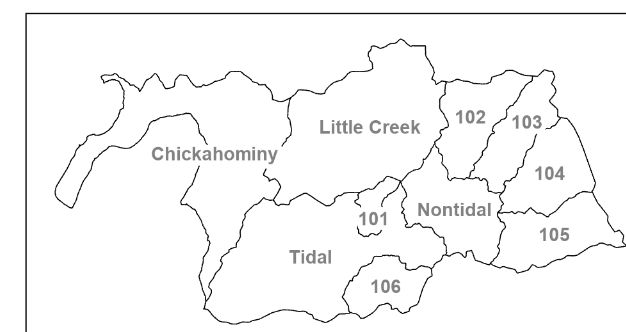
New BMP Opportunities
- Conservation Landscaping
- Constructed Wetland
- Other
- Re/Detention
- SPSC
- Swale

HSI Score
- Confirmed Hotspot

Retrofit of Existing BMPs
- Bioretention
- Outfall Enhancement
- Rehabilitate/ Upgrade
- Retrofit - CW/ Wet Pond

Recommended Stream Projects
- Enhancement
- Restoration

Stream Habitat Rating
- Optimal
- Suboptimal
- Marginal
- Poor
- Streams
- Existing Restored Reach



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

Revised: 2023-11-30 By: mgsanderson

4.1 Stream Restoration Assessment

4.1.1 Methodology for Identifying Candidate Projects: Stream Assessment Reaches

During stream assessment field work, reaches marked to be considered for restoration or enhancement were chosen for a variety of reasons. First, if a reach had extremely low habitat scores (see Section 2.3.1 for explanation/breakdown) it was marked as poor. Reaches with higher scores (Marginal or Suboptimal) that may have received higher overall scores may have been still recommended for restoration or enhancement due to exposed utilities and/or specific areas of downcutting. In the table below, explanations are presented for each reach describing why "Poor" reaches may not have been recommended and why some reaches that scored "Marginal" or "Suboptimal" were included as recommendations.

Additionally, some of the "Poor" rated reaches were shorter reaches and that did not provide an ideal ecological habitat but were considered impractical for restoration; therefore they were not recommended for management action. These types of streams score low but are not good candidates for restoration or enhancement of aquatic and/or riparian habitats (examples of reaches fell into this group ST1-15-C, ST2-6-G, ST2-8-B and ST2-10-C) given the limited amount of ecological uplift they would receive post-restoration. Another consideration was access to the reach of stream in question. If access was poor and/or extreme clearing of good quality forest was required, the reaches were not put forth as project recommendations.

Of the 101 reaches, totaling about 26 miles, there were 22 reaches (totaling approximately 17,300 linear feet) that stood to benefit from some degree of active management. Details of these reaches, their habitat quality scores, and field notes are provided in Table **23**, and shown spatially in Section 6, Subwatershed Management Plans.

Table 23 – Field-Assessed Stream Reaches Receiving Recommended Actions

Sub	Reach ID	Stream Type (Rosgen)	Habitat Condition Rating	Recommended Action	Notes
YC-102	ST2-12-C	C	Poor	Restoration	Channel is extremely incised with little to no vegetative protection, high erosion, and heavy sedimentation. However, only upper portion is recommended for restoration. Mature woods beyond that are high value.
YC-102	ST4-18-G	G	Marginal	Enhancement	Channel is downcut with low vegetative cover on the banks, sloughing banks, and sedimentation.
YC-103	ST4-29-C	C	Marginal	Restoration	Channel is overwidened and incised with little vegetative protection, undercut banks, and sedimentation.
YC-104	ST1-10-G	G	Marginal	Restoration	Channel is incised with low vegetative protection, cover, eroded banks, sedimentation, and deposition.
YC-104	ST1-11-C	C	Marginal	Enhancement	Channel is incised with low vegetative protection, cover, eroded banks, sedimentation, and deposition.
YC-104	ST1-16-G	G	Marginal	Restoration	Channel banks are heavily eroded and have low vegetative protection.
YC-105	ST1-24-A	A	Marginal	Restoration	Channel is heavily eroded at the top of the reach as well as multiple side channels. Channel has many sloughing banks along the reach.
YC-105	ST1-25-G	G	Poor	Restoration	Channel is severely eroded. Extreme vertical and horizontal instability with no vegetative protection.
YC-105	ST1-26-G	G	Poor	Restoration	Channel is severely eroded. Extreme vertical and horizontal instability with no vegetative protection.
YC-105	ST1-28-G	G	Marginal	Restoration	Channel is severely eroded. Extreme vertical and horizontal instability with no vegetative protection.
YC-105	ST1-29-C	C	Marginal	Restoration	Channel is severely eroded. Extreme vertical and horizontal instability with no vegetative protection.
YC-105	ST1-30-C	C	Marginal	Enhancement	Channel has outer bend erosion and some areas of downcutting/headcuts.

Sub	Reach ID	Stream Type (Rosgen)	Habitat Condition Rating	Recommended Action	Notes
YC-105	ST4-16-G	G	Poor	Restoration	Channel is incised with vertical banks, low vegetative protection, and sloughing banks.
YC-LC	ST2-19-B	B	Suboptimal	Enhancement	Channel has low but vertical banks with some small headcuts.
YC-LC	ST2-20-B	B	Suboptimal	Enhancement	Channel has low but vertical banks with some small headcuts.
YC-LC	ST2-21-B	B	Marginal	Restoration	Channel is incised with low vegetative protection and low bank stability.
YC-LC	ST2-25-B	B	Marginal	Restoration	Channel is incised with low vegetative protection and low bank stability.
YC-LC	ST2-26-B	B	Marginal	Restoration	Channel has vertical banks with low vegetative protection and low bank stability.
YC-LC	ST4-31-G	G	Poor	Enhancement	Channel has low but vertical banks with some small headcuts.
YC-LC	ST4-33-B	B	Poor	Enhancement	Channel is slightly to moderately incised with low vegetative protection and poor stability.
YC-LC	ST4-34-C	C	Marginal	Enhancement	Channel is downcut in areas with low vegetative protection and vertical instability.
YC-Tidal	ST1-09-G	G	Poor	Restoration	Channel is extremely eroded and downcut with no vegetative protection and vertical, sloughing banks.

4.2 Localized Projects – Riparian Areas

During the field assessment for stream reaches, field personnel also identified twenty-two specific impact locations (hereafter referred to as Localized Projects) along assessed reaches that would benefit from some degree of active management. The points are listed in Table 24 and can be found in the maps for each Subwatershed in Section 6, *Subwatershed Management Plans*.

Table 24 – Field-Assessed Localized Projects Receiving Recommended Actions

Sub	Map ID	Observations	Proposed Improvements
YC - 102	5	Washed out culvert outfall with erosion	Culvert outlet protection

Sub	Map ID	Observations	Proposed Improvements
YC - 104	2	Inlet at Headcut. Significant erosion.	Inlet protection & stabilization
YC - 105	3	Culvert, some erosion.	Culvert outlet protection
YC - 105	4	Steep headcut.	Possible stabilization
YC - Little Creek	1	Illegal dumping observed.	Removal of material, consider posting signage
YC - Little Creek	6, 7	Undercut valley slope, previous water level.	Consider low-intensity stabilization at erosion feature exposed during lake drawdown, with potential for future submerged wood features for added fish habitat features. Similar opportunities may also be present throughout other portions of the lake.

4.3 Stormwater Retrofit Opportunity Assessment

4.3.1 Methodology for Identifying Stormwater Retrofits: Field Assessment

Stantec staff visited the BMPs shown in Figure 31 (in Section 2.3.2.1 above) indicated as 'Field Inspected' with the objective of determining how each might benefit from retrofit or rehabilitation to meet the needs of the Yarmouth Creek Watershed. Due to access restrictions and other constraints, not all existing BMPs in the watershed were visited. A desktop prioritization occurred in advance of the field work to inform the reconnaissance work and focus on efficiency. Factors considered included drainage area and drainage area characteristics, age of facility (standards to which they were originally designed and built), and facility type (potential magnitude of improvement of water quality or quantity treatment). For each BMP visited in the field there were several considerations as they were assessed for potential retrofit opportunities. These are:

- Area available for retrofit actions within and adjacent to BMP footprint.
- Adjacent land use in surrounding areas.
- Vehicle/equipment access to the BMP for construction and maintenance purposes.
- Potential utility conflicts for permanent expansion of BMP footprint as well as for temporary construction access requirements.
- Permitting and property ownership factors that may make the retrofit less efficient or cost-effective for a given BMP location.

Table 25 provides distilled field notes and recommendations for retrofit or rehabilitation of 35 of the 68 existing BMPs that were assessed. For those without recommendations, they appeared to offer no significant opportunity for improvement in terms of stormwater treatment, and no perceptible need for repair/rehab. There were 15 BMPs that may be candidates for retrofit or repair/rehab that are currently listed as 'Developer Control' under status in JCC's database, meaning they have not yet been released from their construction bonds are not yet available for consideration. These were presented separately to

JCC for future consideration as projects. The following recommendations do not constitute an exhaustive list and should not limit any BMP investigation and retrofit efforts moving forward. Further details about the recommendations for these BMPs are provided by Subwatershed in Section 6, Subwatershed Management Plans.

Table 25 – Recommended Retrofit Opportunities of Existing Stormwater BMPs

Sub	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment
YC - 102	BMP-WC020	Allan Myers Dry Pond	Dry Extended Detention Ponds	9.3	Retrofit - CW/ Wet Pond
YC - 102	BMP-YC013	Toano Woods Wet Pond	Wet Pond	40.5	Rehabilitate/ Upgrade
YC - 102	BMP-YC019	Toano Trace Dry Pond	Dry Extended Detention Ponds	8.72	Bioretention
YC - 102	BMP-YC020	Toano Trace Dry Pond	Dry Extended Detention Ponds	6.59	Bioretention
YC - 103	BMP-YC003	Poplar Creek Business Center Dry Pond	Dry Extended Detention Ponds	24.7	Rehabilitate/ Upgrade
YC - 103	BMP-YC006	Williamsburg Soap & Candle Factory Wet Pond	Wet Pond	142.1	Rehabilitate/ Upgrade
YC - 103	BMP-YC023	Norge Shopping Center Infiltration	Infiltration Trench	4.07	Rehabilitate/ Upgrade
YC - 103	BMP-YC081	Village at Candle Station Bioretention	Bioretention	1.76	Rehabilitate/ Upgrade
YC - 103	BMP-YR030	Tractor Supply Company Infiltration 2	Infiltration Basin		Rehabilitate/ Upgrade

Sub	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment
YC - 104	BMP-YC005	Riverside Medical Center Infiltration	Infiltration Trench	2.9	Rehabilitate/ Upgrade
YC - 104	BMP-YC016	Norge ES Infiltration	Infiltration Trench	8.61	Retrofit - CW/ Wet Pond
YC - 104	BMP-YC021	Williamsburg Dodge Wet Pond	Wet Pond	16.8	Rehabilitate/ Upgrade
YC - 104	BMP-YC028	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	18.7	Bioretention
YC - 104	BMP-YC030	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	6.9	Bioretention
YC - 104	BMP-YC031	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	9.1	Bioretention
YC - 104	BMP-YC032	Colonial Heritage Phase 1 Wet Pond	Wet Pond	36.4	Rehabilitate/ Upgrade
YC - 104	BMP-YC049	Baylands Federal Credit Union Bioretention	Bioretention	1.6	Rehabilitate/ Upgrade
YC - 104	BMP-YC050	Baylands Federal Credit Union Dry Pond	Dry Extended Detention	9.56	Retrofit - CW/ Wet Pond
YC - 104	BMP-YC057	Colonial Car Wash Wet Pond	Wet Pond	4.7	Rehabilitate/ Upgrade
YC - 104	BMP-YC074	Norge Neighborhood Dry Pond	Dry Extended Detention Ponds	33.6	Bioretention

Sub	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment
YC - 105	BMP-YC014	Wythe Candy Warehouse Dry Pond	Dry Extended Detention Ponds	3.94	Retrofit - CW/ Wet Pond
YC - 105	BMP-YC015	Briarwood Park Dry Pond	Dry Extended Detention Ponds	7	Rehabilitate/ Upgrade
YC - 105	BMP-YC022	Chesapeake Bank Bioretention	Bioretention	0.5	Rehabilitate/ Upgrade
YC - 105	BMP-YC025	Colonial Heritage Massie Pond	Wet Pond	150.1	Outfall Enhancement
YC - 105	BMP-YC033	Colonial Heritage Phase 2 Dry Pond	Dry Extended Detention Ponds	12.8	Bioretention
YC - 105	BMP-YC038	Colonial Heritage Phase 4 Dry Pond	Dry Extended Detention Ponds	27.7	Bioretention
YC - 105	BMP-YC039	Colonial Heritage Phase 4 Wet Pond	Wet Pond	26.5	Outfall Enhancement
YC - 105	BMP-YC041	Colonial Heritage Phase 4 Dry Pond	Dry Extended Detention Ponds	17.04	Bioretention
YC - 105	BMP-YC044	Colonial Heritage Phase 3 Dry Pond	Dry Extended Detention Ponds	10.8	Bioretention
YC - 105	BMP-YC045	Colonial Heritage Phase 3 Dry Pond	Dry Extended Detention Ponds	4.8	Bioretention

Sub	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment
YC - 105	BMP-YC055	The Candy Store Dry Pond	Dry Extended Detention Ponds	3	Retrofit - CW/ Wet Pond
YC - 105	BMP-YC090	Lightfoot Marketplace CHKD Permeable Pavers	Permeable Pavement	1.94	Rehabilitate/ Upgrade
YC - Chickahominy	BMP-CR001	Uncles Neck Dry Pond	Dry Extended Detention Ponds	14.01	Retrofit - CW/ Wet Pond
YC - Chickahominy	BMP-CR002	Uncles Neck Dry Pond	Dry Extended Detention Ponds	6.08	Retrofit - CW/ Wet Pond
YC - Tidal	BMP-GC001	WJCC Maintenance and Operations Wet Pond	Wet Pond	5.1	Rehabilitate/ Upgrade

4.4 New Stormwater BMP Opportunity Identification

While field personnel were performing CWP's Neighborhood Source Assessments (NSA) and Hot Spot Investigations (HSI) throughout the Watershed (See Section 2.3.2.2 for more details), opportunities for new BMPs were observed and noted, whether in concert with existing BMPs (e.g., outfall enhancement) or simply as a new stand-alone BMP. In some instances, desktop analysis incidentally revealed a possible site for a new BMP which was then later visited and confirmed by field staff.

Similar to retrofit opportunities, many factors are considered when evaluating and recommending new BMPs, with a lot of crossover between new and retrofit. These newly identified locations can offer great opportunities to capture stormwater flows for quantity and/or quality treatments. The four regional stormwater pond location options were identified from desktop assessment alone, based on location of the streams and confluences above them in the watershed. There were 59 different opportunities identified where a new BMP has potential for success. The list is provided in Table 26 and displayed in maps by Subwatershed in Section 6, Subwatershed Management Plans.

Table 26 – New BMP Opportunity Recommendations

Sub	New BMP ID	Proposed Treatment	Notes
YC - 102	OPP-102-25	Re/Detention	Small practices possible.
YC - 102	OPP-102-26	Re/Detention	Small practices possible.
YC - 102	OPP-102-28	Re/Detention	Small practices possible.
YC - 102	OPP-102-29	SPSC	Concrete channel lining severely undercut.
YC - 102	OPP-102-30	Swale	Drainage paths - require stable BMPs.
YC - 102	OPP-102-31	Re/Detention	Localized drainage to area behind house. Space constraints and recent construction may complicate. Possible opportunity downstream on adjacent, yet-undeveloped parcel.
YC - 102	OPP-102-32	Swale	A few potential opportunities. Roadside ditches, particularly lined ones, convert to WQ swales. May be option for small basins upstream of YC013.
YC - 102	OPP-102-34	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.
YC - 102	OPP-102-35	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.
YC - 102	OPP-102-36	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.
YC - 102	OPP-102-37	Re/Detention	Potential for basin, but wholly on private property. Looks like it would be on two adjoining parcels.
YC - 102	OPP-102-39	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.
YC - 102	OPP-102-40	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.
YC - 102	OPP-102-41	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.

Sub	New BMP ID	Proposed Treatment	Notes
YC - 103	OPP-103-06	SPSC	Ephemeral channel, likely experiencing intense flows. Swale, or SPSC possible.
YC - 103	OPP-103-38	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.
YC - 103	OPP-103-42	Swale	Linear practice possible, type determined by constraints (TBD).
YC - 103	OPP-103-43	Re/Detention	Depending on storm drain elevations, bioretention may be feasible.
YC - 103	OPP-103-44	Re/Detention	Trees and shrubs look mature and healthy. If the balance of environmental benefits checks out, microbioretention may be option.
YC - 103	OPP-103-45	Swale	Location of drainage easement relative to actual drainage path is unclear. Swale possible along drainage path.
YC - 104	OPP-104-05	Re/Detention	Soil Survey suggests well-drained soils. Investigate options for retention. Otherwise detention possible, depending on outlet options.
YC - 104	OPP-104-22	Re/Detention	Appears to be sufficient head for a small bioretention.
YC - 104	OPP-104-27	Swale	Several potential opportunities for light-touch swale BMPs along drainage ditches.
YC - 104	OPP-104-51	Swale	Linear practice. Relationship to existing storm drain infrastructure is uncertain.
YC - 104	OPP-104-52	SPSC	Light-touch SPSC may be an option. Channel appears ephemeral.
YC - 104	OPP-104-53	Re/Detention	Small bioretention basin, if feasible.
YC - 104	OPP-104-54	Swale	Grassed swale, or potential for dry swale if elevations and easements allow.
YC - 104	OPP-104-71	Re/Detention	Small bioretention basin, if feasible.
YC - 104	OPP-104-72	Other	If permeable pavement, and working properly, expand, perhaps increase visibility.
YC - 104	OPP-104-RP02	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) at confluence.
YC - 104	OPP-104-RP03	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) as option to, or in conjunction with, restoration of reach ST1-16-G.

Sub	New BMP ID	Proposed Treatment	Notes
YC - 105	OPP-105-01	SPSC	Step pool stormwater conveyance or dry swale likely viable.
YC - 105	OPP-105-04	Re/Detention	Centerville Road Tributary BMP Retrofit Plan from WEG.
YC - 105	OPP-105-08	Re/Detention	Linear feature may be possible, either parallel or perpendicular to road. Detention possible as well.
YC - 105	OPP-105-09	Re/Detention	Elevation head available for retention/detention practice.
YC - 105	OPP-105-101	Constructed Wetland	Downstream of YC033, on south side of trail, area could become constructed wetland for additional benefit.
YC - 105	OPP-105-102	Re/Detention	Consider a polishing treatment BMP just below the YC025 outfall where the first flush can be diverted to a runoff reduction BMP if feasible following further investigation. See also YC025 retrofit recommendation.
YC - 105	OPP-105-48	Conservation Landscaping	Local depression without available head for underdrain unless installing several hundred feet of pipe. Conservation landscaping an option.
YC - 105	OPP-105-49	Swale	Same location as OPP-105-48 with alternate consideration for new swale improvements, or in tandem with other recommendations.
YC - 105	OPP-105-RP04	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) along Yarmouth Creek.
YC - Little Creek	OPP-LC-111	Swale	Linear practice such as a dry swale may be possible following investigation. Wet swale not advised due to nearby residences.
YC - Little Creek	OPP-LC-12	Swale	Ditch at east end of dam, on south side of road, may be turned into linear feature such as WQ swale. Outfall at end of west side channel may have options beyond mere stabilization.
YC - Little Creek	OPP-LC-13	Swale	Possible linear features, or point treatment at inlet.
YC - Little Creek	OPP-LC-14	Swale	Possible linear features, or point treatment at inlet.

Sub	New BMP ID	Proposed Treatment	Notes
YC - Little Creek	OPP-LC-20	Re/Detention	Range of BMP options possible, pending additional investigation, e.g. elevation of pond outfall, soil types, balance of tree value vs BMP benefit.
YC - Little Creek	OPP-LC-21	Re/Detention	Downstream of YC109, possibilities for additional treatment.
YC - Nontidal	OPP-Nontidal-23	Swale	Roadside ditch conversion.
YC - Nontidal	OPP-Nontidal-24	Re/Detention	End of roadside ditch.
YC - Nontidal	OPP-Nontidal-RP01	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) at confluence of tributaries upstream of Cranston's Mill Pond.
YC - Chickahominy	OPP-Chick-07a	Swale	Proposed integrated management practice from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.
YC - Chickahominy	OPP-Chick-07b	Conservation Landscaping	Proposed revegetation from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.
YC - Chickahominy	OPP-Chick-07c	Other	Proposed permeable pavement from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.
YC - Chickahominy	OPP-Chick-07d	Other	Proposed shoreline stabilization from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.
YC - Chickahominy	OPP-Chick-15	Conservation Landscaping	Large lot appears to wrap around NW and SE side of cul-de-sac. A significant portion seems unused. Preventing development may reduce later mitigation/retrofit needs.
YC - Chickahominy	OPP-Chick-16	Swale	Drainage ditches are essentially wet swales. Enhancement could improve performance and uplift.
YC - Chickahominy	OPP-Chick-17	SPSC	Several options likely exist, with SPSC and re/detention high among them.
YC - Chickahominy	OPP-Chick-18	SPSC	Several options likely exist, with SPSC and re/detention high among them.

Sub	New BMP ID	Proposed Treatment	Notes
YC - Chickahominy	OPP-Chick-19	Re/Detention	Several options likely exist, with SPSC and re/detention high among them.

4.5 Prioritizing Candidate Watershed Enhancement Projects

With the large number of recommended or possible projects presented in the preceding four categories/sections, prioritization is necessary. Using the same approach as in other JCC Watershed Plans (most recent being Skimino Creek Watershed Management Plan, 2020) and detailed in Appendix C, each recommended project within the four major categories was scored using the following criteria, grouped by Prioritization Factors (in favor) and Possible Conflicts (against).

Prioritization Factors

- Water Quality / Runoff Quantity
- Restore Floodplain Connectivity
- Aquatic Habitat
- Sedimentation
- Environmental Awareness
- Project Size / Scope
- Channel Condition
- Condition of Contributing Watershed

Possible Conflicts to Consider

- Utility Conflicts
- Construction Access
- Neighborhood Impact
- Physical Feasibility
- Level of Design
- Private Property
- Permitting Issues
- Negative Environmental Impacts

These considerations help to identify which recommended projects might best meet one or more of the Watershed Goals detailed in previous sections. Table 27 through Table 30 on the following pages provide the scoring and ranking of the projects within each of the four aforementioned project type categories. As projects progress from feasibility considerations into conceptual design, and potential implementation, it is important to note that some of the scoring may be altered over time. Additionally, high-level preliminary cost estimates were based on best professional judgement, but further site investigations and considerations will need to be explored to refine these preliminary cost estimates. Cost estimates (ranges) are to be considered 'order-of-magnitude', with the heavy qualifier that many project recommendations provide for a wide range options or approaches, which leaves a very wide range of possible costs accordingly.

Table 27 – Selected and Prioritized Stream Reach Projects

Subwatershed	Reach ID	Stream Type (Rosgen)	Length (feet)	Total Habitat Score	Habitat Condition Rating	Recommended Action	Estimated Cost Range*	Prioritization Factors								RANKING: Level of Benefit	Possible Conflicts								RANKING: Conflicts	Net Score	Watershed-Wide Rank
								Water Quality / Runoff Quantity	Restore Floodplain Connectivity	Restore Aquatic Habitat	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing Watershed	Increase Environmental Awareness		Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Private Property	Possible Permitting Factors	Negative Environmental Impacts			
YC-105	ST1-28-G	G	1,074	73	Marginal	Restoration	> $500k	5	5	4	4	3	4	4	3	**32**	3	2	2	1	4	3	3	0	**18**	**14**	**1 of 22**
YC-105	ST1-29-C	C	942	115	Marginal	Restoration	> $500k	5	5	4	4	3	4	4	3	**32**	3	2	2	1	4	3	3	0	**18**	**14**	**1 of 22**
YC-105	ST1-25-G	G	457	69	Poor	Restoration	> $500k	5	5	4	4	3	4	4	3	**32**	3	2	2	1	4	3	3	0	**18**	**14**	**1 of 22**
YC-105	ST1-26-G	G	444	81	Poor	Restoration	$250-500k	5	5	4	4	3	4	4	3	**32**	3	2	2	1	4	3	3	0	**18**	**14**	**1 of 22**
YC-104	ST1-10-G	G	1,235	113	Marginal	Restoration	> $500k	5	5	4	4	3	4	4	3	**32**	3	2	2	1	4	3	5	0	**20**	**12**	**5 of 22**
YC-105	ST1-24-A	A	521	122	Marginal	Restoration	> $500k	5	5	4	4	2	2	4	2	**28**	3	0	2	2	4	3	3	0	**17**	**11**	**6 of 22**
YC-Tidal	ST1-09-G	G	597	86	Poor	Restoration	$250-500k	5	5	4	4	3	4	2	0	**27**	3	2	0	1	4	3	3	0	**16**	**11**	**6 of 22**
YC-103	ST4-29-C	C	542	126	Marginal	Restoration	$250-500k	5	3	2	2	3	4	4	2	**25**	3	2	0	1	4	0	5	0	**15**	**10**	**8 of 22**
YC-105	ST1-30-C	C	2,148	113	Marginal	Enhancement	$250-500k	3	3	2	2	3	2	4	2	**21**	3	0	0	1	2	3	3	0	**12**	**9**	**9 of 22**
YC-104	ST1-11-C	C	1,409	125	Marginal	Enhancement	> $500k	3	3	2	2	3	2	4	3	**22**	3	2	2	1	2	1	3	0	**14**	**8**	**10 of 22**
YC-104	ST1-16-G	G	1,587	105	Marginal	Restoration	> $500k	5	5	2	4	1	4	2	0	**23**	3	0	0	1	4	3	5	0	**16**	**7**	**11 of 22**
YC-102	ST2-12-C	C	926	121	Poor	Restoration	> $500k	5	3	2	4	3	4	2	2	**25**	3	2	0	2	4	3	5	0	**19**	**6**	**12 of 22**
YC-LC	ST4-31-G	G	310	51	Poor	Enhancement	$100-250k	3	5	2	2	1	2	2	0	**17**	3	2	2	2	0	3	3	0	**15**	**2**	**13 of 22**
YC-LC	ST4-33-B	B	333	114	Poor	Enhancement	$100-250k	3	3	2	1	2	2	2	0	**15**	3	0	2	2	0	3	3	0	**13**	**2**	**13 of 22**
YC-LC	ST4-34-C	C	252	80	Marginal	Enhancement	$100-250k	3	3	2	1	2	2	2	0	**15**	3	0	2	2	2	3	3	0	**15**	**0**	**15 of 22**
YC-102	ST4-18-G	G	663	108	Marginal	Enhancement	$250-500k	3	3	2	2	1	2	2	0	**15**	3	2	2	1	2	3	3	0	**16**	**-1**	**16 of 22**
YC-LC	ST2-19-B	B	544	134	Suboptimal	Enhancement	$100-250k	3	3	2	2	2	2	2	0	**16**	3	2	2	2	2	3	3	0	**17**	**-1**	**16 of 22**
YC-LC	ST2-25-B	B	746	73	Marginal	Restoration	> $500k	5	3	2	2	2	2	2	0	**18**	3	2	2	2	4	3	3	0	**19**	**-1**	**16 of 22**
YC-105	ST4-16-G	G	1,496	126	Poor	Restoration	> $500k	3	3	2	2	2	2	2	0	**16**	3	2	2	1	4	3	3	0	**18**	**-2**	**19 of 22**
YC-LC	ST2-20-B	B	458	119	Suboptimal	Enhancement	$100-250k	3	3	2	2	1	2	2	0	**15**	3	2	2	2	2	3	3	0	**17**	**-2**	**19 of 22**
YC-LC	ST2-21-B	B	396	79	Marginal	Restoration	$250-500k	3	3	2	2	1	2	2	0	**15**	3	2	2	2	4	3	3	0	**19**	**-4**	**21 of 22**
YC-LC	ST2-26-B	B	258	92	Marginal	Restoration	$100-250k	3	3	2	2	1	2	2	0	**15**	3	2	2	2	4	3	3	0	**19**	**-4**	**21 of 22**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Table 28 – Selected and Prioritized Localized Projects Associated with Stream Corridors

Subwatershed	Map ID	Observations	Proposed Improvements	Cost Range	Prioritization Factors: Water Quality / Runoff Quantity	Restore Floodplain Connectivity	Restore Aquatic Habitat	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing Watershed	Increase Environmental Awareness	RANKING: Level of Benefit	Possible Conflicts: Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental Impacts	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - Little Creek	6, 7	Undercut valley slope, previous water level	Consider low-intensity stabilization at erosion feature exposed during lake drawdown, with potential for future submerged wood features for added fish habitat features. Similar opportunities may also be present throughout other portions of the lake.	$100-250k, each	3	0	4	2	1	2	2	2	**16**	0	2	0	1	0	0	0	**3**	**13**	**1 and 2 of 7**
YC - 105	3	Culvert, some erosion	Culvert outlet protection	< $100k	3	3	-	2	1	2	2	0	**13**	0	2	0	1	2	0	0	**5**	**8**	**3 of 7**
YC - Little Creek	1	Illegal Dumping Observed	Removal of material, consider posting signage.	< $100k	3	0	-	0	1	2	1	2	**9**	0	0	0	1	0	0	0	**1**	**8**	**3 of 7**
YC - 102	5	Washed out culvert outfall with erosion	Culvert outlet protection	< $100k	3	3	-	2	1	2	2	0	**13**	0	2	2	1	2	0	0	**7**	**6**	**5 of 7**
YC - 105	4	Steep headcut	Possible stabilization	< $100k	0	3	0	2	1	2	2	0	**10**	0	2	0	1	2	0	0	**5**	**5**	**6 of 7**
YC - 104	2	Inlet at headcut. Significant erosion	Inlet protection & stabilization	< $100k	3	3	-	2	1	2	2	0	**13**	0	2	2	1	2	3	0	**10**	**3**	**7 of 7**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Table 29 – Selected and Prioritized Stormwater BMP Retrofit Projects

Subwatershed	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Prioritization Factors: Water Quality / Runoff Quantity	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing Watershed	Increase Environmental Awareness	RANKING: Level of Benefit	Possible Conflicts: Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental Impacts	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - 102	BMP-WC020	Allan Myers Dry Pond	Dry Extended Detention Ponds	9.3	Retrofit - CW/ Wet Pond	Opportunity to upgrade to CW or wet pond since vegetation has already developed in this direction. Easy access, some room for footprint expansion.	$100-250k	3	0	4	2	2	2	1	**14**	0	0	0	1	2	0	0	**3**	**11**	**1 of 35**
YC - 105	BMP-YC055	The Candy Store Dry Pond	Dry Extended Detention Ponds	3	Retrofit - CW/ Wet Pond	#16 from Centerville study. Medium sized ED pond, no apparent forebay. Severe short-circuiting. Outfalls into riprap lined channel. Already has wetland vegetation. Resolve short-circuit, convert to CW.	$100-250k	3	0	4	1	2	2	1	**13**	0	0	0	1	2	0	0	**3**	**10**	**2 of 35**
YC - 104	BMP-YC028	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	18.7	Bioretention	Dry ED pond. Looks like a good opportunity.	$100-250k	3	3	2	2	2	2	2	**16**	0	2	2	1	2	0	0	**7**	**9**	**3 of 35**
YC - 104	BMP-YC031	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	9.1	Bioretention	Large well maintained dry ED. Kristiansand #22.	$100-250k	3	3	2	2	2	2	2	**16**	0	2	2	1	2	0	0	**7**	**9**	**3 of 35**
YC - 104	BMP-YC050	Baylands Federal Credit Union Dry Pond	Dry Extended Detention	9.56	Retrofit - CW/ Wet Pond	Extended detention with wet bottom. Would be good candidate for retrofit, but adjacent bioretention may be doing the job.	$100-250k	3	0	4	2	2	2	1	**14**	0	2	0	1	2	0	0	**5**	**9**	**3 of 35**

Subwatershed	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Prioritization Factors: Water Quality / Runoff Quantity	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing Watershed	Increase Environmental Awareness	RANKING: Level of Benefit	Possible Conflicts: Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental Impacts	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - 105	BMP-YC033	Colonial Heritage Phase 2 Dry Pond	Dry Extended Detention Ponds	12.8	Bioretention	Possibilities for upgrade or conversion, such as bioretention or constructed wetland with extended detention. Adjacent homes may complicate.	$100-250k	3	3	2	2	2	2	2	**16**	0	2	2	1	2	0	0	**7**	**9**	**3 of 35**
YC - 105	BMP-YC038	Colonial Heritage Phase 4 Dry Pond	Dry Extended Detention Ponds	27.7	Bioretention	Fairly new, well-maintained. Bioretention (with ED) retrofit may be possible, though side slopes present space constraint.	$100-250k	3	3	2	2	2	2	2	**16**	0	2	2	1	2	0	0	**7**	**9**	**3 of 35**
YC - 105	BMP-YC041	Colonial Heritage Phase 4 Dry Pond	Dry Extended Detention Ponds	17.04	Bioretention	Dry ED pond with forebay. Fairly new, well-maintained. Bioretention (with ED) retrofit may be possible.	$100-250k	3	3	2	2	2	2	2	**16**	0	2	2	1	2	0	0	**7**	**9**	**3 of 35**
YC - 105	BMP-YC044	Colonial Heritage Phase 3 Dry Pond	Dry Extended Detention Ponds	10.8	Bioretention	Dry ED with small wetland cell. Bioretention w/ED may be possible.	$50-100k	3	3	2	2	2	2	2	**16**	0	2	2	1	2	0	0	**7**	**9**	**3 of 35**
YC - 103	BMP-YC006	Williamsburg Soap & Candle Factory Wet Pond	Wet Pond	142.1	Rehabilitate/ Upgrade	Investigate dredging and possible forebay enhancement/enlargement.	> $500k	3	0	2	2	2	2	1	**12**	0	0	0	1	0	3	0	**4**	**8**	**10 of 35**
YC - 103	BMP-YR030	Tractor Supply Company Infiltration 2	Infiltration Basin		Rehabilitate/ Upgrade	Definitely not infiltrating. Appears to be a wetland. Rehab, or convert to proper wetland.	$100-250k	3	0	2	1	2	2	1	**11**	0	2	0	1	0	0	0	**3**	**8**	**10 of 35**

Subwatershed	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Prioritization Factors: Water Quality / Runoff Quantity	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing Watershed	Increase Environmental Awareness	RANKING: Level of Benefit	Possible Conflicts: Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental Impacts	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - 104	BMP-YC074	Norge Neighborhood Dry Pond	Dry Extended Detention Ponds	33.6	Bioretention	Appears that perhaps YC072 is a bioretention upstream that may outfall into this one. Bioretention retrofit is possible, with extended detention, but may require too much clearing.	$100-250k	3	3	2	2	2	2	1	**15**	0	2	2	1	2	0	0	**7**	**8**	**10 of 35**
YC - 105	BMP-YC025	Colonial Heritage Massie Pond	Wet Pond	150.1	Outfall Enhancement	#4 from Centerville study. Modify outlet for improved extended-detention or water quality benefit. Possibly expand buffer, check nutrient management practices on adjacent and contributing lands. See also OPP-105-102.	$250-500k	3	0	2	2	2	2	2	**13**	0	2	2	1	0	0	0	**5**	**8**	**10 of 35**
YC - 105	BMP-YC045	Colonial Heritage Phase 3 Dry Pond	Dry Extended Detention Ponds	4.8	Bioretention	Well maintained ED. Bioretention w/ED may be possible.	$50-100k	3	3	2	1	2	2	2	**15**	0	2	2	1	2	0	0	**7**	**8**	**10 of 35**
YC - 104	BMP-YC005	Riverside Medical Center Infiltration	Infiltration Trench	2.9	Rehabilitate/ Upgrade	Appears to be in good shape, however an 8" pipe appears to run directly from the lot into the riser. Confirm bypass, and	$50-100k	0	0	2	1	2	2	1	**8**	0	0	0	1	0	0	0	**1**	**7**	**15 of 35**

								Prioritization Factors								Possible Conflicts									
Subwatershed	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Water Quality / Runoff Quantity	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing Watershed	Increase Environmental Awareness	RANKING: Level of Benefit	Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental Impacts	RANKING: Conflicts	Net Score	Watershed-Wide Rank
						investigate options to eliminate.																			
YC - 105	BMP-YC015	Briarwood Park Dry Pond	Dry Extended Detention Ponds	7	Rehabilitate/ Upgrade	Overgrown, heavy wooded veg on embankment. Potential issues with stream undercutting embankment. Stream reach ST1-30-C for reference. Sufficient elevation head to likely allow bioretention with extended detention.	$100-250k	3	0	2	1	2	2	2	**12**	0	2	2	1	0	0	0	**5**	**7**	**15 of 35**
YC - 105	BMP-YC022	Chesapeake Bank Bioretention	Bioretention	0.5	Rehabilitate/ Upgrade	Check for function, maintain if/as needed.	< $50k	0	0	2	1	2	2	1	**8**	0	0	0	1	0	0	0	**1**	**7**	**15 of 35**
YC - 103	BMP-YC081	Village at Candle Station Bioretention	Bioretention	1.76	Rehabilitate/ Upgrade	Could use more variety in vegetation.	< $50k	0	0	2	1	2	2	2	**9**	0	0	2	1	0	0	0	**3**	**6**	**18 of 35**
YC - 104	BMP-YC016	Norge ES Infiltration	Infiltration Trench	8.61	Retrofit - CW/ Wet Pond	Kristiansand project #47, infiltration trench, was constructed. This is naturally evolving into a wetland. Recommend purposeful conversion, or selected upgrade and change of BMP tracking. Unsure of likelihood of	$50-100k	3	0	2	1	2	2	3	**13**	0	2	2	1	2	0	0	**7**	**6**	**18 of 35**

								Prioritization Factors								Possible Conflicts									
Subwatershed	**BMP ID**	**Facility Name**	**Facility Type**	**Drainage Area (acres)**	**Proposed Treatment**	**Notes**	**Cost Range**	**Water Quality / Runoff Quantity**	**Restore Floodplain Connectivity**	**Reduce Sedimentation**	**Project Size / Scope**	**Channel Condition**	**Condition of Contributing Watershed**	**Increase Environmental Awareness**	**RANKING: Level of Benefit**	**Conflicts with Existing Utilities**	**Construction Access**	**Neighborhood Impact**	**Physical Feasibility**	**Level of Design**	**Possible Permitting Factors**	**Negative Environmental Impacts**	**RANKING: Conflicts**	**Net Score**	**Watershed-Wide Rank**
						success of restoring infiltration capacity.																			
YC - Tidal	BMP-GC001	WJCC Maintenance and Operations Wet Pond	Wet Pond	5.1	Rehabilitate/ Upgrade	Good condition. Algae present. Possible maintenance/management options.	$50-100k	0	0	2	1	2	0	2	**7**	0	0	0	1	0	0	0	**1**	**6**	**18 of 35**
YC - 103	BMP-YC023	Norge Shopping Center Infiltration	Infiltration Trench	4.07	Rehabilitate/ Upgrade	Upgrade per Norge Area A design from prior WEG study - new grass channel to convey bypassing runoff into facility, inlet cleanup and stabilization, trash rack on riser structure. Revisit, update any recommendations.	$100-250k	0	0	2	1	2	2	2	**9**	3	0	0	1	0	0	0	**4**	**5**	**21 of 35**
YC - 104	BMP-YC030	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	6.9	Bioretention	Ext. det. basin. Looks like a good retrofit opportunity for some combination of bioretention and/or constructed wetland, with extended detention. Appears to have large area to work with.	$100-250k	3	3	2	1	2	2	2	**15**	0	2	2	1	2	3	0	**10**	**5**	**21 of 35**

								Prioritization Factors								Possible Conflicts									
Subwatershed	**BMP ID**	**Facility Name**	**Facility Type**	**Drainage Area (acres)**	**Proposed Treatment**	**Notes**	**Cost Range**	**Water Quality / Runoff Quantity**	**Restore Floodplain Connectivity**	**Reduce Sedimentation**	**Project Size / Scope**	**Channel Condition**	**Condition of Contributing Watershed**	**Increase Environmental Awareness**	**RANKING: Level of Benefit**	**Conflicts with Existing Utilities**	**Construction Access**	**Neighborhood Impact**	**Physical Feasibility**	**Level of Design**	**Possible Permitting Factors**	**Negative Environmental Impacts**	**RANKING: Conflicts**	**Net Score**	**Watershed-Wide Rank**
YC - 104	BMP-YC057	Colonial Car Wash Wet Pond	Wet Pond	4.7	Rehabilitate/ Upgrade	Possible footprint expansion.	$50-100k	0	0	2	1	2	2	1	**8**	0	2	0	1	0	0	0	**3**	**5**	**21 of 35**
YC - 105	BMP-YC090	Lightfoot Marketplace CHKD Permeable Pavers	Permeable Pavement	1.94	Rehabilitate/ Upgrade	Permeable pavement requires maintenance/rehabilitation.	< $50k	0	0	0	1	2	2	1	**6**	0	0	0	1	0	0	0	**1**	**5**	**21 of 35**
YC - Chickahominy	BMP-CR001	Uncles Neck Dry Pond	Dry Extended Detention Ponds	14.01	Retrofit - CW/ Wet Pond	Overgrown, wetland vegetation prominent.	$50-100k	3	0	4	1	0	2	1	**11**	0	0	0	1	2	3	0	**6**	**5**	**21 of 35**
YC - 103	BMP-YC003	Poplar Creek Business Center Dry Pond	Dry Extended Detention Ponds	24.7	Rehabilitate/ Upgrade	Overgrown, would or will require clearing. Room for footprint expansion. Access is not easy. Bioretention may be feasible if elevation head accommodates.	$100-250k	3	0	0	2	2	2	1	**10**	0	2	0	1	0	3	0	**6**	**4**	**26 of 35**
YC - 104	BMP-YC049	Baylands Federal Credit Union Bioretention	Bioretention	1.6	Rehabilitate/ Upgrade	Small bioretention. Low retrofit potential. May be opportunity for upgraded pretreatment/forebay or planting.	$100-250k	0	0	2	1	2	2	1	**8**	0	0	0	1	0	3	0	**4**	**4**	**26 of 35**
YC - 105	BMP-YC039	Colonial Heritage Phase 4 Wet Pond	Wet Pond	26.5	Outfall Enhancement		$100-250k	0	0	0	2	2	2	2	**8**	0	2	2	1	0	0	0	**5**	**3**	**28 of 35**

								Prioritization Factors								Possible Conflicts									
Subwatershed	BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Water Quality / Runoff Quantity	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing Watershed	Increase Environmental Awareness	RANKING: Level of Benefit	Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental Impacts	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - Chickahominy	BMP-CR002	Uncles Neck Dry Pond	Dry Extended Detention Ponds	6.08	Retrofit - CW/ Wet Pond	Completely overgrown, standing water and wetland veg - can upgrade.	$100-250k	3	0	4	1	0	2	1	**11**	0	2	0	1	2	3	0	**8**	**3**	**28 of 35**
YC - 105	BMP-YC014	Wythe Candy Warehouse Dry Pond	Dry Extended Detention Ponds	3.94	Retrofit - CW/ Wet Pond	Medium sized ED pond. Mini check dam forebay. Good retrofit opportunity.	$100-250k	3	0	4	1	2	2	1	**13**	0	5	0	1	2	3	0	**11**	**2**	**30 of 35**
YC - 102	BMP-YC019	Toano Trace Dry Pond	Dry Extended Detention Ponds	8.72	Bioretention	Filled in, riser blocked with trash. Bioretention or extended detention wetland possible.	$100-250k	3	3	2	1	2	2	1	**14**	0	5	2	1	2	3	0	**13**	**1**	**31 of 35**
YC - 102	BMP-YC020	Toano Trace Dry Pond	Dry Extended Detention Ponds	6.59	Bioretention	Wet w/ veg. Bioretention or extended detention wetland possible.	$100-250k	3	3	2	1	2	2	1	**14**	0	5	2	1	2	3	0	**13**	**1**	**31 of 35**
YC - 104	BMP-YC021	Williamsburg Dodge Wet Pond	Wet Pond	16.8	Rehabilitate/ Upgrade	Single cell wet pond. Perhaps buffer expansion, outfall enhancement, or polishing treatment.	$100-250k	0	0	4	2	2	2	2	**12**	0	5	2	1	0	3	0	**11**	**1**	**31 of 35**
YC - 104	BMP-YC032	Colonial Heritage Phase 1 Wet Pond	Wet Pond	36.4	Rehabilitate/ Upgrade	Large wet pond. Could use forebay clean out and aeration. Has wetland cell.	$100-250k	0	0	2	2	0	2	2	**8**	0	5	2	1	0	0	0	**8**	**0**	**34 of 35**
YC - 102	BMP-YC013	Toano Woods Wet Pond	Wet Pond	40.5	Rehabilitate/ Upgrade	Construct forebay for YC013.	$100-250k	3	0	2	1	2	2	1	**11**	3	2	2	1	2	3	0	**13**	**-2**	**35 of 35**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Table 30 – Selected and Prioritized New Stormwater BMP Projects

						Prioritization Factors								Possible Conflicts									
Sub	New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Water Quality / Runoff	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing	Increase Environmental	RANKING: Level of Benefit	Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - 104	OPP-104-05	Re/Detention	Soil Survey suggests well-drained soils. Investigate options for retention. Otherwise detention possible, depending on outlet options.	Onsite utilities (water)	$100-250k	3	3	2	2	2	2	2	**16**	3	0	0	1	2	0	0	**6**	**10**	**1 of 58**
YC - 103	OPP-103-42	Swale	Linear practice possible, type determined by constraints (TBD).		$100-250k	3	3	2	1	2	2	2	**15**	3	2	0	1	2	0	0	**8**	**7**	**2 of 58**
YC - 103	OPP-103-43	Re/Detention	Depending on storm drain elevations, bioretention may be feasible.		$100-250k	3	3	2	1	2	2	2	**15**	3	2	0	1	2	0	0	**8**	**7**	**2 of 58**
YC - 103	OPP-103-44	Re/Detention	Trees and shrubs look mature and healthy. If the balance of environmental benefits checks out, microbioretention may be option.		$100-250k	3	3	2	1	2	2	2	**15**	3	2	0	1	2	0	0	**8**	**7**	**2 of 58**
YC - 103	OPP-103-45	Swale	Location of drainage easement relative to actual drainage path is unclear. Swale possible along drainage path.		< $250k	3	3	2	1	2	2	2	**15**	3	2	0	1	2	0	0	**8**	**7**	**2 of 58**
YC - 105	OPP-105-48	Conservation Landscaping	Local depression without available head for underdrain unless installing several hundred feet of pipe. Conservation landscaping an option.		< $100k	3	3	2	1	2	2	1	**14**	0	2	2	1	2	0	0	**7**	**7**	**2 of 58**
YC - 105	OPP-105-49	Swale	Same location as OPP-105-48 with alternate consideration for new swale improvements, or in tandem with other recommendations.		$100-250k	3	3	2	1	2	2	1	**14**	0	2	2	1	2	0	0	**7**	**7**	**2 of 58**
YC - Chickahominy	OPP-Chick-07c	Other	Proposed permeable pavement from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.		$100-250k	3	0	2	1	0	2	2	**10**	2	0	0	1	0	0	0	**3**	**7**	**2 of 58**
YC - Chickahominy	OPP-Chick-16	Swale	Drainage ditches are essentially wet swales. Enhancement could improve performance and uplift.		< $100k	3	3	2	1	0	2	1	**12**	0	0	2	1	2	0	0	**5**	**7**	**2 of 58**

Sub	New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Prioritization Factors							RANKING: Level of Benefit	Possible Conflicts							RANKING: Conflicts	Net Score	Watershed-Wide Rank
						Water Quality / Runoff	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing	Increase Environmental		Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental			
YC - 104	OPP-104-27	Swale	Several potential opportunities for light-touch swale BMPs along drainage ditches.		$100-250k	3	3	2	1	2	2	1	**14**	0	2	0	1	2	3	0	**8**	**6**	**10 of 58**
YC - 104	OPP-104-54	Swale	Grassed swale, or potential for dry swale if elevations and easements allow.	Property ownership/ easements	< $250k	3	3	2	1	4	2	1	**16**	3	2	2	1	2	0	0	**10**	**6**	**10 of 58**
YC - 104	OPP-104-71	Re/Detention	Small bioretention basin, if feasible.		$100-250k	3	3	2	1	2	2	2	**15**	3	0	0	1	2	3	0	**9**	**6**	**10 of 58**
YC - 103	OPP-103-06	SPSC	Ephemeral channel, likely experiencing intense flows. Swale, or SPSC possible.		$100-250k	3	5	2	1	2	2	2	**17**	3	2	0	1	4	3	0	**13**	**4**	**13 of 58**
YC - 104	OPP-104-22	Re/Detention	Appears to be sufficient head for a small bioretention.		< $100k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	0	0	**10**	**4**	**13 of 58**
YC - 105	OPP-105-08	Re/Detention	Linear feature may be possible, either parallel or perpendicular to road. Detention possible as well.	Trees, steep slopes	$100-250k	3	3	2	1	2	2	1	**14**	0	2	2	1	2	3	0	**10**	**4**	**13 of 58**
YC - 105	OPP-105-101	Constructed Wetland	Downstream of YC033, on south side of trail, area could become constructed wetland for additional benefit.		$100-250k	5	3	2	1	2	2	1	**16**	3	2	2	1	4	0	0	**12**	**4**	**13 of 58**
YC - Little Creek	OPP-LC-12	Swale	Ditch at east end of dam, on south side of road, may be turned into linear feature such as WQ swale. Outfall at end of west side channel may have options beyond mere stabilization.	Permitting	$100-250k	3	3	2	1	2	0	1	**12**	0	2	0	1	2	3	0	**8**	**4**	**13 of 58**
YC - Little Creek	OPP-LC-13	Swale	Possible linear features, or point treatment at inlet.		< $100k	3	3	2	1	2	0	1	**12**	0	2	0	1	2	3	0	**8**	**4**	**13 of 58**

Sub	New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Prioritization Factors								Possible Conflicts									
						Water Quality / Runoff	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing	Increase Environmental	RANKING: Level of Benefit	Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - Little Creek	OPP-LC-14	Swale	Possible linear features, or point treatment at inlet.		< $100k	3	3	2	1	2	0	1	**12**	0	2	0	1	2	3	0	**8**	**4**	**13 of 58**
YC - Chickahominy	OPP-Chick-07a	Swale	Proposed integrated management practice from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.		$100-250k	3	0	2	1	0	0	1	**7**	0	0	0	1	2	0	0	**3**	**4**	**13 of 58**
YC - Chickahominy	OPP-Chick-07b	Conservation Landscaping	Proposed revegetation from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.		< $100k	3	0	2	1	0	0	1	**7**	0	0	0	1	2	0	0	**3**	**4**	**13 of 58**
YC - Chickahominy	OPP-Chick-15	Conservation Landscaping	Large lot appears to wrap around NW and SE side of cul-de-sac. A significant portion seems unused. Preventing development may reduce later mitigation/retrofit needs.		$100-250k	3	3	2	1	0	2	1	**12**	0	2	2	1	0	3	0	**8**	**4**	**13 of 58**
YC - 102	OPP-102-36	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.		< $250k	3	0	0	1	2	2	1	**9**	3	0	2	1	0	0	0	**6**	**3**	**23 of 58**
YC - 104	OPP-104-51	Swale	Linear practice. Relationship to existing storm drain infrastructure is uncertain.	Property ownership/ easements	$100-250k	3	3	2	1	4	2	1	**16**	3	2	2	1	2	3	0	**13**	**3**	**23 of 58**
YC - 105	OPP-105-04	Re/Detention	Centerville Road Tributary BMP Retrofit Plan from WEG.		$250-500k	5	3	2	1	2	2	1	**16**	0	5	0	1	4	3	0	**13**	**3**	**23 of 58**
YC - Little Creek	OPP-LC-20	Re/Detention	Range of BMP options possible, pending additional investigation, e.g. elevation of pond outfall, soil types, balance of tree value vs BMP benefit.	Access and tree cover.	$100-250k	3	3	2	2	2	0	1	**13**	0	2	2	1	2	3	0	**10**	**3**	**23 of 58**
YC - Chickahominy	OPP-Chick-07d	Other	Proposed shoreline stabilization from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.		$250-500k	3	0	2	1	0	2	2	**10**	0	2	0	2	0	3	0	**7**	**3**	**23 of 58**

Sub	New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Prioritization Factors							RANKING: Level of Benefit	Possible Conflicts							RANKING: Conflicts	Net Score	Watershed-Wide Rank
						Water Quality / Runoff	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing	Increase Environmental		Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental			
YC - 104	OPP-104-72	Other	If permeable pavement, and working properly, expand, perhaps increase visibility.		$100-250k	3	0	2	1	0	0	1	**7**	2	0	0	1	2	0	0	**5**	**2**	**28 of 58**
YC - 104	OPP-104-RP02	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) at confluence.	Forest cover, permitting	$250-500k	3	3	2	1	2	2	1	**14**	0	2	0	1	2	5	2	**12**	**2**	**28 of 58**
YC - 105	OPP-105-RP04	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) along Yarmouth Creek.	Nearby homes, access, permitting	$250-500k	3	3	2	2	2	2	1	**15**	0	2	0	2	2	5	2	**13**	**2**	**28 of 58**
YC - Nontidal	OPP-Nontidal-23	Swale	Roadside ditch conversion.	Property ownership/ easements	$100-250k	3	3	2	1	2	0	1	**12**	3	2	2	1	2	0	0	**10**	**2**	**28 of 58**
YC - Nontidal	OPP-Nontidal-24	Re/Detention	End of roadside ditch.	Property ownership/ easements	$100-250k	3	3	2	1	2	0	1	**12**	3	2	2	1	2	0	0	**10**	**2**	**28 of 58**
YC - Nontidal	OPP-Nontidal-RP01	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) at confluence of tributaries upstream of Cranston's Mill Pond.	Forest cover, wetland permitting	> $500k	3	3	2	2	2	1	1	**14**	0	2	0	1	2	5	2	**12**	**2**	**28 of 58**
YC - Chickahominy	OPP-Chick-17	SPSC	Several options likely exist, with SPSC and re/detention high among them.		$100-250k	3	5	2	1	0	2	1	**14**	0	2	2	1	4	3	0	**12**	**2**	**28 of 58**
YC - Chickahominy	OPP-Chick-18	SPSC	Several options likely exist, with SPSC and re/detention high among them.		$100-250k	3	5	2	1	0	2	1	**14**	0	2	2	1	4	3	0	**12**	**2**	**28 of 58**
YC - Chickahominy	OPP-Chick-19	Re/Detention	Several options likely exist, with SPSC and re/detention high among them.		$100-250k	3	3	2	1	0	2	1	**12**	0	2	2	1	2	3	0	**10**	**2**	**28 of 58**

						Prioritization Factors								Possible Conflicts									
Sub	New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Water Quality / Runoff	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing	Increase Environmental	RANKING: Level of Benefit	Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - 105	OPP-105-102	Re/Detention	Consider a polishing treatment BMP just below the YC025 outfall where the first flush can be diverted to a runoff reduction BMP if feasible following further investigation. See also YC025 retrofit recommendation.		$100-250k	3	0	2	3	0	4	1	**13**	3	0	2	1	2	3	0	**11**	**2**	**28 of 58**
YC - 102	OPP-102-25	Re/Detention	Small practices possible.		$100-250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 102	OPP-102-26	Re/Detention	Small practices possible.		$100-250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 102	OPP-102-28	Re/Detention	Small practices possible.		$100-250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 102	OPP-102-29	SPSC	Concrete channel lining severely undercut.		$100-250k	3	5	2	1	2	2	1	**16**	3	2	2	1	4	3	0	**15**	**1**	**38 of 58**
YC - 102	OPP-102-30	Swale	Drainage paths - require stable BMPs.		$100-250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3		**13**	**1**	**38 of 58**
YC - 102	OPP-102-32	Swale	A few potential opportunities. Roadside ditches, particularly lined ones, convert to WQ swales. May be option for small basins upstream of YC013.		$100-250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 102	OPP-102-37	Re/Detention	Potential for basin, but wholly on private property. Looks like it would be on two adjoining parcels.	Property ownership/ easements, utilities	$100-250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**

						Prioritization Factors								Possible Conflicts									
Sub	New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Water Quality / Runoff	Restore Floodplain Connectivity	Reduce Sedimentation	Project Size / Scope	Channel Condition	Condition of Contributing	Increase Environmental	RANKING: Level of Benefit	Conflicts with Existing Utilities	Construction Access	Neighborhood Impact	Physical Feasibility	Level of Design	Possible Permitting Factors	Negative Environmental	RANKING: Conflicts	Net Score	Watershed-Wide Rank
YC - 102	OPP-102-39	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.	Property ownership/ easements	< $250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 102	OPP-102-40	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.	Property ownership/ easements	< $250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 102	OPP-102-41	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.	Property ownership/ easements	< $250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 103	OPP-103-38	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.	Property ownership/ easements	< $250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 104	OPP-104-52	SPSC	Light-touch SPSC may be an option. Channel appears ephemeral.	Property ownership/ easements	$100-250k	3	5	2	1	2	2	1	**16**	3	2	2	1	4	3	0	**15**	**1**	**38 of 58**
YC - 104	OPP-104-53	Re/Detention	Small bioretention basin, if feasible.	Property ownership/ easements	$100-250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**
YC - 105	OPP-105-01	SPSC	Step pool stormwater conveyance or dry swale likely viable.		$100-250k	3	5	2	1	2	2	1	**16**	3	2	2	1	4	3	0	**15**	**1**	**38 of 58**
YC - 105	OPP-105-09	Re/Detention	Elevation head available for retention/detention practice.		$100-250k	3	3	2	1	2	2	1	**14**	3	2	2	1	2	3	0	**13**	**1**	**38 of 58**

						Prioritization Factors								Possible Conflicts									
Sub	**New BMP ID**	**Proposed Treatment**	**Notes**	**Possible Constraints**	**Cost Range**	**Water Quality / Runoff**	**Restore Floodplain Connectivity**	**Reduce Sedimentation**	**Project Size / Scope**	**Channel Condition**	**Condition of Contributing**	**Increase Environmental**	**RANKING: Level of Benefit**	**Conflicts with Existing Utilities**	**Construction Access**	**Neighborhood Impact**	**Physical Feasibility**	**Level of Design**	**Possible Permitting Factors**	**Negative Environmental**	**RANKING: Conflicts**	**Net Score**	**Watershed-Wide Rank**
YC - Little Creek	OPP-LC-111	Swale	Linear practice such as a dry swale may be possible following investigation. Wet swale not advised due to nearby residences.	Utility conflicts; nearby residences may preclude BMPs which stay wet.	< $100k	3	3	2	1	2	0	1	**12**	3	2	0	1	2	3	0	**11**	**1**	**38 of 58**
YC - 102	OPP-102-31	Re/Detention	Localized drainage to area behind house. Space constraints and recent construction may complicate. Possible opportunity downstream on adjacent, yet-undeveloped parcel.	Space, easement/ ownership.	$100-250k	3	3	2	1	2	2	1	**14**	0	5	2	2	2	3	0	**14**	**0**	**54 of 58**
YC - 104	OPP-104-RP03	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) as option to, or in conjunction with, restoration of reach ST1-16-G.	Forest cover, permitting	$250-500k	3	3	2	2	2	2	1	**15**	3	2	0	1	2	5	2	**15**	**0**	**54 of 58**
YC - Little Creek	OPP-LC-21	Re/Detention	Downstream of YC109, possibilities for additional treatment.	Odd property boundaries. Possible issues with easements. Utilities present.	$100-250k	3	3	2	2	2	0	1	**13**	3	2	2	1	2	3	0	**13**	**0**	**54 of 58**
YC - 102	OPP-102-34	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.		< $250k	3	0	0	1	2	2	1	**9**	3	2	2	1	0	3	0	**11**	**-2**	**57 of 58**
YC - 102	OPP-102-35	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.		< $250k	3	0	0	1	2	2	1	**9**	3	2	2	1	0	3	0	**11**	**-2**	**57 of 58**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

5 Strategic Action Plan

As detailed earlier in previous sections, the achievement of watershed goals for the Yarmouth Creek Watershed will involve five (5) general types of Strategic Actions. The recommended actions can be grouped into these categories:

1. **Programmatic** – Efforts such as Land Conservation/Purchase of Development Rights, wildlife management (e.g. goose exclusion from ponds), development of an incentivized public stewardship program, and continued septic system inspections/clean-out/repair support programs.

2. **Regulatory/Enforcement** – For example, expand Special Stormwater Criteria for new development and re-development, increase stormwater controls for infill development, restrict inter-watershed nutrient credit trading.

3. **Floodplain Management** – Consider an enhanced flood modeling effort, coordinating on Dam Break Inundation Zone planning, floodproofing or elevating at-risk sanitary sewer pump stations, drainage upgrades, and elevating road crossings.

4. **Education/Awareness**– Increasing engagement with schools/students, additional public events, public waste disposal and litter prevention campaigns, and small-scale runoff reduction education and encouragement.

5. **Watershed Restoration Projects** – Explore the retrofitting of existing Stormwater Best Management Practices (BMPs) to increase treatment effectiveness of stormwater runoff, construction of new BMPs in areas that are currently not served by existing BMPs, and stream enhancement and/or restoration projects.

A draft Strategic Action Plan is provided to JCC in the following tables broken down by recurring annual activities (Table 31), short-term recommended actions (Table 32), medium-term (Table 33), and longer-term (Table 34). Short-term will generally involve establishing new annual activities that are not already instituted by JCC, advancing follow-up studies or investigations, drafting ordinance changes, and choosing those high-priority Watershed Restoration Project recommendations as identified within this Watershed Management Plan. Medium-term will leverage analyses that may have been completed short-term such as more detailed flood risk modeling and failing septic system assessments, and continued implementation of the next Watershed Restoration Projects in priority. Longer-term will be similar with the exception that the 10-year implementation plan (and project priority list upon which it is based) needs review (annually) to ensure implementation is occurring at a rate to meet desired goals.

Table 31 – Strategic Action Plan for Recurring Annual Activities

Strategic Action Category (Annual)	Action Detail or Evaluation Measure	Level of County Effort and Expense	Funding Stream	Estimated Cost
Special Stormwater Criteria	Monitor success of changes in SSC after BOS approval.	SMALL: -Coordinate review with Stormwater Program Advisory Committee	Within realm of current staff responsibilities. Could become a source of funding for other activities.	+
Land Conservation	Reassess any opportunities for land and easement acquisition.	SMALL	Within realm of current staff responsibilities.	
Other Ordinance Changes to County Stormwater Requirements	Monitor success of changes in other ordinances.	SMALL: -Coordinate review with Stormwater Program Advisory Committee, Planning Department, and Planning Commission	Within realm of current staff responsibilities. May be a source of funding for other activities.	+
Targeted Bacterial Reductions	Hold a certain number of events to educate residents about the importance of pet waste, wildlife, and livestock waste management, including in their backyards.	SMALL to MODERATE: - public notices - development and distribution of printed materials - administrative actions	General Fund.	$5,000
	Find, engage, and support the efforts of relevant stewardship and volunteer groups. This may include groups focused on watershed scales ranging from Yarmouth Creek (local), to Chickahominy River (regional), to James or York Rivers (state), to Chesapeake Bay (national-regional).	SMALL	General Fund.	-
	Evaluate locations and conditions of pet waste stations along public trails to identify where large gaps between stations may be present and repair existing/install additional stations as warranted.	SMALL to MODERATE	Within realm of current staff responsibilities. Costs for new pet waste stations not included in annual budget.	$500
	Provide pet waste composters for individual use or information on pick up services. Also, consider employing similar landowner education materials to the current “scoop the poop” program that is more focused on small scale agricultural activities such as hobby livestock or poultry (including but not limited to backyard chickens).	SMALL to MODERATE	Within realm of current staff responsibilities. Costs for new pet waste stations may not be included in annual budget. Could be obtained as donations made by organizations interested, or companies that manufacture solutions.	$500
	Continue existing septic inspection requirements through the County’s Septic Smart program and seek ways to refine its activities in coordination with the Virginia Department of Health.	SMALL	Within realm of current staff responsibilities.	-
	Annually, following initial setup of program: Monitor at new and existing water quality sampling/monitoring stations for better tracking and data analysis. Revise and refine any informative influence on other efforts and programs.	SMALL to MODERATE	Coordinate with James River Association and other local and Chesapeake Bay-focused organizations. This may be entirely external, internal or some combination thereof.	
Illicit Discharge Detection and Elimination (IDDE)	Continue IDDE program and inspections.	SMALL to MODERATE	Within realm of current staff responsibilities.	-
James City Service Authority (JCSA) Bacterial Reductions	At least once a year, communicate with JCSA and the Hampton Roads Sanitation District (HRSD) to track status of the Regional Wet Weather Management Plan implementation and advocate for prioritization of projects within target areas.	SMALL	Within realm of current staff responsibilities.	-

Strategic Action Category (Annual)	Action Detail or Evaluation Measure	Level of County Effort and Expense	Funding Stream	Estimated Cost
Evaluate Wildlife Management Needs (in cooperation with Department of Wildlife Resources, DWR)	Perform annual meso-mammal and large mammal surveys to understand the size and distribution of existing wildlife populations (not limited to deer) to assess if new game management activities may be warranted.	SMALL to MODERATE - explore academic and volunteer input from consulting community, and DWR	Potentially within realm of current staff responsibilities. Possible DWR involvement.	-
	Identify and monitor locations and size of permanent geese populations and develop or maintain goose exclusion measures to reduce amount of concentration in or near sensitive resources. Implement passive controls such as do-not-feed geese signs and buffer plantings between turf areas and edge of water.	SMALL to MODERATE - explore academic and volunteer input from community, and DWR	Potentially within realm of current staff responsibilities. Possible DWR involvement.	-
	Check if any additional/new wild or feral animal population concerns have developed (beyond wild meso-mammal and geese). Coordinate with DWR as necessary.	SMALL	Within realm of current staff responsibilities.	-
Increase Engagement at the Schools in the County	Hold at least one on-site educational activity with each school per school year.	SMALL to MODERATE	Within realm of current staff responsibilities, though volunteer organizations may contribute.	-
Site-Specific Stormwater Treatment Practices	Continue BMP Inspections annually to determine undersized, disrepair, or retrofit opportunities.	SMALL	Within realm of current staff responsibilities.	-
	Check and update County BMP database.	SMALL	Within realm of current staff responsibilities.	-
Agriculture and Forestry Management	Continue to coordinate with Colonial Soil and Water Conservation District to assess and adjust as necessary the agricultural and silvicultural practices in the County.	SMALL	Within realm of current staff responsibilities.	-

Table 32 – Strategic Action Plan for Short-Term

Strategic Action (Short-Term)	Strategic Action Detail or Evaluation Measure	Level of County Effort and Expense	Funding Stream	Estimated Cost
Special Stormwater Criteria	Expand the SSC to apply to the entire watershed for any new development and re-development and not limited to SUP applications only. Revise SSC content based on alternate considerations.	SMALL: - Coordinate with Stormwater Program Advisory Committee	Within realm of current staff responsibilities. Could become a source of funding for other activities.	-
Land Conservation	Identify potential additional funding sources for land and easement acquisition toward conserving and preserving Conservation Areas, Habitat Cores, and Corridors.	SMALL to MODERATE	Potentially within realm of current staff responsibilities.	
Other Ordinance Changes to County Stormwater Requirements	Other Ordinance Changes.	SMALL: - Coordinate with Stormwater Program Advisory Committee and JCC Planning Department, and Planning Commission	Within realm of current staff responsibilities. May be a source of funding for other activities.	-

Strategic Action (Short-Term)	Strategic Action Detail or Evaluation Measure	Level of County Effort and Expense	Funding Stream	Estimated Cost
Targeted Bacterial Reductions	Analyze number of failed septic systems over time, date of install, and project potential future failures that may be anticipated.	SMALL	Potentially within realm of current staff responsibilities.	-
	Expand existing Pump-out Grant Program to also help subsidize the cost of replacing failed drainfields.	SMALL to MODERATE	Within realm of current staff responsibilities. General fund, grant applications. Can apply for DEQ funding through EPA.	$10,000
	Evaluate grant opportunities and alternative funding mechanisms towards potential future extension of public sanitary sewer lines within the existing Public Service Area (PSA).	SMALL to MODERATE: - Coordinate with JCSA	Within realm of current staff responsibilities. Grant applications and potential alternative funding mechanisms.	$100,000
	Consider how to incorporate Biochar into select BMP retrofits or areas of high bacteria concentration potential such as dog parks. Set up pre- and post-implementation scientific study to determine local effectiveness. This may involve initial design considerations.	SMALL to MODERATE: - Explore academic and volunteer input from community	Within realm of current staff responsibilities but support from Academia could be recruited.	-
	Coordinate with James River Association and Hampton Roads Sanitation District on potential bacteria source tracking within the Watershed.	SMALL to MODERATE	Within realm of current staff responsibilities.	-
	Coordinate with Department of Environmental Quality (DEQ) on impairment statuses and strategies, with focus and intent on setting up monitoring program.	SMALL to MODERATE	Within realm of current staff responsibilities.	-
James City Service Authority (JCSA) Bacterial Reductions	Review RIM elevations and status of waterproofing of sanitary sewer manholes in floodprone areas. Continue to perform inspections on waterproofing efficacy to ensure proper function and employ similar mitigatory measures for other manholes not yet addressed.	SMALL to MODERATE	Within realm of current staff responsibilities.	-
Flood Risk Items	Perform more quantitative flood modeling to better understand interior drainage flash flooding and riverine risks outside of just the tidal surge flooding. Develop a countywide resilience plan to expand the review across watershed boundaries and build off of the analysis performed herein.	MODERATE to HIGH	Develop a RFQ/RFP to solicit proposals to perform this work. Consider CFPF grants or other grant opportunities for flood risk resiliency planning.	$100,000
	Collaborate with dam owners in need of rehabilitation to meet Virginia Dam Safety regulations to ensure: 1) Downstream risks in storms below the Spillway Design Flood are also considered (i.e. avoid 10-yr to 100-yr storm increases) during the rehabilitation design. 2) Implementation of a county grant program to incorporate low-flow orifice for water quality and channel protection benefits into the rehabilitation design, or other retrofit potential at the impoundment (including but not limited to forebays, aeration, and polishing treatment). A similar grant could be explored for private BMP maintenance not for regulated dams, incorporating betterments into the BMP during non-routine maintenance.	SMALL to MODERATE	Within realm of current staff responsibilities.	-

Strategic Action (Short-Term)	Strategic Action Detail or Evaluation Measure	Level of County Effort and Expense	Funding Stream	Estimated Cost
Flood Risk Items	Share flood risk findings with County Emergency Management and Hampton Roads Planning District Commission (HRPDC), compare to their action plans, and identify if any adjustments are needed to their evacuation zone prioritization and/or emergency access routes.	SMALL to MODERATE	Within realm of current staff responsibilities.	-
	Encourage private landowners within the floodplain (especially areas of high concentration such as Chickahominy Haven) to raise the elevations of the first finished floors, HVAC systems, critical utility features, etc. of their buildings and/or employ other floodproofing measures. Perform a benefit-cost analysis (BCA) on such improvements to aid in FEMA funding assistance or other grant programs to help subsidize the costs. Consider property buyouts and conversion to natural areas for select structures with the greatest risks and/or low BCA ratio.	SMALL to MODERATE	Within realm of current staff responsibilities.	-
Site-Specific Stormwater Treatment Practices	Finalize prioritization of recommended projects to select the highest priority projects for implementation in Year 1 and into Year 2. Begin 1-2 Stream Reach projects, 3-5 Retrofit BMP opportunities, and 3-5 New BMP opportunities, depending on scale and funds.	SMALL to MODERATE - explore academic and volunteer input from community	Within realm of current staff responsibilities.	Prioritization: < $100k Design/Permitting: > $100k Construction: > $1,000,000
	Evaluate potential water quality benefits for larger projects such as regional wetland/wet pond opportunities. Perform concept design and engineering cost estimates, and cost/benefit analysis for 1-2. (Relates to Targeted Bacterial Reductions as well.)	SMALL to MODERATE	Within realm of current staff responsibilities.	$10,000 - 20,000

Table 33 – Strategic Action Plan for Medium-Term

Strategic Action (Medium-Term)	Strategic Action Detail or Evaluation Measure	Level of County Effort and Expense	Funding Stream	Estimated Cost
Targeted Bacterial Reductions	Use results from Year 1 analysis estimating number of failed septic systems over time, date of install, and project potential future failures that may be anticipated to plan a 5-year full implementation of actions.	MODERATE	Within realm of current staff responsibilities.	-
	Continue existing Pump-out Grant Program to also help subsidize the cost of replacing failed drainfields.	SMALL to MODERATE	Within realm of current staff responsibilities. General fund, grant applications.	$10,000
	Continue to evaluate grant opportunities and alternative funding mechanisms towards potential future extension of public sanitary sewer lines within the existing Public Service Area (PSA).	SMALL to MODERATE: - Coordinate with JCSA	Within realm of current staff responsibilities. Grant applications and potential alternative funding mechanisms.	Per study recommended in short-term plan
	Reassess biochar applications after interpretation of past monitoring results of performance.	SMALL to MODERATE: - Explore academic and volunteer input from community	Within realm of current staff responsibilities but support from Academia could be recruited.	-
	Set up water quality monitoring program and begin monitoring.	SMALL to MODERATE: - Explore academic and volunteer input from community	Partner organizations, grant funds. Coordinate with James River Association and other local and Chesapeake Bay-focused organizations (EPA, CBPO). This may be entirely external, internal, or some combination thereof.	-
Land Conservation	Put as much land under conservation easements as feasible given timing and funds. Target priority areas, cores, and corridors.	MODERATE	Within realm of current staff responsibilities. General fund, grants, independent conservation land trusts.	> $1,000,000

Strategic Action (Medium-Term)	Strategic Action Detail or Evaluation Measure	Level of County Effort and Expense	Funding Stream	Estimated Cost
Evaluate Wildlife Management Needs	Evaluate success of prior and ongoing wildlife management efforts. Refine as appropriate.	SMALL to MODERATE: - Explore academic and volunteer input from community	Within realm of current staff responsibilities.	-
Site-Specific Stormwater Treatment Practices	Continue implementation of first round of projects. Reassess prioritization and incorporate any lessons learned from first round. Begin next round of projects in years 3 and beyond: another 1-2 Stream Reach, 3-5 BMP Retrofit, and 3-5 New BMP projects, and ideally 1-2 of the larger-scale or regional practices. Develop 10-year implementation plan for all recommended projects which are still relevant to evolving goals.	MODERATE to HIGH	Within realm of current staff responsibilities.	> $2,000,000
	If preliminary studies indicate need and/or good benefit-to-cost ratio, begin engineering design, permitting, and land or land rights acquisition processes for one or more large-scale/regional BMPs	MODERATE to HIGH	Within realm of current staff responsibilities.	$100,000

Table 34 – Strategic Action Plan for Longer-Term

Strategic Action (Longer-Term)	Strategic Action Detail or Evaluation Measure	Level of County Effort and Expense	Funding Stream	Estimated Cost
Other Ordinance Changes to County Stormwater Requirements	Evaluate successes/failures of previously implemented ordinance changes, and begin revision process if warranted.	MODERATE	Within realm of current staff responsibilities.	-
Land Conservation	Aim for 75% of Corridors, 50% of Conservation Areas, and 35% of Habitat Cores to be under some form of measureable and enforceable protection.	MODERATE to HIGH	Within realm of current staff responsibilities. General fund, grants, independent conservation land trusts.	-
Targeted Bacterial Reductions	Continue existing Pump-out Grant Program to also help subsidize the cost of replacing failed drainfields.	SMALL to MODERATE	Within realm of current staff responsibilities. General fund, grant applications.	$10,000
	Continue to evaluate grant opportunities and alternative funding mechanisms towards potential future extension of public sanitary sewer lines within the existing Public Service Area (PSA).	SMALL to MODERATE: - Coordinate with JCSA	Within realm of current staff responsibilities. Grant applications and potential alternative funding mechanisms.	Per study conducted in short-term plan, and observations/ experience from medium-term efforts
	Continue inclusion of Biochar into select BMP retrofits or areas of high bacteria concentration potential and scientific studies to determine effectiveness.	SMALL to MODERATE: - Explore academic and volunteer input from community	Within realm of current staff responsibilities but support from Academia could be recruited.	$50,000
Site-Specific Stormwater Treatment Practices	Continue or conclude implementation of regional BMPs. Plan funding for the next round of projects in years 3 and beyond. Finalize 10-year implementation plans, and continue working through priority lists.	MODERATE to HIGH	Within realm of current staff responsibilities.	> $2,000,000

6 Subwatershed Management Plans

This section provides a more detailed or higher resolution look at all the characteristics, findings, analyses, and recommendations for each subwatershed individually. However, a high-level summary of all subwatersheds is provided here to put each in context of the overall Yarmouth Creek Watershed. Figure 35 below shows the geographic layout of the subwatersheds within the Watershed. For larger version of map with greater geographic extents, refer to Figure 1 in Section 1.1.

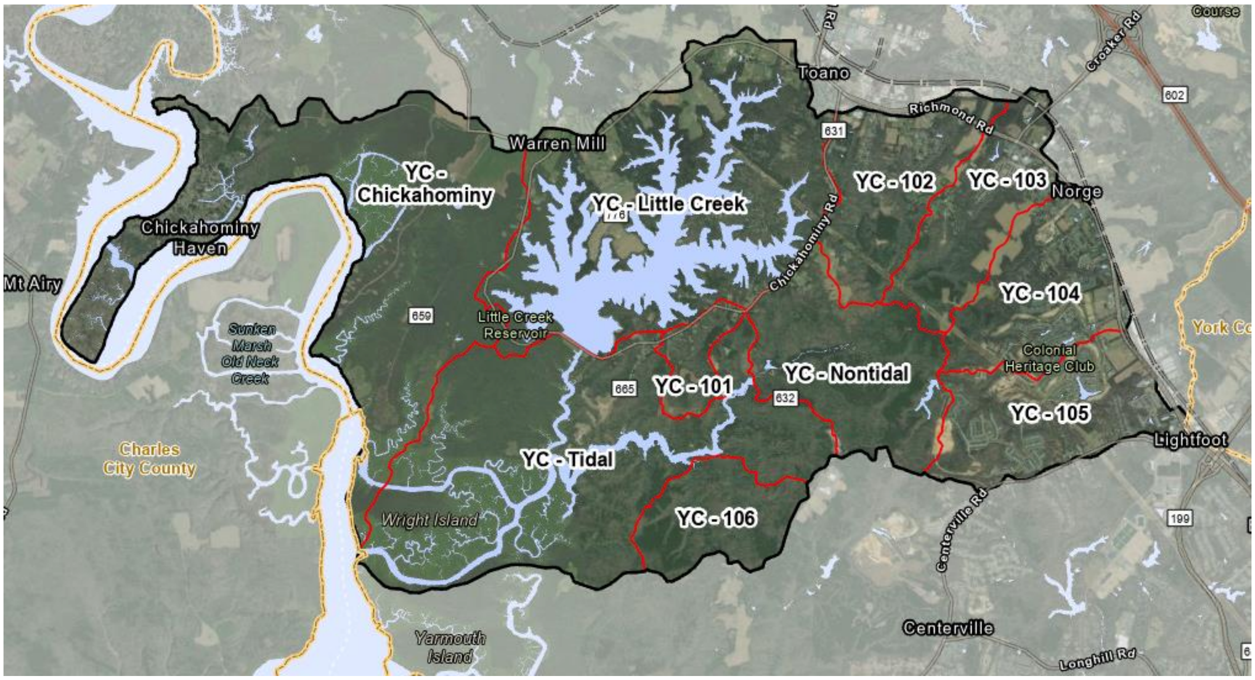


Figure 35 – Yarmouth Creek Subwatersheds

Combining all the desktop analyses and field assessments—the Impervious Cover Model (ICM) analyses, Watershed Treatment Model (WTM) pollutant load modeling, best management practice (BMP) inventory and review of areas treated, and the stream and upland field work results (stream reach habitat scores, Hot Spot Investigation, Neighborhood Source Assessment, BMP retrofit and new opportunity assessment)—offers the high-level picture.

Regarding the variable capitalization of "subwatershed" versus "Subwatershed," we aimed to follow the general rules differentiating between noun (lowercase) and proper noun (uppercase).

The Yarmouth Creek Watershed's distance from Williamsburg has resulted in a lower level of development relative to the watersheds closer to Williamsburg (such as Powhatan, Mill, and Skiffes Creeks). Unsurprisingly, those Yarmouth Creek subwatersheds closer to primary roadways (Route 60, and Interstate 64) have been built out to a much greater degree than those closer to the Chickahominy River. As such, both the pressures of development and the environmentally beneficial responses to those development pressures are much more significant in these areas. Specifically, Subwatersheds 102, 103, 104, and 105 have the most urbanization, with 104 and 105 having roughly twice as much impervious land cover as 102 and 103. Based on several high-level metrics such as existing and estimated future impervious cover percentages, percentage of assessed stream reach length that is of poor or marginal quality, number of potential hotspots, WTM loading estimates, and more, the most impacted Subwatershed is 104, with 105 closely behind, followed by 102, and then 103. However, these Subwatersheds all have the highest level of stormwater treatment as well. Many of the metrics which are typical indicators for watershed health are just that – indicators.

It is also worth mentioning that the Impervious Cover Model (ICM) and Watershed Treatment Model (WTM) can be set up to view changes with a designated area, whether it is a single Subwatershed, or a larger view. For example, looking at the future buildout of Subwatershed 104, one can look at only Subwatershed 104 and changes, loading rates, etc., or one can look at the Nontidal and/or Tidal Subwatersheds and see the overall changes in the larger watershed boundaries/context, focusing on potential downstream impacts. The limitations of any model and view like this are that it is theoretically possible to completely mitigate upstream impacts, upstream. One practical example of this is Subwatersheds 102 through 105 all have an impact on the Tidal Subwatershed. However, not only do stormwater treatment BMPs within these (102-105) subwatersheds reduce downstream loading, but Cranston's Mill Pond has a contributing drainage area of nearly 4,500 acres, with roughly 500 acres of impervious cover. It acts as an impressive interceptor for upstream stormwater flows, providing significant water quality and hydrologic improvement before releasing to downstream areas (Tidal Subwatershed). The same would apply (with smaller drainage areas) for the potential new constructed wetland BMPs at locations designated OPP-[Subwatershed]-RP0x in the BMP recommendations in Section 4.4 and upcoming subwatershed-specific subsections.

The regional wetland (or other) treatment system recommendation locations are based on seemingly feasible locations following limited desktop analysis. To better inform any efforts at this scale, water quality monitoring is highly recommended. Periodic water quality monitoring, ideally focusing on pollutants of concern—bacteria and nutrients in the case of Yarmouth Creek's impairments—and if feasible simultaneously at several points in the watershed for comparison which reduces factors of uncertainty to the greatest degree practical. It is possible that one of these locations would offer a much greater return on investment, and two may be desirable with different focuses in terms of design and engineering; perhaps one is aimed at the greatest bacterial reduction, and another is designed for hydraulic and hydrologic process influences.

Table 35 below presents some overarching observations and findings from the watershed assessments and planning efforts. The color coding is merely to highlight areas of either concern, or opportunity, depending on viewpoint or philosophy.

Table 35 – Summary of Overall Subwatershed-Scale Findings

Subwatershed	Key observations
101	With low imperviousness and no buildout projected, 101 is expected to stay in good condition. No immediate concerns or anticipated impacts.
102	Current pollutant modeling and stream health assessments put 102 in low rank (bottom 3), despite relatively low imperviousness, partly due to early development at looser standards. However, 102 has a lot of potential for improvement, retrofit, and thoughtful development.
103	A proportionally large increase in imperviousness and general area of buildout is a concern for 103. Care in approach to buildout will be very important in this subwatershed, but there is good opportunity for improvement, especially if retrofits and new BMPs can address the untreated prior development to a significant degree.

Subwatershed	Key observations
104	Based on two different scoring/assessment rubrics, 104 is considered to be in the most impacted condition in terms of watershed health with stream health being high among current concerns. However, it is projected to have very little relative degradation, and has good opportunities for improvement.
105	Very similar to 104 and 102 in terms of watershed impacts and buildout, 105 is heavily developed with stream health being a high concern currently. There is substantial buildout and development pressure primarily in the commercial corridor along Route 60. Subwatershed 105 is a focal point for "above and beyond" with respect to stormwater management moving forward, and has the highest projected bacterial and TSS loading increases of any subwatershed by a large margin, with a second place TN loading increase.
106	While subwatershed 106 is in excellent condition currently, based on the potential for development to change the overall landscape, this subwatershed warrants significant care in approach to possible future development, and has the potential based on WTM modeling to have the highest increases in TN and TP loading of any subwatershed.
Little Creek	Little Creek subwatershed is in moderately impacted condition, with little change projected. However, stream health is relatively low and there are many enhancement and restoration projects recommended.
Nontidal	The Nontidal subwatershed is in good condition, and is expected to stay in relatively good condition in part due to development constraints.
Tidal	The Tidal subwatershed is in good condition, but perhaps surprisingly has the third highest project TN loading increase of any subwatershed in Yarmouth Creek Watershed. The planned/potential development south of Yarmouth Creek, west of subwatershed 106, is an important place to focus care and efforts in minimizing impacts.
Chickahominy	The Chickahominy subwatershed is in good condition and is expected to stay this way. Perhaps the greatest concern in this subwatershed is flooding risks and associated water quality impacts due to flooding in the Chickahominy Haven development.

6.1 Subwatershed 101

6.1.1 General Description

Subwatershed 101 is the smallest subwatershed in the Yarmouth Creek Watershed. It is minimally developed with little to suggest significant buildout in the future. It is an upland subwatershed, situated south of the Little Creek Reservoir, and north of Yarmouth Creek downstream of Cranston's Mill Pond.

6.1.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 36. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Table 36 – Composition of Soils: Subwatershed 101

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
10C	Craven fine sandy loam, 6 to 10 percent slopes	C	0.8%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	21.0%
15D	Emporia complex, 10 to 15 percent slopes	C	0.8%
15E	Emporia complex, 15 to 25 percent slopes	C	1.0%
15F	Emporia complex, 25 to 50 percent slopes	C	26.7%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	9.9%
14C	Emporia fine sandy loam, 6 to 10 percent slopes	C	6.1%
17	Johnston complex	D	7.1%
18B	Kempsville fine sandy loam, 2 to 6 percent slopes	B	3.7%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	5.6%
21	Levy silty clay	D	0.1%
25B	Norfolk fine sandy loam, 2 to 6 percent slopes	B	0.1%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	0.4%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	4.9%
31B	Suffolk fine sandy loam, 2 to 6 percent slopes	B	11.7%
W	Water	N/A	0.0%

Note: Water (W) soil type being listed at 0.0% is rounded, and therefore less than 0.05%.

6.1.3 Land Use and Impervious Area

Subwatershed 101 is primarily rural, mostly forest cover. The few lightly developed areas are mostly single-family residences along the Little Creek Dam Road and Chickahominy Road.

6.1.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is less than nine (9) acres, accounting for 4% of the subwatershed area and 1.2% of the overall Yarmouth Creek Watershed impervious area. Table 37 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 37 – Existing Land Use and Land Cover Composition: Subwatershed 101

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Forest	118.73	53.7%	0.75	0.6%
LDR	17.24	7.8%	2.20	12.7%
Roadway	4.58	2.1%	2.13	46.4%
Rural	80.37	36.4%	3.75	4.7%

6.1.3.2 Future Conditions

A small amount of additional residential or rural development may occur. No significant buildout is anticipated. Current and future conditions are essentially the same.

6.1.4 Pollutant Loads

6.1.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 38, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 38 – Estimated Pollutant Loading for Existing Conditions: Subwatershed 101

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	22	151	15	3,517	5,118
Illicit Connections	-	2	0	13	1,434
Vacant Lots	-	-	-	-	-
RURAL SOURCES					
Rural Land	80	370	56	8,037	3,134
Forest	119	297	24	11,873	1,425
Open Water	-	-	-	-	-
TOTAL LOAD	**221**	**819**	**95**	**23,440**	**11,111**
Storm Load	-	441	70	21,264	9,677
Non-Storm Load	-	378	25	2,176	1,434

Table 39 – Estimated Load Reductions from Existing Treatment: Subwatershed 101

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	8.2	0.2	-	-
Pet Waste Education	1.8	0.2	-	15.4
Structural Stormwater Management Practices	-	-	-	-
Total Reduction	9.9	0.4	-	15.4

6.1.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 40. The row for vacant lots is not included since the conservative assumption for future buildout is that no developable lots will remain vacant.

Table 40 – Estimated Pollutant Loading for Future Conditions: Subwatershed 101

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	22	151	15	3,517	5,118
Illicit Connections	-	2	0	13	1,434
RURAL SOURCES					
Rural Land	80	370	56	8,037	3,134
Forest	119	297	24	11,873	1,425
Open Water	-	-	-	-	-
TOTAL LOAD	**221**	**819**	**95**	**23,440**	**11,111**
Storm Load	-	441	70	21,264	9,677
Non-Storm Load	-	378	25	2,176	1,434

6.1.5 Field Assessments

See Figure 36 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, Hot Spot Investigations, stream reaches, existing stormwater BMPs and new opportunities.

6.1.5.1 Stormwater Management

There are no existing stormwater management best management practices (BMPs) currently treating runoff within this subwatershed, nor any opportunities identified during field assessment. This does not mean there are no opportunities, but between the overall quality of the subwatershed and increased focus on others, none were identified.

6.1.5.2 Stream Assessment

One stream reach approximately 3,255 linear feet in length was assessed in this subwatershed. See Figure 36 for location. It scored Optimal (the highest rating) for the Habitat Assessment.

6.1.5.3 Upland Reconnaissance

Of the 60 acres of neighborhoods assessed within this subwatershed, 38% were scored at Moderate risk for pollution by the NSA methods, and the remaining 62% at High pollution potential. No areas were evaluated as potential hot spots. However, based on the high quality of receiving stream channels observed in the field, the actual pollution from these areas would appear to be less than the NSA scoring suggests as a possibility.

6.1.6 Opportunities for Improvements

There were no candidate projects identified within Subwatershed 101. Other subwatersheds bear the focus of restoration efforts, since 101 is not at notable risk or in a current state of degradation. See Figure 36 for assessment locations.

Management activities for this subwatershed should consist of maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and preventive maintenance education. While no designated Conservation Areas are present in Subwatershed 101, almost the entire subwatershed is comprised of a heightened priority habitat core, and therefore the land conservation efforts are very important as well.

Title

Figure 36 - Subwatershed 101 Results and Recommendations

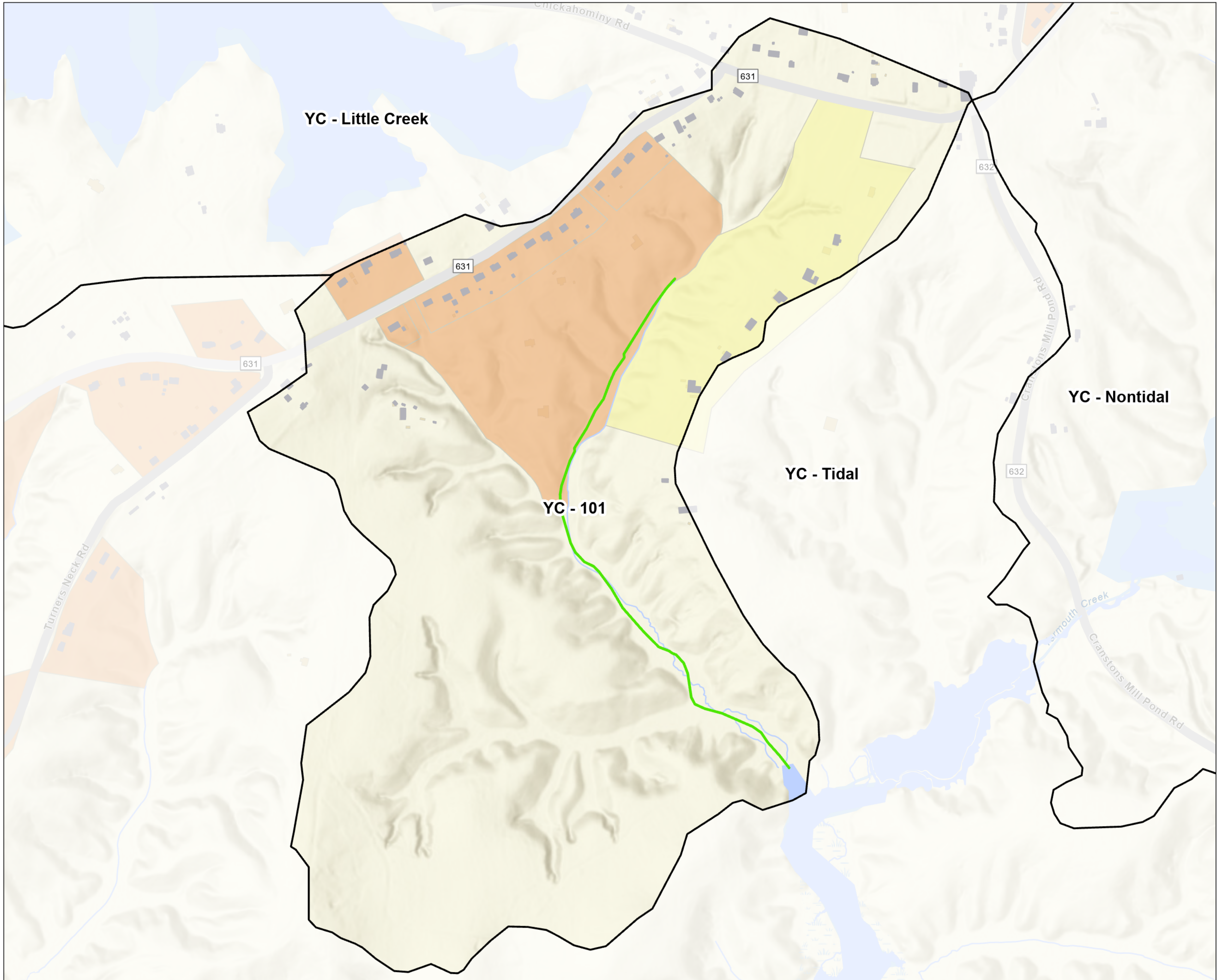
Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23



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Yarmouth Creek Watershed
Yarmouth Creek Subwatershed
Localized Project
Existing Stormwater BMP

Stream Habitat Rating

Optimal
Suboptimal
Marginal
Poor
Existing Restored Reach

New BMP Opportunities

Conservation Landscaping
Constructed Wetland
Other
Re/Detention
SPSC
Swale

Field Inspected Existing Stormwater BMP

Inspected
Not Inspected

Retrofit of Existing BMPs

Bioretention
Outfall Enhancement
Rehabilitate/ Upgrade
Retrofit - CW/ Wet Pond

HSI Score

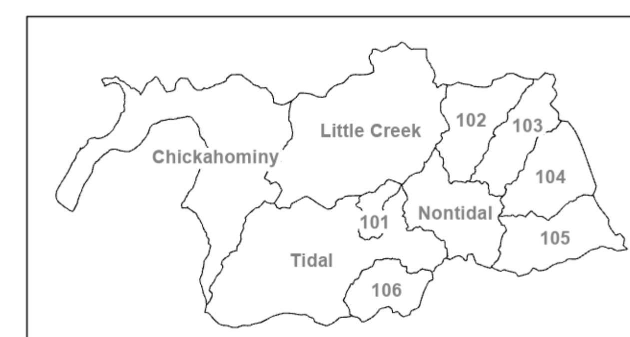
Not a Hotspot
Potential Hotspot
HSI Recommendations

Recommended Stream Projects

Enhancement
Restoration

NSA Score

High
Moderate



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

James City County Virginia Jamestown 1607

6.2 Subwatershed 102

6.2.1 General Description

Subwatershed 102 is a midsized subwatershed, the fourth most developed in the Yarmouth Creek Watershed, and lies on Route 60. It has a total area of 855 acres, approximately 6% of the total Watershed. It contains primarily older residential development, predating the current stormwater management regulations. Despite this, it is still in relatively decent shape due partly to the low level of development to this point, and large amount of forest cover.

6.2.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 41. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Table 41 – Composition of Soils: Subwatershed 102

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
10B	Craven fine sandy loam, 2 to 6 percent slopes	C	1.0%
11B	Craven-Uchee complex, 2 to 6 percent slopes	C/A	0.2%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	26.3%
15D	Emporia complex, 10 to 15 percent slopes	C	1.2%
15E	Emporia complex, 15 to 25 percent slopes	C	2.8%
15F	Emporia complex, 25 to 50 percent slopes	C	23.2%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	2.3%
17	Johnston complex	D	5.8%
18B	Kempsville fine sandy loam, 2 to 6 percent slopes	B	3.8%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	12.8%
20B	Kenansville loamy fine sand, 2 to 6 percent slopes	A	1.6%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	1.3%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	9.1%
31B	Suffolk fine sandy loam, 2 to 6 percent slopes	B	6.3%
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	2.3%

6.2.3 Land Use and Impervious Area

Subwatershed 102 is approximately 25% developed, approximately 21% of that Residential (mix of Low- and Medium-Density), and roughly 4% Commercial land uses. Most of the watershed is currently Rural and Forest. See below for additional details.

6.2.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is 65 acres, accounting for 7.6% of the subwatershed area and 8.6% of the overall Yarmouth Creek Watershed impervious area. This classifies it as Transitional from Sensitive moving toward Impacted in the Impervious Cover Model (ICM). Table 42 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 42 – Existing Land Use and Land Cover Composition: Subwatershed 102

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Commercial	33.73	3.9%	8.81	26.1%
Forest	142.89	16.7%	0.64	0.4%
Industrial	12.67	1.5%	6.41	50.6%
LDR	80.79	9.5%	5.17	6.4%
MDR	94.56	11.1%	14.12	14.9%
Open Water	0.95	0.1%	0.06	5.9%
Roadway	45.40	5.3%	20.30	44.7%
Rural	442.39	51.8%	9.73	2.2%
Vacant	1.12	0.1%	0.00	0.0%

6.2.3.2 Future Conditions

There is still land available in this subwatershed that can be built out. It is estimated that the percent impervious area in this subwatershed could reach as much as 19.6%. The exact pattern, location, and type of future development in this future, full build-out estimation is not known but it is expected to be mostly in Low-Density Residential with an approximate additional 100 acres of impervious cover estimated at the high end. This would be a significant increase, and even with best efforts, likely lead to significant deterioration of downstream aquatic ecosystems.

6.2.4 Pollutant Loads

6.2.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 43, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 43 – Estimated Pollutant Loading for Existing Conditions: Subwatershed 102

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	267	2,132	226	48,007	76,760
Illicit Connections	-	37	17	314	11,800
Vacant Lots	1	3	0	112	13
RURAL SOURCES					
Rural Land	442	2,035	310	44,239	17,253
Forest	143	357	29	14,289	1,715
Open Water	1	12	0	147	-
TOTAL LOAD	**855**	**4,576**	**582**	**107,109**	**107,542**
Storm Load	-	2,925	457	99,987	95,742
Non-Storm Load	-	1,651	125	7,122	11,800

Table 44 – Estimated Load Reductions from Existing Treatment: Subwatershed 102

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	78.0	1.6	-	-
Pet Waste Education	10.7	1.4	-	92.8
Structural Stormwater Management Practices	74.8	17.2	4,647	7,151
Total Reduction	163	20.1	4,647	7,244

6.2.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 45.

Table 45 – Estimated Pollutant Loading for Future Conditions: Subwatershed 102

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	577	3,732	399	79,027	101,073
Illicit Connections	-	37	17	314	11,800
RURAL SOURCES					
Rural Land	190	875	133	19,016	7,416
Forest	86	215	17	8,604	1,033
Open Water	1	12	0	147	-
TOTAL LOAD	**855**	**4,871**	**567**	**107,108**	**121,322**
Storm Load	-	3,124	449	103,189	109,535
Non-Storm Load	-	1,750	118	4,031	11,800

6.2.5 Field Assessments

See Figure 37 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, Hot Spot Investigations, stream reaches, existing stormwater BMPs and new opportunities.

6.2.5.1 Stormwater Management

There are seven (7) existing stormwater management best management practices currently treating runoff within this subwatershed. Table 46 provides the number of BMPs of each type or category, and the total area and impervious area treated by them. The areas in Table 46 are based on the data entered into the County BMP database. See Figure 37 for BMP locations and types.

Table 46 – Existing Stormwater BMPs: Subwatershed 102

BMP Type	Count	Impervious Area Treated (Acres)*	Total Area Treated (Acres)*
Bioretention	1	0.1	0.2
Constructed Wetland			
Dry Pond	3	12.1	24.6
Dry Swale			
Infiltration	1	1.6	1.9
Permeable Pavement			
Urban Infiltration Practices			
Urban stream restoration			
Water Quality Inlet			
Wet Pond	2	14.3	75.8
Wet Swale			
Grand Total	**7**	**28.1**	**102.6**

*Areas treated by BMPs are based on County database information and may be incomplete or have overlaps.

6.2.5.2 Stream Assessment

Approximately 18,800 linear feet of streams were assessed in this subwatershed (Figure 37). The reaches ranged in scoring from Poor to Optimal, with 3% Poor, 37% Marginal, and most of the remainder Suboptimal.

6.2.5.3 Upland Reconnaissance

Four different neighborhoods totaling approximately 200 acres were assessed within this subwatershed split approximately half and half in Moderate and High risk categories for pollution by the NSA methods. Four areas were investigated for Hot Spots of pollution with one confirmed and three potential hot spots identified (see Figure 37).

The one confirmed hot spot in Subwatershed 102 is at John Deere at Route 60 and Bush Springs Rd. Recommended actions: Clean parking lot surface to remove stains. Construct covered area for outdoor material storage. Move long term vehicle storage indoors or under cover. Clean dumpster area from stains and keep top closed when not in use.

6.2.6 Opportunities for Improvements

Recommended projects for further investigation include two headwater stream projects (one enhancement, one restoration), one localized project, four BMP retrofits, and 14 new BMP opportunities were identified. Table 47 through Table 50 show the candidate projects of various types.

Management activities for this subwatershed should consist of maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and preventive maintenance education. While no designated Conservation Areas are present in Subwatershed 102, a portion of the subwatershed is contains a heightened priority habitat core, and therefore the land conservation efforts should be included programmatic efforts.

Table 47 – Candidate Projects for Stream Reach Recommendations: Subwatershed 102

Reach ID	Length (feet)	Total Habitat Score	Habitat Condition Rating	Recommended Action	Notes	Estimated Cost Range*	Watershed-Wide Rank
ST2-12-C	926	121	Poor	Restoration	Channel is extremely incised with little to no vegetative protection, high erosion, and heavy sedimentation. However, only upper portion is recommended for restoration. Mature woods beyond that are high value.	> $500k	**11 of 22**
ST4-18-G	663	108	Marginal	Enhancement	Channel is downcut with low vegetative cover on the banks, sloughing banks, and sedimentation.	$250-500k	**22 of 22**

*Includes design, engineering, and construction

Table 48 – Candidate Projects for Localized Projects in Stream Corridors: Subwatershed 102

Map ID	Observations	Proposed Improvements	Cost Range	Watershed-Wide Rank
5	Washed out culvert outfall with erosion	Culvert outlet protection	< $100k	**5 of 7**

Table 49 – Candidate Projects for Retrofit of Existing BMPs: Subwatershed 102

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-WC020	Allan Myers Dry Pond	Dry Extended Detention Ponds	9.3	Retrofit - CW/ Wet Pond	Opportunity to upgrade to CW or wet pond since vegetation has already developed in this direction. Easy access, some room for footprint expansion.	$100-250k	**1 of 35**
BMP-YC019	Toano Trace Dry Pond	Dry Extended Detention Ponds	8.72	Bioretention	Filled in, riser blocked with trash. Bioretention or extended detention wetland possible.	$100-250k	**31 of 35**
BMP-YC020	Toano Trace Dry Pond	Dry Extended Detention Ponds	6.59	Bioretention	Wet w/ veg. Bioretention or extended detention wetland possible.	$100-250k	**31 of 35**
BMP-YC013	Toano Woods Wet Pond	Wet Pond	40.5	Rehabilitate/ Upgrade	Construct forebay for YC013.	$100-250k	**35 of 35**

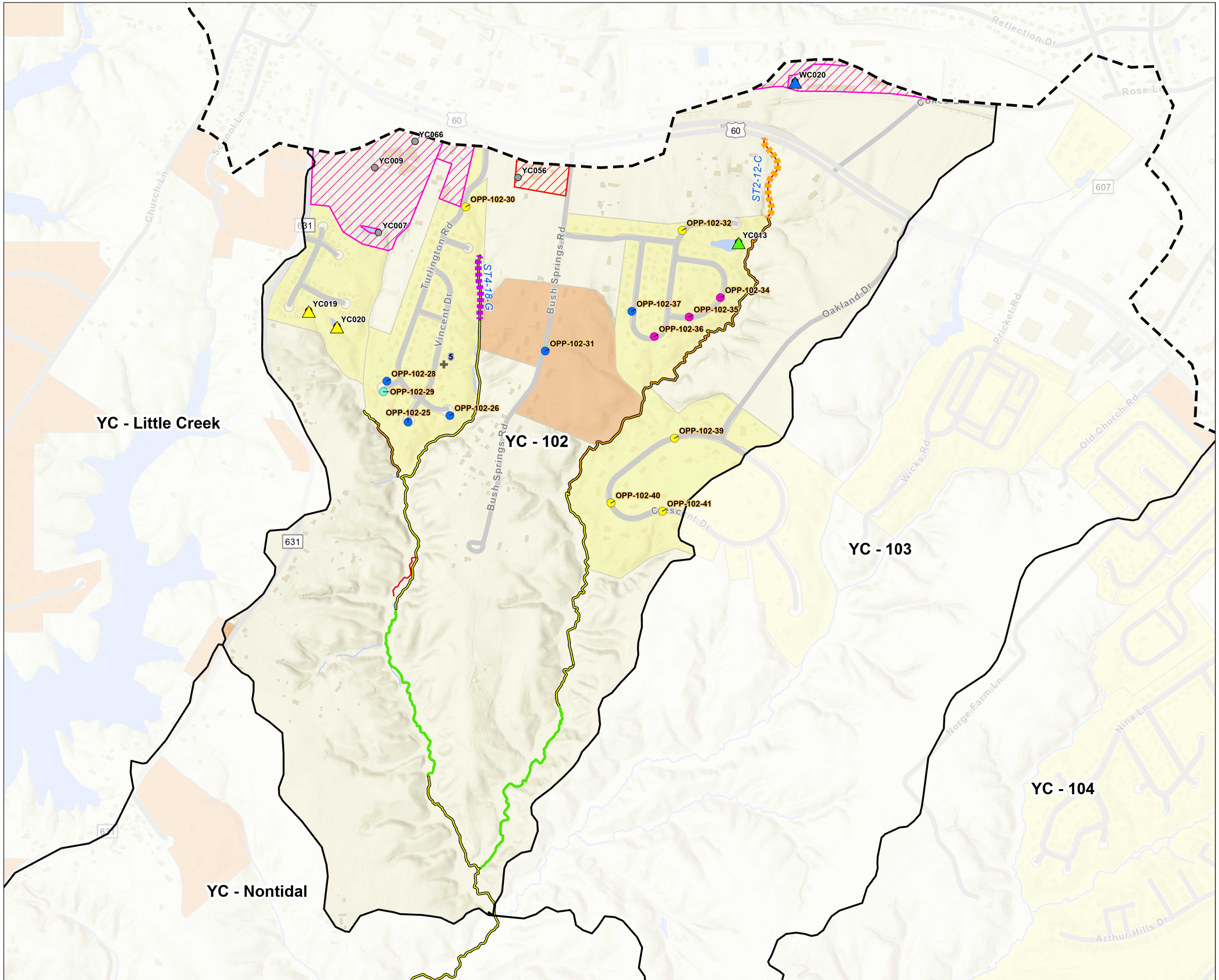
Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Table 50 – Candidate Projects for New Stormwater BMPs: Subwatershed 102

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed -Wide Rank
OPP-102-36	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.		< $250k	**23 of 58**
OPP-102-25	Re/Detention	Small practices possible.		$100-250k	**38 of 58**
OPP-102-26	Re/Detention	Small practices possible.		$100-250k	**38 of 58**
OPP-102-28	Re/Detention	Small practices possible.		$100-250k	**38 of 58**
OPP-102-29	SPSC	Concrete channel lining severely undercut.		$100-250k	**38 of 58**
OPP-102-30	Swale	Drainage paths - require stable BMPs.		$100-250k	**38 of 58**
OPP-102-32	Swale	A few potential opportunities. Roadside ditches, particularly lined ones, convert to WQ swales. May be option for small basins upstream of YC013.		$100-250k	**38 of 58**
OPP-102-37	Re/Detention	Potential for basin, but wholly on private property. Looks like it would be on two adjoining parcels.	Property ownership/ easements, utilities	$100-250k	**38 of 58**
OPP-102-39	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.	Property ownership/ easements	< $250k	**38 of 58**
OPP-102-40	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.	Property ownership/ easements	< $250k	**38 of 58**

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed -Wide Rank
OPP-102-41	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.	Property ownership/ easements	< $250k	**38 of 58**
OPP-102-31	Re/Detention	Localized drainage to area behind house. Space constraints and recent construction may complicate. Possible opportunity downstream on adjacent, yet-undeveloped parcel.	Space, easement/ ownership.	$100-250k	**54 of 58**
OPP-102-34	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.		< $250k	**57 of 58**
OPP-102-35	Other	Potential for manufactured treatment devices, or possibly SPSC, swale, or small basin.		< $250k	**57 of 58**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.



Title

Figure 37 - Subwatershed 102 Results and Recommendations

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23

N

0 1,000 2,000 Feet

(At original document size of 11x17)
1:12,000

Yarmouth Creek Watershed
Yarmouth Creek Subwatershed
Localized Project
Existing Stormwater BMP

Stream Habitat Rating
- Optimal
- Suboptimal
- Marginal
- Poor
- Existing Restored Reach

New BMP Opportunities
- Conservation Landscaping
- Constructed Wetland
- Other
- Re/Detention
- SPSC
- Swale

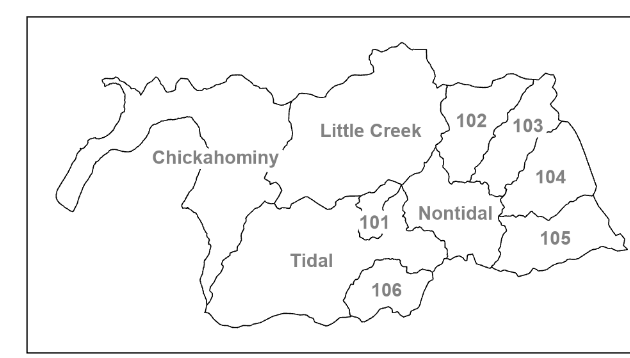
Field Inspected Existing Stormwater BMP
- Inspected
- Not Inspected

Retrofit of Existing BMPs
- Bioretention
- Outfall Enhancement
- Rehabilitate/ Upgrade
- Retrofit - CW/ Wet Pond

HSI Score
- Not a Hotspot
- Potential Hotspot
- HSI Recommendations

Recommended Stream Projects
- Enhancement
- Restoration

NSA Score
- High
- Moderate



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

James City County Virginia Jamestown 1607

6.3 Subwatershed 103

6.3.1 General Description

Subwatershed 103 is a midsized subwatershed with a similar amount of residential development, though more commercial and industrial development. It is the third most developed subwatershed in the Yarmouth Creek Watershed, located along Route 60. It has a total area of 738 acres, approximately 5% of the total Watershed. There is currently significant expansion of residential development occurring along the southeast border of the subwatershed, shared with Subwatershed 104.

6.3.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 51. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Table 51 – Composition of Soils: Subwatershed 103

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
8B	Caroline fine sandy loam, 2 to 6 percent slopes	C	0.2%
10C	Craven fine sandy loam, 6 to 10 percent slopes	C	0.8%
11B	Craven-Uchee complex, 2 to 6 percent slopes	C/A	1.1%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	17.9%
15D	Emporia complex, 10 to 15 percent slopes	C	4.0%
15E	Emporia complex, 15 to 25 percent slopes	C	7.5%
15F	Emporia complex, 25 to 50 percent slopes	C	18.9%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	4.0%
14C	Emporia fine sandy loam, 6 to 10 percent slopes	C	1.4%
17	Johnston complex	D	6.4%
18B	Kempsville fine sandy loam, 2 to 6 percent slopes	B	3.4%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	15.0%
20B	Kenansville loamy fine sand, 2 to 6 percent slopes	A	4.9%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	3.6%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	3.2%
31B	Suffolk fine sandy loam, 2 to 6 percent slopes	B	3.9%
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	3.0%
34C	Uchee loamy fine sand, 6 to 10 percent slopes	A	0.5%
W	Water	N/A	0.2%

6.3.3 Land Use and Impervious Area

Developed areas are mostly composed of low- and medium-density residential developments, but impervious cover is split relatively evenly between residential, commercial/industrial, and roadway land uses.

6.3.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is 71 acres, accounting for 9.6% of the subwatershed area and 9.4% of the overall Yarmouth Creek Watershed impervious area. This classifies it as Transitional, nearly Impacted in the Impervious Cover Model (ICM). Table 52 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 52 – Existing Land Use and Land Cover Composition: Subwatershed 103

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Commercial	30.17	4.1%	10.95	36.3%
Forest	40.89	5.5%	0.09	0.2%
Industrial	20.03	2.7%	12.66	63.2%
LDR	57.36	7.8%	4.41	7.7%
MDR	94.24	12.8%	21.51	22.8%
Open Water	2.65	0.4%	0.00	0.0%
Roadway	46.39	6.3%	18.54	40.0%
Rural	434.00	58.8%	2.84	0.7%
Vacant	12.54	1.7%	0.19	1.5%

6.3.3.2 Future Conditions

It is estimated that the percent impervious area in this subwatershed may increase to 23% with continued residential development. Per the ICM, this would put Subwatershed 103 in the transition zone close to non-supporting. Thus, it is important to focus efforts on this subwatershed to reduce the impacts of any eventual urbanization.

6.3.4 Pollutant Loads

6.3.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 53, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 53 – Estimated Pollutant Loading for Existing Conditions: Subwatershed 103

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	248	1,793	162	26,902	50,175
Illicit Connections	-	42	18	355	14,459
Vacant Lots	13	31	3	1,254	150
RURAL SOURCES					
Rural Land	434	1,996	304	43,400	16,926
Forest	41	102	8	4,089	491
Open Water	3	34	1	411	-
TOTAL LOAD	**738**	**3,999**	**496**	**76,411**	**82,201**
Storm Load	-	2,483	377	70,323	67,742
Non-Storm Load	-	1,515	119	6,088	14,459

Table 54 – Estimated Load Reductions from Existing Treatment: Subwatershed 103

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	66.8	1.3	-	-
Pet Waste Education	13.6	1.8	-	119
Structural Stormwater Management Practices	376	77.3	24,427	32,460
Total Reduction	457	80.4	24,427	32,579

6.3.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 55.

Table 55 – Estimated Pollutant Loading for Future Conditions: Subwatershed 103

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	495	3,279	322	52,421	75,233
Illicit Connections	-	42	18	355	14,459
RURAL SOURCES					
Rural Land	239	1,099	167	23,894	9,319
Forest	1	3	0	114	14
Open Water	3	34	1	411	-
TOTAL LOAD	**738**	**4,457**	**509**	**77,194**	**99,024**
Storm Load	-	2,875	399	74,708	84,716
Non-Storm Load	-	1,613	113	3,740	14,459

6.3.5 Field Assessments

See Figure 38 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, Hot Spot Investigations, stream reaches, existing stormwater BMPs and new opportunities.

6.3.5.1 Stormwater Management

There are 33 existing stormwater management best management practices currently treating runoff within this subwatershed. Table 56 provides the number of BMPs of each type or category, and the total area and impervious area treated by them. It shows cumulative treatment areas greater than those in the watershed likely due to some overlap of drainage areas. Treatment areas for existing BMPs were taken from the County BMP database.

In the James City County BMP database, YC002 is classified as “urban stream restoration.” This project is a set of restored stream reaches just south of the Oakland Estates neighborhood. These are shown as gray lines in Figure 38 as “Existing Restored Reach.”

Table 56 – Existing Stormwater BMPs: Subwatershed 103

BMP Type	Count	Impervious Area Treated (Acres)*	Total Area Treated (Acres)*
Bioretention	13	8.2	20.5
Constructed Wetland	1	2.1	3.5
Dry Pond	3	19.9	40.8
Dry Swale	5	3.1	6.9
Infiltration	6	7.5	12.0
Permeable Pavement			
Urban Infiltration Practices			
Urban stream restoration	1	0.1	1170.0
Water Quality Inlet	2		
Wet Pond	2	71.2	151.7
Wet Swale			
Grand Total	**33**	**112.0**	**1405.3**

*Areas treated by BMPs are based on County database information and may be incomplete or have overlaps.

6.3.5.2 Stream Assessment

Approximately 17,800 linear feet of streams were assessed in this subwatershed. Approximately one third scored Marginal and two thirds Suboptimal. No stream reaches assessed were scored Optimal or Poor.

6.3.5.3 Upland Reconnaissance

Of 148 acres of neighborhoods assessed, two thirds scored as Moderate for pollution risk and one third as High per the NSA method. Six hot spot areas were investigated, two confirmed, and five potential based on the scoring system.

The two confirmed hot spots in Subwatershed 103, and the recommended actions for resolution are:

- O'Reilly Auto Parts in Norge Crossing – Clean parking lot surface to remove stains. Move long term vehicle storage indoors or under cover.
- Village at Candle Station shopping center – Clean parking lot surface to remove stains. Construct covered area for outdoor material storage. Move long term vehicle storage indoors or under cover. Clean dumpster area from stains and keep top closed when not in use.

6.3.6 Opportunities for Improvements

One stream reach is recommended for restoration, no localized projects associated with stream corridors in this subwatershed. There are five existing stormwater BMPs that have a potential for retrofit and six potential locations for a new stormwater BMP. See the following tables and Figure 38 for details.

Management activities for this subwatershed should consist of maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and preventive maintenance education. While no designated Conservation Areas are present in Subwatershed 103, a large portion of the subwatershed is heightened priority habitat core, with one local connection corridor across the Dominion utility easement into the Nontidal Subwatershed habitat, and therefore the land conservation efforts are a very important part of the programmatic efforts.

Table 57 – Candidate Projects for Stream Reach Recommendations: Subwatershed 103

Reach ID	Length (feet)	Total Habitat Score	Habitat Condition Rating	Recommended Action	Notes	Estimated Cost Range*	Watershed-Wide Rank
ST4-29-C	542	126	Marginal	Restoration	Channel is overwidened and incised with little vegetative protection, undercut banks, and sedimentation.	$250-500k	**9 of 22**

*Includes design, engineering, and construction

Table 58 – Candidate Projects for Retrofit of Existing BMPs: Subwatershed 103

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-YC006	Williamsburg Soap & Candle Factory Wet Pond	Wet Pond	142.1	Rehabilitate/ Upgrade	Investigate dredging and possible forebay enhancement/enlargement.	> $500k	**10 of 35**
BMP-YR030	Tractor Supply Company Infiltration 2	Infiltration Basin		Rehabilitate/ Upgrade	Definitely not infiltrating. Appears to be a wetland. Rehab, or convert to proper wetland.	$100-250k	**10 of 35**
BMP-YC081	Village at Candle Station Bioretention	Bioretention	1.76	Rehabilitate/ Upgrade	Could use more variety in vegetation.	< $50k	**18 of 35**

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-YC023	Norge Shopping Center Infiltration	Infiltration Trench	4.07	Rehabilitate/ Upgrade	Upgrade per Norge Area A design from prior WEG study – new grass channel to convey bypassing runoff into facility, inlet cleanup and stabilization, trash rack on riser structure. Revisit, update any recommendations.	$100-250k	**21 of 35**
BMP-YC003	Poplar Creek Business Center Dry Pond	Dry Extended Detention Ponds	24.7	Rehabilitate/ Upgrade	Overgrown, would or will require clearing. Room for footprint expansion. Access is not easy. Bioretention may be feasible if elevation head accommodates.	$100-250k	**26 of 35**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Table 59 – Candidate Projects for New Stormwater BMPs: Subwatershed 103

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed-Wide Rank
OPP-103-42	Swale	Linear practice possible, type determined by constraints (TBD).		$100-250k	**2 of 58**
OPP-103-43	Re/Detention	Depending on storm drain elevations, bioretention may be feasible.		$100-250k	**2 of 58**
OPP-103-44	Re/Detention	Trees and shrubs look mature and healthy. If the balance of environmental benefits checks out, microbioretention may be option.		$100-250k	**2 of 58**
OPP-103-45	Swale	Location of drainage easement relative to actual drainage path is unclear. Swale possible along drainage path.		< $250k	**2 of 58**

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed-Wide Rank
OPP-103-06	SPSC	Ephemeral channel, likely experiencing intense flows. Swale, or SPSC possible.		$100-250k	**13 of 58**
OPP-103-38	Swale	Linear practices, such as dry swale or SPSC possible. Re/detention basin may be option depending on space and ownership/easement constraints.	Property ownership/ easements	< $250k	**38 of 58**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Title
Figure 38 - Subwatershed 103 Results and Recommendations

Client/Project
James City County
Yarmouth Creek WSMP

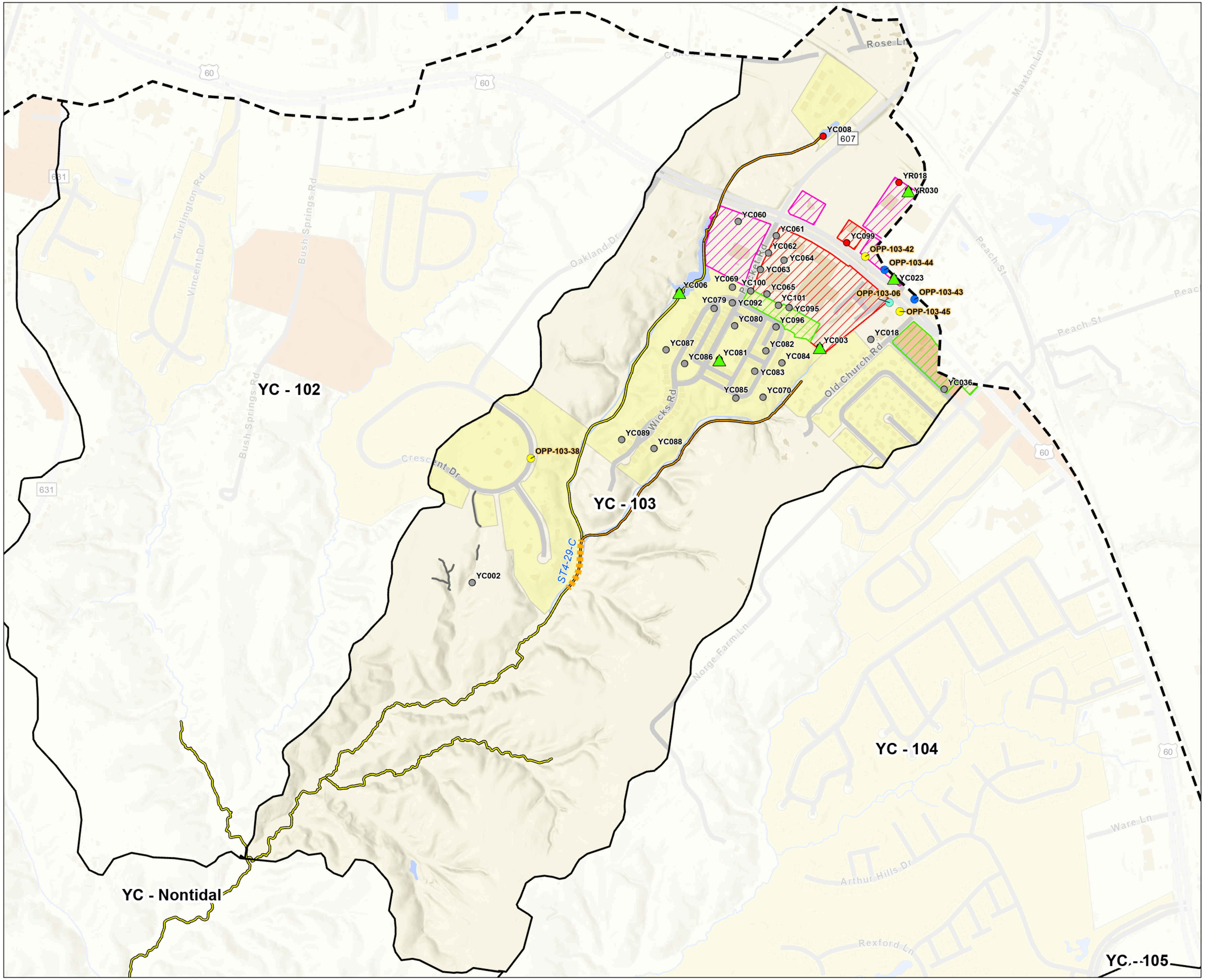
203408987

Project Location
James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23

N

0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,000



Yarmouth Creek Watershed
Yarmouth Creek Subwatershed
Localized Project
Existing Stormwater BMP

Stream Habitat Rating
Optimal
Suboptimal
Marginal
Poor
Existing Restored Reach

New BMP Opportunities
Conservation Landscaping
Constructed Wetland
Other
Re/Detention
SPSC
Swale

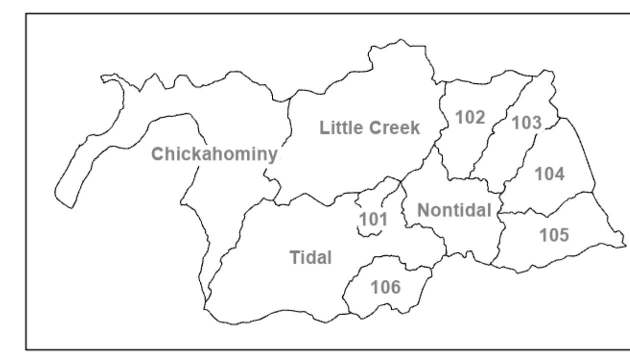
Field Inspected Existing Stormwater BMP
Inspected
Not Inspected

Retrofit of Existing BMPs
Bioretention
Outfall Enhancement
Rehabilitate/ Upgrade
Retrofit - CW/ Wet Pond

HSI Score
Not a Hotspot
Potential Hotspot
HSI Recommendations

Recommended Stream Projects
Enhancement
Restoration

NSA Score
High
Moderate



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

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6.4 Subwatershed 104

6.4.1 General Description

Subwatershed 104 is a midsized subwatershed, and the second most developed in the Yarmouth Creek Watershed. It has a total area of 862 acres, approximately 6% of the total Watershed. It has a combination of some older residential development, some commercial, and significant residential and golf course development (including Colonial Heritage) since the last watershed reporting and planning efforts twenty years ago.

6.4.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 60. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Table 60 – Composition of Soils: Subwatershed 104

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
8B	Caroline fine sandy loam, 2 to 6 percent slopes	C	1.5%
10B	Craven fine sandy loam, 2 to 6 percent slopes	C	0.5%
11B	Craven-Uchee complex, 2 to 6 percent slopes	C/A	2.8%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	13.6%
15D	Emporia complex, 10 to 15 percent slopes	C	6.5%
15E	Emporia complex, 15 to 25 percent slopes	C	3.6%
15F	Emporia complex, 25 to 50 percent slopes	C	21.8%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	4.1%
14C	Emporia fine sandy loam, 6 to 10 percent slopes	C	1.7%
17	Johnston complex	D	5.4%
18B	Kempsville fine sandy loam, 2 to 6 percent slopes	B	1.6%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	5.1%
20B	Kenansville loamy fine sand, 2 to 6 percent slopes	A	15.2%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	6.6%
31B	Suffolk fine sandy loam, 2 to 6 percent slopes	B	1.4%
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	5.1%
34C	Uchee loamy fine sand, 6 to 10 percent slopes	A	3.5%

6.4.3 Land Use and Impervious Area

Subwatershed 104 is approximately 65% developed, with approximately 55% Residential (mix of Low- and Medium-Density), and roughly 9% Commercial land uses.

6.4.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is 163 acres, accounting for 18.9% of the subwatershed area and 21.4% of the overall Yarmouth Creek Watershed impervious area. This classifies it as Impacted in the Impervious Cover Model (ICM), very nearly into the transitional zone toward Non-Supporting. Table 61 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 61 – Existing Land Use and Land Cover Composition: Subwatershed 104

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Commercial	80.27	9.3%	33.65	41.9%
Forest	0.02	0.0%	0.00	0.0%
LDR	135.65	15.7%	8.75	6.4%
MDR	342.87	39.8%	71.79	20.9%
Open Water	3.54	0.4%	0.06	1.6%
Roadway	77.17	9.0%	46.09	59.7%
Rural	192.72	22.4%	2.25	1.2%
Vacant	29.36	3.4%	0.29	1.0%

6.4.3.2 Future Conditions

There is currently some residential development occurring on the border with Subwatershed 103, and the currently vacant lots along Route 60 are expected to be developed as well based on observed trends. It is estimated that the percent impervious area in this subwatershed may increase to 31% with additional development.

6.4.4 Pollutant Loads

6.4.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 62, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 62 – Estimated Pollutant Loading for Existing Conditions: Subwatershed 104

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	636	4,758	448	88,294	145,352
Illicit Connections	-	71	28	579	28,516
Vacant Lots	29	73	6	2,936	352
RURAL SOURCES					
Rural Land	193	887	135	19,272	7,516
Forest	-	-	-	-	-
Open Water	4	45	2	549	-
TOTAL LOAD	**862**	**5,834**	**619**	**111,629**	**181,736**
Storm Load	-	4,003	530	107,218	153,220
Non-Storm Load	-	1,831	90	4,411	28,516

Table 63 – Estimated Load Reductions from Existing Treatment: Subwatershed 104

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	212	4.2	-	-
Pet Waste Education	29.1	3.8	-	253
Structural Stormwater Management Practices	370	78.6	23,656	34,455
Total Reduction	611	86.6	23,656	34,708

6.4.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 64.

Table 64 – Estimated Pollutant Loading for Future Conditions: Subwatershed 104

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	741	5,490	528	100,839	160,377
Illicit Connections	-	71	28	579	28,516
RURAL SOURCES					
Rural Land	117	540	82	11,740	4,578
Forest	-	-	-	-	-
Open Water	4	45	2	549	-
TOTAL LOAD	**862**	**6,146**	**640**	**113,706**	**193,471**
Storm Load	-	4,371	563	112,984	165,308
Non-Storm Load	-	1,848	83	3,658	28,516

6.4.5 Field Assessments

See Figure 39 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, Hot Spot Investigations, stream reaches, existing stormwater BMPs and new opportunities.

6.4.5.1 Stormwater Management

There are 29 existing stormwater management best management practices currently treating runoff within this subwatershed. Table 65 provides the number of BMPs of each type or category, and the total area and impervious area treated by them. The areas in Table 65 are based on the data entered into the County BMP database. One stream restoration project is associated with a very large contributing drainage area.

In the James City County BMP database, YC010 is classified as "urban stream restoration." This project is a restored stream reach beginning between Williamsburg Village Dr. and Ware Ln. This is shown in Figure 39 as "Existing Restored Reach."

Table 65 – Existing Stormwater BMPs: Subwatershed 104

BMP Type	Count	Impervious Area Treated (Acres)*	Total Area Treated (Acres)*
Bioretention	8	1.3	6.1
Constructed Wetland			
Dry Pond	8	24.2	92.7
Dry Swale			
Infiltration	5	9.2	16.3
Permeable Pavement			
Urban Infiltration Practices			
Urban stream restoration	1	6.0	450.0
Water Quality Inlet	2		
Wet Pond	5	56.7	164.7
Wet Swale			
Grand Total	**29**	**97.4**	**729.8**

*Areas treated by BMPs are based on County database information and may be incomplete or have overlaps.

6.4.5.2 Stream Assessment

Approximately 18,300 linear feet of streams were assessed in this subwatershed, with 20% in Poor condition and 35% in Marginal condition, and most of the remainder (minus a few hundred feet) of assessed stream reaches in Suboptimal condition.

6.4.5.3 Upland Reconnaissance

The assessed area totals approximately 520 acres with 98% scoring Moderate on the Neighborhood Source Assessment (NSA) for pollution risk. Nine areas were investigated for Hot Spots of pollution. No confirmed hot spots were found; the nine assessed were rated as Potential Hot Spots.

6.4.6 Opportunities for Improvements

There were three reaches recommended for stream reach restoration activities, one localized project associated with stream corridors in this subwatershed, 11 existing stormwater BMPs that have potential for retrofit, and 11 potential locations for new stormwater BMPs. See the following tables and Figure 39 for details. Two of these new BMP opportunities, OPP-104-RP02 and OPP-104-RP03 are regional treatment practices discussed in the introduction to Section 6. A large constructed wetland or wet pond inline in streams could have significant benefits for the watershed. Additional investigation is warranted to determine feasibility, and benefit-cost-analysis. See Figure 39 for locations.

Management activities for this subwatershed should consist of maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and preventive maintenance education. Conservation Area C5 (see Figure 14 in Section 2.2.2) comprises a significant portion of Subwatershed 104, though a large portion of it is now developed. Land conservation efforts to preserve the remainder of C5 are advised, particularly due to the buildout and development pressure in this subwatershed.

Table 66 – Candidate Projects for Stream Reach Recommendations: Subwatershed 104

Reach ID	Length (feet)	Total Habitat Score	Habitat Condition Rating	Recommended Action	Notes	Estimated Cost Range*	Watershed-Wide Rank
ST1-10-G	1,235	113	Marginal	Restoration	Channel is incised with low vegetative protection, cover, eroded banks, sedimentation, and deposition.	> $500k	**7 of 22**
ST1-16-G	1,587	105	Marginal	Restoration	Channel banks are heavily eroded and have low vegetative protection.	> $500k	**8 of 22**
ST1-11-C	1,409	125	Marginal	Enhancement	Channel is incised with low vegetative protection, cover, eroded banks, sedimentation, and deposition.	> $500k	**17 of 22**

* - Includes design, engineering, and construction

Table 67 – Candidate Projects for Localized Projects in Stream Corridors: Subwatershed 104

Map ID	Observations	Proposed Improvements	Cost Range	Watershed-Wide Rank
2	Inlet at Headcut. Significant erosion	Inlet protection & stabilization	< $100k	**7 of 7**

Table 68 – Candidate Projects for Retrofit of Existing BMPs: Subwatershed 104

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-YC028	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	18.7	Bioretention	Dry ED pond. Looks like a good opportunity.	$100-250k	**3 of 35**
BMP-YC031	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	9.1	Bioretention	Large well maintained dry ED. Kristiansand #22.	$100-250k	**3 of 35**
BMP-YC050	Baylands Federal Credit Union Dry Pond	Dry Extended Detention	9.56	Retrofit - CW/ Wet Pond	Extended detention with wet bottom. Would be good candidate for retrofit, but adjacent bioretention may be doing the job.	$100-250k	**3 of 35**
BMP-YC074	Norge Neighborhood Dry Pond	Dry Extended Detention Ponds	33.6	Bioretention	Appears that perhaps YC072 is a bioretention upstream that may outfall into this one. Bioretention retrofit is possible, with extended detention, but may require too much clearing.	$100-250k	**10 of 35**
BMP-YC005	Riverside Medical Center Infiltration	Infiltration Trench	2.9	Rehabilitate/ Upgrade	Appears to be in good shape, however an 8" pipe appears to run directly from the lot into the riser. Confirm bypass, and investigate options to eliminate.	$50-100k	**15 of 35**

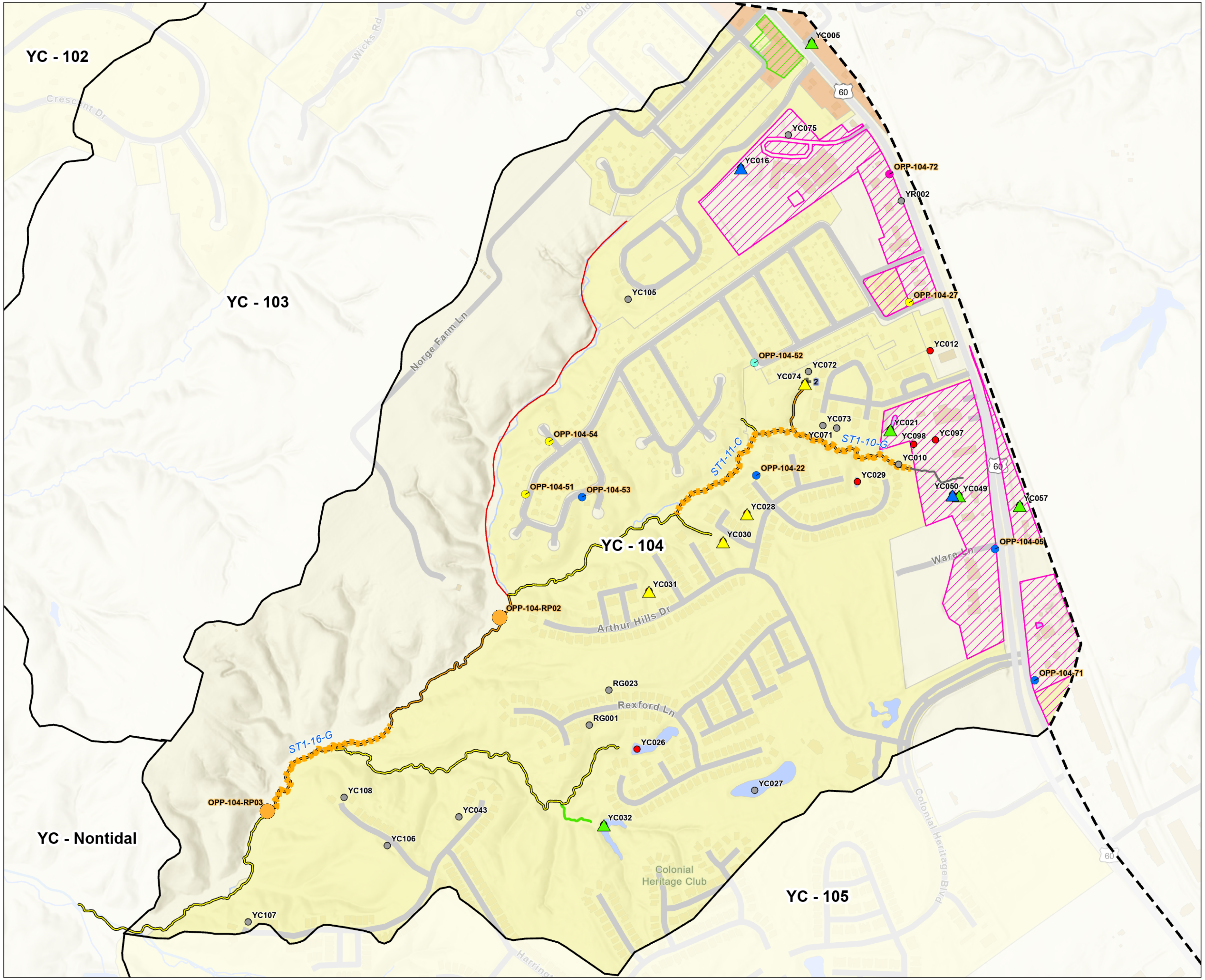
BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-YC016	Norge ES Infiltration	Infiltration Trench	8.61	Retrofit - CW/ Wet Pond	Kristiansand project #47, infiltration trench, was constructed. This is naturally evolving into a wetland. Recommend purposeful conversion, or selected upgrade and change of BMP tracking. Unsure of likelihood of success of restoring infiltration capacity.	$50-100k	**18 of 35**
BMP-YC030	Colonial Heritage Phase 1 Dry Pond	Dry Extended Detention Ponds	6.9	Bioretention	Ext. det. basin. Looks like a good retrofit opportunity for some combination of bioretention and/or constructed wetland, with extended detention. Appears to have large area to work with.	$100-250k	**21 of 35**
BMP-YC057	Colonial Car Wash Wet Pond	Wet Pond	4.7	Rehabilitate/ Upgrade	Possible footprint expansion.	$50-100k	**21 of 35**
BMP-YC049	Baylands Federal Credit Union Bioretention	Bioretention	1.6	Rehabilitate/ Upgrade	Small bioretention. Low retrofit potential. May be opportunity for upgraded pretreatment/forebay or planting.	$100-250k	**26 of 35**
BMP-YC021	Williamsburg Dodge Wet Pond	Wet Pond	16.8	Rehabilitate/ Upgrade	Single cell wet pond. Perhaps buffer expansion, outfall enhancement, or polishing treatment.	$100-250k	**31 of 35**
BMP-YC032	Colonial Heritage Phase 1 Wet Pond	Wet Pond	36.4	Rehabilitate/ Upgrade	Large wet pond. Could use forebay clean out and aeration. Has wetland cell.	$100-250k	**34 of 35**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Table 69 – Candidate Projects for New Stormwater BMPs: Subwatershed 104

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed-Wide Rank
OPP-104-05	Re/Detention	Soil Survey suggests well-drained soils. Investigate options for retention. Otherwise detention possible, depending on outlet options.	Onsite utilities (water)	$100-250k	**1 of 58**
OPP-104-27	Swale	Several potential opportunities for light-touch swale BMPs along drainage ditches.		$100-250k	**10 of 58**
OPP-104-54	Swale	Grassed swale, or potential for dry swale if elevations and easements allow.	Property ownership/ easements	< $250k	**10 of 58**
OPP-104-71	Re/Detention	Small bioretention basin, if feasible.		$100-250k	**10 of 58**
OPP-104-22	Re/Detention	Appears to be sufficient head for a small bioretention.		< $100k	**13 of 58**
OPP-104-51	Swale	Linear practice. Relationship to existing storm drain infrastructure is uncertain.	Property ownership/ easements	$100-250k	**23 of 58**
OPP-104-72	Other	If permeable pavement, and working properly, expand, perhaps increase visibility.		$100-250k	**28 of 58**
OPP-104-RP02	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) at confluence.	Forest cover, permitting	$250-500k	**28 of 58**
OPP-104-52	SPSC	Light-touch SPSC may be an option. Channel appears ephemeral.	Property ownership/ easements	$100-250k	**38 of 58**
OPP-104-53	Re/Detention	Small bioretention basin, if feasible.	Property ownership/ easements	$100-250k	**38 of 58**
OPP-104-RP03	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) as option to, or in conjunction with, restoration of reach ST1-16-G.	Forest cover, permitting	$250-500k	**54 of 58**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.



Title

Figure 39 - Subwatershed 104 Results and Recommendations

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23

N

0 800 1,600 Feet

(At original document size of 11x17)
1:9,600

Yarmouth Creek Watershed
Yarmouth Creek Subwatershed
Localized Project
Existing Stormwater BMP

Stream Habitat Rating

- Optimal
- Suboptimal
- Marginal
- Poor
- Existing Restored Reach

New BMP Opportunities

- Conservation Landscaping
- Constructed Wetland
- Other
- Re/Detention
- SPSC
- Swale

Field Inspected Existing Stormwater BMP

- Inspected
- Not Inspected

Retrofit of Existing BMPs

- Bioretention
- Outfall Enhancement
- Rehabilitate/ Upgrade
- Retrofit - CW/ Wet Pond

HSI Score

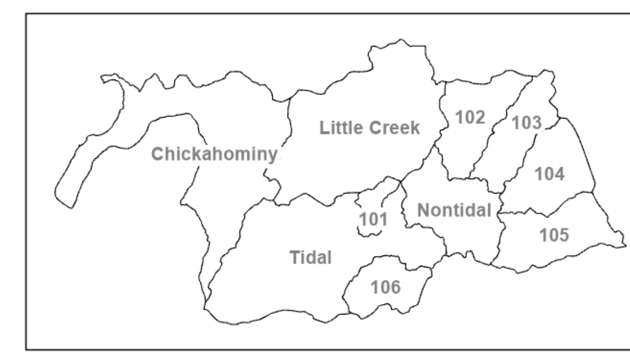
- Not a Hotspot
- Potential Hotspot
- HSI Recommendations

Recommended Stream Projects

- Enhancement
- Restoration

NSA Score

- High
- Moderate



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

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6.5 Subwatershed 105

6.5.1 General Description

Subwatershed 105 is a midsized subwatershed, and the most developed in the Yarmouth Creek Watershed based on impervious cover and land uses, slightly more developed than neighboring Subwatershed 104. It has a total area of 942 acres, approximately 7% of the total Watershed. Most of the residential and golf course development (including Colonial Heritage) occurred since the last watershed reporting and planning efforts twenty years ago. Although, there are also some older residential areas and commercial development in Lightfoot.

6.5.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 70. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Of note, this is the only subwatershed within the Yarmouth Creek Watershed which includes the soil series "Urban land," which has no HSG classification. It can best be described as heavily disturbed and compacted soils, no longer fitting any historically known soil type.

Table 70 – Composition of Soils: Subwatershed 105

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
8B	Caroline fine sandy loam, 2 to 6 percent slopes	C	2.6%
10B	Craven fine sandy loam, 2 to 6 percent slopes	C	1.3%
10C	Craven fine sandy loam, 6 to 10 percent slopes	C	1.4%
11B	Craven-Uchee complex, 2 to 6 percent slopes	C/A	2.4%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	18.2%
15D	Emporia complex, 10 to 15 percent slopes	C	7.6%
15E	Emporia complex, 15 to 25 percent slopes	C	3.9%
15F	Emporia complex, 25 to 50 percent slopes	C	24.4%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	3.8%
14C	Emporia fine sandy loam, 6 to 10 percent slopes	C	4.3%
17	Johnston complex	D	5.2%
18B	Kempsville fine sandy loam, 2 to 6 percent slopes	B	1.4%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	7.3%
20B	Kenansville loamy fine sand, 2 to 6 percent slopes	A	5.8%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	4.1%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	0.4%
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	3.1%
34C	Uchee loamy fine sand, 6 to 10 percent slopes	A	1.3%
37	Urban land	N/A	1.0%
W	Water	N/A	0.5%

6.5.3 Land Use and Impervious Area

Over half the subwatershed area is Medium-Density Residential (MDR) development, with a total of nearly two thirds of the subwatershed in residential land use. The MDR, Commercial, and Roadway land uses account for nearly all of the impervious cover.

6.5.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is 186 acres, accounting for 19.7% of the subwatershed area and 24.4% of the overall Yarmouth Creek Watershed impervious area. This classifies it as Impacted in the Impervious Cover Model (ICM), very nearly into the transitional zone toward Non-Supporting. Table 71 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 71 – Existing Land Use and Land Cover Composition: Subwatershed 105

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Commercial	45.45	4.8%	24.90	54.8%
Forest	82.95	8.8%	1.84	2.2%
Industrial	4.08	0.4%	2.81	69.0%
LDR	118.43	12.6%	4.37	3.7%
MDR	489.79	52.0%	110.42	22.5%
Open Water	6.95	0.7%	0.02	0.3%
Roadway	56.03	5.9%	34.08	60.8%
Rural	85.45	9.1%	5.02	5.9%
Vacant	53.09	5.6%	2.15	4.0%

6.5.3.2 Future Conditions

It is estimated that the percent impervious area in this subwatershed may increase to as high as 45.6% with additional development, occurring in both commercial and residential sectors. The Impervious Cover Model places 46% impervious cover very high into the Non-Supporting category in terms of watershed health. Subwatershed 105 is the headwater subwatershed of the mainstem of Yarmouth Creek. This subwatershed should be a primary focal point for future stormwater treatment practice implementation and other strategic actions.

6.5.4 Pollutant Loads

6.5.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 72, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 72 – Estimated Pollutant Loading for Existing Conditions: Subwatershed 105

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	712	4,573	392	71,177	120,903
Illicit Connections	-	74	24	566	38,794
Vacant Lots	53	133	11	5,309	637
RURAL SOURCES					
Rural Land	85	393	60	8,545	3,333
Forest	83	207	17	8,295	995
Open Water	7	89	3	1,077	-
TOTAL LOAD	**940**	**5,469**	**506**	**94,969**	**164,663**
Storm Load	-	3,590	435	90,458	125,868
Non-Storm Load	-	1,879	71	4,512	38,794

Table 73 – Estimated Load Reductions from Existing Treatment: Subwatershed 105

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	262	5.2	-	-
Pet Waste Education	43.8	5.7	-	381
Structural Stormwater Management Practices	582	126	39,610	55,585
Total Reduction	888	137	39,610	55,966

6.5.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 74.

Table 74 – Estimated Pollutant Loading for Future Conditions: Subwatershed 105

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	919	6,041	550	95,762	151,097
Illicit Connections	-	74	24	566	38,794
RURAL SOURCES					
Rural Land	7	32	5	699	273
Forest	7	17	1	693	83
Open Water	7	89	3	1,077	-
TOTAL LOAD	**940**	**6,253**	**584**	**98,797**	**190,247**
Storm Load	-	4,350	515	101,139	152,090
Non-Storm Load	-	2,036	80	2,967	38,794

6.5.5 Field Assessments

See Figure 40 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, Hot Spot Investigations, stream reaches, existing stormwater BMPs and new opportunities.

6.5.5.1 Stormwater Management

There are 33 existing stormwater management best management practices currently treating runoff within this subwatershed. Table 75 provides the number of BMPs of each type or category, and the total area and impervious area treated by them. However, the areas in Table 75 do not represent a true treatment area when BMPs are located within another BMP's upstream drainage area.

Table 75 – Existing Stormwater BMPs: Subwatershed 105

BMP Type	Count	Impervious Area Treated (Acres)*	Total Area Treated (Acres)*
Bioretention	7	0.5	2.8
Constructed Wetland			
Dry Pond	17	38.0	141.8
Dry Swale			
Infiltration	1		
Permeable Pavement	1	1.1	1.9
Urban Infiltration Practices	1	0.9	1.3
Urban stream restoration			
Water Quality Inlet			
Wet Pond	5	105.8	280.4
Wet Swale	1	0.8	1.0
Grand Total	**33**	**147.0**	**429.2**

*Areas treated by BMPs are based on County database information and may be incomplete or have overlaps.

6.5.5.2 Stream Assessment

Approximately 25,300 linear feet of streams were assessed in this subwatershed, with 23% rated as Marginal, 18% rated as Poor, and the remainder as Suboptimal.

6.5.5.3 Upland Reconnaissance

The assessed area totals approximately 688 acres with 93% scoring Moderate and 7% scoring High on the Neighborhood Source Assessment (NSA) for pollution risk. Seven areas were investigated for Hot Spots of pollution. All hot spot investigation areas were rated as Potential hot spots; no confirmed hot spots were found.

6.5.6 Opportunities for Improvements

There were seven reaches recommended for stream reach restoration or enhancement activities, two localized projects associated with stream corridors, 12 existing stormwater BMPs with a potential for retrofit, and 9 potential locations for a new stormwater BMP. See the following tables and Figure 40 for details. One of these new BMP opportunities, OPP-105-RP04, is a regional treatment practice discussed in the introduction to Section 6. A large constructed wetland or wet pond inline in Yarmouth Creek could have significant benefits for the watershed, providing additional treatment for nearly all of Subwatershed 105 before the confluence above Cranston's Mill Pond. Additional investigation is warranted to determine feasibility, and benefit-cost-analysis. See Figure 40 for location.

Management activities for this subwatershed should consist of maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and preventive maintenance education.

Table 76 – Candidate Projects for Stream Reach Recommendations: Subwatershed 105

Reach ID	Length (feet)	Total Habitat Score	Habitat Condition Rating	Recommended Action	Notes	Estimated Cost Range*	Watershed-Wide Rank	Recommended Prioritization Rank (professional judgement)
ST1-25-G	457	69	Poor	Restoration	Channel is severely eroded. Extreme vertical and horizontal instability with no vegetative protection.	> $500k	**1 of 22**	**1**
ST1-26-G	444	81	Poor	Restoration	Channel is severely eroded. Extreme vertical and horizontal instability with no vegetative protection.	$250-500k	**1 of 22**	**2**
ST1-24-A	521	122	Marginal	Restoration	Channel is heavily eroded at the top of the reach as well as multiple side channels. Channel has many sloughing banks along the reach.	> $500k	**3 of 22**	**10**
ST1-28-G	1,074	73	Marginal	Restoration	Channel is severely eroded. Extreme vertical and horizontal instability with no vegetative protection.	> $500k	**3 of 22**	**3**
ST1-29-C	942	115	Marginal	Restoration	Channel is severely eroded. Extreme vertical and horizontal instability with no vegetative protection.	> $500k	**3 of 22**	**4**
ST1-30-C	2,148	113	Marginal	Enhancement	Channel has outer bend erosion and some areas of downcutting/headcuts.	$250-500k	**10 of 22**	**5**
ST4-16-G	1,496	126	Poor	Restoration	Channel is incised with vertical banks, low vegetative protection, and sloughing banks.	> $500k	**17 of 22**	**13**

Table 77 – Candidate Projects for Localized Projects in Stream Corridors: Subwatershed 105

Map ID	Observations	Proposed Improvements	Cost Range	Watershed-Wide Rank
3	Culvert, some erosion	Culvert outlet protection	< $100k	**3 of 7**
4	Steep headcut	Possible stabilization	< $100k	**6 of 7**

Table 78 – Candidate Projects for Retrofit of Existing BMPs: Subwatershed 105

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-YC055	The Candy Store Dry Pond	Dry Extended Detention Ponds	3	Retrofit - CW/ Wet Pond	#16 from Centerville study. Medium sized ED pond, no apparent forebay. Severe short-circuiting. Outfalls into riprap lined channel. Already has wetland vegetation. Resolve short-circuit, convert to CW.	$100 -250k	**2 of 35**
BMP-YC033	Colonial Heritage Phase 2 Dry Pond	Dry Extended Detention Ponds	12.8	Bioretention	Possibilities for upgrade or conversion, such as bioretention or constructed wetland with extended detention. Adjacent homes may complicate.	$100 -250k	**3 of 35**
BMP-YC038	Colonial Heritage Phase 4 Dry Pond	Dry Extended Detention Ponds	27.7	Bioretention	Fairly new, well-maintained. Bioretention (with ED) retrofit may be possible, though side slopes present space constraint.	$100 -250k	**3 of 35**
BMP-YC041	Colonial Heritage Phase 4 Dry Pond	Dry Extended Detention Ponds	17.04	Bioretention	Dry ED pond with forebay. Fairly new, well-maintained. Bioretention (with ED) retrofit may be possible.	$100 -250k	**3 of 35**

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-YC044	Colonial Heritage Phase 3 Dry Pond	Dry Extended Detention Ponds	10.8	Bioretention	Dry ED with small wetland cell. Bioretention w/ED may be possible.	$50-100k	**3 of 35**
BMP-YC025	Colonial Heritage Massie Pond	Wet Pond	150.1	Outfall Enhancement	#4 from Centerville study. Modify outlet for improved extended-detention or water quality benefit. Possibly expand buffer, check nutrient management practices on adjacent and contributing lands. See also OPP-105-102.	$250-500k	**10 of 35**
BMP-YC045	Colonial Heritage Phase 3 Dry Pond	Dry Extended Detention Ponds	4.8	Bioretention	Well maintained ED. Bioretention w/ED may be possible.	$50-100k	**10 of 35**
BMP-YC015	Briarwood Park Dry Pond	Dry Extended Detention Ponds	7	Rehabilitate/ Upgrade	Overgrown, heavy wooded veg on embankment. Potential issues with stream undercutting embankment. Stream reach ST1-30-C for reference. Sufficient elevation head to likely allow bioretention with extended detention.	$100-250k	**15 of 35**
BMP-YC022	Chesapeake Bank Bioretention	Bioretention	0.5	Rehabilitate/ Upgrade	Check for function, maintain if/as needed.	< $50k	**15 of 35**
BMP-YC090	Lightfoot Marketplace CHKD	Permeable Pavement	1.94	Rehabilitate/ Upgrade	Permeable pavement requires maintenance/rehabilitation.	< $50k	**21 of 35**

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
	Permeable Pavers						
BMP-YC039	Colonial Heritage Phase 4 Wet Pond	Wet Pond	26.5	Outfall Enhancement		$100-250k	**28 of 35**
BMP-YC014	Wythe Candy Warehouse Dry Pond	Dry Extended Detention Ponds	3.94	Retrofit - CW/ Wet Pond	Medium sized ED pond. Mini check dam forebay. Good retrofit opportunity.	$100-250k	**30 of 35**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Table 79 – Candidate Projects for New Stormwater BMPs: Subwatershed 105

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed-Wide Rank
OPP-105-48	Conservation Landscaping	Local depression without available head for underdrain unless installing several hundred feet of pipe. Conservation landscaping an option.		< $100k	**2 of 58**
OPP-105-49	Swale	Same location as OPP-105-48 with alternate consideration for new swale improvements, or in tandem with other recommendations.		$100-250k	**2 of 58**
OPP-105-08	Re/Detention	Linear feature may be possible, either parallel or perpendicular to road. Detention possible as well.	Trees, steep slopes	$100-250k	**13 of 58**
OPP-105-101	Constructed Wetland	Downstream of YC033, on south side of trail, area could become constructed wetland for additional benefit.		$100-250k	**13 of 58**
OPP-105-04	Re/Detention	Centerville Road Tributary BMP Retrofit Plan from WEG.		$250-500k	**23 of 58**
OPP-105-RP04	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) along Yarmouth Creek.	Nearby homes, access, permitting	$250-500k	**28 of 58**
OPP-105-102	Re/Detention	Consider a polishing treatment BMP just below the YC025 outfall where the first flush can be diverted to a runoff reduction BMP if feasible following further investigation. See also YC025 retrofit recommendation.		$100-250k	**28 of 58**
OPP-105-01	SPSC	Step pool stormwater conveyance or dry swale likely viable.		$100-250k	**38 of 58**
OPP-105-09	Re/Detention	Elevation head available for retention/detention practice.		$100-250k	**38 of 58**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

Title

Figure 40 - Subwatershed 105 Results and Recommendations

Client/Project 203408987

James City County
Yarmouth Creek WSMP

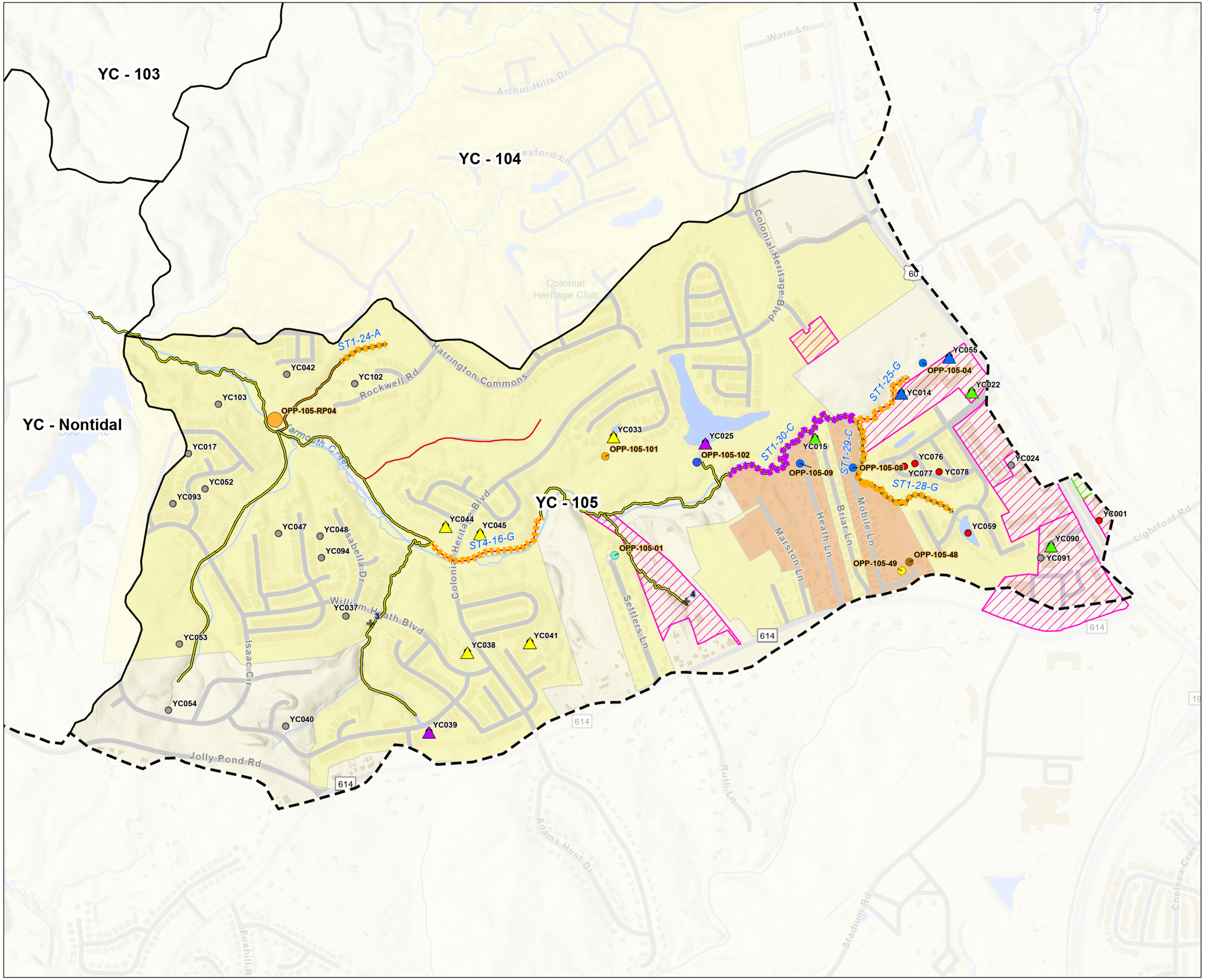
Project Location

James City County, Virginia

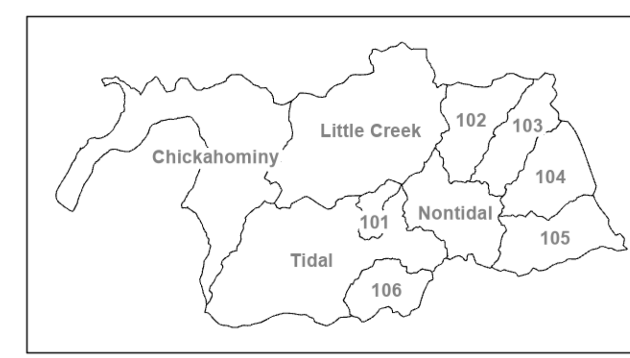
Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23

N

0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,000



Legend	
Yarmouth Creek Watershed	**Field Inspected Existing Stormwater BMP**
Yarmouth Creek Subwatershed	Inspected
Localized Project	Not Inspected
Existing Stormwater BMP	**Retrofit of Existing BMPs**
Stream Habitat Rating	Bioretention
Optimal	Outfall Enhancement
Suboptimal	Rehabilitate/ Upgrade
Marginal	Retrofit - CW/ Wet Pond
Poor	**HSI Score**
Existing Restored Reach	Not a Hotspot
New BMP Opportunities	Potential Hotspot
Conservation Landscaping	HSI Recommendations
Constructed Wetland	**Recommended Stream Projects**
Other	Enhancement
Re/Detention	Restoration
SPSC	**NSA Score**
Swale	High
	Moderate



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

6.6 Subwatershed 106

6.6.1 General Description

Subwatershed 106 is one of the smaller subwatersheds in the Yarmouth Creek Watershed with an area of 552 acres, approximately 4% of the total Watershed. It is essentially untouched at the moment, though there is a master plan on file which proposes to ultimately develop the entirety of Subwatershed 106 and a small portion of the Tidal Subwatershed to the west. This subwatershed and any development within it, partly due to the presence of Conservation Area C7, is a particularly good example of where to apply the "above and beyond" protective measures as described in Sections 3.1.4 and 3.2.3. Proactive, conservative action will help prevent degradation of the streams within and downstream of 106.

6.6.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 80. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Table 80 – Composition of Soils: Subwatershed 106

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
8B	Caroline fine sandy loam, 2 to 6 percent slopes	C	2.0%
10B	Craven fine sandy loam, 2 to 6 percent slopes	C	1.1%
10C	Craven fine sandy loam, 6 to 10 percent slopes	C	2.1%
11B	Craven-Uchee complex, 2 to 6 percent slopes	C/A	0.1%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	28.2%
15D	Emporia complex, 10 to 15 percent slopes	C	0.5%
15E	Emporia complex, 15 to 25 percent slopes	C	2.6%
15F	Emporia complex, 25 to 50 percent slopes	C	38.5%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	2.2%
14C	Emporia fine sandy loam, 6 to 10 percent slopes	C	1.6%
17	Johnston complex	D	3.3%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	9.7%
21	Levy silty clay	D	0.1%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	0.3%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	4.7%
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	2.7%
W	Water	N/A	0.2%

6.6.3 Land Use and Impervious Area

Subwatershed 106 is almost fully in forest cover. Conservation Area C7 (See Section 2.2.2) contains this entire subwatershed.

6.6.3.1 Existing Conditions

Existing impervious land cover is less than 1% (less than 4 acres) and is almost entirely the roadway running along the southern edge.

Table 81 – Existing Land Use and Land Cover Composition: Subwatershed 106

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Forest	536.30	97.1%	0.28	0.1%
Open Water	0.73	0.1%	0.00	0.0%
Roadway	8.92	1.6%	3.11	34.8%
Rural	6.34	1.1%	0.46	7.2%

6.6.3.2 Future Conditions

There is currently a master plan on file for a development which would ultimately see very low density residential development throughout Subwatershed 106 and a portion of the Tidal Subwatershed adjacent to 106 to the west. This area has been designated 'Rural' in the Land Use/Land Cover projections, maps, and modeling inputs due to the low impervious cover planned. The planned development would leave much of the existing tree cover intact but make the future projections much less certain. Impervious buildout projections are currently at up to 3.23%, safely within the Sensitive range in the Impervious Cover Model.

6.6.4 Pollutant Loads

6.6.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 82, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 82 – Estimated Pollutant Loading for Existing Conditions: Subwatershed 106

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	8	120	16	3,301	5,470
Illicit Connections	-	0	0	0	52
Vacant Lots	-	-	-	-	-
RURAL SOURCES					
Rural Land	6	29	4	634	247
Forest	536	1,341	107	53,630	6,436
Open Water	1	9	0	113	-
TOTAL LOAD	**552**	**1,499**	**128**	**57,679**	**12,205**
Storm Load	-	805	94	52,139	12,153
Non-Storm Load	-	694	34	5,540	52

Table 83 – Estimated Load Reductions from Existing Treatment: Subwatershed 106

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	0.0	0.0	-	-
Pet Waste Education	0.1	0.0	-	0.6
Structural Stormwater Management Practices	-	-	-	-
Total Reduction	0.1	0.0	-	0.6

6.6.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 84.

Table 84 – Estimated Pollutant Loading for Future Conditions: Subwatershed 106

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	9	121	16	3,386	5,476
Illicit Connections	-	0	0	0	52
RURAL SOURCES					
Rural Land	454	2,089	318	45,405	17,708
Forest	89	221	18	8,858	1,063
Open Water	1	9	0	113	-
TOTAL LOAD	**552**	**2,441**	**352**	**57,763**	**24,299**
Storm Load	-	1,276	251	52,223	24,247
Non-Storm Load	-	1,164	101	5,540	52

6.6.5 Field Assessments

See Figure 41 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, Hot Spot Investigations, stream reaches, existing stormwater BMPs and new opportunities.

6.6.5.1 Stormwater Management

There are no existing stormwater management best management practices within this subwatershed.

6.6.5.2 Stream Assessment

Approximately 11,600 linear feet of streams were assessed in this subwatershed, with 14% Marginal, and the rest Optimal. See Figure 41 for a map of all stream reaches assessed and the habitat score ratings.

6.6.5.3 Upland Reconnaissance

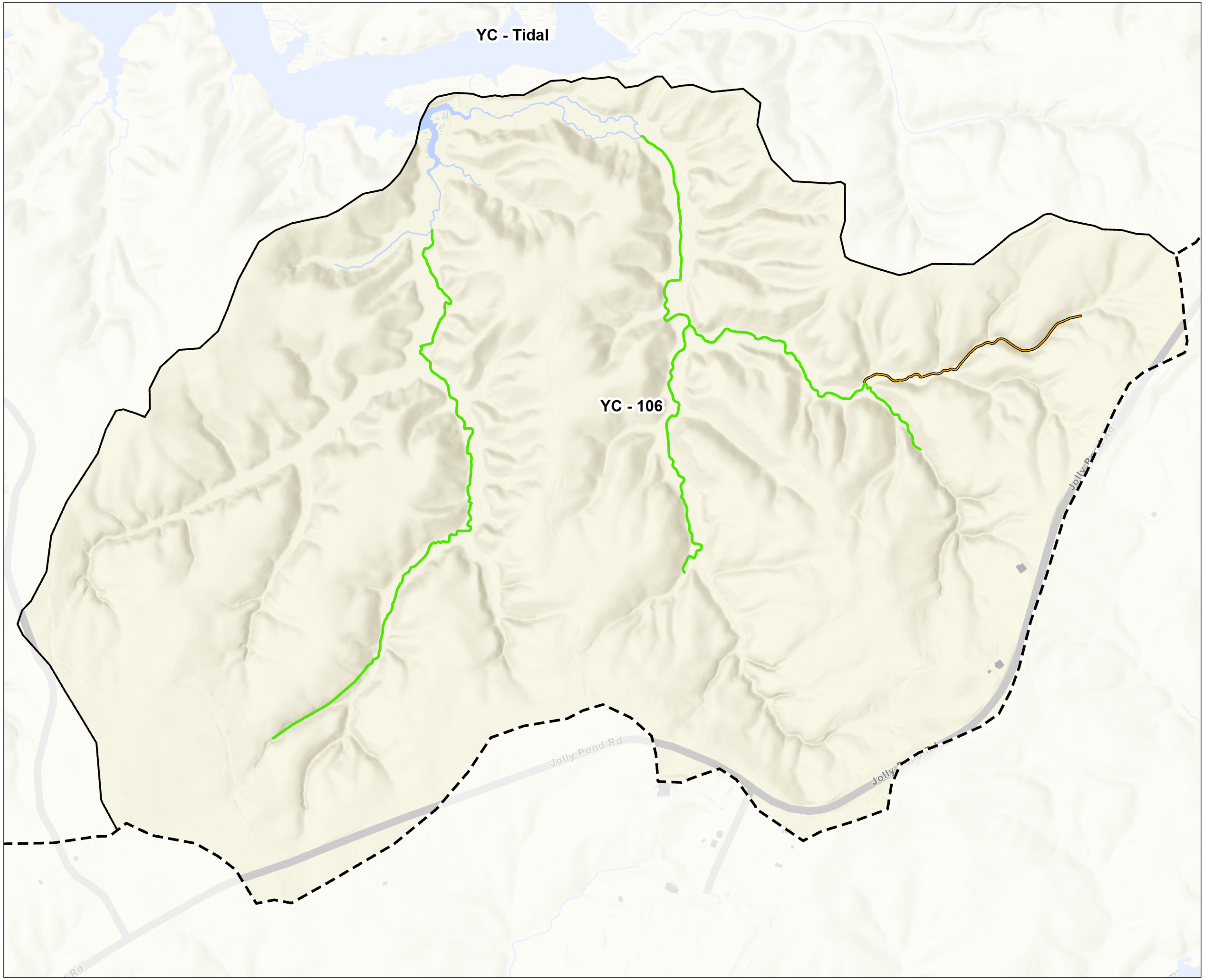
There are no neighborhoods in Subwatershed 106, thus, no Neighborhood Source Assessment (NSA) was performed. No hot spots were predicted.

6.6.6 Opportunities for Improvements

No BMPs exist for retrofitting, no streams were in condition that warranted action, and no sites were sought or found for new BMPs. If development is slated to occur (beyond the current Master Plan stage), this subwatershed can and should be revisited.

If development of Subwatershed 106 occurs, management activities should include maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and particularly preventive maintenance education. Newly installed septic systems offer the best opportunity for installing physical measures such as effluent sediment screens.

Since Conservation Area C7 (see Figure 14 in Section 2.2.2) accounts for all of Subwatershed 106, any and all land conservation efforts should be investigated. Though the current zoning and development master plan suggest very low future impervious cover conditions, it could still have a large impact on the character and quality of the Conservation Area.



Title

Figure 41 - Subwatershed 106 Results and Recommendations

Client/Project 203408987
James City County
Yarmouth Creek WSMP

Project Location
James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23

N

0 600 1,200 Feet
(At original document size of 11x17)
1:7,200

Yarmouth Creek Watershed
Yarmouth Creek Subwatershed
Localized Project
Existing Stormwater BMP

Stream Habitat Rating
Optimal
Suboptimal
Marginal
Poor
Existing Restored Reach

New BMP Opportunities
Conservation Landscaping
Constructed Wetland
Other
Re/Detention
SPSC
Swale

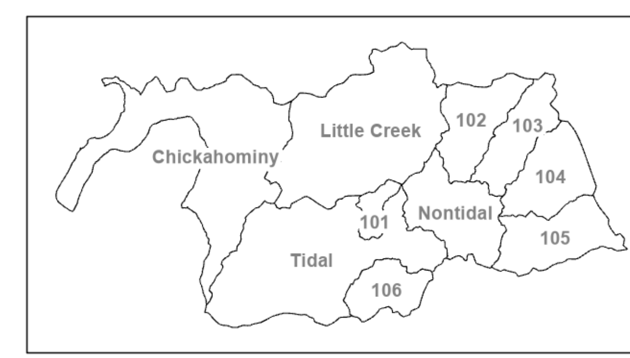
Field Inspected Existing Stormwater BMP
Inspected
Not Inspected

Retrofit of Existing BMPs
Bioretention
Outfall Enhancement
Rehabilitate/ Upgrade
Retrofit - CW/ Wet Pond

HSI Score
Not a Hotspot
Potential Hotspot
HSI Recommendations

Recommended Stream Projects
Enhancement
Restoration

NSA Score
High
Moderate



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

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6.7 Little Creek Subwatershed

6.7.1 General Description

The Little Creek Subwatershed is one of the largest subwatersheds in the Yarmouth Creek Watershed with an area of 2,887 acres, approximately 21% of the total Watershed. This subwatershed is very lightly developed, and contains the Little Creek Reservoir, accounting for over 30% of its area.

6.7.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 85. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst. Of note for this subwatershed is that the presence of the Little Creek Reservoir puts the percentage of open water over 30%.

Table 85 – Composition of Soils: Little Creek Subwatershed

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
10B	Craven fine sandy loam, 2 to 6 percent slopes	C	0.1%
10C	Craven fine sandy loam, 6 to 10 percent slopes	C	0.3%
11B	Craven-Uchee complex, 2 to 6 percent slopes	C/A	0.2%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	19.9%
15D	Emporia complex, 10 to 15 percent slopes	C	0.7%
15E	Emporia complex, 15 to 25 percent slopes	C	2.0%
15F	Emporia complex, 25 to 50 percent slopes	C	9.3%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	1.9%
14C	Emporia fine sandy loam, 6 to 10 percent slopes	C	0.1%
17	Johnston complex	D	0.0%
18B	Kempsville fine sandy loam, 2 to 6 percent slopes	B	1.9%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	11.6%
20B	Kenansville loamy fine sand, 2 to 6 percent slopes	A	0.4%
25B	Norfolk fine sandy loam, 2 to 6 percent slopes	B	1.6%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	0.6%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	3.3%
31B	Suffolk fine sandy loam, 2 to 6 percent slopes	B	12.4%
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	2.8%
34C	Uchee loamy fine sand, 6 to 10 percent slopes	A	0.1%
35	Udorthents, loamy	N/A	0.3%
W	Water	N/A	30.4%

6.7.3 Land Use and Impervious Area

The Little Creek Subwatershed is currently mostly defined by the presence of the Little Creek Reservoir, accounting for over 30% of the area. Another third of the subwatershed is in forest cover, primarily immediately adjacent to the reservoir. Approximately 7.5% is currently in residential development, though with a rural character (much tree cover). One quarter of the subwatershed is classified as Rural, but significant portions will remain open space.

6.7.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is just over 100 acres, accounting for 3.5% of the subwatershed area and 13.4% of the overall Yarmouth Creek Watershed impervious area due to the size of the Little Creek Subwatershed. Table 86 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 86 – Existing Land Use and Land Cover Composition: Little Creek Subwatershed

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Commercial	0.03	0.0%	0.00	0.0%
Forest	957.55	33.2%	2.04	0.2%
LDR	90.52	3.1%	8.34	9.2%
MDR	126.16	4.4%	18.97	15.0%
Open Water	900.38	31.2%	16.23	1.8%
Roadway	63.78	2.2%	28.24	44.3%
Rural	748.34	25.9%	28.04	3.7%

6.7.3.2 Future Conditions

Very little buildout is possible. Small portions are expected to change to Low-Density Residential (LDR) closest to Richmond Road (Route 60), and a few homes are likely to be built within current rural developments. Overall, the impervious cover is projected to increase from 3.5% to approximately 4.25%, which would continue to qualify as Sensitive per the Impervious Cover Model.

6.7.4 Pollutant Loads

6.7.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 87, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 87 – Estimated Pollutant Loading for Existing Conditions: Little Creek Subwatershed

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	280	1,639	136	28,049	33,912
Illicit Connections	-	14	2	91	10,328
Vacant Lots	-	-	-	-	-
RURAL SOURCES					
Rural Land	748	3,442	524	74,834	29,185
Forest	958	2,394	192	95,755	11,491
Open Water	900	11,525	450	139,559	-
TOTAL LOAD	**2,887**	**19,013**	**1,304**	**338,288**	**84,917**
Storm Load	-	4,129	630	180,674	74,588
Non-Storm Load	-	14,885	673	157,614	10,328

Table 88 – Estimated Load Reductions from Existing Treatment: Little Creek Subwatershed

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	95.9	1.9	-	-
Pet Waste Education	12.8	1.7	-	111
Structural Stormwater Management Practices	440	90.5	31,258	44,049
Total Reduction	548	94.1	31,258	44,160

6.7.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 89.

Table 89 – Estimated Pollutant Loading for Future Conditions: Little Creek Subwatershed

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	459	2,479	225	45,928	47,002
Illicit Connections	-	14	2	91	10,328
RURAL SOURCES					
Rural Land	637	2,932	446	63,739	24,858
Forest	890	2,224	178	88,971	10,677
Open Water	900	11,525	450	139,559	-
TOTAL LOAD	**2,887**	**19,174**	**1,301**	**338,289**	**92,866**
Storm Load	-	4,255	632	182,463	82,537
Non-Storm Load	-	14,919	670	155,826	10,328

6.7.5 Field Assessments

See Figure 42 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, Hot Spot Investigations, stream reaches, and new BMP opportunities.

6.7.5.1 Stormwater Management

There are no existing stormwater management best management practices currently treating runoff within this subwatershed. There was one at the northeast extent, but it is now retired. This location may provide an opportunity for a new stormwater BMP, designated as OPP-LC-111 in Table 92.

6.7.5.2 Stream Assessment

Approximately 11,700 linear feet of streams were assessed in this subwatershed (see Figure 42). A small portion (310 feet, or 3% of those assessed) were rated as Poor, and 5,200 linear feet (45%) were rated as Marginal. The rest were Suboptimal. It is also important to note that the reservoir has been drawn down to a lower water level for many months leading up to the assessment due to ongoing seepage monitoring and pending dam rehabilitation efforts by Newport News Waterworks (NNWW). This could have contributed to some of the lower habitat ratings closest to the reservoir, in areas normally submerged but possibly subsequently exposed to open channel flows.

6.7.5.3 Upland Reconnaissance

Of the nearly 450 acres of neighborhoods assessed, all were rated per the Neighborhood Source Assessment method as High pollution potential. One area was assessed for hot spot identification and it was rated as Potential.

6.7.6 Opportunities for Improvements

There are eight reaches recommended for stream restoration or enhancement activities, three localized projects associated with stream corridors, zero retrofits (since no existing/active BMPs are present), and six potential locations for new stormwater BMPs. See the following tables and Figure 42 for details.

Management activities for this subwatershed should consist of maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and preventive maintenance education.

Conservation Area C8 (see Figure 14 in Section 2.2.2) accounts for a portion of the western extent of the Little Creek Subwatershed, and essentially all of the buffer area around the Little Creek Reservoir is a habitat core, continued land conservation efforts are important. The habitat core is likely sufficiently protected due to Resource Protection Area (RPA) restrictions, but any efforts to reduce development impacts to C8 and the habitat core are advised.

Table 90 – Candidate Projects for Stream Reach Recommendations: Little Creek Subwatershed

Reach ID	Length (feet)	Total Habitat Score	Habitat Condition Rating	Recommended Action	Notes	Estimated Cost Range*	Watershed-Wide Rank	Recommended Prioritization Rank (professional judgement)
ST4-34-C	252	80	Marginal	Enhancement	Channel is downcut in areas with low vegetative protection and vertical instability.	$100-250k	**12 of 22**	**16**
ST4-31-G	310	51	Poor	Enhancement	Channel has low but vertical banks with some small headcuts.	$100-250k	**13 of 22**	**11**
ST4-33-B	333	114	Poor	Enhancement	Channel is slightly to moderately incised with low vegetative protection and poor stability.	$100-250k	**13 of 22**	**17**
ST2-19-B	544	134	Suboptimal	Enhancement	Channel has low but vertical banks with some small headcuts.	$100-250k	**15 of 22**	**14**
ST2-25-B	746	73	Marginal	Restoration	Channel is incised with low vegetative protection and low bank stability.	> $500k	**15 of 22**	**19**
ST2-20-B	458	119	Suboptimal	Enhancement	Channel has low but vertical banks with some small headcuts.	$100-250k	**17 of 22**	**21**
ST2-21-B	396	79	Marginal	Restoration	Channel is incised with low vegetative protection and low bank stability.	$250-500k	**17 of 22**	**20**
ST2-26-B	258	92	Marginal	Restoration	Channel has vertical banks with low vegetative protection and low bank stability.	$100-250k	**17 of 22**	**18**

* - Includes design, engineering, and construction

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

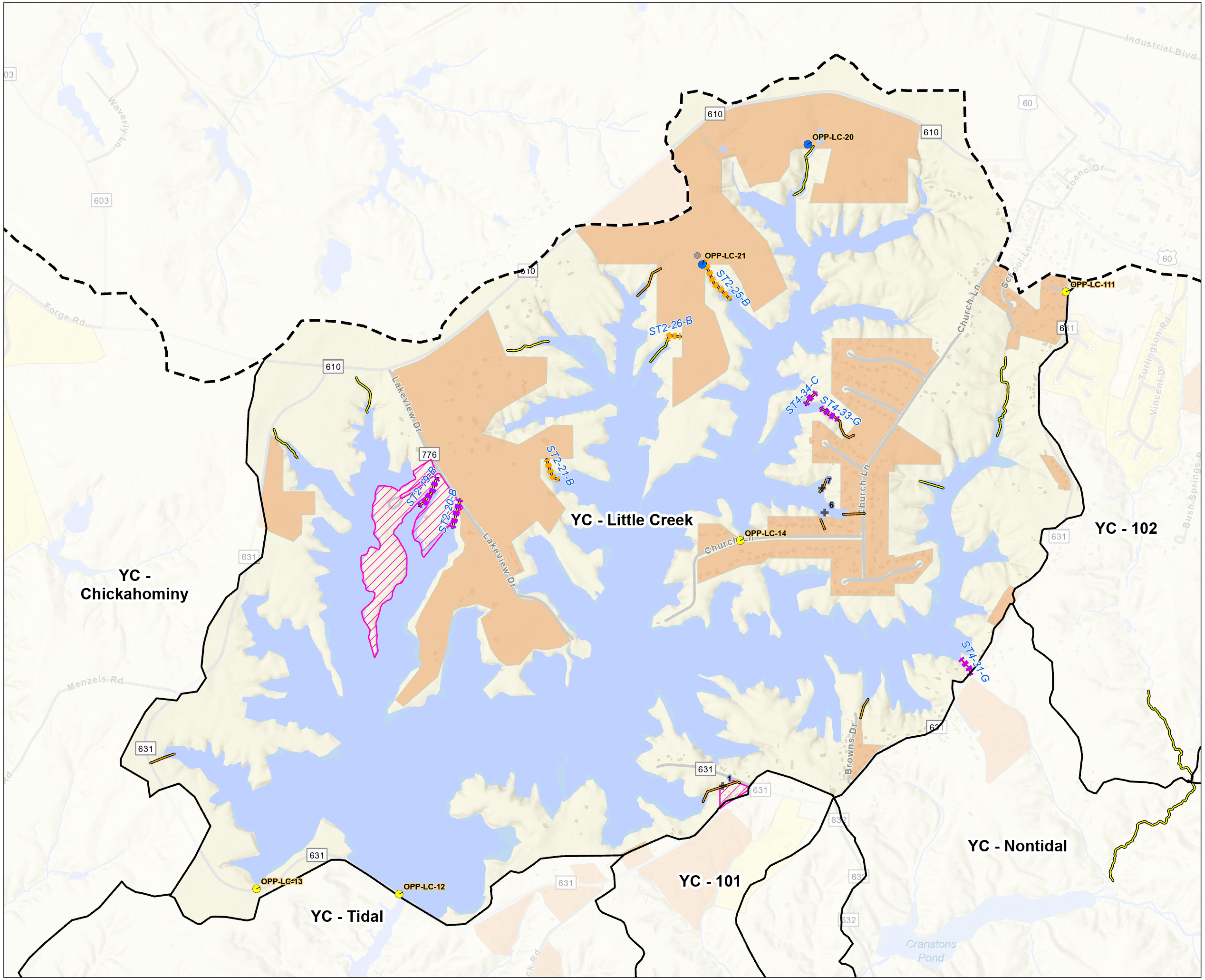
Table 91 – Candidate Projects for Localized Projects in Stream Corridors: Little Creek Subwatershed

Map ID	Observations	Proposed Improvements	Cost Range	Watershed-Wide Rank
6, 7	Undercut valley slope, previous water level	Consider low-intensity stabilization at erosion feature exposed during lake drawdown, with potential for future submerged wood features for added fish habitat features. Similar opportunities may also be present throughout other portions of the lake.	$100-250k, each	**1 and 2 of 7**
1	Illegal Dumping Observed	Removal of material, consider posting signage.	< $100k	**3 of 7**

Table 92 – Candidate Projects for New Stormwater BMPs: Little Creek Subwatershed

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed-Wide Rank
OPP-LC-12	Swale	Ditch at east end of dam, on south side of road, may be turned into linear feature such as WQ swale. Outfall at end of west side channel may have options beyond mere stabilization.	Permitting	$100-250k	**13 of 58**
OPP-LC-13	Swale	Possible linear features, or point treatment at inlet.		< $100k	**13 of 58**
OPP-LC-14	Swale	Possible linear features, or point treatment at inlet.		< $100k	**13 of 58**
OPP-LC-20	Re/Detention	Range of BMP options possible, pending additional investigation, e.g. elevation of pond outfall, soil types, balance of tree value vs BMP benefit.	Access and tree cover.	$100-250k	**23 of 58**
OPP-LC-111	Swale	Linear practice such as a dry swale may be possible following investigation. Wet swale not advised due to nearby residences.	Utility conflicts; nearby residences may preclude BMPs which stay wet.	< $100k	**38 of 58**

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed-Wide Rank
OPP-LC-21	Re/Detention	Downstream of YC109, possibilities for additional treatment.	Odd property boundaries. Possible issues with easements. Utilities present.	$100-250k	**54 of 58**



Title

Figure 42 - Little Creek Subwatershed Results and Recommendations

Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location
James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23

N

0 1,000 2,000 Feet
(At original document size of 11x17)
1:18,000

Yarmouth Creek Watershed
Yarmouth Creek Subwatershed
Localized Project
Existing Stormwater BMP

Stream Habitat Rating
Optimal
Suboptimal
Marginal
Poor
Existing Restored Reach

New BMP Opportunities
Conservation Landscaping
Constructed Wetland
Other
Re/Detention
SPSC
Swale

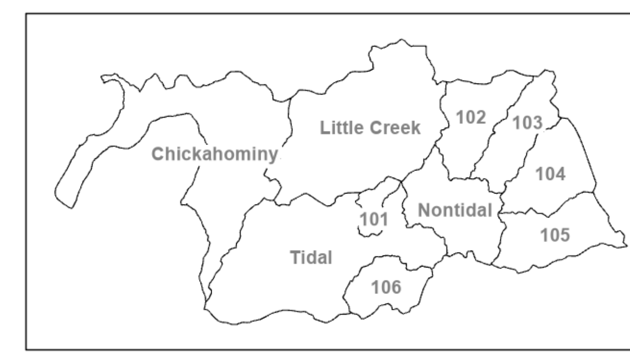
Field Inspected Existing Stormwater BMP
Inspected
Not Inspected

Retrofit of Existing BMPs
Bioretention
Outfall Enhancement
Rehabilitate/ Upgrade
Retrofit - CW/ Wet Pond

HSI Score
Not a Hotspot
Potential Hotspot
HSI Recommendations

Recommended Stream Projects
Enhancement
Restoration

NSA Score
High
Moderate



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

James City County Virginia Jamestown 1607

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6.8 Nontidal Subwatershed

6.8.1 General Description

The Nontidal Subwatershed is a mid-sized subwatershed in the Yarmouth Creek Watershed with an area of 1,082 acres, approximately 8% of the total Watershed. It is west and downstream of the four most developed subwatersheds, 102, 103, 104, and 105, receiving drainage from all of them as the various streams all reach their confluence with the Yarmouth Creek mainstem in the Nontidal Subwatershed just upstream of Cranston's Mill Pond, located centrally in the subwatershed. The Nontidal and Tidal (next subsection) Subwatersheds are divided at the transition nontidal/tidal transition of Yarmouth Creek, just downstream of the impoundment for Cranston's Mill Pond.

6.8.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 93. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Table 93 – Composition of Soils: Nontidal Subwatershed

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
8B	Caroline fine sandy loam, 2 to 6 percent slopes	C	0.3%
10B	Craven fine sandy loam, 2 to 6 percent slopes	C	0.6%
10C	Craven fine sandy loam, 6 to 10 percent slopes	C	0.6%
11B	Craven-Uchee complex, 2 to 6 percent slopes	C/A	0.1%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	29.8%
15D	Emporia complex, 10 to 15 percent slopes	C	0.8%
15E	Emporia complex, 15 to 25 percent slopes	C	2.4%
15F	Emporia complex, 25 to 50 percent slopes	C	35.2%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	6.0%
14C	Emporia fine sandy loam, 6 to 10 percent slopes	C	1.3%
17	Johnston complex	D	6.1%
18B	Kempsville fine sandy loam, 2 to 6 percent slopes	B	0.5%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	5.2%
20B	Kenansville loamy fine sand, 2 to 6 percent slopes	A	0.9%
25B	Norfolk fine sandy loam, 2 to 6 percent slopes	B	1.9%
27	Peawick silt loam	D	0.3%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	0.5%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	1.1%
31B	Suffolk fine sandy loam, 2 to 6 percent slopes	B	0.6%
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	2.2%
W	Water	N/A	3.7%

6.8.3 Land Use and Impervious Area

The Nontidal Subwatershed is very lightly developed currently, with a relatively even split between Low- and Medium-Density Residential and Commercial, though the Commercial land use is actually the public schools operations center, no private businesses. The remaining impervious area is roadway and small portions in the Rural zoning area, with very low density residential development.

6.8.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is approximately 22 acres, accounting for 2% of the subwatershed area and 2.9% of the overall Yarmouth Creek Watershed impervious area. Table 94 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 94 – Existing Land Use and Land Cover Composition: Nontidal Subwatershed

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Commercial	5.77	0.5%	3.10	53.7%
Forest	620.93	57.4%	1.88	0.3%
LDR	47.28	4.4%	3.74	7.9%
MDR	19.43	1.8%	3.94	20.3%
Open Water	46.23	4.3%	0.22	0.5%
Roadway	15.07	1.4%	6.84	45.4%
Rural	327.33	30.3%	2.11	0.6%

6.8.3.2 Future Conditions

Some residential development is anticipated in the southeastern portion associated with the Colonial Heritage residential and golf community. A large portion of the Nontidal Subwatershed is in conservation easement adjacent to this expanding development, which is slated to occur at Low-Density Residential composition.

6.8.4 Pollutant Loads

6.8.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 95, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 95 – Estimated Pollutant Loading for Existing Conditions: Nontidal Subwatershed

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	88	505	41	8,755	10,255
Illicit Connections	-	8	3	59	3,732
Vacant Lots	-	-	-	-	-
RURAL SOURCES					
Rural Land	327	1,506	229	32,733	12,766
Forest	621	1,552	124	62,093	7,451
Open Water	46	592	23	7,166	-
TOTAL LOAD	**1,082**	**4,162**	**420**	**110,805**	**34,204**
Storm Load	-	1,889	286	93,625	30,472
Non-Storm Load	-	2,273	134	17,180	3,732

Table 96 – Estimated Load Reductions from Existing Treatment: Nontidal Subwatershed

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	30.6	0.6	-	-
Pet Waste Education	4.1	0.5	-	36
Structural Stormwater Management Practices	127	26.1	9,198	12,697
Total Reduction	162	27.2	9,198	12,733

6.8.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 97.

Table 97 – Estimated Pollutant Loading for Future Conditions: Nontidal Subwatershed

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	291	1,471	128	29,110	22,878
Illicit Connections	-	8	3	59	3,732
RURAL SOURCES					
Rural Land	327	1,506	229	32,733	12,766
Forest	417	1,043	83	41,738	5,009
Open Water	46	592	23	7,166	-
TOTAL LOAD	**1,082**	**4,620**	**466**	**110,805**	**44,385**
Storm Load	-	2,143	316	95,661	40,653
Non-Storm Load	-	2,476	150	15,144	3,732

6.8.5 Field Assessments

See Figure 43 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including stream reaches and existing stormwater BMPs.

6.8.5.1 Stormwater Management

There are two existing stormwater management best management practices, both wet ponds, currently treating runoff within this subwatershed. One is Cranston's Mill Pond which acts as an online wet pond BMP treating all of the upstream/headwaters subwatersheds' downstream flows as all tributaries and streams join Yarmouth Creek just upstream of Cranston's Mill Pond. Its treatment area is listed as 92 impervious acres, which may be an example of accounting to eliminate double-coverage by other BMPs. The other wet pond is Deer Lake (YC046 - Colonial Heritage Phase 6 Deer Lake), which is listed in the JCC BMP database as treating 190.8 acres total, with no impervious area. Deer Lake is a private lake which will ultimately receive runoff from the development of Colonial Heritage Phase 6, previously mentioned in Section 6.8.3.2.

6.8.5.2 Stream Assessment

Approximately 22,400 linear feet of streams were assessed in this subwatershed. All reaches were either Optimal or Suboptimal (none Marginal or Poor).

6.8.5.3 Upland Reconnaissance

Neighborhood Source Assessments covered 42 acres with 46% of the areas rating a Moderate risk, and 54% as High risk for pollution by the NSA methods. No Hot Spot Investigation was performed in the Nontidal Subwatershed.

6.8.6 Opportunities for Improvements

Three new BMP opportunities are presented for the Nontidal Subwatershed. See Table 98 below for some details, and Figure 43 for locations. Regarding OPP-Nontidal-RP01, the location is generalized, but the intent is to consider a larger regional facility at or after the confluence of the streams draining from Subwatersheds 102 and 103. This locations lands in the Nontidal Subwatershed, although it (or other potential regional facilities noted in other subwatersheds) would primarily treat the other more developed subwatersheds upstream, in an effort to better protect the receiving stream channels that drain through the Nontidal Subwatershed from potential future threats. Monitoring upstream would be advised to inform design considerations, as a facility can be focused to treat certain pollutants more effectively than others. For example, if dissolved oxygen is the focus, a wet pond may be better for removing nutrients, whereas if bacteria are the focus, a wetland with particular focus on certain plant species and communities may be better suited to the goal.

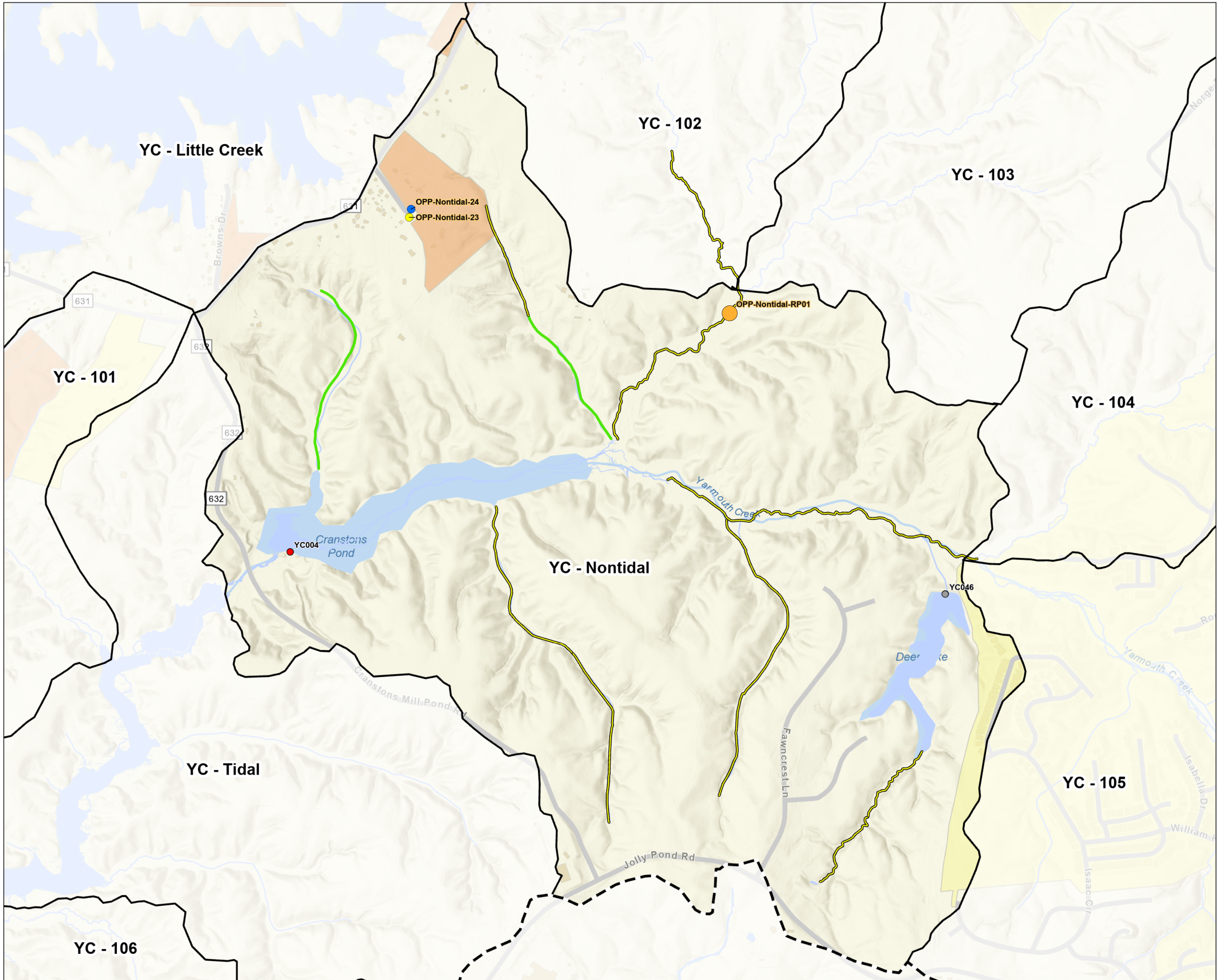
An alternate management approach could be careful monitoring of the conditions within the Yarmouth Creek mainstem as future development continues in upstream subwatersheds - if the other strategic actions proposed in those subwatersheds help to preserve the good quality of the downstream receiving channels, further action within this subwatershed may not be necessary aside from land conservation considerations or other programmatic actions.

Since Conservation Area C4 (see Figure 14 in Section 2.2.2) and heightened priority habitat core comprises essentially all of the Nontidal Subwatershed, land conservation efforts should continue to be investigated and implemented. Additional conservation easements and/or fee simple land acquisition (and subsequent placement of easements) are advised to the extent practicable.

Table 98 – Candidate Projects for New Stormwater BMPs: Nontidal Subwatershed

New BMP ID	Proposed Treatment	Notes	Possible Constraints	Cost Range	Watershed-Wide Rank
OPP-Nontidal-23	Swale	Roadside ditch conversion.	Property ownership/ easements	\$100-250k	**28 of 58**
OPP-Nontidal-24	Re/ Detention	End of roadside ditch.	Property ownership/ easements	\$100-250k	**28 of 58**
OPP-Nontidal-RP01	Constructed Wetland	Regional stormwater facility (constructed wetland treatment system, or wet pond) at confluence of tributaries upstream of Cranston's Mill Pond.	Forest cover, wetland permitting	> \$500k	**28 of 58**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.



Title
Figure 43 - Nontidal Subwatershed Results and Recommendations

Client/Project
203408987
James City County
Yarmouth Creek WSMP

Project Location
James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23

N
0 1,000 2,000 Feet
(At original document size of 11x17)
1:12,000

Yarmouth Creek Watershed
Yarmouth Creek Subwatershed
Localized Project
Existing Stormwater BMP

Stream Habitat Rating
Optimal
Suboptimal
Marginal
Poor
Existing Restored Reach

New BMP Opportunities
Conservation Landscaping
Constructed Wetland
Other
Re/Detention
SPSC
Swale

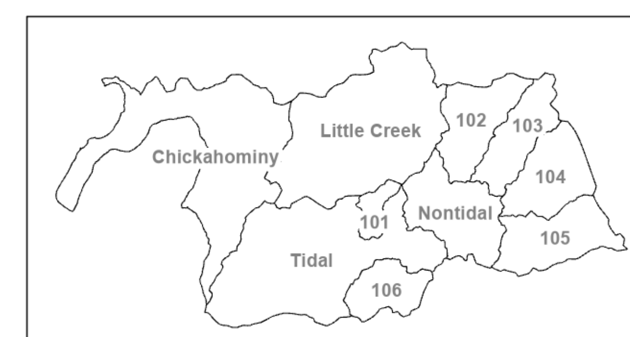
Field Inspected Existing Stormwater BMP
Inspected
Not Inspected

Retrofit of Existing BMPs
Bioretention
Outfall Enhancement
Rehabilitate/ Upgrade
Retrofit - CW/ Wet Pond

HSI Score
Not a Hotspot
Potential Hotspot
HSI Recommendations

Recommended Stream Projects
Enhancement
Restoration

NSA Score
High
Moderate



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

James City County Virginia Jamestown 1607

6.9 Tidal Subwatershed

6.9.1 General Description

The Tidal Subwatershed is the largest in the Yarmouth Creek Watershed at 2,903 acres, accounting for 21% of the overall watershed, and just slightly larger than the Little Creek Subwatershed. There is a very small amount of development, and a substantial portion of the subwatershed is marsh, primarily downstream of the confluence of Little Creek and Yarmouth Creek where the Shipyard Creek and Yarmouth Creek delta begins and splits around Wright Island.

6.9.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 99. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Table 99 – Composition of Soils: Tidal Subwatershed

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
1	Altavista fine sandy loam	C	0.0%
2	Augusta fine sandy loam	C	0.1%
7	Bojac sandy loam	B	1.1%
8B	Caroline fine sandy loam, 2 to 6 percent slopes	C	0.0%
10B	Craven fine sandy loam, 2 to 6 percent slopes	C	0.3%
10C	Craven fine sandy loam, 6 to 10 percent slopes	C	0.5%
11B	Craven-Uchee complex, 2 to 6 percent slopes	C/A	0.1%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	16.5%
13	Dragston fine sandy loam	C	0.6%
15E	Emporia complex, 15 to 25 percent slopes	C	1.4%
15F	Emporia complex, 25 to 50 percent slopes	C	22.3%
14B	Emporia fine sandy loam, 2 to 6 percent slopes	C	1.4%
14C	Emporia fine sandy loam, 6 to 10 percent slopes	C	0.4%
17	Johnston complex	D	2.8%
18B	Kempsville fine sandy loam, 2 to 6 percent slopes	B	1.0%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	2.3%
21	Levy silty clay	D	23.8%
22	Munden loamy fine sand	B	0.4%
24	Nimmo fine sandy loam	D	0.5%
25B	Norfolk fine sandy loam, 2 to 6 percent slopes	B	0.7%
27	Peawick silt loam	D	6.2%
28	Seabrook loamy fine sand	C	1.5%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	0.7%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	0.7%

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
31B	Suffolk fine sandy loam, 2 to 6 percent slopes	B	1.4%
33	Tomotley fine sandy loam	B/D	0.0%
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	1.6%
35	Udorthents, loamy	N/A	0.4%
W	Water	N/A	11.3%

6.9.3 Land Use and Impervious Area

The Tidal Subwatershed it primarily Forest land use, though the marshlands are shown as forest, primarily, for lack of a more accurate land use/cover classification. The few developed areas are Rural, residential and agricultural. Due to zoning, conservation easements, and water resources, additional development in this subwatershed is quite limited, though some is expected.

6.9.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is 27 acres, accounting for 0.9% of the subwatershed area and 3.5% of the overall Yarmouth Creek Watershed impervious area. Table 100 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 100 – Existing Land Use and Land Cover Composition: Tidal Subwatershed

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Commercial	22.05	0.8%	2.23	10.1%
Forest	1943.19	66.9%	5.63	0.3%
LDR	0.01	0.0%	0.00	27.1%
Open Water	289.17	10.0%	0.07	0.0%
Roadway	16.69	0.6%	4.65	27.8%
Rural	632.16	21.8%	14.43	2.3%

6.9.3.2 Future Conditions

Future buildout is expected in the southern portion of the subwatershed bordering Subwatershed 106 (Summerplace). A current Master Plan is on file for an ultra-low density residential development, which would classify as Rural based on imperviousness. It is estimated that the percent impervious area in this subwatershed could increase up to just over 4% total (from 0.9%), still landing within the Sensitive category per the Impervious Cover Model. Due to proximity to tidal waters, any development within this subwatershed likely warrants the application of all best practices, structural and strategic, such as those discussed in Section 3.2.

6.9.4 Pollutant Loads

6.9.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 101, as computed from the WTM modeling. Illicit connections are any discharge to the municipal separate storm sewer system (MS4) that are not composed entirely of stormwater and can include, but are not limited to, unpermitted floor drain connections from homes or businesses, failing septic systems, illegal dumping, and improper disposal of sewage.

Table 101 – Estimated Pollutant Loading for Existing Conditions: Tidal Subwatershed

Modeled Pollutant Source	Existing Loads				
	Area (acres)	TN lb/year	TP lb/year	TSS lb/year	Fecal Coliform billion/year
URBAN SOURCES					
Urban Land	38	507	66	13,933	23,108
Illicit Connections	-	14	7	124	2,731
Vacant Lots	-	-	-	-	-
RURAL SOURCES					
Rural Land	632	2,908	443	63,216	24,654
Forest	1,943	4,858	389	194,319	23,318
Open Water	289	3,701	145	44,821	-
TOTAL LOAD	**2,903**	**11,988**	**1,049**	**316,413**	**73,812**
Storm Load	-	4,390	648	245,713	71,081
Non-Storm Load	-	7,598	401	70,700	2,731

Table 102 – Estimated Load Reductions from Existing Treatment: Tidal Subwatershed

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	0.0	0.0	-	-
Pet Waste Education	1.5	0.2	-	13
Structural Stormwater Management Practices	1	0.3	88	112
Total Reduction	3	0.5	88	125

6.9.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 103.

Table 103 – Estimated Pollutant Loading for Future Conditions: Tidal Subwatershed

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	39	509	66	14,087	23,118
Illicit Connections	-	14	7	124	2,731
RURAL SOURCES					
Rural Land	960	4,415	672	95,972	37,429
Forest	1,616	4,039	323	161,555	19,387
Open Water	289	3,701	145	44,821	-
TOTAL LOAD	**2,903**	**12,678**	**1,213**	**316,559**	**82,665**
Storm Load	-	4,736	762	245,861	79,934
Non-Storm Load	-	7,942	450	70,699	2,731

6.9.5 Field Assessments

See Figure 44 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, Hot Spot Investigations, stream reaches, existing stormwater BMPs and retrofit opportunities.

6.9.5.1 Stormwater Management

There are three existing stormwater management best management practices currently treating runoff within this subwatershed. Table 104 provides the amount of impervious area treated by a BMP as well as the Total Area Treated. The areas in Table 104 are based on the data entered into the County BMP database.

Table 104 – Existing Stormwater BMPs: Tidal Subwatershed

BMP Type	Count	Impervious Area Treated (Acres)*	Total Area Treated (Acres)*
Bioretention	2	0.8	1.0
Wet Pond	1	2.7	5.1
Grand Total	**3**	**3.5**	**6.1**

*Areas treated by BMPs are based on County database information and may be incomplete or have overlaps.

6.9.5.2 Stream Assessment

Approximately 8,750 linear feet of streams were assessed in this subwatershed. Less than 7% rated Poor, none Marginal, and the remainder Optimal and Suboptimal.

6.9.5.3 Upland Reconnaissance

Neighborhood areas totaling approximately 99 acres were assessed with 3% of the areas rating a Moderate risk, and 97% as High risk for pollution by the NSA methods. Two areas were identified as possible Hot Spots of pollution with both rated as Potential.

6.9.6 Opportunities for Improvements

One approximately 600-foot stream reach is recommended for restoration, and one existing stormwater BMP has been identified as a potential for retrofit. See the following tables and Figure 44 for details.

Management activities for this subwatershed should consist of maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and preventive maintenance education. While there is very little residential development in this subwatershed, any that is, and any that may follow, warrants special attention due to the sensitive nature of this subwatershed.

The Tidal Subwatershed is essentially entirely comprised of Conservation Areas C1, C2, C3, and C7, and high priority habitat core areas (see Figure 14 in Section 2.2.2). Any and all land conservation efforts should be investigated and implemented to the extent practicable. The master plan covering development in the southern portion of the subwatershed covers a relatively small area, but still any efforts to reduce its potential impacts are advised. The Shipyard Creek and Yarmouth Creek confluence and estuary surrounding and including Wright Island is a valuable and important natural resource, especially in the context of wildlife.

Table 105 – Candidate Projects for Stream Reach Recommendations: Tidal Subwatershed

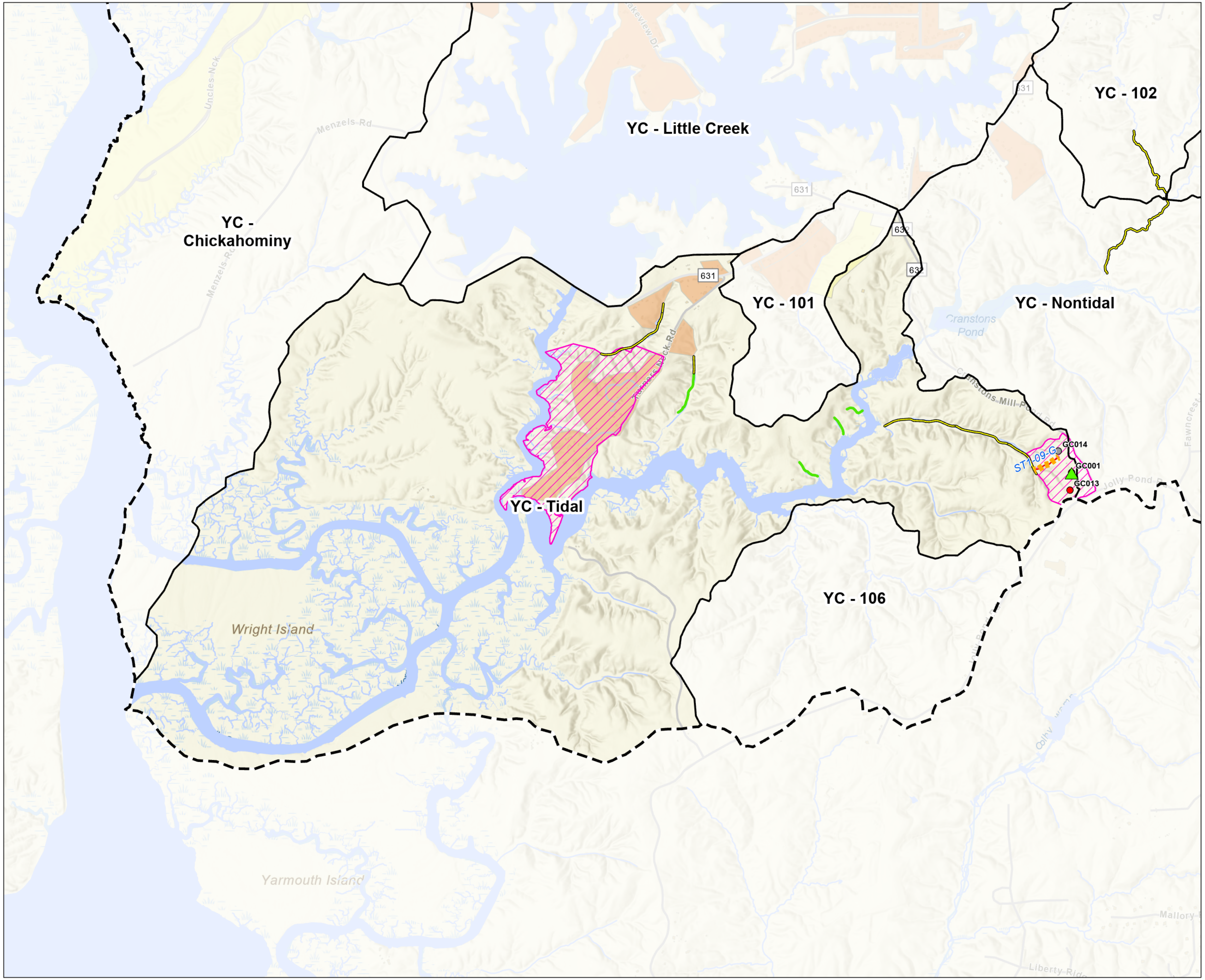
Reach ID	Length (feet)	Total Habitat Score	Habitat Condition Rating	Recommended Action	Notes	Estimated Cost Range*	Watershed-Wide Rank
ST1-09-G	597	86	Poor	Restoration	Channel is extremely eroded and downcut with no vegetative protection and vertical, sloughing banks.	$250-500k	**3 of 22**

Table 106 – Candidate Projects for Retrofit of Existing BMPs: Tidal Subwatershed

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-GC001	WJCC Maintenance and Operations Wet Pond	Wet Pond	5.1	Rehabilitate/ Upgrade	Good condition. Algae present. Possible maintenance/management options.	$50-100k	**18 of 35**

Title

Figure 44 - Tidal Subwatershed Results and Recommendations



Client/Project 203408987

James City County
Yarmouth Creek WSMP

Project Location

James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23

N

0 2,000 4,000 Feet

(At original document size of 11x17)
1:24,000

Yarmouth Creek Watershed

Yarmouth Creek Subwatershed

Localized Project

Existing Stormwater BMP

Stream Habitat Rating

Optimal

Suboptimal

Marginal

Poor

Existing Restored Reach

New BMP Opportunities

Conservation Landscaping

Constructed Wetland

Other

Re/Detention

SPSC

Swale

Field Inspected Existing Stormwater BMP

Inspected

Not Inspected

Retrofit of Existing BMPs

Bioretention

Outfall Enhancement

Rehabilitate/ Upgrade

Retrofit - CW/ Wet Pond

HSI Score

Not a Hotspot

Potential Hotspot

HSI Recommendations

Recommended Stream Projects

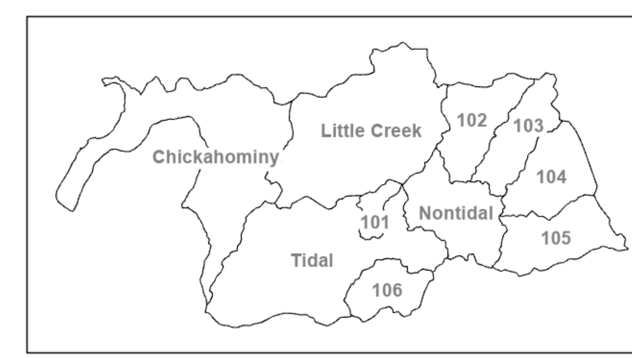
Enhancement

Restoration

NSA Score

High

Moderate



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

6.10 Chickahominy Subwatershed

6.10.1 General Description

The Chickahominy Subwatershed is administratively considered part of the Yarmouth Creek subwatershed, but technically does not drain to the Yarmouth Creek. It is so named because, as the name suggests, it drains directly to the Chickahominy River. It is a tidal (not “capital ‘T’ tidal”) subwatershed, with one notable residential development, Chickahominy Haven, and Brickyard Landing public river access and park owned and maintained by James City County Parks & Recreation. It is 2,807 acres, on par with the other two large subwatersheds in the designated Yarmouth Creek Watershed.

6.10.2 Soils

The USDA SSURGO geospatial data set provided by JCC is provided below in Table 107. The Map Unit Symbol is the short-form alphanumeric code for that soil series in the maps. The hydrologic soil group (HSG) is a general indicator for how well the soil drains or infiltrates water, with A being the best, and D being the worst.

Table 107 – Composition of Soils: Chickahominy Subwatershed

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
1	Altavista fine sandy loam	C	0.3%
2	Augusta fine sandy loam	C	0.4%
5	Bethera silt loam	D	0.6%
7	Bojac sandy loam	B	3.6%
9	Chickahominy silt loam	D	1.7%
11C	Craven-Uchee complex, 6 to 10 percent slopes	C/A	13.9%
13	Dragston fine sandy loam	C	1.5%
15D	Emporia complex, 10 to 15 percent slopes	C	0.4%
15E	Emporia complex, 15 to 25 percent slopes	C	9.7%
15F	Emporia complex, 25 to 50 percent slopes	C	8.2%
16	Izagora loam	C	0.8%
17	Johnston complex	D	2.5%
19B	Kempsville-Emporia fine sandy loams, 2 to 6 percent slopes	B/C	0.4%
21	Levy silty clay	D	17.5%
22	Munden loamy fine sand	B	1.6%
23	Newflat silt loam	D	1.5%
24	Nimmo fine sandy loam	D	1.1%
27	Peawick silt loam	D	8.2%
28	Seabrook loamy fine sand	C	5.3%
29A	Slagle fine sandy loam, 0 to 2 percent slopes	C	1.4%
29B	Slagle fine sandy loam, 2 to 6 percent slopes	C	4.3%
31B	Suffolk fine sandy loam, 2 to 6 percent slopes	B	7.1%
33	Tomotley fine sandy loam	B/D	0.6%

Map Unit Symbol	Soil Series Description	Hydrologic Soil Group (HSG)	Percentage of Subwatershed Area
34B	Uchee loamy fine sand, 2 to 6 percent slopes	A	0.4%
35	Udorthents, loamy	N/A	1.4%
W	Water	N/A	5.7%

6.10.3 Land Use and Impervious Area

Developed areas are primarily Medium-Density Residential (single-family). Most of the subwatershed is Rural and Forest.

6.10.3.1 Existing Conditions

Total existing impervious cover in the subwatershed is 113 acres, accounting for 4% of the subwatershed. Table 108 provides the distribution of land uses/covers within the subwatershed, and the imperviousness associated with each.

Table 108 – Existing Land Use and Land Cover Composition: Chickahominy Subwatershed

Land Use/ Cover	Area (acres)	Percent of Subwatershed (%)	Impervious Area (acres)	Percent Imperviousness in Land Use/ Cover
Forest	1219.06	43.4%	0.94	0.1%
LDR	27.34	1.0%	4.72	17.3%
MDR	179.63	6.4%	42.93	23.9%
Open Water	135.51	4.8%	1.24	0.9%
Roadway	83.68	3.0%	36.09	43.1%
Rural	1158.89	41.3%	27.20	2.3%
Vacant	3.20	0.1%	0.04	1.3%

6.10.3.2 Future Conditions

Little to no additional buildout is anticipated in this subwatershed, with a projected final/total imperviousness of just of 4%.

6.10.4 Pollutant Loads

6.10.4.1 Existing Conditions

Estimated existing pollutant loads from various potential sources are provided in Table 109, as computed from the WTM modeling.

Table 109 – Estimated Pollutant Loading for Existing Conditions: Chickahominy Subwatershed

Modeled Pollutant Source	Existing Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	291	2,389	270	57,240	93,562
Illicit Connections	-	18	3	120	13,664
Vacant Lots	3	8	1	320	38
RURAL SOURCES					
Rural Land	1,159	5,331	811	115,889	45,197
Forest	1,219	3,048	244	121,906	14,629
Open Water	136	1,735	68	21,004	-
TOTAL LOAD	**2,807**	**12,528**	**1,396**	**316,479**	**167,090**
Storm Load	-	6,191	1,003	271,302	153,426
Non-Storm Load	-	6,337	393	45,177	13,664

Table 110 – Estimated Load Reductions from Existing Treatment: Chickahominy Subwatershed

Treatment Type	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	Bacteria (billion/year)
Lawn Care Education	88.5	1.8	-	-
Pet Waste Education	16.9	2.2	-	147
Structural Stormwater Management Practices	1	0.4	13	73
Total Reduction	106	4.4	13	220

6.10.4.2 Future Conditions

Estimated future loads with assumed reductions from treatment included are provided in Table 111.

Table 111 – Estimated Pollutant Loading for Future Conditions: Chickahominy Subwatershed

Modeled Pollutant Source	Future Loads				
	Area	TN	TP	TSS	Fecal Coliform
	(acres)	lb/year	lb/year	lb/year	billion/year
URBAN SOURCES					
Urban Land	294	2,405	271	57,561	93,847
Illicit Connections	-	18	3	120	13,664
RURAL SOURCES					
Rural Land	1,159	5,331	811	115,889	45,197
Forest	1,219	3,048	244	121,906	14,629
Open Water	136	1,735	68	21,004	-
TOTAL LOAD	**2,807**	**12,536**	**1,397**	**316,480**	**167,337**
Storm Load	-	6,202	1,004	271,623	153,711
Non-Storm Load	-	6,343	393	45,177	13,664

6.10.5 Field Assessments

See Figure 45 for a map of all assessment locations, findings, and recommended projects within the subwatershed, including Neighborhood Source Assessment (NSA) areas, existing stormwater BMPs, and new and retrofit opportunities.

6.10.5.1 Stormwater Management

There are two existing stormwater management best management practices within this subwatershed currently treating runoff from a combined 20.1 acres, 3.0 of which are impervious.

6.10.5.2 Stream Assessment

No streams within this subwatershed were assessed.

6.10.5.3 Upland Reconnaissance

The assessed neighborhood areas total approximately 713 acres with 76% scoring Moderate and 24% scoring High on the Neighborhood Source Assessment (NSA) for pollution risk. No areas were investigated for pollution Hot Spots.

6.10.6 Opportunities for Improvements

There were no reaches recommended for stream reach restoration activities or localized projects associated with stream corridors in this subwatershed. There are two existing stormwater BMPs with a potential for retrofit and nine potential locations for a new stormwater BMP. See the following tables and Figure 45 for details.

Management activities for this subwatershed should consist of maintaining programmatic efforts noted herein, with special attention to tracking septic system performance, pump out efforts, resolving any failures, and preventive maintenance education. The location of Chickahominy Haven, and the number and density of septic fields makes this area a high priority for focus with respect to septic system considerations.

While no designated Conservation Areas are present in the Chickahominy Subwatershed, all but the Chickahominy Haven neighborhood is a habitat core. We advise further investigation to identify potential higher priority areas, and specific conservation areas, and to employ land conservation efforts to the extent possible.

One of the most significant drivers of strategic actions in the Chickahominy Subwatershed will be Floodplain Management. The density and high number of flood-prone properties, particularly at Chickahominy Haven, warrants thoughtful planning.

Table 112 – Candidate Projects for Retrofit of Existing BMPs: Chickahominy Subwatershed

BMP ID	Facility Name	Facility Type	Drainage Area (acres)	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
BMP-CR001	Uncles Neck Dry Pond	Dry Extended Detention Ponds	14.01	Retrofit - CW/ Wet Pond	Overgrown, wetland vegetation prominent.	$50-100k	**21 of 35**
BMP-CR002	Uncles Neck Dry Pond	Dry Extended Detention Ponds	6.08	Retrofit - CW/ Wet Pond	Completely overgrown, standing water and wetland veg - can upgrade.	$100-250k	**28 of 35**

Table 113 – Candidate Project for New Stormwater BMPs: Chickahominy Subwatershed

New BMP ID	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
OPP-Chick-07c	Other	Proposed permeable pavement from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.	$100-250k	**2 of 58**
OPP-Chick-16	Swale	Drainage ditches are essentially wet swales. Enhancement could improve performance and uplift.	< $100k	**2 of 58**
OPP-Chick-07a	Swale	Proposed integrated management practice from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.	$100-250k	**13 of 58**
OPP-Chick-07b	Conservation Landscaping	Proposed revegetation from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.	< $100k	**13 of 58**

New BMP ID	Proposed Treatment	Notes	Cost Range	Watershed-Wide Rank
OPP-Chick-15	Conservation Landscaping	Large lot appears to wrap around NW and SE side of cul-de-sac. A significant portion seems unused. Preventing development may reduce later mitigation/retrofit needs.	$100-250k	**13 of 58**
OPP-Chick-07d	Other	Proposed shoreline stabilization from WEG Brickyard Landing study. Coordinate with Brickyard Landing Master Plan.	$250-500k	**23 of 58**
OPP-Chick-17	SPSC	Several options likely exist, with SPSC and re/detention high among them.	$100-250k	**28 of 58**
OPP-Chick-18	SPSC	Several options likely exist, with SPSC and re/detention high among them.	$100-250k	**28 of 58**
OPP-Chick-19	Re/Detention	Several options likely exist, with SPSC and re/detention high among them.	$100-250k	**28 of 58**

Note: Where scoring rubric returns the same score for multiple projects, their ranking will be tied, and not sequential.

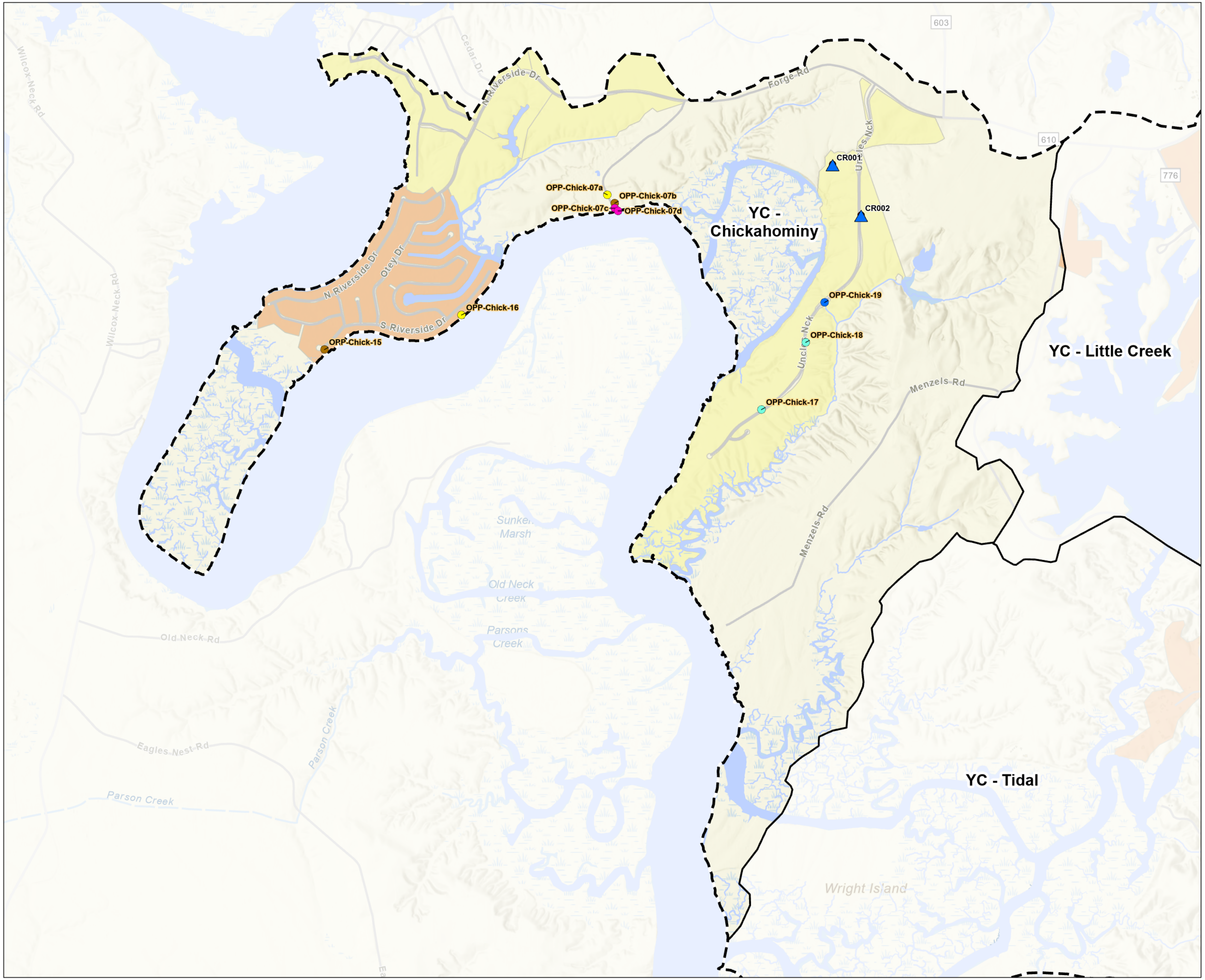
Title
Figure 45 - Chickahominy Subwatershed Results and Recommendations

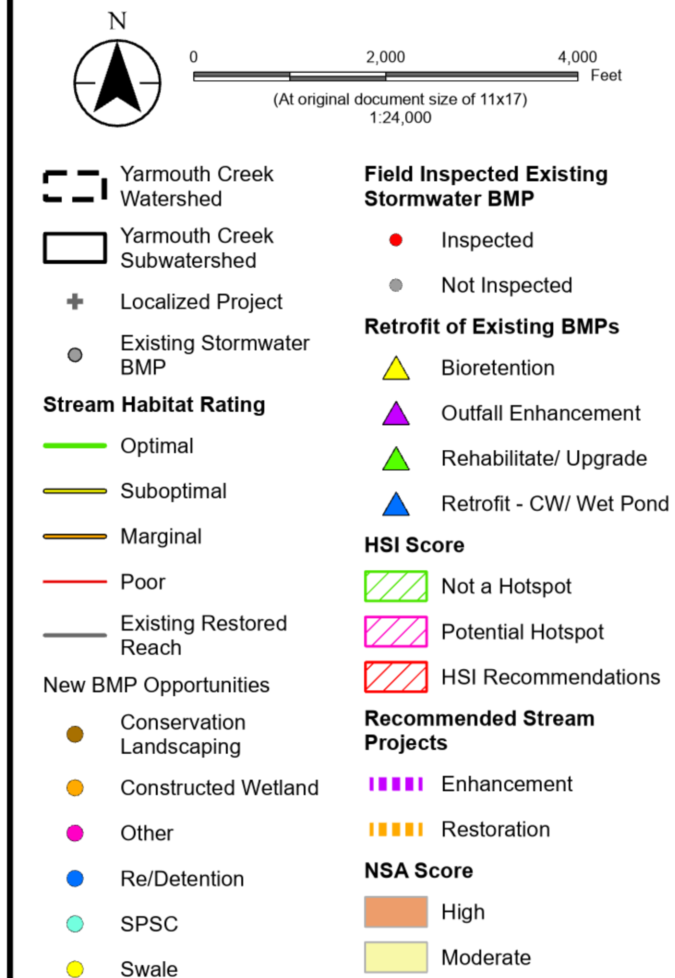
Client/Project
James City County
Yarmouth Creek WSMP

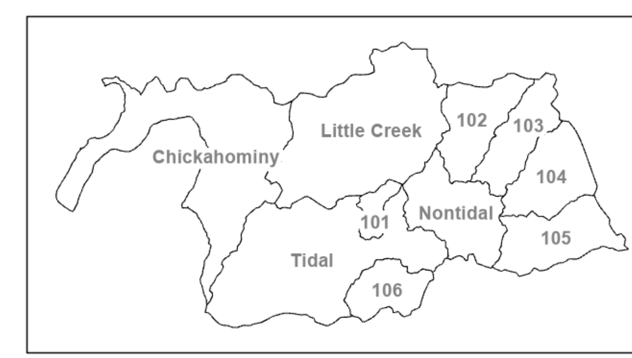
203408987

Project Location
James City County, Virginia

Prepared by MGS on 2023-06-22
TR by PC on 2023-06-23
IR by DP on 2026-06-23







Notes
1. Coordinate System: NAD 1983 StatePlane Virginia South FIPS 4502 Feet
2. Data Sources: ESRI, James City County, Stantec

Stantec

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Appendix A Field Photographs – Stream & Riparian Areas

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 1

Survey Date: 2/1/2023

Reach Name: ST1-1-G

Stream Condition: Suboptimal

Photograph ID: 2

Survey Date: 2/1/2023

Reach Name: ST1-1-G

Stream Condition: Suboptimal

Stantec **Photographic Log**

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 3 **Survey Date:** 2/1/2023 **Reach Name:** ST1-2-C **Stream Condition:** Suboptimal	
Photograph ID: 4 **Survey Date:** 2/1/2023 **Reach Name:** ST1-2-C **Stream Condition:** Suboptimal	

Stantec

Photographic Log

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 5 **Survey Date:** 2/1/2023 **Reach Name:** ST1-3-G **Stream Condition:** Suboptimal	
Photograph ID: 6 **Survey Date:** 2/1/2023 **Reach Name:** ST1-3-G **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 7 **Survey Date:** 2/1/2023 **Reach Name:** ST1-4-C **Stream Condition:** Optimal	
Photograph ID: 8 **Survey Date:** 2/1/2023 **Reach Name:** ST1-4-C **Stream Condition:** Optimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 9 **Survey Date:** 2/1/2023 **Reach Name:** ST1-5-C **Stream Condition:** Optimal	
Photograph ID: 10 **Survey Date:** 2/1/2023 **Reach Name:** ST1-5-C **Stream Condition:** Optimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 11 **Survey Date:** 2/1/2023 **Reach Name:** ST1-6-C **Stream Condition:** Suboptimal	
Photograph ID: 12 **Survey Date:** 2/1/2023 **Reach Name:** ST1-6-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 13 **Survey Date:** 2/1/2023 **Reach Name:** ST1-7-G **Stream Condition:** Suboptimal	
Photograph ID: 14 **Survey Date:** 2/1/2023 **Reach Name:** ST1-7-G **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 15 **Survey Date:** 2/1/2023 **Reach Name:** ST1-8-C **Stream Condition:** Suboptimal	
Photograph ID: 16 **Survey Date:** 2/1/2023 **Reach Name:** ST1-8-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 17 **Survey Date:** 2/1/2023 **Reach Name:** ST1-9-G **Stream Condition:** Poor	
Photograph ID: 18 **Survey Date:** 2/1/2023 **Reach Name:** ST1-9-G **Stream Condition:** Poor	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 19 **Survey Date:** 2/2/2023 **Reach Name:** ST1-10-G **Stream Condition:** Marginal	
Photograph ID: 20 **Survey Date:** 2/2/2023 **Reach Name:** ST1-10-G **Stream Condition:** Marginal	

Stantec **Photographic Log**

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 21 **Survey Date:** 2/2/2023 **Reach Name:** ST1-11-C **Stream Condition:** Marginal	
Photograph ID: 22 **Survey Date:** 2/2/2023 **Reach Name:** ST1-11-C **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 23 **Survey Date:** 2/2/2023 **Reach Name:** ST1-12-C **Stream Condition:** Suboptimal	
Photograph ID: 24 **Survey Date:** 2/2/2023 **Reach Name:** ST1-12-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 25 **Survey Date:** 2/2/2023 **Reach Name:** ST1-13-C **Stream Condition:** Suboptimal	
Photograph ID: 26 **Survey Date:** 2/2/2023 **Reach Name:** ST1-13-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 27 **Survey Date:** 2/2/2023 **Reach Name:** ST1-14-C **Stream Condition:** Suboptimal	
Photograph ID: 28 **Survey Date:** 2/2/2023 **Reach Name:** ST1-14-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 29 **Survey Date:** 2/2/2023 **Reach Name:** ST1-15-C **Stream Condition:** Suboptimal	
Photograph ID: 30 **Survey Date:** 2/2/2023 **Reach Name:** ST1-15-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 31 **Survey Date:** 2/2/2023 **Reach Name:** ST1-16-G **Stream Condition:** Marginal	
Photograph ID: 32 **Survey Date:** 2/2/2023 **Reach Name:** ST1-16-G **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 33

Survey Date:
2/2/2023

Reach Name:
ST1-17-D

Stream Condition:
Suboptimal

Photograph ID: 34

Survey Date:
2/2/2023

Reach Name:
ST1-17-D

Stream Condition:
Suboptimal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 35 **Survey Date:** 2/2/2023 **Reach Name:** ST1-18-G **Stream Condition:** Suboptimal	
Photograph ID: 36 **Survey Date:** 2/2/2023 **Reach Name:** ST1-18-G **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 37

Survey Date:
2/2/2023

Reach Name:
ST1-19-C

Stream Condition:
Suboptimal

Photograph ID: 38

Survey Date:
2/2/2023

Reach Name:
ST1-20-D

Stream Condition:
Suboptimal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 39 **Survey Date:** 2/2/2023 **Reach Name:** ST1-20-D **Stream Condition:** Suboptimal	
Photograph ID: 40 **Survey Date:** 2/2/2023 **Reach Name:** ST1-21-C **Stream Condition:** Suboptimal	

Stantec **Photographic Log**

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 41 **Survey Date:** 2/2/2023 **Reach Name:** ST1-21-C **Stream Condition:** Suboptimal	
Photograph ID: 42 **Survey Date:** 2/2/2023 **Reach Name:** ST1-22-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 43 **Survey Date:** 2/2/2023 **Reach Name:** ST1-22-C **Stream Condition:** Suboptimal	
Photograph ID: 44 **Survey Date:** 2/2/2023 **Reach Name:** ST1-23-C **Stream Condition:** Marginal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 45 **Survey Date:** 2/2/2023 **Reach Name:** ST1-23-C **Stream Condition:** Marginal	
Photograph ID: 46 **Survey Date:** 2/2/2023 **Reach Name:** ST1-24-A **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 47 **Survey Date:** 2/2/2023 **Reach Name:** ST1-24-A **Stream Condition:** Marginal	
Photograph ID: 48 **Survey Date:** 2/2/2023 **Reach Name:** ST1-25-G **Stream Condition:** Poor	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 49

Survey Date:
2/2/2023

Reach Name:
ST1-25-G

Stream Condition:
Poor

Photograph ID: 50

Survey Date:
2/2/2023

Reach Name:
ST1-26-G

Stream Condition:
Poor

Photographic Log

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 51 **Survey Date:** 2/2/2023 **Reach Name:** ST1-26-G **Stream Condition:** Poor	
Photograph ID: 52 **Survey Date:** 2/2/2023 **Reach Name:** ST1-27-C **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 53 **Survey Date:** 2/2/2023 **Reach Name:** ST1-27-C **Stream Condition:** Suboptimal	
Photograph ID: 54 **Survey Date:** 2/2/2023 **Reach Name:** ST1-28-G **Stream Condition:** Marginal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 55 **Survey Date:** 2/2/2023 **Reach Name:** ST1-28-G **Stream Condition:** Marginal	
Photograph ID: 56 **Survey Date:** 2/2/2023 **Reach Name:** ST1-29-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 57 **Survey Date:** 2/2/2023 **Reach Name:** ST1-29-C **Stream Condition:** Suboptimal	
Photograph ID: 58 **Survey Date:** 2/2/2023 **Reach Name:** ST1-30-C **Stream Condition:** Marginal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 59

Survey Date: 2/2/2023

Reach Name: ST1-30-C

Stream Condition: Marginal

Photograph ID: 60

Survey Date: 2/2/2023

Reach Name: ST1-31-B

Stream Condition: Suboptimal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 61 **Survey Date:** 2/2/2023 **Reach Name:** ST1-31-B **Stream Condition:** Suboptimal	
Photograph ID: 62 **Survey Date:** 2/3/2023 **Reach Name:** ST1-32-C **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 63

Survey Date:
2/3/2023

Reach Name:
ST1-32-C

Stream Condition:
Suboptimal

Photograph ID: 64

Survey Date:
2/3/2023

Reach Name:
ST1-33-C

Stream Condition:
Optimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 65 **Survey Date:** 2/3/2023 **Reach Name:** ST1-33-C **Stream Condition:** Optimal	
Photograph ID: 66 **Survey Date:** 2/3/2023 **Reach Name:** ST1-34-D **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 67

Survey Date:
2/3/2023

Reach Name:
ST1-34-D

Stream Condition:
Suboptimal

Photograph ID: 68

Survey Date:
2/1/2023

Reach Name:
ST2-1-A

Stream Condition:
Marginal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 69

Survey Date: 2/1/2023

Reach Name: ST2-1-A

Stream Condition: Marginal

Photograph ID: 70

Survey Date: 2/1/2023

Reach Name: ST2-2-G

Stream Condition: Marginal

Stantec

Photographic Log

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 71 **Survey Date:** 2/1/2023 **Reach Name:** ST2-2-G **Stream Condition:** Marginal	
Photograph ID: 72 **Survey Date:** 2/2/2023 **Reach Name:** ST2-3-B **Stream Condition:** Optimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 73 **Survey Date:** 2/2/2023 **Reach Name:** ST2-3-B **Stream Condition:** Optimal	
Photograph ID: 74 **Survey Date:** 2/2/2023 **Reach Name:** ST2-4-G **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 75

Survey Date: 2/2/2023

Reach Name: ST2-4-G

Stream Condition: Suboptimal

Photograph ID: 76

Survey Date: 2/2/2023

Reach Name: ST2-5-A

Stream Condition: Marginal

Stantec

Photographic Log

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 77 **Survey Date:** 2/2/2023 **Reach Name:** ST2-5-A **Stream Condition:** Marginal	
Photograph ID: 78 **Survey Date:** 2/2/2023 **Reach Name:** ST2-6-G **Stream Condition:** Poor	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 79 **Survey Date:** 2/2/2023 **Reach Name:** ST2-6-G **Stream Condition:** Poor	
Photograph ID: 80 **Survey Date:** 2/2/2023 **Reach Name:** ST2-8-B **Stream Condition:** Poor	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 81 **Survey Date:** 2/2/2023 **Reach Name:** ST2-8-B **Stream Condition:** Poor	
Photograph ID: 82 **Survey Date:** 2/3/2023 **Reach Name:** ST2-9-C **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 83 **Survey Date:** 2/3/2023 **Reach Name:** ST2-9-C **Stream Condition:** Suboptimal	
Photograph ID: 84 **Survey Date:** 2/3/2023 **Reach Name:** ST2-10-C **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 85 **Survey Date:** 2/3/2023 **Reach Name:** ST2-10-C **Stream Condition:** Marginal	
Photograph ID: 86 **Survey Date:** 2/3/2023 **Reach Name:** ST2-11-G **Stream Condition:** Poor	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 87 **Survey Date:** 2/3/2023 **Reach Name:** ST2-11-G **Stream Condition:** Poor	
Photograph ID: 88 **Survey Date:** 2/7/2023 **Reach Name:** ST2-12-C **Stream Condition:** Poor	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 89 **Survey Date:** 2/7/2023 **Reach Name:** ST2-12-C **Stream Condition:** Poor	
Photograph ID: 90 **Survey Date:** 2/7/2023 **Reach Name:** ST2-13-B **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 91 **Survey Date:** 2/7/2023 **Reach Name:** ST2-13-B **Stream Condition:** Marginal	
Photograph ID: 92 **Survey Date:** 2/7/2023 **Reach Name:** ST2-14-F **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 93

Survey Date: 2/7/2023

Reach Name: ST2-14-F

Stream Condition: Suboptimal

Photograph ID: 94

Survey Date: 2/7/2023

Reach Name: ST2-15-G

Stream Condition: Marginal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 95

Survey Date: 2/7/2023

Reach Name: ST2-15-G

Stream Condition: Marginal

Photograph ID: 96

Survey Date: 2/8/2023

Reach Name: ST2-16-A

Stream Condition: Marginal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 97

Survey Date: 2/8/2023

Reach Name: ST2-16-A

Stream Condition: Marginal

Photograph ID: 98

Survey Date: 2/8/2023

Reach Name: ST2-17-B

Stream Condition: Suboptimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 99

Survey Date: 2/8/2023

Reach Name: ST2-17-B

Stream Condition: Suboptimal

Photograph ID: 100

Survey Date: 2/8/2023

Reach Name: ST2-18-B

Stream Condition: Suboptimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 101 **Survey Date:** 2/8/2023 **Reach Name:** ST2-18-B **Stream Condition:** Suboptimal	
Photograph ID: 102 **Survey Date:** 2/8/2023 **Reach Name:** ST2-19-B **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 103 **Survey Date:** 2/8/2023 **Reach Name:** ST2-19-B **Stream Condition:** Suboptimal	
Photograph ID: 104 **Survey Date:** 2/2/2023 **Reach Name:** ST2-19-B **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 105 **Survey Date:** 2/8/2023 **Reach Name:** ST2-20-B **Stream Condition:** Suboptimal	
Photograph ID: 106 **Survey Date:** 2/8/2023 **Reach Name:** ST2-20-B **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 107 **Survey Date:** 2/8/2023 **Reach Name:** ST2-21-B **Stream Condition:** Marginal	
Photograph ID: 108 **Survey Date:** 2/8/2023 **Reach Name:** ST2-21-B **Stream Condition:** Marginal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 109 **Survey Date:** 2/9/2023 **Reach Name:** ST2-22-B **Stream Condition:** Suboptimal	
Photograph ID: 110 **Survey Date:** 2/9/2023 **Reach Name:** ST2-22-B **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 111 **Survey Date:** 2/9/2023 **Reach Name:** ST2-23-F **Stream Condition:** Marginal	
Photograph ID: 112 **Survey Date:** 2/9/2023 **Reach Name:** ST2-23-F **Stream Condition:** Marginal	

Stantec

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 113 **Survey Date:** 2/9/2023 **Reach Name:** ST2-24-B **Stream Condition:** Suboptimal	
Photograph ID: 114 **Survey Date:** 2/9/2023 **Reach Name:** ST2-24-B **Stream Condition:** Suboptimal	

Stantec

Photographic Log

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 115 **Survey Date:** 2/9/2023 **Reach Name:** ST2-25-B **Stream Condition:** Marginal	
Photograph ID: 116 **Survey Date:** 2/9/2023 **Reach Name:** ST2-25-B **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 117 **Survey Date:** 2/9/2023 **Reach Name:** ST2-26-B **Stream Condition:** Marginal	
Photograph ID: 118 **Survey Date:** 2/9/2023 **Reach Name:** ST2-26-B **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 119 **Survey Date:** 2/9/2023 **Reach Name:** ST2-27-B **Stream Condition:** Suboptimal	
Photograph ID: 120 **Survey Date:** 2/9/2023 **Reach Name:** ST2-27-B **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 121 **Survey Date:** 2/9/2023 **Reach Name:** ST2-28-C **Stream Condition:** Marginal	
Photograph ID: 122 **Survey Date:** 2/9/2023 **Reach Name:** ST2-28-C **Stream Condition:** Marginal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 123 **Survey Date:** 2/9/2023 **Reach Name:** ST2-29-B **Stream Condition:** Suboptimal	
Photograph ID: 124 **Survey Date:** 2/9/2023 **Reach Name:** ST2-29-B **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 125 **Survey Date:** 2/1/2023 **Reach Name:** ST4-1-C **Stream Condition:** Optimal	
Photograph ID: 126 **Survey Date:** 2/1/2023 **Reach Name:** ST4-1-C **Stream Condition:** Optimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 127

Survey Date: 2/1/2023

Reach Name: ST4-2-D

Stream Condition: Optimal

Photograph ID: 128

Survey Date: 2/1/2023

Reach Name: ST4-2-D

Stream Condition: Optimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 129

Survey Date: 2/1/2023

Reach Name: ST4-3-C

Stream Condition: Optimal

Photograph ID: 130

Survey Date: 2/1/2023

Reach Name: ST4-3-C

Stream Condition: Optimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 131 **Survey Date:** 2/1/2023 **Reach Name:** ST4-4-C **Stream Condition:** Optimal	
Photograph ID: 132 **Survey Date:** 2/1/2023 **Reach Name:** ST4-4-C **Stream Condition:** Optimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 133

Survey Date: 2/1/2023

Reach Name: ST4-5-C

Stream Condition: Optimal

Photograph ID: 134

Survey Date: 2/1/2023

Reach Name: ST4-5-C

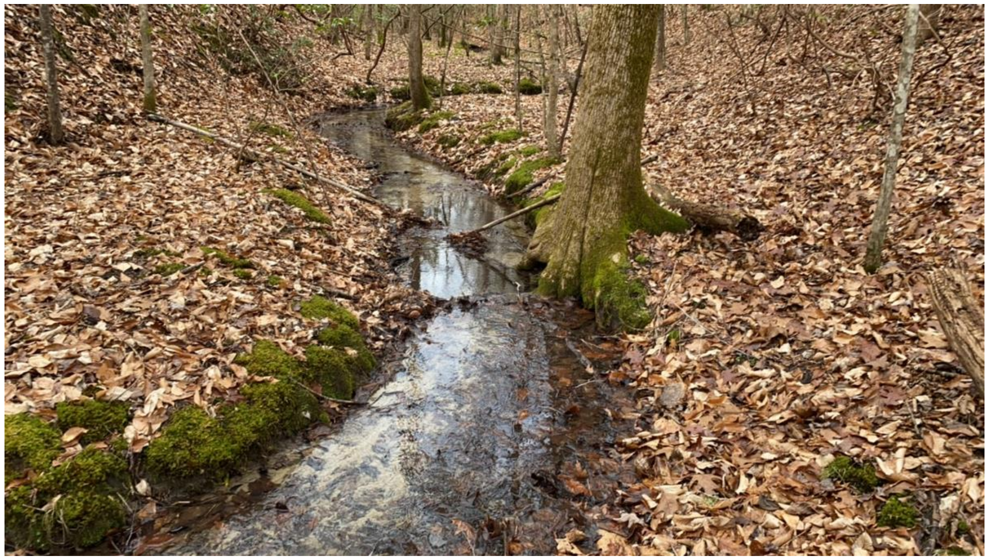
Stream Condition: Optimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 135 **Survey Date:** 2/1/2023 **Reach Name:** ST4-6-C **Stream Condition:** Optimal	
Photograph ID: 136 **Survey Date:** 2/1/2023 **Reach Name:** ST4-6-C **Stream Condition:** Optimal	

Stantec **Photographic Log**

Client:	James City County	Project:	203408987
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 137 **Survey Date:** 2/1/2023 **Reach Name:** ST4-7-C **Stream Condition:** Optimal	
Photograph ID: 138 **Survey Date:** 2/1/2023 **Reach Name:** ST4-7-C **Stream Condition:** Optimal	

Stantec

Photographic Log

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 139 **Survey Date:** 2/1/2023 **Reach Name:** ST4-8-C **Stream Condition:** Optimal	
Photograph ID: 140 **Survey Date:** 2/1/2023 **Reach Name:** ST4-8-C **Stream Condition:** Optimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 141 **Survey Date:** 2/2/2023 **Reach Name:** ST4-9-C **Stream Condition:** Suboptimal	
Photograph ID: 142 **Survey Date:** 2/2/2023 **Reach Name:** ST4-9-C **Stream Condition:** Suboptimal	

Stantec **Photographic Log**

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 143

Survey Date: 2/2/2023

Reach Name: ST4-10-C

Stream Condition: Suboptimal

Photograph ID: 144

Survey Date: 2/2/2023

Reach Name: ST4-10-C

Stream Condition: Suboptimal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 145

Survey Date: 2/2/2023

Reach Name: ST4-11-C

Stream Condition: Suboptimal

Photograph ID: 146

Survey Date: 2/2/2023

Reach Name: ST4-11-C

Stream Condition: Suboptimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 147

Survey Date: 2/2/2023

Reach Name: ST4-12-G

Stream Condition: Suboptimal

Photograph ID: 148

Survey Date: 2/2/2023

Reach Name: ST4-12-G

Stream Condition: Suboptimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 149

Survey Date: 2/2/2023

Reach Name: ST4-13-C

Stream Condition: Suboptimal

Photograph ID: 150

Survey Date: 2/2/2023

Reach Name: ST4-13-C

Stream Condition: Suboptimal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 151

Survey Date: 2/2/2023

Reach Name: ST4-14-C

Stream Condition: Suboptimal

Photograph ID: 152

Survey Date: 2/2/2023

Reach Name: ST4-14-C

Stream Condition: Suboptimal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 153 **Survey Date:** 2/2/2023 **Reach Name:** ST4-15-C **Stream Condition:** Suboptimal	
Photograph ID: 154 **Survey Date:** 2/2/2023 **Reach Name:** ST4-15-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 155 **Survey Date:** 2/2/2023 **Reach Name:** ST4-16-G **Stream Condition:** Poor	
Photograph ID: 156 **Survey Date:** 2/2/2023 **Reach Name:** ST4-16-G **Stream Condition:** Poor	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 157 **Survey Date:** 2/2/2023 **Reach Name:** ST4-17-C **Stream Condition:** Suboptimal	
Photograph ID: 158 **Survey Date:** 2/2/2023 **Reach Name:** ST4-17-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 159 **Survey Date:** 2/3/2023 **Reach Name:** ST4-18-G **Stream Condition:** Marginal	
Photograph ID: 160 **Survey Date:** 2/3/2023 **Reach Name:** ST4-18-G **Stream Condition:** Marginal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 161 **Survey Date:** 2/3/2023 **Reach Name:** ST4-19-C **Stream Condition:** Suboptimal	
Photograph ID: 162 **Survey Date:** 2/3/2023 **Reach Name:** ST4-19-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 163

Survey Date: 2/3/2023

Reach Name: ST4-20-C

Stream Condition: Optimal

Photograph ID: 164

Survey Date: 2/3/2023

Reach Name: ST4-20-C

Stream Condition: Optimal

Stantec **Photographic Log**

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 165 **Survey Date:** 2/7/2023 **Reach Name:** ST4-21-C **Stream Condition:** Suboptimal	
Photograph ID: 166 **Survey Date:** 2/7/2023 **Reach Name:** ST4-21-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 167 **Survey Date:** 2/7/2023 **Reach Name:** ST4-22-E **Stream Condition:** Suboptimal	
Photograph ID: 168 **Survey Date:** 2/7/2023 **Reach Name:** ST4-22-E **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 169

Survey Date: 2/7/2023

Reach Name: ST4-23-D

Stream Condition: Optimal

Photograph ID: 170

Survey Date: 3/6/2023

Reach Name: ST4-23-D

Stream Condition: Optimal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 171 **Survey Date:** 2/7/2023 **Reach Name:** ST4-24-D **Stream Condition:** Optimal	
Photograph ID: 172 **Survey Date:** 2/7/2023 **Reach Name:** ST4-24-D **Stream Condition:** Optimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 173 **Survey Date:** 2/7/2023 **Reach Name:** ST4-25-C **Stream Condition:** Suboptimal	
Photograph ID: 174 **Survey Date:** 2/7/2023 **Reach Name:** ST4-25-C **Stream Condition:** Suboptimal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 175 **Survey Date:** 2/7/2023 **Reach Name:** ST4-26-C **Stream Condition:** Suboptimal	
Photograph ID: 176 **Survey Date:** 2/7/2023 **Reach Name:** ST4-26-C **Stream Condition:** Suboptimal	

Stantec **Photographic Log**

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 177 **Survey Date:** 2/7/2023 **Reach Name:** ST4-27-E **Stream Condition:** Suboptimal	
Photograph ID: 178 **Survey Date:** 2/7/2023 **Reach Name:** ST4-27-E **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 179 **Survey Date:** 2/7/2023 **Reach Name:** ST4-28-C **Stream Condition:** Suboptimal	
Photograph ID: 180 **Survey Date:** 2/7/2023 **Reach Name:** ST4-28-C **Stream Condition:** Suboptimal	

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 181 **Survey Date:** 2/7/2023 **Reach Name:** ST4-29-C **Stream Condition:** Marginal	
Photograph ID: 182 **Survey Date:** 2/7/2023 **Reach Name:** ST4-29-C **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 183 **Survey Date:** 2/8/2023 **Reach Name:** ST4-30-B **Stream Condition:** Marginal	
Photograph ID: 184 **Survey Date:** 2/8/2023 **Reach Name:** ST4-30-B **Stream Condition:** Marginal	

Photographic Log

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 185

Survey Date: 2/8/2023

Reach Name: ST4-31-G

Stream Condition: Poor

Photograph ID: 186

Survey Date: 2/8/2023

Reach Name: ST4-31-G

Stream Condition: Poor

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 187

Survey Date: 2/8/2023

Reach Name: ST4-32-C

Stream Condition: Suboptimal

Photograph ID: 188

Survey Date: 2/8/2023

Reach Name: ST4-32-C

Stream Condition: Suboptimal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

Photograph ID: 189

Survey Date: 2/8/2023

Reach Name: ST4-33-G

Stream Condition: Marginal

Photograph ID: 190

Survey Date: 2/8/2023

Reach Name: ST4-33-G

Stream Condition: Marginal

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 191 **Survey Date:** 2/8/2023 **Reach Name:** ST4-34-C **Stream Condition:** Marginal	
Photograph ID: 192 **Survey Date:** 2/8/2023 **Reach Name:** ST4-34-C **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 193 **Survey Date:** 2/8/2023 **Reach Name:** ST4-35-B **Stream Condition:** Marginal	
Photograph ID: 194 **Survey Date:** 2/8/2023 **Reach Name:** ST4-35-B **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

Photograph ID: 195

Survey Date: 2/8/2023

Reach Name: ST4-36-B

Stream Condition: Marginal

Photograph ID: 196

Survey Date: 2/8/2023

Reach Name: ST4-36-B

Stream Condition: Marginal

Client:	**James City County**	**Project:**	**203408987**
Site Name:	**JCC WSMP - Yarmouth Creek Watershed**	**Site Location:**	**James City County**

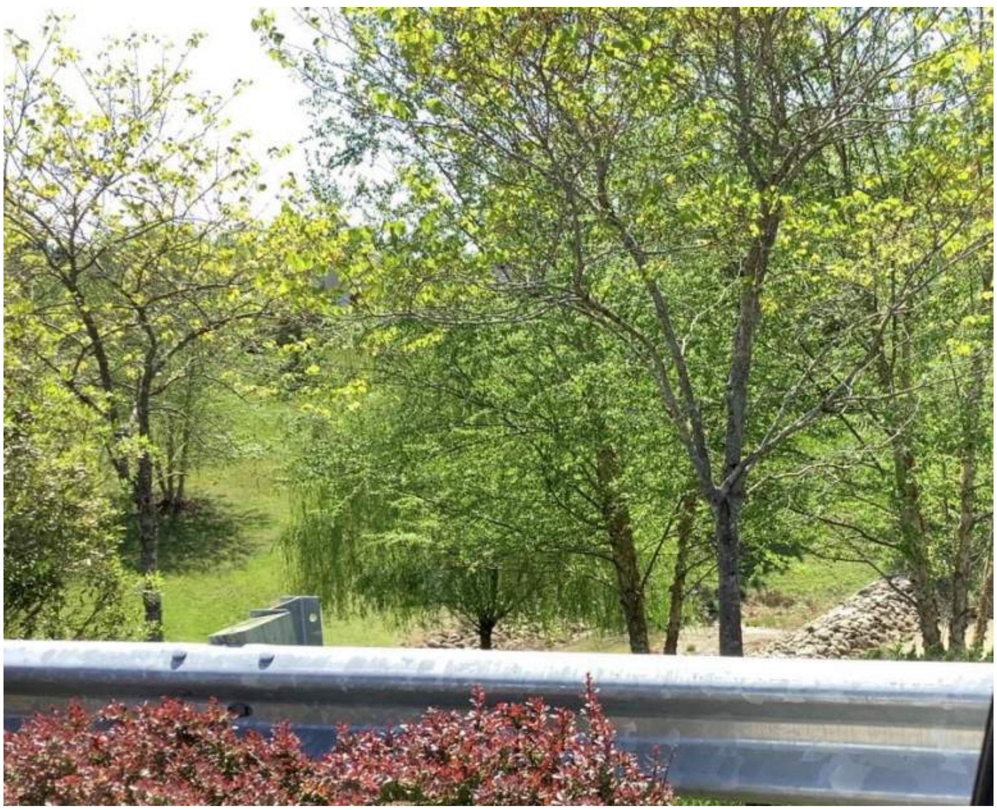
Photograph ID: 197 **Survey Date:** 2/8/2023 **Reach Name:** ST4-37-G **Stream Condition:** Marginal	
Photograph ID: 198 **Survey Date:** 2/8/2023 **Reach Name:** ST4-37-G **Stream Condition:** Marginal	

Client:	James City County	Project:	203408987
Site Name:	JCC WSMP - Yarmouth Creek Watershed	Site Location:	James City County

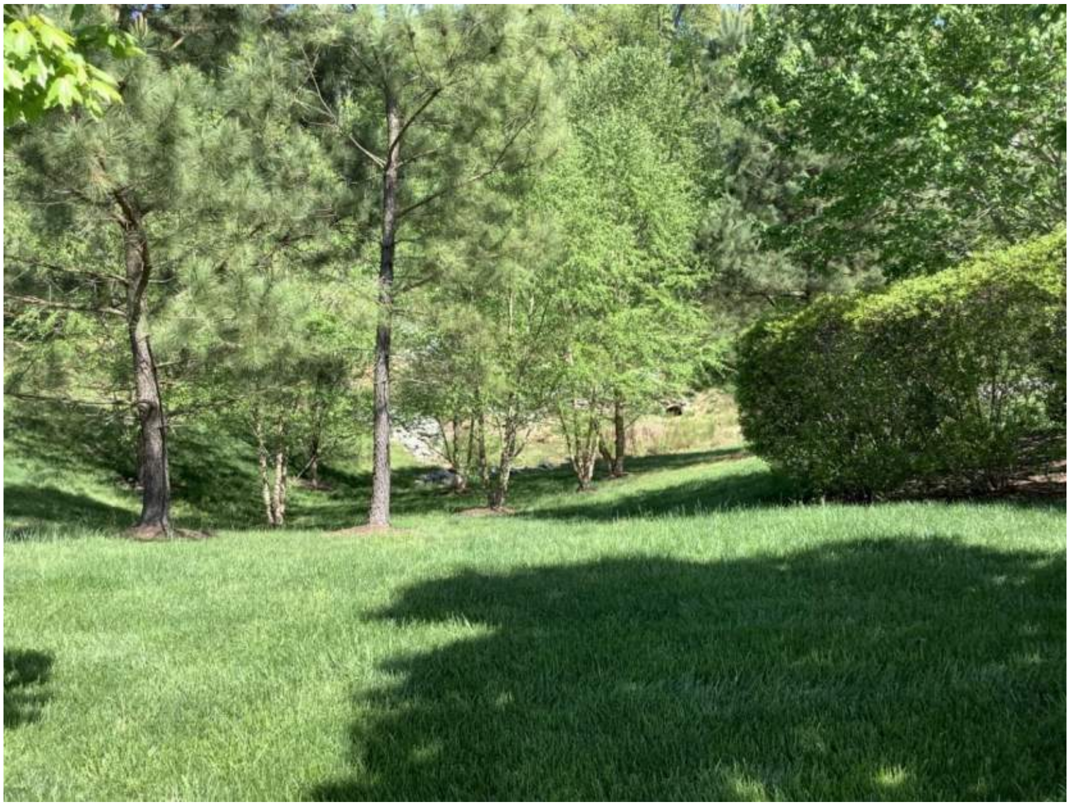
Photograph ID: 199 **Survey Date:** 2/8/2023 **Reach Name:** ST4-38-B **Stream Condition:** Marginal	
Photograph ID: 200 **Survey Date:** 2/8/2023 **Reach Name:** ST4-38-B **Stream Condition:** Marginal	

Appendix B Field Photographs – Upland Areas

BMP-YC039



BMP-YC038

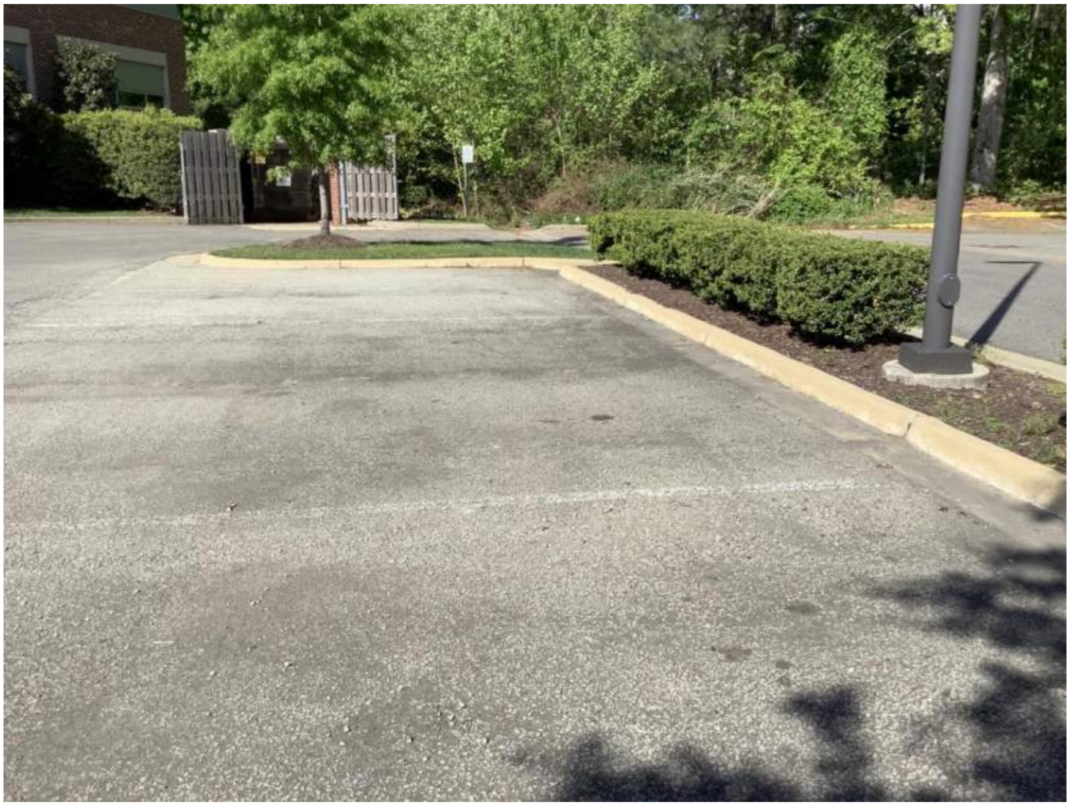


BMP-YC041

BMP-GC013

BMP-YC037

BMP-GC001

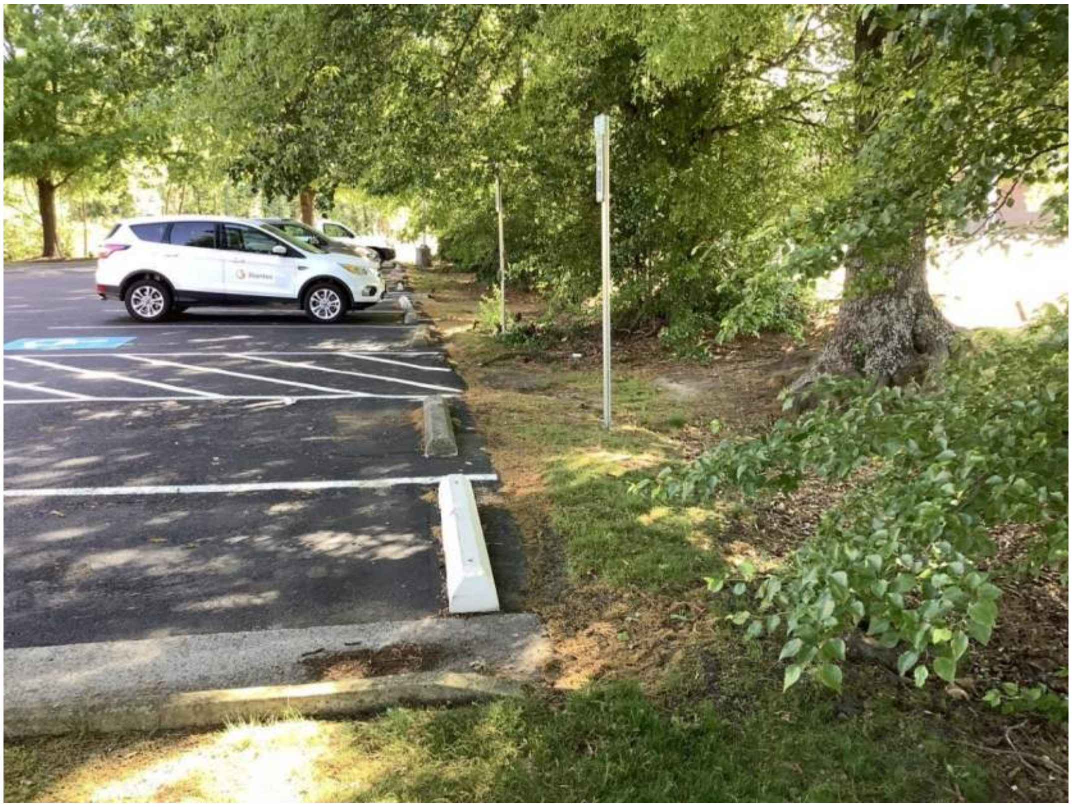


BMP-YC090

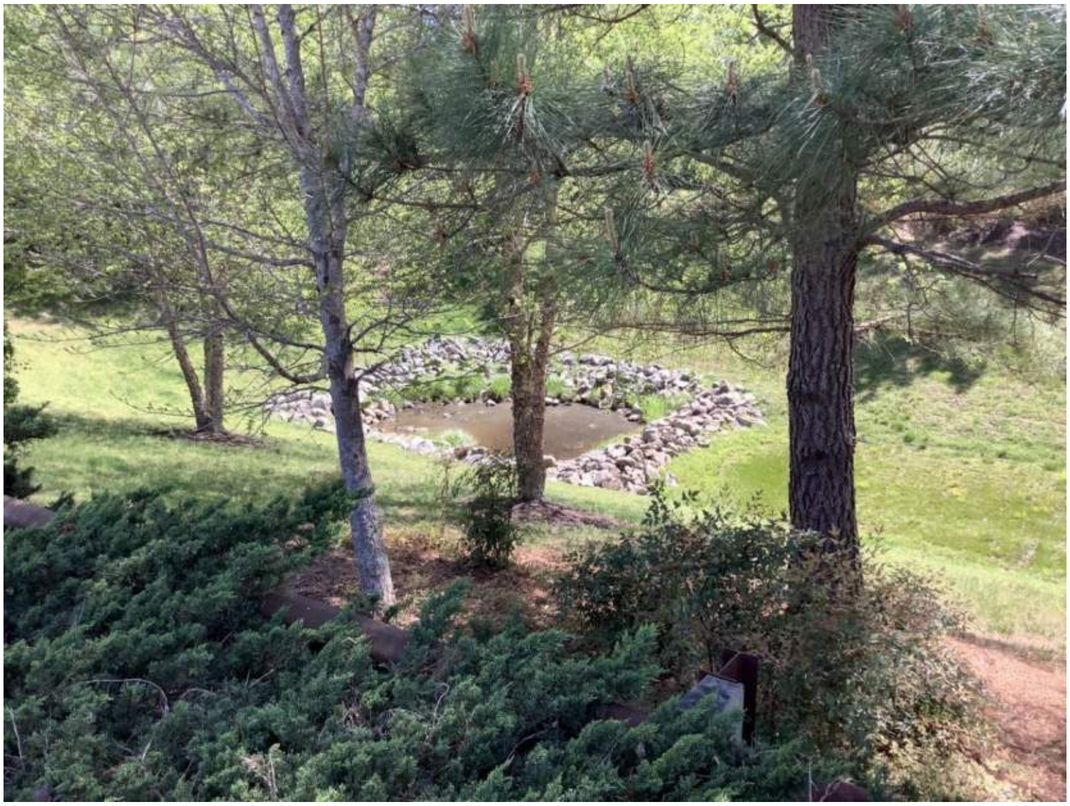
BMP-YC059

BMP-YC048

BMP-YC045



BMP-YC001

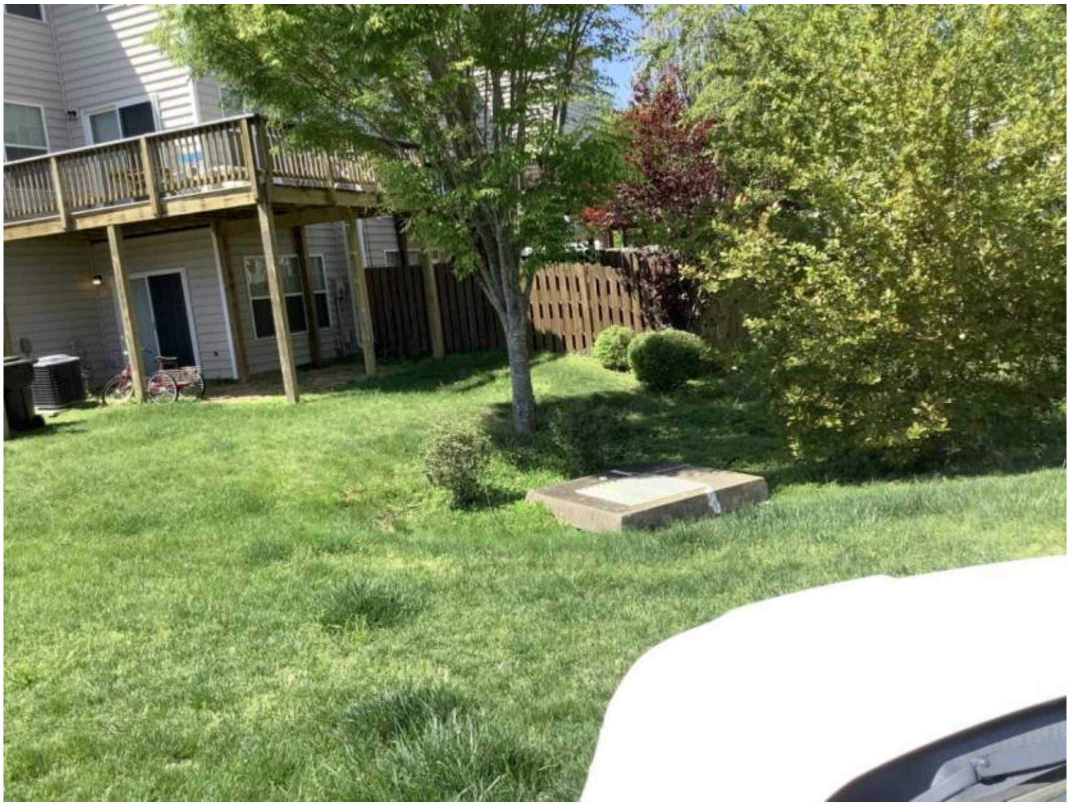


BMP-YC044

BMP-YC052

BMP-YC078

BMP-YC077



BMP-YC076

BMP-YC025

BMP-YC015

BMP-YC022

BMP-YC014

BMP-YC103

BMP-YC102

BMP-YC042

BMP-YC055

BMP-YC107

BMP-YC004 (Downstream Crossing at Cranston's Mill Pond Rd)

BMP-YC106

BMP-YC032

BMP-YC043

BMP-YC108

BMP-YC026

BMP-YC031

BMP-YC030

BMP-YC028

BMP-YC057

BMP-YC049

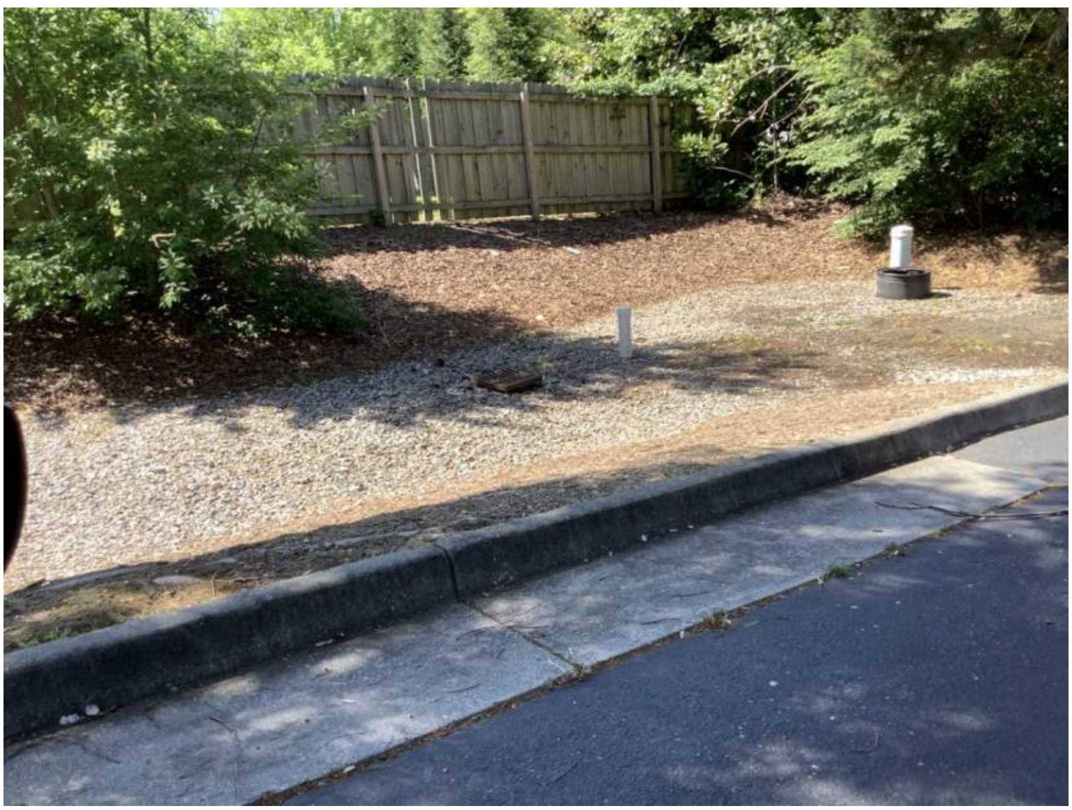
BMP-YC050

BMP-YC029

BMP-YC098

BMP-YC097

BMP-YC021



BMP-YC012

BMP-YC105

BMP-YC088

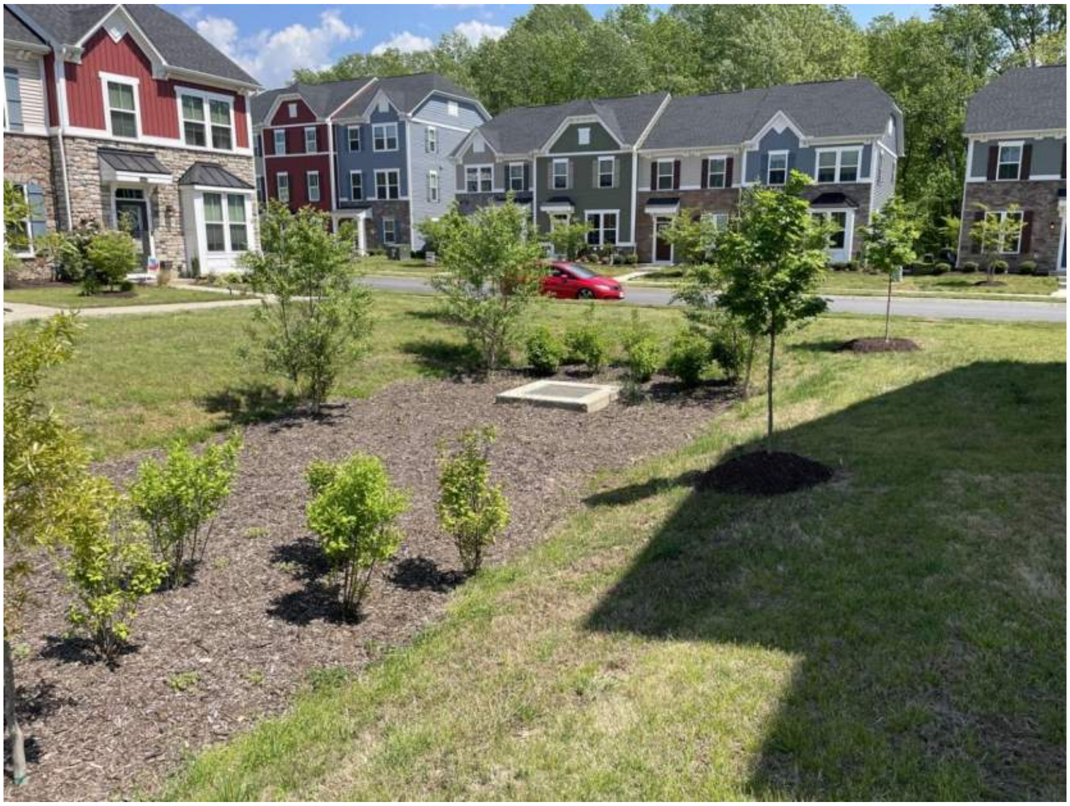
BMP-YC089

BMP-YC005

BMP-YC085

BMP-YC070

BMP-YC036



BMP-YC083

BMP-YC084

BMP-YC081

BMP-YC082

BMP-CR002

BMP-YC020

BMP-YC019

BMP-YR018

BMP-YC099

BMP-CR001

BMP-YR030

BMP-YC008

BMP-YC011

OPP-102-25

OPP-102-26

OPP-102-28

OPP-102-29

OPP-102-30

OPP-102-31

OPP-102-32

BMP-YC013

OPP-102-34

OPP-102-35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Decorative
Safety & Security

OPP-102-36

OPP-102-37

OPP-102-39

OPP-102-40

OPP-103-06

OPP-103-38

OPP-103-42

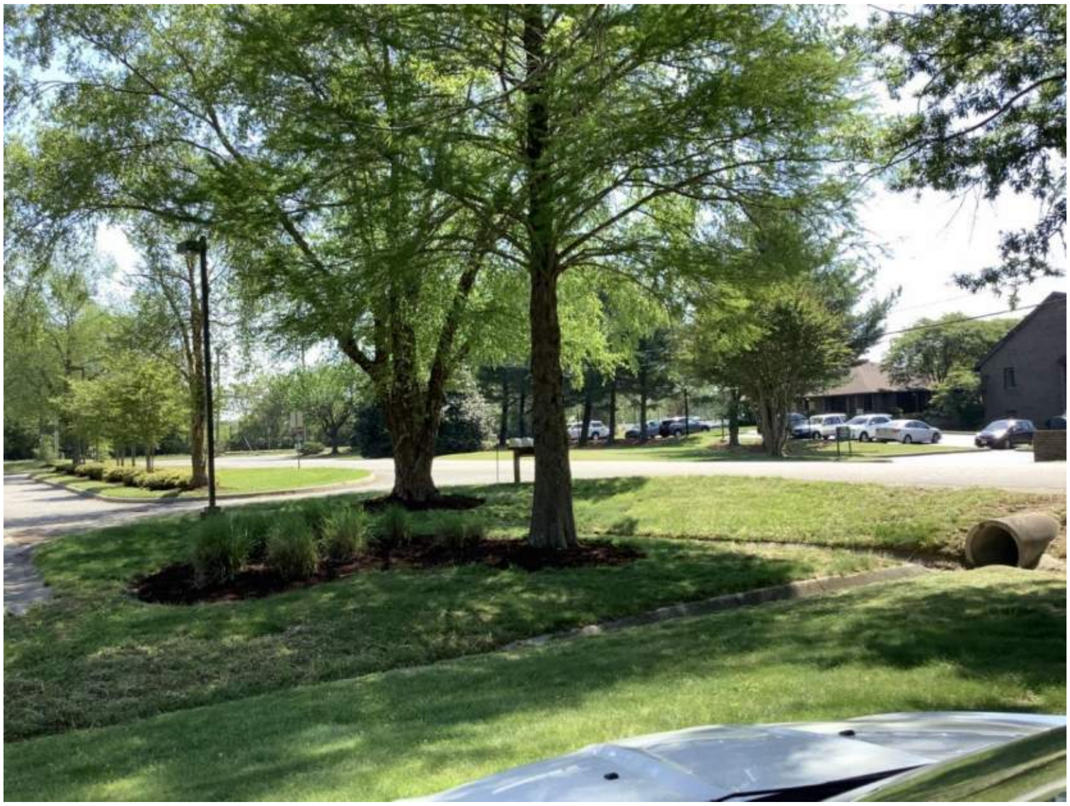
OPP-103-43

OPP-103-44

OPP-103-45

OPP-104-05

OPP-104-22



OPP-104-27

OPP-104-51

OPP-104-52

OPP-104-71

OPP-104-72

OPP-105-01

OPP-105-08

OPP-105-09

OPP-105-48

OPP-105-49

OPP-Chick-07a-d

OPP-Chick-15

OPP-Chick-16

OPP-Chick-17

OPP-Chick-18

OPP-Chick-19

OPP-LC-12

OPP-LC-13

OPP-LC-14

OPP-LC-20

OPP-LC-21

OPP-Nontidal-23

OPP-Nontidal-24

Appendix C Decision Support System

Appendix C: The Decision Support System from Skimino WSMP

Introduction

An essential component of any Watershed Management Plan and/or Stormwater Management Plan is the ability to identify, rank and prioritize potential retrofit and restoration opportunities. The goals of creating and using a DSS include:

- Provide an objective, yet technically accurate method of prioritizing projects.
- Provide a consistent ranking procedure for potential projects.
- Help to guide County Planning.

Various factors are taken into consideration with the development of a DSS, including the goals of the municipality in reference to stormwater control, water quality improvements, flooding issues, land use planning and regulatory requirements. The development of this tool, while informed by actual field data from JCC, can be tailored to meet the needs of any municipality depending on the goals of their management plans and the intrinsic environmental conditions at their location. Any DSS should be created with specific input from the personnel within the municipality that are intimately familiar with watershed and stormwater management activities and that will use the resulting DSS to prioritize and implement projects.

Decision Support System

By definition, a DSS is an information system that supports organizational decision-making activities. A well designed DSS allows decision makers to compile data, technical knowledge and other useful information to identify and solve problems and/or make decisions. For the purposes of this DSS, VHB has created a spreadsheet matrix that will allow JCC to rank and prioritize stormwater retrofit and stream restoration and enhancement / channel stabilization opportunities within the County's watersheds. The ultimate goal is to improve water quality throughout the County by addressing areas that are currently impacted through development as well as those that will be developed in the future.

Various examples of DSSs used in other municipalities were compiled and analyzed to determine what type of DSS structure would best suit the needs of JCC. In addition to the previously developed examples, VHB conferred with JCC on their specific goals in using such a system to rank and prioritize possible projects throughout the County.

Project Identification

Potential project sites may be identified through a variety of channels of information. Potential sources of project identifications may include:

- Citizen Requests
- Master Planning of County
- Regulatory Requirements (i.e. TMDL Implementation Plan)
- Results of Watershed Assessments
- Inspections of Facilities by County Personnel

The County may elect to use the existing Capital Improvement Project (CIP) Request Form, or create a form that is specific to the ranking criteria within the DSS.

Project Prioritization

The ability to identify potential water quality/stormwater improvement projects is an important aspect of a Watershed Management Assessment Program. Once potential project areas are identified, they must then be stratified using results of analyses of the field data collected by the specified methodology during an assessment. This stratification allows for the projects with the most potential for retrofit and/or restoration to be identified. Following stratification, the sites may then be ranked for funding and implementation. The criteria used in such a ranking procedure should be representative of the goals of the County and may be adjusted over time as new issues arise or priorities change. A DSS is the logical tool to use for the purposes of this final ranking. The benefits of having a dynamic DSS tailored for the County or even a specific (sub) watershed include the ability to address management issues that may be indicative of particular land use(s), pollutant(s) of concern, inadequate infrastructure and other sources of water quality degradation.

Consistency of ranking criteria allows for comparison between sites and determination as to which projects will provide the most improvement and should be implemented first. For the purpose of the JCC DSS, the possible benefits associated with the projects were derived from the goals for the Watershed Plans as well as the field data collected during the watershed assessment(s). These benefits are then assigned a numerical score according to the degree of improvement offered by the chosen treatment method on a particular site or stream reach. The degree of improvement is assessed as having either primary, secondary, supplemental or no benefit. Each project area that is included in the DSS is attributed values for eight (8) Prioritization Factors and eight (8) Possible Conflicts. The DSS spreadsheet located in Appendix A is designed such that project sites are prioritized based on the highest to lowest scores afforded by the sum of the Prioritization Factor scores (Ranking: Level of Benefit) minus the sum of the Possible Conflict scores (Ranking: Degree of Complexity).

For JCC, opportunities for watershed restoration activities were broken into two general categories:

1. Stream Restoration and/or Channel Stabilization
2. Stormwater Management Treatment Opportunities

Prioritization Factors

Prioritization Factors for both categories are scored based on the Prioritization Factor Weighting Table (Appendix A), though the methodology for how the scores are derived differs between the two types of watershed restoration activities. These methodologies are discussed below in relation to the watershed activity.

Stream Restoration and/or Channel Stabilization

The Prioritization Factors (i.e., potential watershed benefits) for Stream Restoration and/or Channel Stabilization opportunities include:

- Water Quality/Runoff Quantity:
    - Significant Improvements – Indicates a significant reduction in pollutant loading, and/or quantity of runoff entering the reach during storm events; may possibly aid in meeting TMDL pollutant reduction requirements (5 points)
    - Minimal - Creates a minor reduction in pollutant loading and/or runoff quantity (3 points)
    - None - Creates no reduction in pollutant loading and/or runoff (0 points)

- Restore Floodplain Connectivity
    - Significantly increase connectivity – restoration efforts provide for access to a floodplain (either historical or newly created) at bankfull and greater flow events (5 points)
    - Maintain Existing – minimal access to a floodplain at bankfull events, more access during higher flow events (3 points)
    - No increase in connectivity – no increase in floodplain access within the reach (0 points)

- Restore Aquatic Habitat
  - Significant Improvement - Improvements in aquatic habitat as measured by increased diversity in aquatic organism population (4 points)
  - Minimal Improvement – Minimal improvement of aquatic habitat due to slight reductions in pollutant loading and/or physical channel instability (2 points)
  - Maintain - Maintain existing quality of aquatic habitat (0 points)

- Reduce Sedimentation
  - Significantly Reduce – Significantly reduce amount of sediment entering watershed through streambank erosion and/or poor Erosion & Sedimentation Control (E&S) practices related to land disturbing activities within the watershed (4 points)
  - Slight Reduction – Minimal reduction in sedimentation due to little improvement to existing channel instability and/or lack of improvement of poor E&S practices within the watershed (2 points)
  - Maintain - No change in sedimentation within project reach (0 points)

- Project Size/Scope
  - Significant – Proposed project length would provide for maximum water quality benefit; several adjacent project stream reaches may be restored as one larger project (3 points)
  - Moderate – Project length is moderate and/or adjacent to unstable stream reaches not to be restored (2 points)
  - Minimal – Project length is minimal and/or adjacent unstable stream reaches not to be restored (1 point)

- Channel Condition
  - Project reach is severely incised and has eroding stream banks (4 points)
  - Project reach is moderately incised and has some eroding stream banks (2 points)
  - Minimal incision present with little to no eroding stream banks (0 points)

- Condition of Contributing Watershed – Three factors are taken into consideration for this ranking factor: Total Impervious Area (TIA), Pollution Severity Index (PSI; average of Neighborhood Source Assessment [NSA] sites), and Hotspot Site Investigation (HIS; average of sites)
  - Developed watershed (4 points):
    - TIA - >25%
    - PSI – Any severe
    - HIS – Any severe
  - Developing watershed (2 points):
    - TIA – 10% - 25%
    - PSI – Any high
    - HIS – Any confirmed
  - Undeveloped watershed (0 points):
    - TIA - <10%
    - PSI – All others
    - HIS – All others

- Increase Environmental Awareness
  - High - Significant public involvement (associated with project location and/or community involvement; (3 points)
  - Medium - Project provides educational opportunities (2 points)
  - Low - Nearby residents may be aware of project/benefits (0 points)

Of the Prioritization Factors noted above, scores for Water Quality/Runoff Quantity, Restore Floodplain Connectivity, Restore Aquatic Habitat, Reduce Sedimentation, Project Size/Scope and Channel Condition can be informed largely by field data collected during stream and floodplain assessment activities. Field efforts associated with the DSS, as well as a detailed discussion of the Stream Restoration and/or Channel Stabilization Prioritization Factor evaluation, weighting scheme and calculation are provided as Appendix C.

Stormwater Management Treatment Opportunities

The Prioritization Factors (i.e., potential watershed benefits) for Stormwater Management Treatment Opportunities include:

- Water Quality/Runoff Quantity: Improving water quality and decreasing runoff quantity (this ranking is determined by the total removal percentage of the stormwater management facility):
  - Significant Improvements (5 points) – Indicates a significant reduction in pollutant loading, and/or quantity of runoff entering the reach during storm events; may possibly aid in meeting TMDL pollutant reduction requirements; quantified as:
    - TSS >80%
    - TN[2] >50%
    - TP[1] >50%
    - NO_3 >40%
    - Runoff Volume[1] >50%
  - Minimal (3 points) - Creates a minor reduction in pollutant loading and/or runoff quantity; quantified as:
    - TSS 0% - 80%
    - TN[2] 0% - 50%
    - TP[1] 0% - 50%
    - NO_3 0% - 40%
    - Runoff Volume[1] 0% - 50%

[1] Percentages from Table 2, TM: Runoff Reduction Method, April 2008
[2] Percentages from Table 3, TM: Runoff Reduction Method, April 2008
[3] CWP, National Pollutant Removal Performance Database, version 3, September 2007

- None (0 points) - Creates no reduction in pollutant loading and/or runoff quantity; quantified as:
  - TSS 0%
  - TN[2] 0%
  - TP[1] 0%
  - NO_3 0%
  - Runoff Volume[1] 0%

- Restore Floodplain Connectivity
  - Decrease stormflow – stormflow entering the receiving waterbody is reduced by 70 to 100% (5 points)
  - Maintain Existing – stormflow is decreased by 40-70% (3 points)
  - Increase stormflow – stormflow entering the waterbody is decreased by less than 40% (0 points)

- Restore Aquatic Habitat – This topic is not applicable to the Stormwater Management Treatment Opportunities

- Reduce Sedimentation
  - Reduce (4 points) – Significantly reduce amount of sediment entering watershed through streambank erosion and/or poor Erosion & Sedimentation Control (E&S) practices related to land disturbing activities within the watershed; quantified for the stormwater treatment options as a percent of the Total Volume (Tv) captured:
    - 70% - 100%
  - Maintain (2 points) – Percentage of Tv capture required to maintain the existing condition:
    - 40% - 70%
  - Increase (0 points) – Sedimentation is assumed to increase if the Tv is <40%

- Project Size/Scope
  - Significant (3 points) – The percentage of the sub-watershed that is included in the drainage being treated is >20%
  - Moderate (2 points) – The percentage of the sub-watershed that is included in the drainage being treated is 1% - 20%
  - Minimal (1 point) – The percentage of the sub-watershed that is included in the drainage being treated is <1%

- Channel Condition
  - Downstream of stormwater facility is severely incised and has eroding stream banks (4 points)
  - Downstream of stormwater facility is moderately incised and has some eroding stream banks (2 points)
  - Downstream of stormwater facility has minimal eroding stream banks (0 points)

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[1] Percentages from Table 2, TM: Runoff Reduction Method, April 2008
[2] Percentages from Table 3, TM: Runoff Reduction Method, April 2008
[3] CWP, National Pollutant Removal Performance Database, version 3, September 2007

- Condition of Contributing Watershed: (Same as for stream projects)
    - Developed watershed (4 points):
        - TIA – >25%
        - PSI – Any severe
        - HIS – Any severe
    - Developing watershed (2 points):
        - TIA – 10% - 25%
        - PSI – Any high
        - HIS – Any confirmed
    - Undeveloped watershed (0 points):
        - TIA – <10%
        - PSI – All others
        - HIS – All others

- Increase Environmental Awareness
    - High (3 points) - Significant public involvement (associated with project location and/or community involvement); In close proximity to a school, community center or other educational opportunity
    - Medium (2 points) - Project provides educational opportunities; In close proximity to parks or pedestrian routes with potential for signage
    - Low (1 point) - Nearby residents may be aware of project/benefits; near commercial or industrial area with limited visibility

Possible Conflicts

Once the potential benefits associated with improving a particular stream reach or stormwater facility through one of the Proposed Treatments are defined and ranked appropriately for a given site, the constraints or conflicts are then taken into consideration. The constraints that are included in the JCC DSS were derived from the Retrofit Reconnaissance Inventory (RRI) data forms used by the CWP and are applicable to Stream Restoration and/or Channel Stabilization as well as the various Stormwater Management Treatment Opportunities.

The Possible Conflicts include:

- Conflicts with Existing Utilities
    - Significant (5 points) – Utilities will greatly impact project design and may require expensive relocation
    - Minimal (3 points) – Utilities are present in the project area and may constrain project design
    - None (0 points) – Utilities not present in the project area

- Construction Access
    - Major Restrictions (5 points) – Construction access will require creating roads with impacts to sensitive areas; no stockpile areas near site

- Minimal Restrictions (2 points) – Some impact to landscaped areas will be required; limited stockpile areas
- No Restrictions (0 points) – Site is open/there is access with paved surface; stockpile areas are available near the project site

- Neighborhood Impact
  - Dense Development (4 points) – Residential areas adjacent to site with easy access; Potential for standing water, mosquitoes, or safety issues
  - Some Development (2 points) – Residential areas at some distance/site can be fenced; shallow water with safety bench, gentle slopes, fenced
  - Open Space (0 points) – Site is either in open space or commercial or industrial land use with no nearby residential area; Project will not result in standing water

- Physical Feasibility
  - Poor (3 points) – Site constraints limit feasibility of project
  - Fair (2 points) – Some limitation, but project is feasible
  - Good (1 point) – Little to no limitations on site

- Level of Design
  - Major (4 points) – Significant level of effort required for project design
  - Moderate (2 points) - Reasonable level of effort required
  - Minor (0 points) – Minimal level of effort required

- Private Property
  - No Interest (5 points) – Site is entirely on private property and owners have no interest in project
  - Moderate Interest (3 points) - Site is either on private property with some owner interest or site is on publicly owned land currently in other uses
  - High interest (0 points) – Site is either on private property with actively interested owners or site is on publicly-owned land available for the project

- Possible Permitting Factors
  - Major (5 points) – Wetland, Forest, and/or Waters of the U.S. impacts will be incurred and permits will be required
  - Moderate (3 points) – Wetlands are present but there will be no impacts associated with construction; Some tree removal will be necessary, and tree replacement will be required
  - Minor (0 points) – No impacts will be incurred resulting in additional permits being required

- Negative Environmental Impacts
  - Major (4 points) – Implementation of the proposed treatment for a particular project reach would have significant negative environmental impacts
  - Moderate (2 points) – Implementation of the proposed treatment for a particular project reach would have minimal negative environmental impacts
  - Minor (0 points) – Implementation of the proposed treatment for a particular project reach would not have negative environmental impacts

Implementation

The County may use the DSS to prioritize projects identified through watershed assessments as well as other methods. Following this ranking of potential retrofit and/or restoration sites, the County may elect to implement the highest ranked project(s) based on available funds. Issues, other than funding, that should be considered include:

- Relevancy of a project to a larger County or watershed goal, such as implementation of the TMDL plan.
- Coordination of a particular project with other on-going projects – such as stream restoration work adjacent to a culvert replacement.
- Limits of project boundaries need to be clearly defined to avoid redundancy and overlap.
- Project sequencing should be considered to maximize potential benefits and not jeopardize previously completed sites.
- Coordination between projects and County Departments should result in potential cost reduction, minimization of environmental and social impacts, and streamlining of the project implementation process.

While the DSS was carefully developed to act as a universal tool and not be watershed-specific, the values assigned to each category of benefit and constraint may be amended somewhat according to the feedback gleaned from initial prioritization efforts.

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Carla T. Brittle, Tourism and Centers Administrator

SUBJECT: Support of the Virginia American Revolution 250 Commission

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The Virginia American Revolution 250 Commission (VA250) was created by the General Assembly in 2020 for the purpose of commemorating the 250th Anniversary of the American Revolution, the Revolutionary War, and the independence of the United States in the Commonwealth of Virginia. The primary goal of the Commission is to convene and facilitate a multi-year series of robust events, including three national signature events annually through 2026 and dozens of Virginia-specific signature events that mark key anniversaries and events across every corner of the state.

In an effort to offer more programming and to better engage with citizens, the Commission has requested each locality in Virginia to form a local committee to support their efforts.

Staff recommends approval of the attached resolution to support the Virginia American Revolution 250 Commission and to establish the local James City County committee to aid in the planning for the commemoration period.

CTB/ap
SupVAAmRev250-mem

Attachment

R E S O L U T I O N

SUPPORT OF THE VIRGINIA AMERICAN REVOLUTION 250 COMMISSION

WHEREAS, the Virginia American Revolution 250 Commission (VA250) was created in 2020 by the General Assembly for the purpose of preparing for and commemorating the 250th Anniversary of Virginia's participation in American independence; and

WHEREAS, the VA250 has requested that each locality form a local committee to aid in the planning for the commemoration period; and

WHEREAS, the committee will coordinate programs occurring within the locality and communicate regularly with the VA250; and

WHEREAS, the Board of Supervisors wishes to undertake this endeavor with the VA250 to promote and commemorate this important historic milestone.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, hereby desires to support the Virginia American Revolution 250 Commission and its efforts to commemorate the 250th Anniversary of Virginia's participation in the American independence.

____
Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

____
Teresa J. Saeed
Deputy Clerk to the Board

	VOTES			
	AYE	NAY	ABSTAIN	ABSENT
NULL	____	____	____	____
HIPPLE	____	____	____	____
MCGLENNON	____	____	____	____
ICENHOUR	____	____	____	____
LARSON	____	____	____	____

Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

SupVAAmRev250-res

M E M O R A N D U M

DATE: January 23, 2024

TO: The Board of Supervisors

FROM: Scott A. Stevens, County Administrator

SUBJECT: Interim Agreement for New Consolidated Government Center

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At the November 14, 2023, Board of Supervisors Regular Meeting, the Board directed the County Administrator to negotiate an interim agreement with Henderson, Inc. and Gilbane Building Company with the intent of moving forward with the construction of a new consolidated government center located at 5231 Longhill Road. The proposed site plan and building design would also include a parking structure and an approximately 60,000-square-foot building addition to the government center that would potentially house the Williamsburg-James City County School Administration function. Funding for this phase of the project has been previously allocated in the Fiscal Year (FY) 2024 Capital Improvements Program (CIP) for this purpose. County staff has negotiated an interim agreement that will take the design of the facility up to a 30% completion status along with initial site testing and required surveys. Part of the design process will include soliciting input from our residents, County staff, and elected officials to finalize the site plan, building schematic, and architectural design. If the County chose to move to the construction phase, a comprehensive agreement to complete the design and construction would be negotiated and brought before the Board of Supervisors for approval. The cost for the services provided under the interim agreement shall not exceed $4,450,000. Funding for this phase of the project was previously approved in the FY2024 CIP for this purpose.

Staff recommends adoption of the attached resolution.

SAS/md
IntrmAgrConsGCtr-mem

Attachment

R E S O L U T I O N

INTERIM AGREEMENT FOR NEW CONSOLIDATED GOVERNMENT CENTER

WHEREAS, the James City County Board of Supervisors (the "Board"), on November 14, 2023, directed the County Administrator to negotiate an interim agreement for the design of a consolidated government center (the "Project"); and

WHEREAS, James City County selected Henderson, Inc., a Virginia stock corporation ("Henderson") and Gilbane Building Company, a Virginia stock corporation ("Gilbane"), jointly and severally, hereinafter ("HGJV"), as the primary partners in this project; and

WHEREAS, the interim agreement will require the County to pay HGJV an amount not to exceed $4,450,000 for a partial design plan, site testing, and surveys; and

WHEREAS, funds were previously allocated in the County's Fiscal Year 2024 Capital Improvements Program to cover this expense; and

WHEREAS, the Board desires the County to enter into an interim agreement with Henderson, Inc. and Gilbane.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of James City County, Virginia, does hereby authorize and direct the County Administrator to execute those documents necessary to enter into an interim agreement with HGJV for a partial design plan, site testing, and surveys for a new consolidated government center.

____
Ruth M. Larson
Chairman, Board of Supervisors

ATTEST:

____
Teresa J. Saeed
Deputy Clerk to the Board

VOTES	AYE	NAY	ABSTAIN	ABSENT
NULL	____	____	____	____
HIPPLE	____	____	____	____
MCGLENNON	____	____	____	____
ICENHOUR	____	____	____	____
LARSON	____	____	____	____

Adopted by the Board of Supervisors of James City County, Virginia, this 23rd day of January, 2024.

IntrmAgrConsGCtr-res