



From the desk of April N. Bingham, Director
City of Richmond Department of Public Utilities
730 East Broad Street, 6th Floor, Richmond, VA 23219

November 1, 2022

The Honorable Michael Rolband, Director
Virginia Department of Environmental Quality
1111 East Main Street, Suite 1400, Richmond, VA 23219

Subject: City of Richmond 2022 Combined Sewer System General Assembly Report

Dear Mr. Rolband:

In accordance with Virginia Senate Bill 1064 ([Acts of Assembly Chapter 634, 2020](#)), the City of Richmond is pleased to submit this report on the efforts it has undertaken to address the Interim and Final Plans for its combined sewer system. This report demonstrates that the City will meet the obligations the General Assembly intended, and in doing so, will provide central Virginia with cost-effective engineered solutions that will further protect and enhance the environment, and, in particular, the vitally important James River.

The City is conducting ongoing operation and maintenance enhancements, implementing projects identified in the Interim Plan, and developing the Final Plan as required by SB 1064. These activities are taking place simultaneously, requiring the City to apply tremendous resources of both funding and staff. As the City of Richmond advances these major projects in the face of workforce issues and logistical and supply chain challenges, we are, at the same time, capturing efficiencies to ensure there is a significant and clear benefit to the environment and the James River.

This 2022 General Assembly Report will provide updates on:

- Interim Plan implementation status
- Final Plan development status
- Other ongoing projects
- Community engagement and outreach
- Costs and funding sources, as specified in the SB 1064 reporting requirements
- Future outlook

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COLOR KEY

Throughout this report, **Interim Plan** projects and processes are indicated in green, **Final Plan** projects and processes are indicated in blue, and other **CSS Operations and Maintenance** projects are indicated in orange.



Federal Lawmakers tour the 35 million gallon (MG) Shockoe Retention Basin on January 28, 2022.
Pictured left to right: U.S. Senator Tim Kaine, EPA Administrator Michael Regan,
Congressman Donald McEachin



Richmond City Councilmembers tour the 35 MG Shockoe Retention Basin on May 2, 2022.
Pictured left to right: 2nd District City Councilmember Katherine Jordan,
DPU Director April N. Bingham, 3rd District City Councilmember Ann-Francis Lambert

SECTION A: BACKGROUND

Richmond's combined sewer system
is the **largest in Virginia.**

Parts of the City's sewer system are over 150 years old and were designed as a combined sewer system (CSS). In the CSS, the pipes were constructed to transport wastewater and stormwater, with the vast majority being stormwater. As a result, the CSS can become overwhelmed during wet weather conditions.

Richmond's CSS area covers 19 square miles and includes 25 combined sewer outfalls. During storm events, there can be overflows from these outfalls. Overflows are primarily stormwater but can contain small amounts of wastewater. The City has made significant strides in reducing the number and volume of these overflows as reflected in this report. This report does not detail the City's significant efforts to address other water quality matters, like the Chesapeake Bay TMDL, which is not related to the CSS.

Since 1988, the City of Richmond and the Commonwealth of Virginia have invested more than \$300 million for projects to address the CSS to provide cleaner water for our community.

Improvements to the City's CSS are complicated projects that must be carefully engineered and implemented. To date, the City's efforts have improved the Combined Sewer Overflow (CSO) capture rate to approximately 91%. This means that the amount of CSO entering the James River has been reduced by more than 3 billion gallons annually. SB 1064, approved by the Virginia General Assembly in 2020 (Acts of Assembly Chapter 634), requires the City to undertake additional projects, identified in an Interim and Final Plan and to be completed by 2035.

The completion of the Interim Plan projects by 2027 will further reduce approximately 182 million gallons of CSO, thereby increasing the CSO capture rate to 92%. The bulk of the remaining CSO comes from the Shockoe outfall. Given the size of the drainage area (12.5 square miles) and its significant infrastructure, addressing it will be engineering and cost intensive. The Final Plan will address additional CSO.

The City of Richmond remains steadfast in its commitment to meeting the obligations established by SB 1064. In 2022, the Richmond City Council adopted [Resolution No. 2022-R025](#) expressing its support for prioritizing improvements to the CSS.

Figure 1. Project Timeline

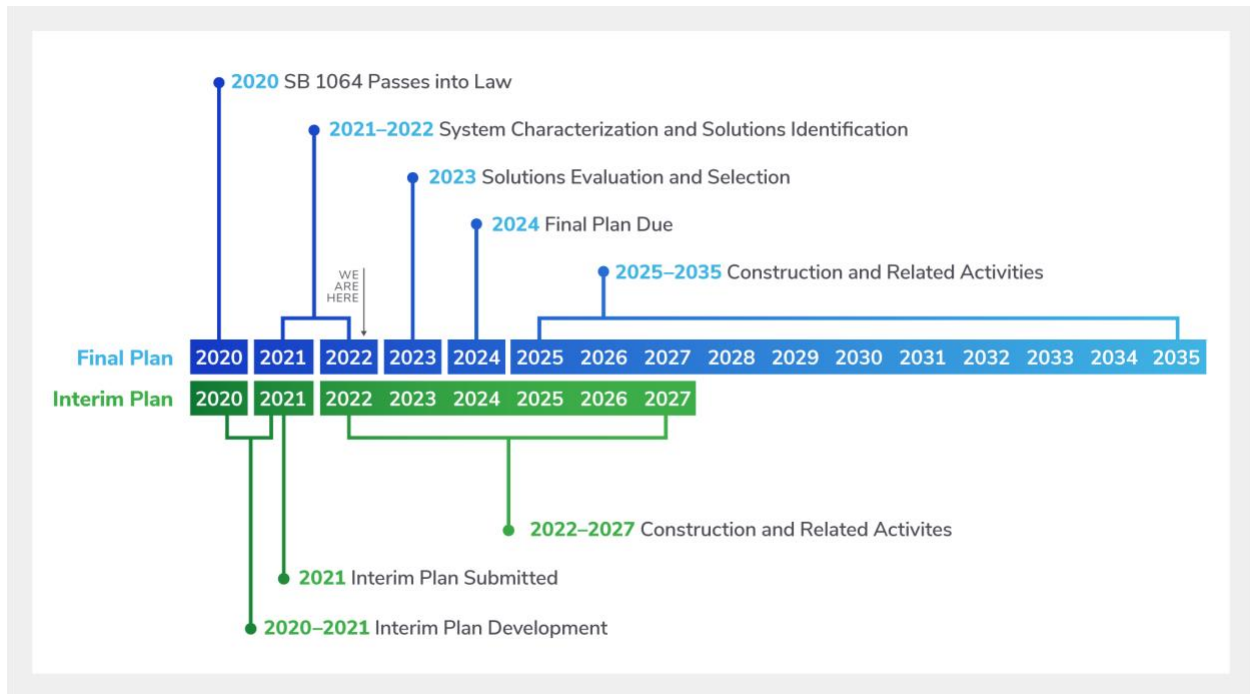
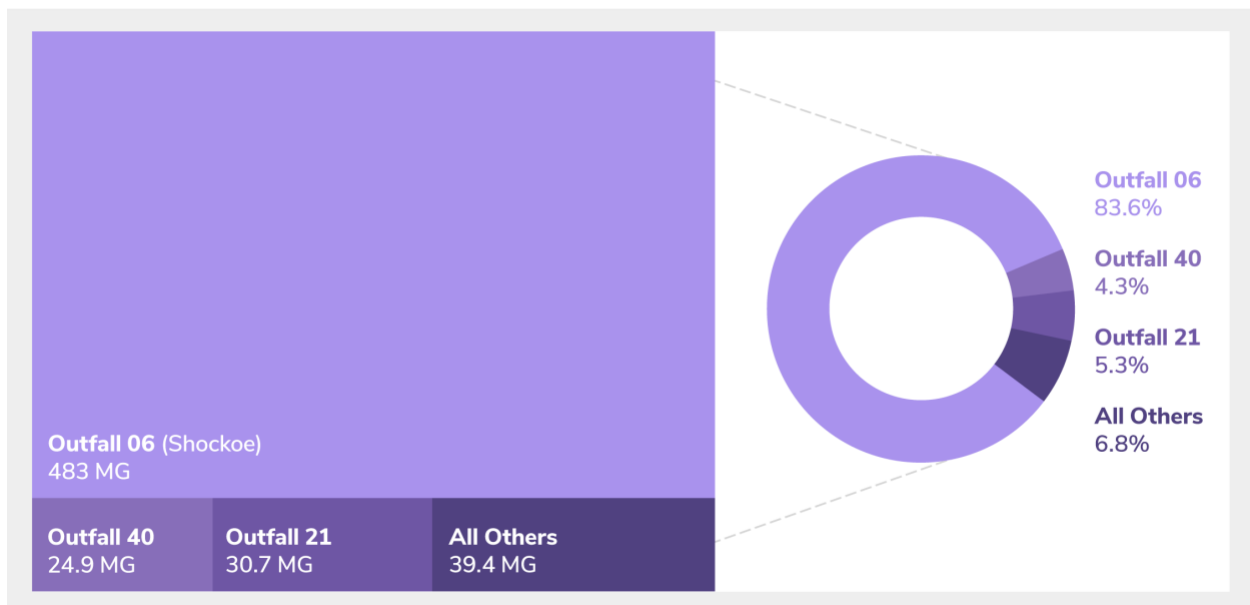
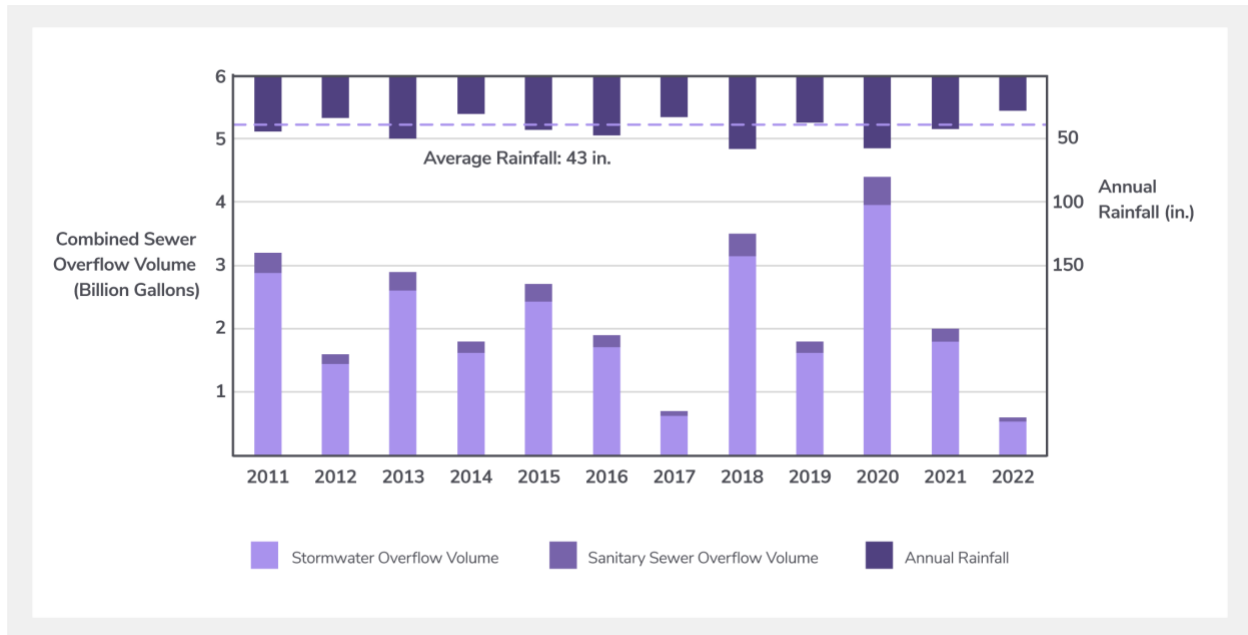


Figure 2. 2022 YTD Combined Sewer Overflow Volume



Outfall 06 in Shockoe has accounted for more than 80% of CSO volume in 2022 and will be the focus of the Final Plan.

Figure 3. 2011–2022 YTD Combined Sewer Overflow Compared to Annual Rainfall



More than 90% of annual CSO volume is stormwater. The rainfall in the CSS (43 inches annually on average) would flow into the James River even if Richmond did not have a CSS.

SECTION B: INTERIM PLAN IMPLEMENTATION STATUS

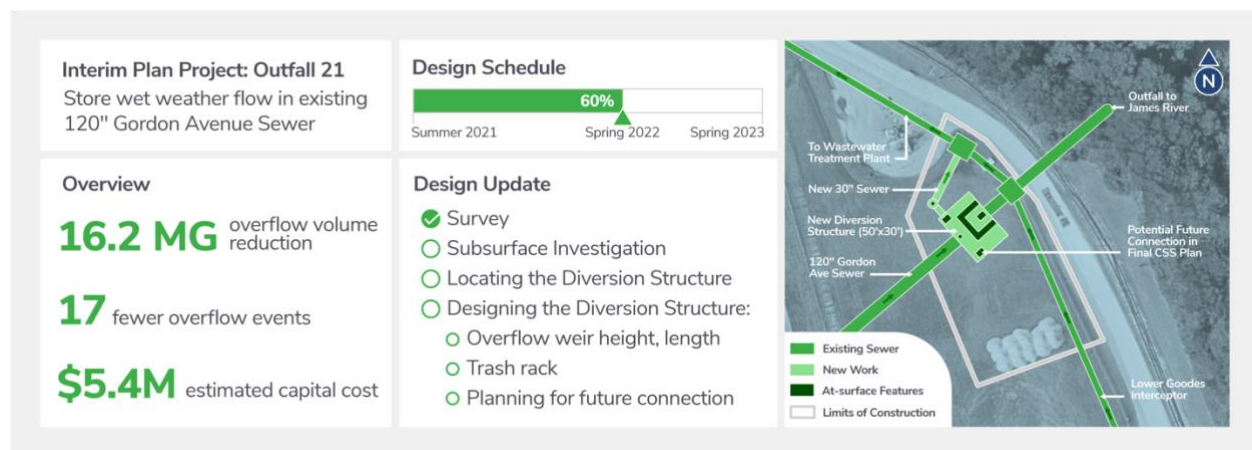
Interim Plan implementation is currently underway,
tackling issues that can be swiftly addressed.

The City submitted the [Interim Plan](#) by the SB 1064 July 1, 2021 deadline. It identifies 10 projects with an estimated \$33.3 million cost. The City initiated construction and related activities by the July 1, 2022 deadline.

Interim Plan Due Date	Initiate Construction and Related Activities	Complete Construction and Related Activities
 July 1, 2021	 July 1, 2022	 July 1, 2027

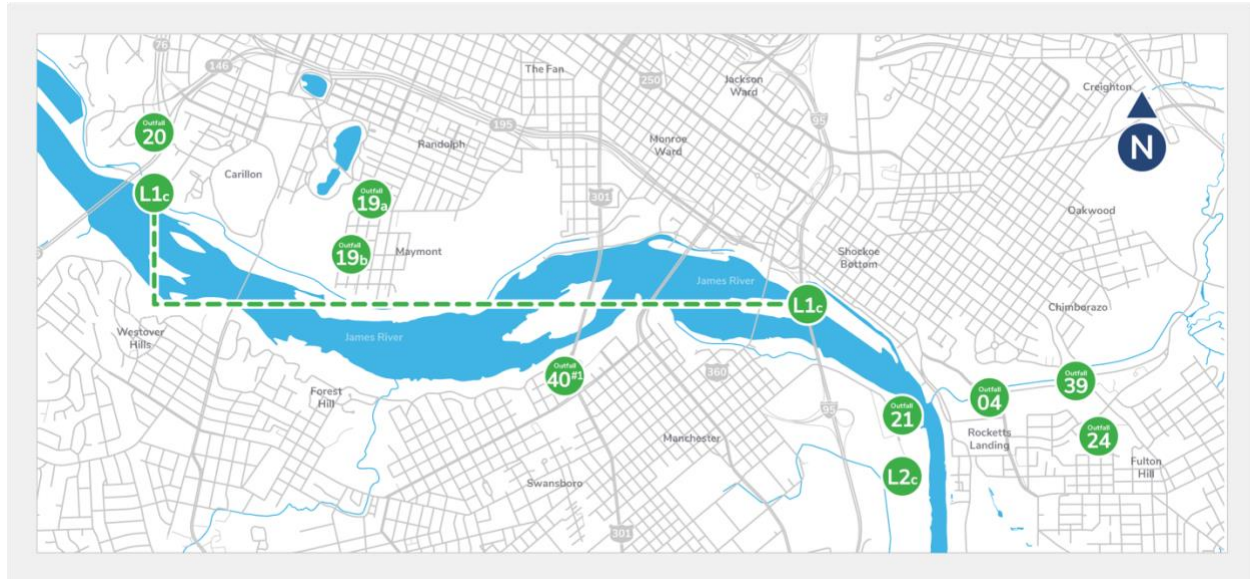
The projects will be completed on or before the July 1, 2027 completion deadline and will reduce approximately 182 million gallons of the remaining 1.9 billion gallons of annual CSO from overflowing into the James River. This will increase the City's capture rate from 91% to 92%. Additional overflow is being addressed in the Final Plan.

The 10 projects feature the utilization of a new real-time decision support system (RT-DSS) that will be informed by real-time system monitoring data. This system will provide the City with the ability to adjust operations during wet weather events based on current and expected system operating conditions. These adjustments will optimize the use of the existing infrastructure and facilities. This means that the City can direct the combined sewer flows to available storage areas and shut off discharges from certain areas to better control where and when the discharges occur and to reduce CSO.



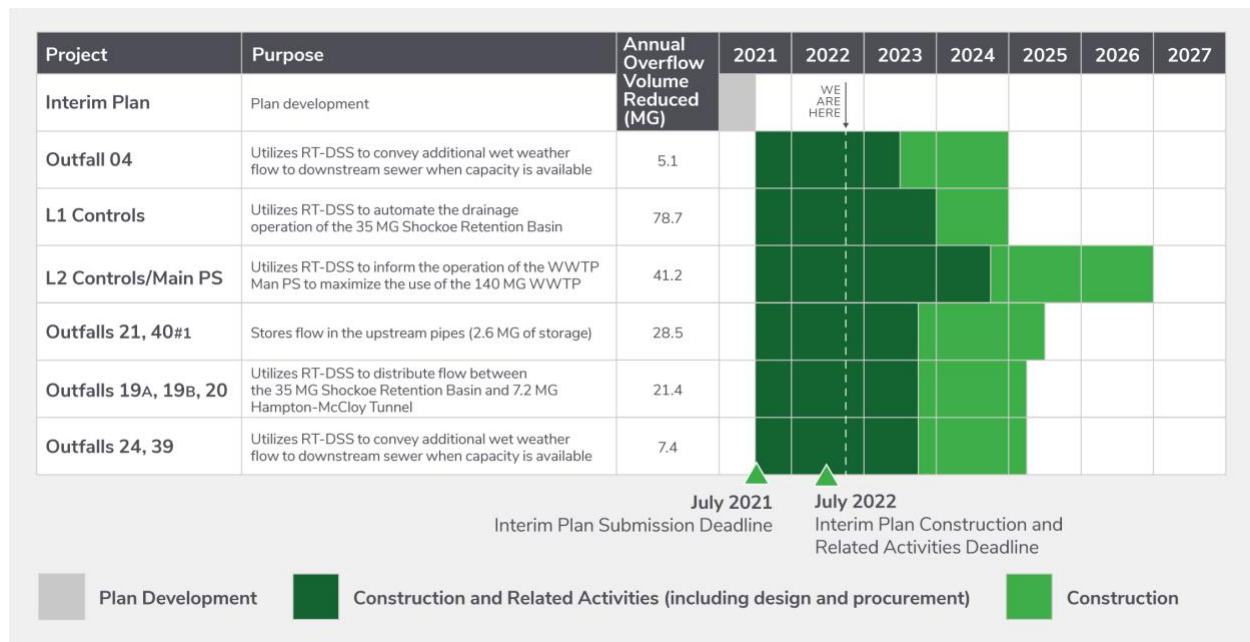
An example of a status update: CSO 21 Interim Plan project

Figure 4. Interim Plan Project Locations



This map illustrates the locations of the 10 Interim Plan projects.

Figure 5. Interim Plan Project Implementation Schedule



This chart provides a summary of the implementation schedule for all Interim Plan projects.

SECTION C: FINAL PLAN DEVELOPMENT STATUS

The Final Plan will identify projects to **meet or exceed** the performance goals established in SB 1064.

The required Final Plan deadlines are provided below:

Final Plan Due Date	Initiate Construction and Related Activities	Complete Construction and Related Activities
<input type="radio"/> July 1, 2024	<input type="radio"/> July 1, 2025	<input type="radio"/> July 1, 2035

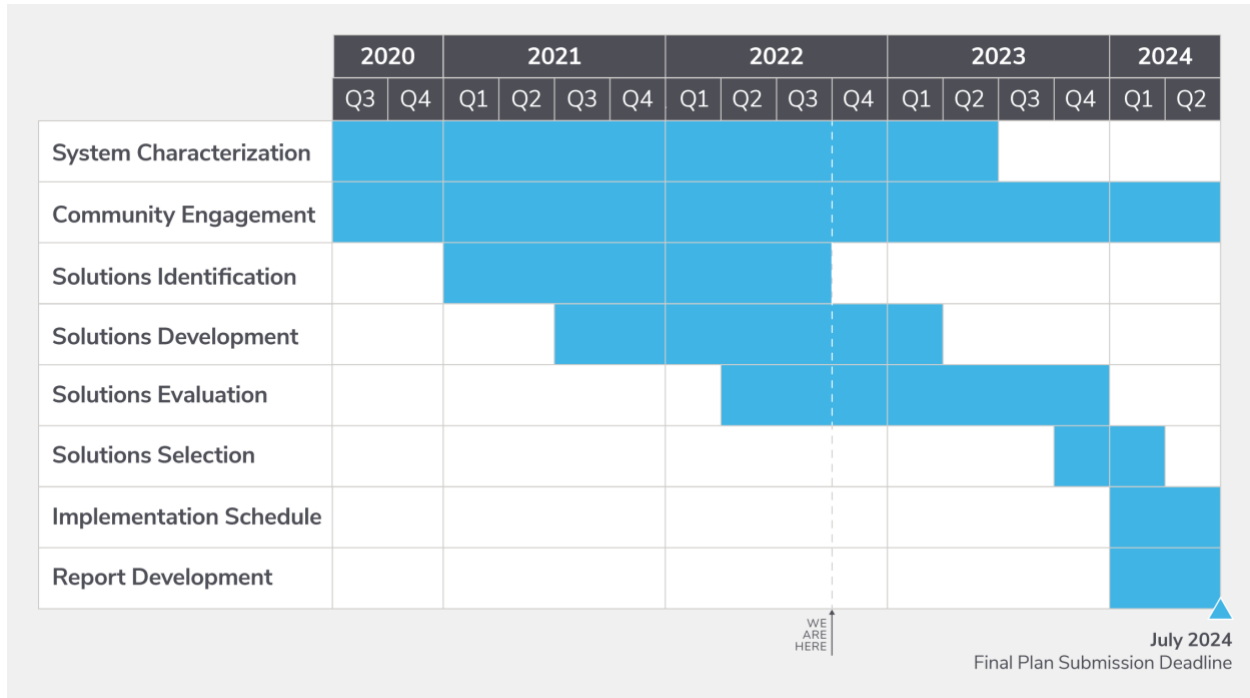
Since the passage of SB 1064, the City of Richmond's technical experts have been developing a cost-effective plan to be submitted on or before July 1, 2024. The Final Plan will identify solutions and provide an implementation schedule. Solutions currently under consideration include large-diameter conveyance tunnels, storage facilities, and high-rate wet weather treatment facilities.

Figure 6. Richmond's 14-ft Diameter Hampton-McCloy Tunnel



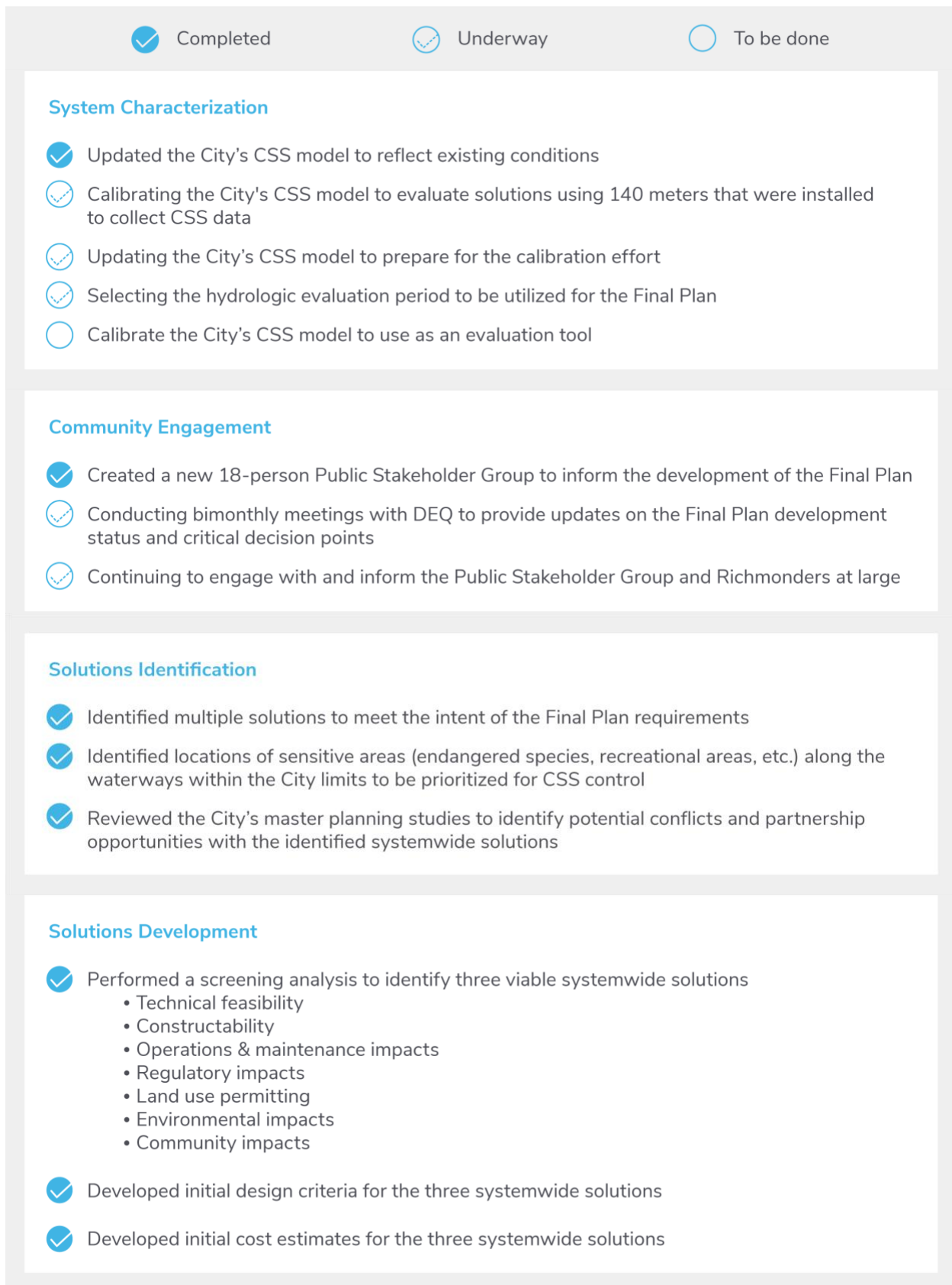
The Final Plan will likely include a new tunnel larger than the Hampton-McCloy Tunnel shown here.

Figure 7. Final Plan Development Timeline



This chart provides a summary of the Final Plan development schedule.

Figure 8. Final Plan Development Status



Solutions Evaluation

- ☒ Conducting a preliminary level of control analysis to better understand the relationship between the estimated program cost and performance
- ☒ Developing project scoring criteria in coordination with the Public Stakeholder Group
- ☐ Utilize the City's calibrated model for the following:
 - Evaluate the performance of the three systemwide solutions
 - Update the level of control analysis
 - Perform a climate change sensitivity analysis for the three systemwide solutions
- ☐ Conduct water quality modeling to evaluate the water quality improvements associated with the three systemwide solutions

Solutions Selection

- ☐ Compare the three systemwide solutions to the remaining Special Order projects
- ☐ Select the projects to be implemented in the Final Plan

Implementation Schedule

- ☐ Conduct a financial capability and affordability assessment to evaluate the City's options for financing the Final Plan projects
- ☐ Develop an implementation schedule for the selected projects
- ☐ Develop an Operation and Maintenance Plan for the selected projects
- ☐ Develop a Post Construction Monitoring Plan for the selected projects

Report Development

- ☒ Developing the Final Plan to be submitted

SECTION D: CSS OPERATIONS AND MAINTENANCE PROJECTS AND IMPLEMENTATION STATUS

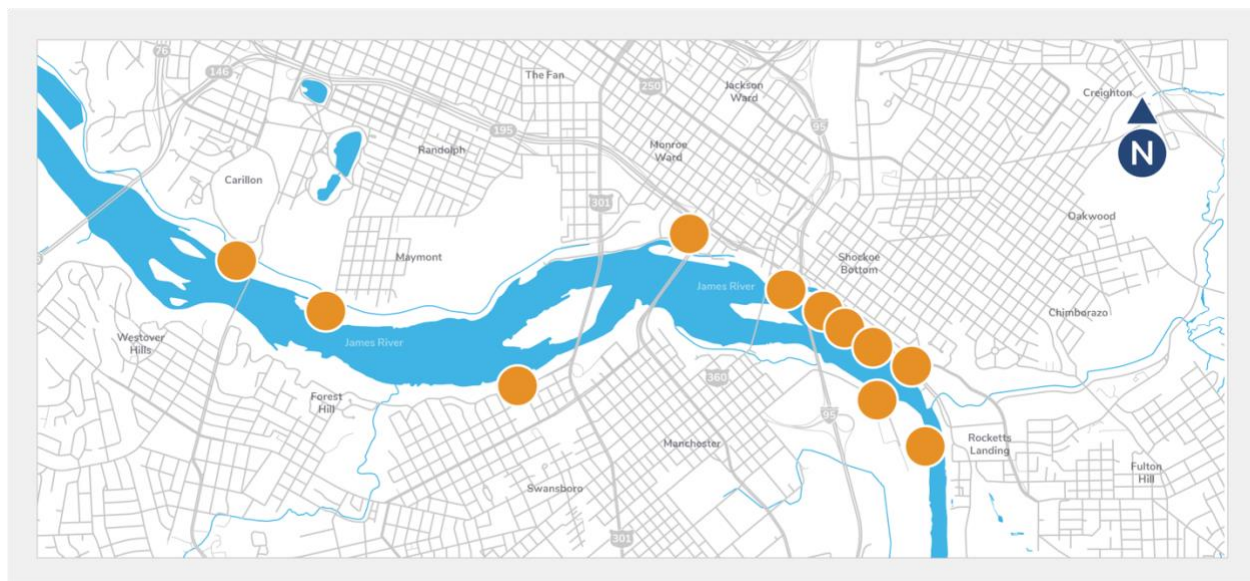
In addition to the Interim and Final Plans, the City is implementing **several other projects** not required by SB 1064 to maintain and improve CSS performance.

Shockoe Facility Projects: The Shockoe outfall (#06) is the largest outfall operated by the City and accounts for over 80% of the City's annual overflow volume. Several projects are being completed in or around the Shockoe Facilities to improve the performance of the system.

Wastewater Treatment Plant (WWTP) Improvements: With the recent upgrades in 2020, the WWTP is now capable of treating up to 140 million gallons per day (MGD) in wet weather. The performance of the City's WWTP is critical to the performance of the CSS. The City is in the process of conducting significant upgrades to improve WWTP operations and the reliability of the 140 MGD treatment during wet weather.

Regulator and Outfall Improvements: The City's CSS contains 25 outfalls and 40 regulator structures. Operations and maintenance (O&M) activities and capital improvement projects are ongoing to maintain and improve the functionality of these facilities.

Figure 9. Locations of Ongoing CSS O&M Projects Separate from Interim and Final Plans



This map shows the locations of the ongoing CSS projects, which are outside the scope of the Interim and Final Plans.

Figure 10. Implementation Status for the Additional CSS Projects

Project	Estimated Cost	Purpose	Estimated Completion Date
Outfall 05 and 21 Tide Gate Replacements	\$1M	Tide Gate Replacement	Complete
James River Park Outfall Improvements	\$0.5M	Rehabilitation of existing outfalls (15, 16, 17, and 18)	Complete
Hampton-McCloy Outfall Improvements	\$0.25M	Rehabilitation of existing outfalls (19 and 20)	Fall 2022
Shockoe 96-Inch Sewer and Twin 66-Inch Siphon Cleanings	\$5M	Cleaning critical interceptors to reinstate the conveyance capacity of the sewers	Spring 2023
Shockoe Retention Basin Roof Repairs	\$2M	Rehabilitation of the Shockoe Retention Basin roof	Fall 2023
Regulator Improvements	\$1M	Upgrading equipment in seven regulator structures	Spring 2024
WWTP Screening and Grit Facility	\$40M	Installation of a new Screening and Grit Facility	Fall 2024
Shockoe Screening and Crest Gate Improvements	\$39M	Upgrades the screening equipment in the Shockoe West Diversion Structure and replaces the two crest gates (86-ft and 54-ft long)	Fall 2024
Shockoe Retention Basin and Hampton-McCloy Tunnel Cleaning	\$10M	Cleaning critical storage facilities to reinstate the storage capacity	Summer 2025
Shockoe Retention Basin Aeration Improvements	\$2.5M	Replacement of the Shockoe Retention Basin aeration system	Fall 2025
WWTP Main Pump Station (PS) Improvements	\$40M	Rehabilitation of the existing WWTP Main Pump Station	Fall 2026

Figure 10 summarizes the other ongoing CSS projects' purposes, estimated costs, and estimated completion dates.

SECTION E: COMMUNITY ENGAGEMENT AND OUTREACH

The City has continued to expand its robust, **award-winning community engagement** and involvement initiatives.

Throughout the process of addressing its CSS, Richmond has educated, informed, and sought the input and feedback of stakeholders and the public at large. This outreach builds off of years of communications and campaigns undertaken by the City prior to SB 1064. The City has since expanded its efforts to allow for stakeholder involvement in the development of the Interim and Final Plans. From DPU's Citizens Academy programming and facility tours to social media to close collaboration with DEQ and more, DPU is working diligently to engage Richmond residents.



Spring 2022 DPU Citizens Academy participants visit Richmond's Wastewater Treatment Plant.

Final Plan Public Stakeholder Group (Founded 2022)

In 2022, the City formed a new Public Stakeholder Group (PSG) to assist in the development of the Final Plan. This 18-person group includes two members from each of Richmond's nine City Council districts. As ratepayers who deserve the highest-quality service, the residents of Richmond are critical stakeholders in the development of the Final Plan. The members were selected based on recommendations from City Council members, their liaisons, and neighborhood associations.

The PSG will meet with the City's Project Team on a quarterly basis throughout the development of the Final Plan and will:

- Review and monitor the development of the Final Plan
- Provide input and insight from their communities
- Share progress with their communities



DPU Director April N. Bingham welcomes members to the first Final Plan Public Stakeholder Group meeting in May 2022.

Four meetings have been held to date with the PSG:

Meeting #1 (Hybrid on Thursday, May 5, 2022)

- Introductions
- Background on the Department of Public Utilities
- Introduction to combined sewer systems
- Introduction to SB 1064, its requirements, and the Final Plan's purpose
- Overview of the PSG's role in the development of the Final Plan

Meeting #2 (Fully Virtual on Thursday, July 28, 2022)

- Communally creating ground rules for the PSG
- Overview of Richmond's combined sewer system
- Review of the Final Plan's purpose
- Overview of the Final Plan's requirements

Meeting #3 (In-Person Facilities Tour on Tuesday, September 20, 2022)

- Site visit to Richmond's Wastewater Treatment Plant
- Tour of Shockoe Retention Basin

Meeting #4 (Fully Virtual on Thursday, September 29, 2022)

- Review of Richmond's combined sewer system
- Overview of methods and technologies for CSS control
- Solutions in other CSS communities (Cook County and the District of Columbia)
- Overview of how solutions for Richmond will be evaluated

RVAH2O Technical Stakeholder Group (Founded 2014)

The PSG complements the pre-existing RVAH2O Technical Stakeholder Group. RVAH2O consists of dozens of representatives from the community, including environmental groups and other stakeholders. This group was formed in the fall of 2014. While the primary focus of RVAH2O is involvement in the City's implementation of its integrated permit, the group has also provided feedback on the Interim and Final Plans. The Interim Plan projects, for instance, were reviewed with RVAH2O throughout their development. During this group's biannual meetings, they will be provided with progress reports on project implementation and continue to offer valuable feedback and insights.



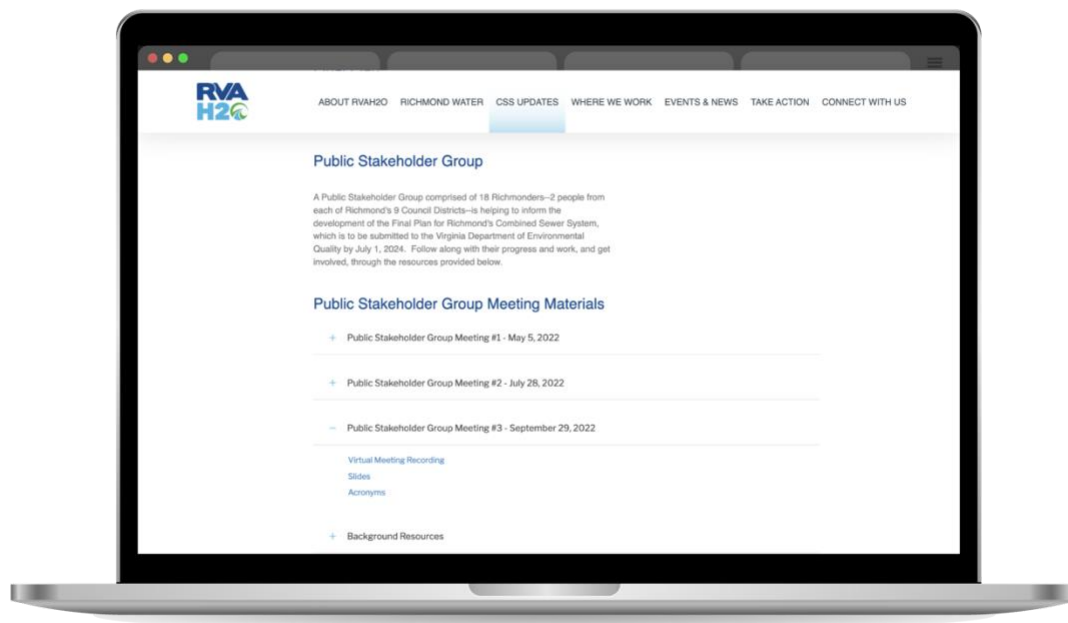
The RVAH2O Technical Stakeholder Group consists of government, community, nonprofit, and private sector partners.

Coordinating with DEQ

The City has met regularly with DEQ 22 times. Throughout the development of the Interim Plan, the City met with DEQ monthly to include the agency in decision-making and allow for full involvement and inclusion in the process. During the Final Plan's development, the City has continued to meet with DEQ. These ongoing bimonthly meetings allow DEQ to track the progress and the process of the Final Plan's development and provide the City with the opportunity to obtain important feedback from the agency, such as the Final Plan's purpose, modeling criteria, and solutions.

Online Engagement

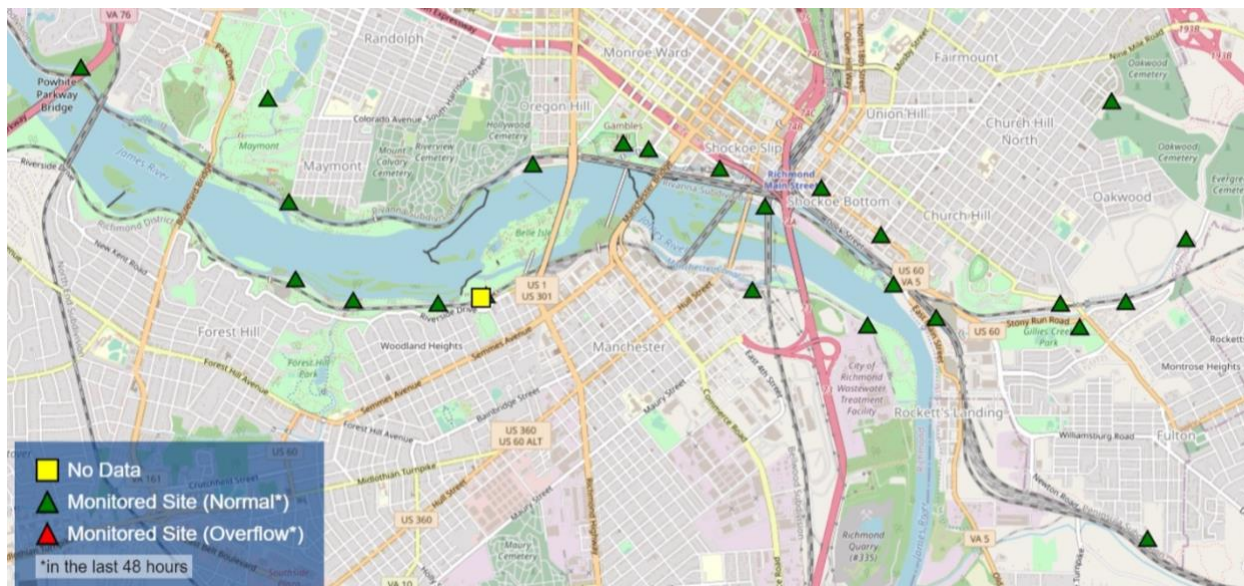
DPU has worked diligently to continually enhance its digital presence. Background information on the CSS, resources, reports, and presentations are all maintained on the RVAH2O.org website. This includes the latest information on Richmond's CSS and improvements made to date, SB 1064 requirements, the Interim Plan, the Final Plan's development, and content created and shared with the PSG. PSG meeting slides, resources, and recordings are made available on the website for the PSG members and the public alike. Similarly, RVAH2O meeting slides and recordings are also posted to the site. The website is also home to other resources including an explanatory [StoryMap](#) that helps newcomers understand the CSS.



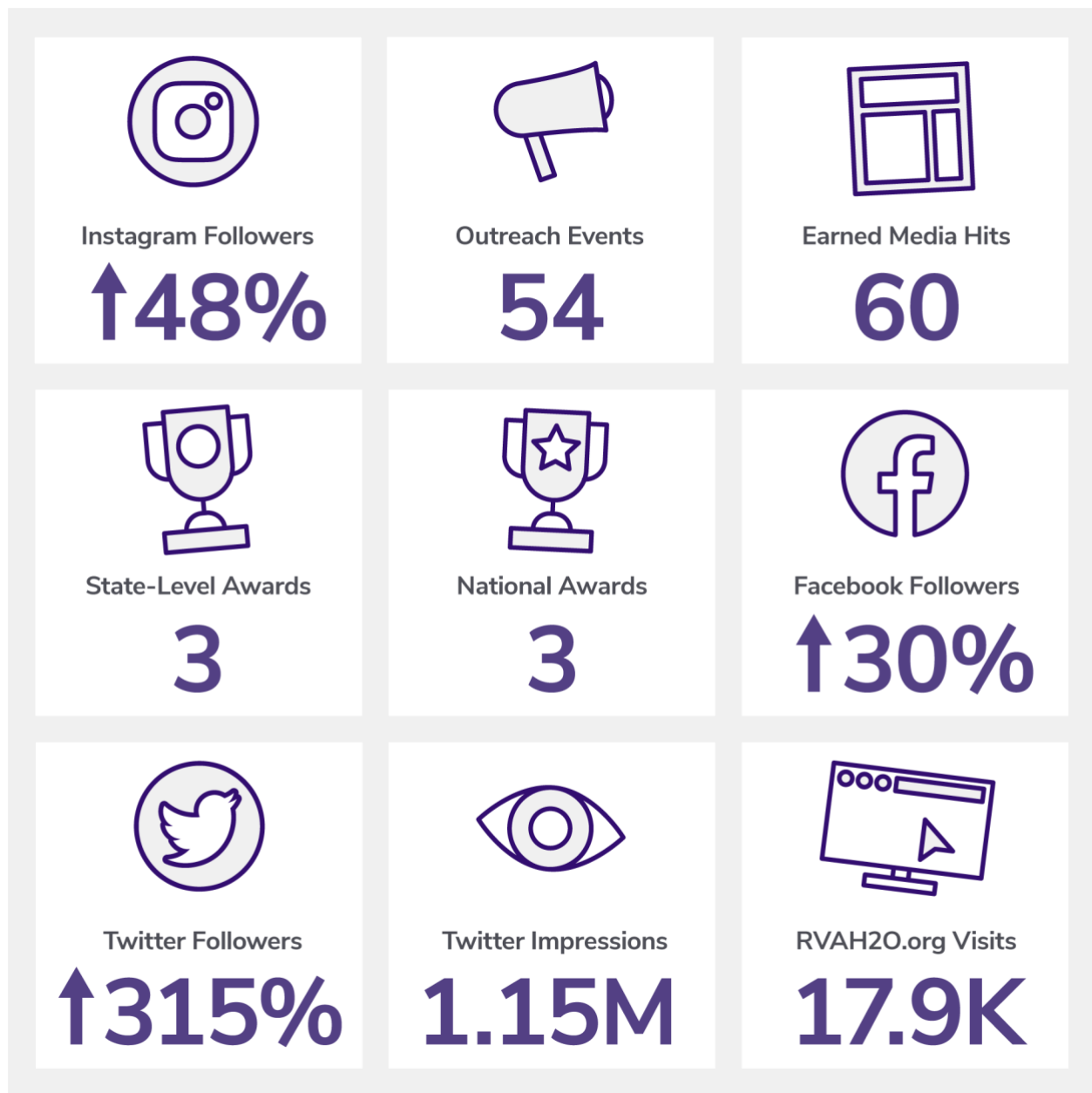
The RVAH2O.org website offers information regarding the ongoing improvement of Richmond's CSS.

Additionally, in October 2021, [a real-time notification map](#) was developed to provide the public with access to monitor recent overflow activity at the CSS outfalls. This map, shown in Figure 11, offers transparency to Richmonders and other James River users and allows the public to stay informed of overflow activity throughout Richmond. Though users are empowered to visit the map directly at their discretion, reminders are often shared on the RVAH2O social media channels during and after rain events.

Figure 11. A Screenshot of the City's Publicly Available, Real-Time CSO Notification Map



The award-winning RVAH2O social media accounts – [Twitter](#), [Instagram](#), and [Facebook](#) – serve as additional avenues for two-way communication between Richmonders and DPU. These active accounts provide updates on ongoing efforts, operations, and maintenance activities, and the Interim and Final Plans alongside basic, general combined sewer system education. DPU has found that sharing online through these platforms keeps followers engaged and the audience growing, speaking to the efficacy of consistent, transparent, and clear information.



Community engagement and outreach metrics from Q1 2021 to Q3 2022.

Awards

DPU and RVAH2O have garnered 12 awards over the past several years, six of which were presented in the past two years:

2021

Virginia Water Environment Association's A. H. Paessler Environmental Stewardship Award:
Eric Whitehurst

National Association of Flood & Stormwater Management Agencies' Excellence in Communications Awards: First Place, Improving Water Quality Campaign – RVAH2O's "No Trash Where We Splash" Billboard Campaign

Virginia American Water Works Association's Public Information Award: Social Media – RVAH2O's 2020 Floodwall Closure Twitter Thread and Social Media Posts

Virginia American Water Works Association's Public Information Awards: Issues and Crisis Management – RVAH2O's 2020 Floodwall Closure Twitter Thread and Social Media Posts

2022 year to date

National Association of Clean Water Agencies' National Environmental Achievement Award: Public Information and Education E-Media – RVAH2O's Floodwall Twitter Thread and Online Outreach

Water Environment Federation's National Municipal Stormwater and Green Infrastructure Awards: Gold Level Status, Innovation



The James River was awarded the
2019 Thiess International Riverprize
from the International RiverFoundation.

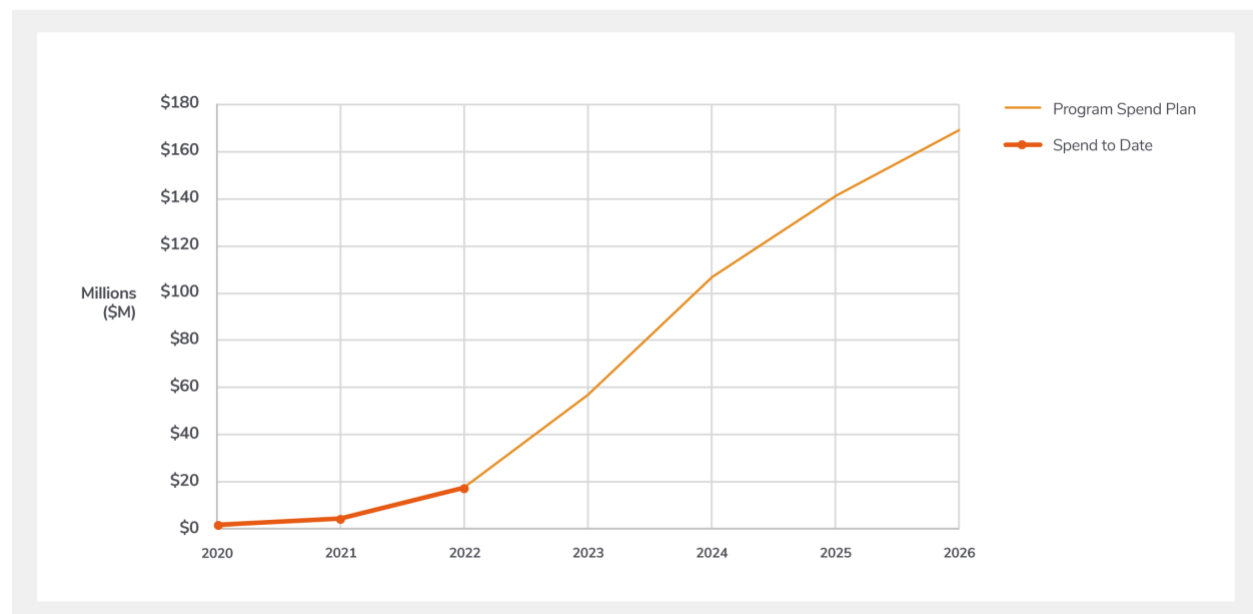
SECTION F: PROGRAM COST AND FUNDING

The combined costs of the Interim and Final Plans are projected to be over **\$1.3 billion**.

CSS Operations and Maintenance Expenses

As detailed in Section D, normal CSS O&M (excluding the Interim and Final Plan projects) to maintain and improve the performance of the existing CSS will be costly for ratepayers. As illustrated in Figure 12, since 2020, the City has invested \$20 million on such projects and is projected to spend an additional \$140 million over the next four years. The City has expended a total of over \$300 million on CSS-related projects since 1988. This is important context for the additional spend associated with the Interim and Final Plan projects.

Figure 12. CSS O&M Spending Plan through 2026



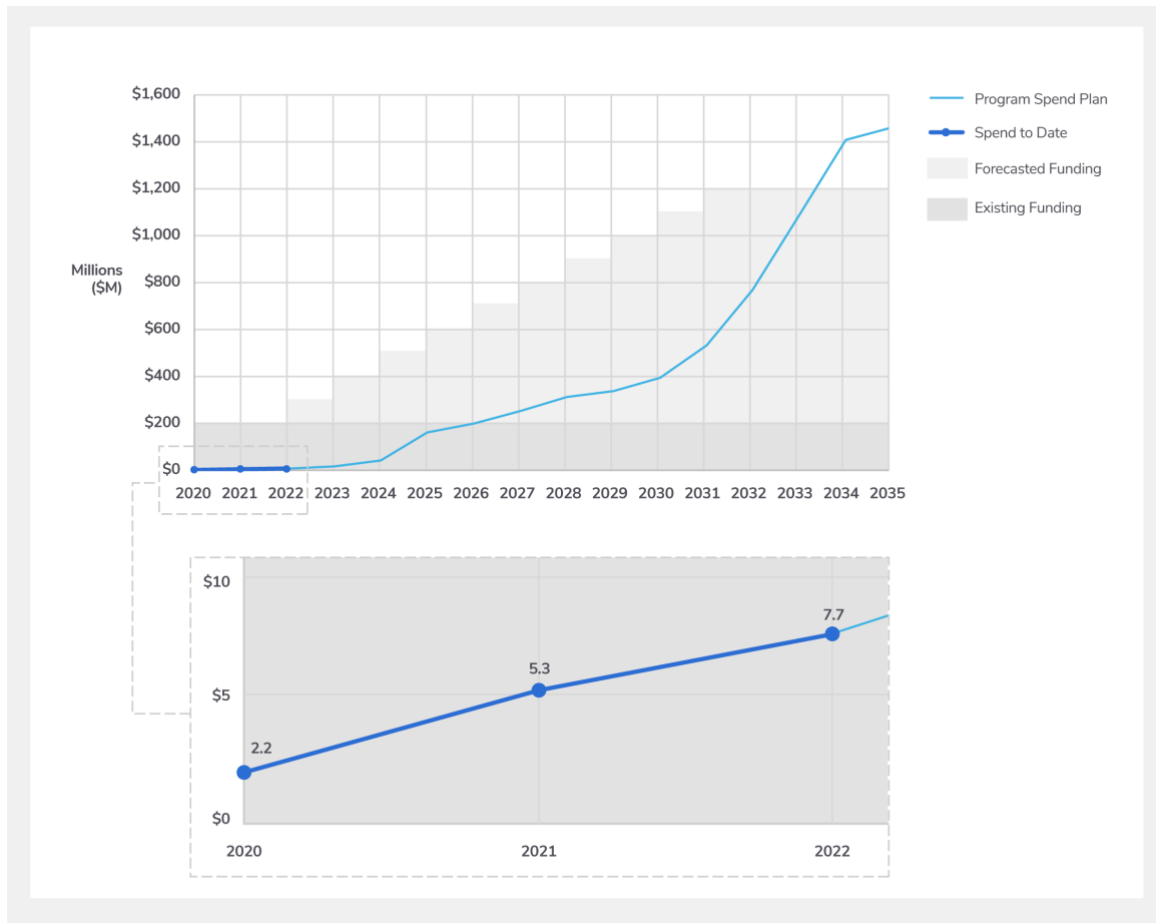
Interim and Final Plan Spending

The current Interim and Final Plan cost estimate is over \$1.3 billion. This represents a preliminary amount that will be updated as the City's Final Plan is further developed and completed (in 2024). The total spend to date is approximately \$8 million. There may be opportunities to save money in the long run by spending money upfront due to ordering efficiency, logistics, price escalations, etc.

The City appreciates the General Assembly's 2021 \$50 million appropriation (with 100% match) and 2022 \$100 million appropriation of American Rescue Plan Act (ARPA) funds. The City remains in close contact with DEQ staff to apply for and obtain these funds in accordance with state and federal guidelines.

The City will, of course, match the 2021 \$50 million appropriation (by the Federal ARPA spending deadline) and is committed to matching the 2022 \$100 million appropriation by 2035. After burdening the City's ratepayers with an additional \$150 million for Interim and Final Plan projects, the City will need at least an additional \$1 billion in grant funding. For financial planning purposes, the graph below forecasts the City receiving \$100 million annually for the next ten years.

Figure 13. Projected Interim and Final Plan Spending Plan



SB 1064 Reporting Requirements

SB 1064 requires the City to submit this progress report and to provide certain financial information. The City applied the following level and sources of funding to the CSS over the past five fiscal years.

Figure 14. CSS Funding – Last Five Years

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	5-year Totals
Virginia Revolving Loan Fund	\$592,203	\$0	\$0	\$886,551	\$3,867,832	\$5,346,586
Grant Receipts	\$3,655,252	\$10,008,717	\$10,351,801	\$0	\$1,271,149	\$25,286,919
Wastewater Revenue Bonds/Operating Cash	\$4,546,731	\$4,224,198	\$8,878,249	\$2,999,262	\$8,291,953	\$11,183,895
Total CSS Expenditures	\$8,794,185	\$14,232,915	\$1,473,552	\$3,885,813	\$13,430,934	\$41,817,400

The City will need at least \$1 billion in grants, not loans, to complete the work. It is not absolutely necessary to receive funding in Fiscal Year 2024, although it would be helpful. The City will need significant financial support very soon. As required by SB 1064, the City requests appropriations in the General Assembly's regular budget bill sufficient to stay on schedule financially and to carry out the purposes of SB 1064.

Other Funding Sources

In addition to state funds, the City identified and is evaluating the potential use of the following federal funding programs (including loan forgiveness options) as it continues to develop the Final Plan:

- Water Infrastructure Finance and Innovation Act (WIFIA) loans
- Flood and Inundation Mapping and Forecasting, Water Modeling, Precipitation Frequency Studies
- Economic Development Administration
- Clean Water State Revolving Fund (CWSRF)
- CWSRF – Emerging Contaminants
- DWSRF – Capitalization Grant
- Justice40 Initiative
- Build Resilient Infrastructure and Communities – Grants
- Flood Mitigation Assistance Grant Program
- Cybersecurity for Critical Infrastructure
- Aquatic Ecosystem Restoration Projects
- Community Development Block Grant
- National Culvert Removal, Replacement, and Restoration
- Economic Development Administration
- Water and Waste Disposal Program
- Watershed and Flood Prevention Operations
- Emergency Watershed Protection Programs

SECTION G: FUTURE OUTLOOK

**The James River is the City of Richmond's
most valuable natural resource.**

Residents, businesses, and visitors rely upon the James River as a water supply source, an economic driver, and a recreational resource. The City has undertaken significant projects to protect and preserve that resource while relying on our stakeholders to help us identify and prioritize ways to enhance the river.

The CSS projects required by SB 1064 build upon the efforts the City already has underway. However, this requires additional projects and costs, and an accelerated timeline. The City values its partnership with the General Assembly in focusing on improvements to the James River, and the funding and incentives necessary to implement those improvements.

As this report reflects, the City of Richmond is on schedule with construction of the Interim Plan projects. The Final Plan is in development, with a focus on addressing Richmond's largest CSO source, the Shockoe drainage area. Thanks to the General Assembly's support, there are some significant projects under consideration as part of the Final Plan.

The City's immediate next steps include:

- Completion of construction of the Interim Plan projects
- Evaluation of the Final Plan solutions, including seeking input from City stakeholders
- Continued implementation of the City's ongoing enhancement projects, including construction of the WWTP's new Screening and Grit Facility (construction is expected to be complete by June 2024)
- Ongoing robust engagement with the Public Stakeholder Group and Richmonders at large

We appreciate the opportunity to provide this update on the vital work that is underway in the City and the partnership that DEQ has demonstrated in this process. Should you have any questions or comments, please contact me directly at 804.646.5205 or april.bingham@rva.gov.

Sincerely,

April N. Bingham

April N. Bingham, Director

Copy:

Levar M. Stoney, Mayor, City of Richmond

Lincoln Saunders, Chief Administrative Officer, City of Richmond

Cynthia I. Newbille, Council President and City Councilmember, 7th Voter District

Ellen F. Robertson, Council Vice President and City Councilmember, 6th Voter District

Andreas D. Addison, City Councilmember, 1st Voter District

Katherine Jordan, City Councilmember, 2nd Voter District

Ann-Frances Lambert, City Councilmember, 3rd Voter District

Kristen M. Nye, City Councilmember, 4th Voter District

Stephanie A. Lynch, City Councilmember, 5th Voter District

Reva M. Trammell, City Councilmember, 8th Voter District

Michael J. Jones, City Councilmember, 9th Voter District

Robert C. Steidel, Deputy Chief Administrative Officer, Operations, City of Richmond

A. Ross Phillips, Assistant City Attorney, City of Richmond

Scott Morris, Chief Deputy, Virginia DEQ

Melanie Davenport, Director of Regulatory Affairs & Outreach, Virginia DEQ

Jerome Brooks, Director, Piedmont Regional Office, Virginia DEQ