INSTITUTE for ENGAGEMENT & NEGOTIATION
Shaping Our World Together

City of Alexandria Stream Improvement Project Processes and Outcomes:

Taylor Run and Strawberry Run

Final Report

Prepared by the Institute for Engagement & Negotiation

April 10, 2023

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Acknowledgements

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We at IEN could not have achieved a strong consensus on these recommendations for stream improvement practices without their dedication to the citizens of the City of Alexandria. For her constant work throughout this time period, we thank Camille Liebnitzky, Project Manager, for her patience and flexibility in adapting to the ebb and flow of this community work and project. The participating City staff are listed below and in Appendix C as a part of the CBG work:

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Section 1: Executive Summary

In Fall 2021, the City of Alexandria's Department of Transportation and Environmental Services (T&ES) contracted with the University of Virginia's Institute for Engagement & Negotiation (IEN) to assist with community engagement on the conceptual design and path of implementation for two stream health improvement projects in Taylor Run (TR) and Strawberry Run (TR). Initial efforts in moving forward with completing the design of these projects were not successful due to some community opposition to the original choice of natural channel designs used for stream restoration. In addition, City residents, including local environmental advocates, were not satisfied with the City's public engagement work efforts, being transparent with their stream restoration plans, testing for water quality, and keeping residents informed on City interests, progress, and funding commitments. In response to the community opposition, a work session was held during the April 27, 2021, City Council Legislative session. At that time, City Council directed staff to pause the two projects and perform additional community engagement to collaborate on alternatives to the original 'natural channel design' approach.

IEN worked closely with T&ES throughout the contracted period to create an inclusive, responsive, adaptive, collaborative engagement process. IEN held frequent meetings from the start and then weekly meetings starting in June 2022 with T&ES staff during the project time frame. IEN also conducted stakeholder interviews, developed an interview summary report, formed a Stakeholder Advisory Group (SAG), and selected representative stakeholders to form a large consensus-building group (CBG), from which a smaller group (the TR CBG) self-selected themselves to work on TR issues and another (the SR CBG) self-selected to work on SR issues. The first meeting included both groups and was held in-person for the full day on September 10th, 2022. Eight speakers were invited to talk about topics important to the greater community – one from the Environmental Policy Commission (EPC), one from each stream community, one from City staff, one who spoke on restorative practices, another who spoke on best management practices for increased stormwater runoff, and two who spoke on the alternative approaches for each stream. A total of five different alternative in-stream approaches were presented for each stream. The meeting was open to the public and began with a welcome and opening remarks by Alexandria's City Manager, Jim Parajon to reset the community engagement process for these projects.

On September 10th, IEN also began facilitating a series of workgroup meetings for each of the TR CBG and the SR CBG memberships. Thirty-two community members participated in the September event. Between September 2022 and March 2023, additional members joined, and the workgroups met virtually, five times for TR and four times for Strawberry Run, with an additional two meetings with SR community members. Additionally, stream walks were held for each stream with community members and City staff. All meeting recordings are posted on the Stream Health Improvement Community Collaboration webpage. [1]

[1] https://www.alexandriava.gov/stormwater-management/stream-health-improvement-community-collaboration

As a result of the presentations on September 2022 and individual community work, both the TR CBG and the SR CBG learned alternative stabilization techniques from consultants at AECOM (a September 2022 CBG presenter) and Greeley and Hansen (TR CBG only). From those presentations, each CBG determined they preferred a minimal intervention approach in both streams and wished to learn more about possible minimal approaches at various points along the streams. Dr. John Field, a September 2022 CBG meeting presenter, was invited back to further evaluate both streams and present his recommendations for each stream. He was asked to make his evaluation in a manner that could be easily compared with AECOM presentations on three alternative conceptual designs. IEN and CBG members for both streams then developed a consensus - based Recommendations Worksheet to formulate the goals and objectives they recommend for stream improvement. Both community workgroups will continue to work with the City through the ongoing design process.

Please find below an abbreviated list of the consensus-based recommended practices for TR and SR:

TR Recommendations (Abridged for the Executive Summary)

- **Construction practices:** Work on the infrastructure protection shall be done within the portions of the stream shown on the engineering proposals presented to the CBG in a manner calculated to have minimal impact on the wetlands and key forest communities adjacent to the stream and on the stream bed and banks.

- **Design review**: The current community members of the CBG should be recognized as a stakeholder group that will participate in the design consultation process at the 30%, 60%, 90%, and 100% design stages. The City desires to open up and increase engagement to the larger community as appropriate during the design process.

- **Upper Culvert, lower sewer pipe, and manhole cover protection:** City staff should select from the options presented to the CBG. A stone covering of the culvert walls facing the stream should be put in place and concrete rubble removed as appropriate. For the manhole, consider removal of the “skirt” of concrete from base, install several large stones at base of the cone and the lower stream bank to prevent erosion of the bank. The lower culvert should be cleared as needed to allow for free flow of the stream through the culvert.

- **Post-work Restoration:** The City and community group will work together throughout the design and work process to develop and accomplish a comprehensive ecological restoration plan for TR that the City and the community will be proud of. Adequate funding for the restoration should be part of the funding for the improvement project.

SR Recommendations (Abridged for the Executive Summary)

- **Overarching Recommendation**: To the extent that work is deemed necessary by the work group, the large wood option approach presented by Dr. John Field, Field Geology Services, will be involved in the design and execution of the project, and we urge the City to enable that in compliance with the Virginia Public Procurement Act (VPPA).

- **Ongoing CBG and Community Engagement**: The current CBG and the broader community (City residents) will participate and provide input before decisions are made at all stages of the project including initial design and the City-led 30%, 60%, and 90% designated design stages.

- **Equipment and Access Roads**: Equipment and access road length and width in the SR riparian zone will be kept to an absolute minimum to allow direct access to do the necessary work and minimize ecosystem impact, including to protect tree roots for equipment crossing.

- **Protection of Trees**: High value trees identified by the community in consultation with a certified arborist with a specialty in urban forestry will be marked for preservation and will be avoided during project implementation. Where possible and recommended by a certified arborist, pruning should be considered as an alternative to removal.

- **Practical and Beneficial Removal of Broken Pipe, Concrete, and Unnecessary Rip Rap:** Only when practical and beneficial to the SR ecosystem, legacy broken pipes, concrete, and unnecessary rip rap will be removed from the stream and riparian zone within the work areas, including in front of and in close proximity to the Walika and Cortez properties.

Miscellaneous Practice Recommendations:

- **Fencing**: Replace the damaged safety fence around the culvert at the Ft. Williams Parkway. Place a safety fence around the culvert on Duke Street. Both new fences should consist of aesthetically pleasing materials per the Park Facilities Standards Manual.

- **New Name and Signage**: The CBG would like to discuss renaming the area, as well as consideration for new signage, by participating in the standard naming process described on the City's website.

Community Practices Recommendations Pertaining to Specific Locations:

- **Wood Basket Structures**: Repair scouring of the west stormwater outlet and repair as needed the east stormwater outlet, placing wood basket structures under both the west and east outfalls. Any work in the west outlet should utilize the wood option and shall be executed via collaborative consultation between the City and the stakeholders, particularly proximate property owners.

- **Log Jams**: Investigate placing log jams along the stream and in the adjacent gullies to manage the hydraulic stream flow regime. If determined to be necessary, access should occur only where it has already been established.

- **Property Bank Erosion:** Investigate stabilizing options with the stakeholder group and specifically the adjacent property owners

Recommendation for a Consultation with the City Attorney:

- At a point in the design process where there is sufficient information, City staff will consult with the City attorney for guidance if the City may use City funds and funding obtained from non-City entities, such as grants provided by the Commonwealth of Virginia, regional government entities, and the federal government, to repair erosion on the private properties.

For TR, consensus on the recommended practices for the City was reached on March 8, 2023. For SR, consensus was reached on 15 of 18 recommendations on March 20, 2023. A set of recommendations from IEN is offered for consideration and is as follows:

- **Recommendation #1:** Create an email listserv for updating on project progress, including regular updates of the project websites.
- **Recommendation #2:** Continue the CBG groups' participation till project conclusion. (The City has indicated that this will include the broader Alexandria community as well.)
- **Recommendation #3:** Create a standing Community and City staff group that addresses community engagement and follows the 2014 City Handbook for Civic Engagement.[2]
- **Recommendation #4:** Consider creating local advocacy groups for TR and SR

Section 2: Introduction

Prior to the establishment of stormwater management requirements, streams in developing communities such as Alexandria were negatively impacted by increased stormwater runoff from residential and commercial development and unregulated overland flow. Cities developed rapidly with an increase in impervious surfaces and loss of infiltration capacity that increased stormwater flows. At this time, streams served as the major way to move overland flow out of communities and served as a stormwater "pipe" to quickly get stormwater out of our communities during storm events. Streams were often disturbed – straightened or piped – to accommodate development or concentrated, increased stormwater runoff from storm sewer pipe outfalls into the streams. Streams were also identified as the ideal location to site sanitary sewer lines that flow by gravity to a central wastewater treatment plant. The installation of sanitary sewer infrastructure that occurred in the 1940s and 1950s as a response to the Water Pollution Control Act 1948 in many developing areas often impacted streams. The 1970 Federal Clean Water Act (CWA) is the principal law governing pollution control and water quality with the core objective to restore and maintain the chemical, physical, and biological integrity of the nation's waterways, with local requirements for detention to slow the flow of stormwater before it enters a stream. Now, there are significant state and local regulations, such as in Alexandria, to complement the CWA.

Today, Alexandria has a robust sanitary and storm sewer system that continuously operates to move out waste and water, reducing the burden on local streams. However, the impacts of the past still play a part in the streams we see today.[2]

One can easily identify streams that have been impacted by too much stormwater runoff and worn over time by their severely eroding banks, excess trash and debris, vegetation issues such as undermine trees, exposed root balls, and dead and decaying trees. Stream restoration techniques have evolved over time, with a variety of techniques utilized to address these legacy issues.

[2] City of Alexandria, Stream History in Alexandria: https://www.alexandriava.gov/stormwater-management/stream-restoration

TR and SR were identified by the City as two streams experiencing the issues noted above as well as negatively impacting the Potomac River and Chesapeake Bay. The initial stream restoration designs using natural channel design techniques proposed by the City for these spaces were rejected by some community members, who also expressed concern with the public engagement, information sharing, and transparency involved in these processes. The COVID pandemic presented new challenges in project communication that exacerbated these concerns. The City contracted the University of Virginia's Institute for Engagement & Negotiation (IEN) to assist with additional community engagement involved in the development of alternative designs for these stream health improvement projects.

Section 3: Overall Community Engagement Process

IEN's primary contractual responsibility and interest has been to serve as a bridge, build trust, and facilitate a working relationship between City staff and the community members representing these streams to enable opportunities for consensus-building. IEN guided and facilitated nearly all community workgroup and CBG meetings, arranged meeting content, formulated agendas, and led process and goal-setting activities.

Initially in the process, there was considerable mistrust between the two community groups and the City. The City had experienced several other infrastructure projects in the recent past which contributed to the ongoing mistrust for these stream improvement projects. An interview process, described later, was initiated up front to capture the sentiment and goals for these streams from key stakeholders.

Within the City, two additional citizen groups, the Environmental Policy Commission (EPC), whose members are appointed by City Council and the Environmental Council of Alexandria (ECA) have significant influence in the Taylor Run and Strawberry Run communities. The EPC advises and makes recommendations to the City Council and, where appropriate, to the Planning Commission and City Manager, on matters relating to the environment. The Commission is supported by the City of Alexandria Department of Transportation and Environmental Services (T&ES), Office of Environmental Quality. The ECA advocates for environmental issues but also can weigh in on local political races. Both groups had representatives participating in these engagement efforts.

Stakeholder Advisory Group (SAG) Formation

Recognizing that community input would be an essential part of shaping the engagement process, IEN convened a SAG to receive guidance and feedback from community members and act as a sounding board for IEN. Primarily serving an active role earlier in the process with identifying community members for the interviews and CBG, SAG members became integrated more in the community workgroup meetings during the middle and latter stages of the process. With support from SAG leadership and continued participation, community members retained their voice throughout the process. The SAG comprised seven representatives of different community interests, including the City's EPC, Seminary Ridge Civic Association, Wakefield-Tarleton Civic Association, and stakeholders of TR and SR. SAG members are shown in Appendix A.

Community Interview Summary

In February and March 2022, IEN conducted a stakeholder assessment comprised of 17 qualitative stakeholder interviews. The report, *Stakeholder Assessment Report for Two Stream Health Improvement Projects in the City of Alexandria (interview summary report)* as finalized and provided to the City in May 2022 and is shown in Appendix B. Guided by consultation with both

the SAG and City project team, five of these interviews were conducted with City staff and 12 with representative community stakeholders. Due to concurrent consultations with SAG at the time, members of the SAG were not included in those interviewed. The purpose of these interviews was to achieve the following:

- Elicit the range of stakeholder perspectives on the history and status of these projects, their concerns, hopes, and suggestions about what might be done to support and protect the health of these two streams;
- Gain an understanding of how stakeholders might wish the community to be engaged to influence decision-making about these two streams; and
- Develop a set of recommendations for City consideration for a community engagement process to develop a community-supported strategy for protecting the two streams.

Many interviewees expressed a lack of trust in the City's approach and intent, with the perception of a lack of transparency and insufficient engagement efforts. Most interviewees expressed their desire to see the stream improvement work move forward to protect City infrastructure, improve habitat, and enhance the recreational components of these stream corridors. Community stakeholders recommended an expanded community outreach approach including workgroups to facilitate engagement and resolution of the technical issues around stream improvement.

For SR specifically, there was disagreement among the community on the severity of the stream erosion concerns expressed in the interview summary report. The IEN report did acknowledge this erosion concern as expressed during the interviews, however, one SR homeowner expressed explicit concern for erosion while the other two residents interviewed did not express significant concern over the erosion issue. Others interviewed, who are not SR adjacent homeowners, believed significant erosion was occurring in Strawberry Run. The City listed SR as having erosion concerns in previous documents and studies. Some believe that stream erosion in SR is most prominent in the lower portion of this segment adjacent to the existing threatened private properties and is less impactful in the northern portion of this segment.

Environmental Policy Commission (EPC) Presentations and Collaboration

During this time, IEN delivered two different presentations to the City's EPC outlining the project's progress. At the October 18th, 2021, meeting, an initial presentation outlined the proposed community engagement and consensus-building strategy. At the March 21st, 2022, EPC meeting, IEN presented their Stakeholder Assessment Report findings and interim recommendations were presented. IEN developed a more detailed proposal for a consensus building approach with community engagement to address both technical and non-technical issues surrounding the stream health goals. EPC members were also involved in both the TR and SR CBGs.

Brief Historical Context for TR and SR: Mayoral and City Council Guidance

The impetus for IEN's work with TR and SR community members and City staff derives from the April 27, 2021, City Council Legislative session where a work session was held on the stream restoration projects. Following the work session, the City Council directed staff to pause the TR and SR projects and undertake community and EPC collaboration. Updates to the City Council on EPC collaboration were recorded in two memoranda to the Mayor and City Council, one on the

other on the "Stream Restoration Work Session Follow Up"[3] from the Director of Transportation & Environmental Services, Yon Lambert, on May 26, 2021 and the other on the "Stream Restoration Update" from the City Manager at the time, Mark B. Jinks, on December 28, 2021[4] As a result of the EPC's collaboration with the City, three tasks were put forth for City staff in the memorandum from the City Manager.

The December 2021 memo[5] was an update showing City Staff's commitment to City Council's request supporting the EPC's request that City staff perform soil sampling, determine the need for water quality credits to meet regulatory requirements, examine the downstream portion of SR to determine why restoration failed there, and to explore alternatives to natural channel design. Staff subsequently met with EPC to discuss these, with the exploration of alternative designs forming the basis of IEN's work. A SR Downstream Forensic Investigation[5] determined several reasons for the failure and provided recommendations that included two relevant to the upstream portion of Strawberry Run - protecting the SR pedestrian bridge and design and build a stable channel to address the flow of water to protect the downstream portion from further erosion. As noted above and repeated here for clarity, the May 2021 memo shows City Council's support for EPC's request for City staff to collaborate on alternatives to natural channel design for TR and the upstream portion of SR.

Section 4: Consensus-Building Group (CBG) Formation and First Meeting

Based on the stakeholder assessment and IEN's community engagement recommendations, a Consensus-Building Group (CBG) was formed. Members were identified to serve as representatives of the community, and to provide ideas and feedback on the various options being considered for each stream. Initial CBG invitations were extended by IEN with input from the SAG and City staff. Members from within the CBG then self-selected to work in two smaller work groups – one for each stream. These smaller groups are referred to as the TR CBG for Taylor Run and the SR CBG for Strawberry Run.

On September 10, 2022, the first combined CBG meeting was held at the AlexRenew Building in Alexandria. Thirty-two community participants joined the first CBG meeting. There were seven City staff, seven IEN staff, and four stream experts present. Four consultants made informational presentations on general stream restoration, upland best management practices (BMPs) and the five design alternatives. The entire record of the day's event is captured on the City's website. Additional members were added to the CBG based on interest expressed by event attendees. CBG members are shown in Appendix C.

The meeting was open to the public and began with a welcome and opening remarks by Alexandria City Manager, Jim Parajon. Mr. Parajon expressed his sincere appreciation for the community's work in assisting the City with these important projects. He also indicated that the community groups could take whatever time necessary to achieve an agreement on what practices should be implemented at these locations. Remarks were also provided by EPC Chair

[3] City of Alexandria. "Path forward with the community." https://www.alexandriava.gov/stormwater-management/stream-health-improvement-community-collaboration. Accessed March 17, 2023.

[4] https://static1.squarespace.com/static/603fd5769f97e558ed58da64/t/60b29f06fb2ab914311fdfc9/1622318854873/20210526+Jinks+Memo+to+CC+-+Stream+Restoration+Work+Session+Follow+Up.pdf

[5] https://media.alexandriava.gov/docs-archives/tes/stormwater/12282021memotocitycouncilstreamrestoration.pdf

Kathie Hoekstra, and community members Russ Bailey, Bill Gillispie, and former Congressman Joe Sestak. Camille Liebnitzky, PE, professional engineer from the City of Alexandria gave an overview on the issues in both streams.

Kip Mumaw, a professional engineer with Ecosystem Services Inc., gave the first expert presentation where he provided an overview of stream restoration and a framework for evaluating the most appropriate design for a stream. He provided a "surgical" analogy – an initial harm before a future good. He recommended CBG members develop goals related to the problems they perceived problems, develop measurable objectives related to stream function and social context, develop metrics, and collect associated data, and then evaluate their solutions in terms of those goals and measurable objectives.

The next two experts introduced alternative conceptual designs for TR and SR CBG members to compare. Five different categories of stream improvement options/approaches were offered for comparison - the "Do Nothing Approach," Large Wood Use, Bioengineering, Hard Armoring, and Minimal Intervention. These options are summarized below:

Option 1 – "Do Nothing" with Dr. John Field, Field Geology Services

Dr. Field provided a brief overview of the natural process within a stream. He said a stream will always heal or self-stabilize itself over time. Both erosion and deposition will occur in the self-stabilizing process of a stream. Flowing water carries sediment, and, if lots of water is moving quickly, the water will carry lots of sediment, and as that flood recedes and velocity is reduced, sediment will be deposited. In SR, Dr. Field said he found that the deepening stream has reached its hard clay bottom and, as a result, has started to widen the stream, as is natural. He also noted that he has seen wood-trapping deposits in the stream, an emerging flood plain, and thinks this indicates the channel evolutionary phase is coming to an end.

Option 2 – Large Wood Use with Dr. John Field- Dr. Field explained that he recommends adding wood to the stream to reduce erosive forces, promote stabilization, increase sediment deposition, and enhance aquatic habitat. He suggested using channel-spanning log jams for infrastructure, periodically along the streams reaches, and for culvert outlets and inlets. He also suggested log-crib walls for bank stabilization near private property and infrastructure, marginal log jams for bank stabilization and infrastructure, and individual logs to reduce erosive forces and trap sediment. He thought the implementation process would have less impact on trees and acknowledged concerns with wood, noting the importance of properly anchoring the wood and sharing how wood strength and stability compares to manufactured materials. He also said upland BMPs would take many years to become fully effective, and that wood projects are a good bridge during that time.

Option 3 – Bioengineering- AECOM represented by Brandon Alderman

Mr. Alderman explained that this approach uses a mix of hard armoring and vegetation and is the most robust alternative proposed by AECOM. The design uses geotextile soil bags to grow and support vegetation. The design creates a retaining wall but can be constructed on vertical slopes. He said construction requires a lot of soil compaction, and equipment. He noted that a lot of the steeper slopes would remain.

Option 4 - Hard Armoring - AECOM

Mr. Alderman described this approach as the traditional approach using riprap and other hardened materials. He noted it can be quickly implemented, but that it has the most destructive intervention, requires regular maintenance, and not as conducive to in-stream and bank habitat development than the bioengineering alternative.

Option 5 – Minimal Intervention – AECOM

Mr. Alderman said that this approach is as close to a do nothing as can be achieved at the site. He explained that it can be implemented very quickly, minimizes tree impacts, has a simple design, but needs more frequent maintenance. He also explained that the alternatives he was describing could be mixed and matched on the TR and SR projects. He noted that they all require site preparation, construction access, grading limits, material delivery, soil compensation, and safe working areas. He also talked about the varying amounts of mitigation work required of these three AECOM alternatives.

Upland Best Management Practices - Hirschman Water & Environment, LLC

In addition, Dave Hirschman, Hirschman Water & Environment, LLC shared his expertise on upland best management practices (BMPs). Members of the CBG had expressed interest in learning whether upland BMPs could have an impact on the quality and quantity of water in TR and SR. Mr. Hirschman told members that within the City of Alexandria, upland watershed practices are strictly controlled by a suite of federal, state, and local laws. He noted, however, that there is room for additional voluntary practices (known as retrofitting) installed by willing landowners who are not pursuing development or other activities requiring any legal considerations.

He also explained how current studies, taken as a whole, show that the impact of these upland BMPs takes 50 to 60 years to reach their full potential and that more studies are needed due to the difficulty in ascertaining cost and impact. Mr. Hirschman discussed the importance of the upland practices as a part of the total approach to both water quality and water quantity and overall stream health, but that they are not capable of addressing downstream or in stream issues caused by erosion.

Reflection on the Two Stream Community Engagement Processes

In comparing the TR and SR community engagement processes, there were clear differences in technical content, engagement structure and approach. Those key differences include:

- TR has significant infrastructure in jeopardy of failure while SR does not;
- The TR community leadership remained stable and constant while SR transferred community leadership during the engagement process;
- A common theme between TR and SR was dedicated community leadership which contributed to the success of both groups;
- Although both SR and TR flow through public property, SR flows immediately adjacent to a private residential area;
- Due in part to the proximity of SR to members' homes and, therefore, the more personal nature of the issues discussed, the SR community members were more hesitant, at first, to trust working with City staff in a consensus-building process than were the TR community members;

- The complexity of the issues related to SR required continued guidance and facilitation assistance throughout the lengthy engagement process.

Section 5: Taylor Run - Process and Outcomes

The TR Stream Restoration project is part of the stormwater infrastructure system and involves approximately 1,900 linear feet section of stream near the Chinquapin Park & Aquatics Recreation Center, along the walking path in Chinquapin Park and Forest Park. The project limits are from the culvert on the property downstream from the Chinquapin Park & Aquatics Recreation Center within City parkland for approximately 1,000 feet and enters First Baptist Church property for the remainder of the project limits.

The stream corridor is highly disturbed with severe bank erosion, stream downcutting and widening at various locations, undermining of trees, along with two exposed sanitary sewer infrastructure crossings, an exposed sanitary sewer manhole, and erosion around stormwater infrastructure. Significant amounts of fallen trees, riprap, and debris can be found in the channel. Ongoing erosion along the stream banks is deteriorating water quality and threatening existing infrastructure.

The project's main goals include protecting the stormwater pipe outfalls and manhole present, stabilizing the stream banks, protecting exposed sanitary sewer pipes, and managing the hydraulic stream flow regime. Whenever possible, and when a greater impact will not be created, on-site materials will be used in the construction of the project. The project stakeholder team for the City's stream restoration projects include Transportation and Environmental Services (T&ES), Department of Project Implementation (DPI), Recreation, Parks, and Cultural Activities (RPCA) Parks Services, the IEN consulting team, and the community.

A TR CBG was formed in Fall 2022 at the September 2022 meeting so that the community and City could collaboratively develop alternatives to the original 'natural channel design' approach to resolve the stream issues. The TR community workgroup held 5 meetings between the first September 2022 meeting including the final one in March 2023.

As mentioned above, The TR CBG chose to recommend a "minimal intervention approach" which focuses on protecting critical infrastructure, while providing for, minimal construction in access paths and set-up areas and minimal environmental damage such as tree loss and the avoidance of wetland impacts, while still addressing the infrastructure issues. The City has presented a "minimal approach" to stabilizing the critical sanitary infrastructure and reducing water flows at the culvert inlet. A "large wood option," which uses wood as an erosion stabilization technique and streamflow stability tool, has also been presented to the CBG.

There has also been discussion of a "hybrid approach" that would use elements of the City's minimal intervention approach and the large wood approach. Only conceptual designs have been presented to the CBG. Following the consensus decision by the CBG through this engagement process, the City would then seek to procure a consultant to create an engineered plan set. The City will continue to include robust community input throughout the design process, including in the initial design phase and at the 30%, 60% and 90% design completion process points. The following Taylor Run project goals have been identified by the CBG:

- Protect biological diversity
- Preserve existing tree canopy
- Protect infrastructure services

- Minimize erosion, sediment flow, and land loss
- Have infrastructure repairs done in an effective and attractive manner
- Promote cost effectiveness

Reflection on the TR Community Workgroup Meetings and Dialogue Process

From September 2022 through March 2023, the TR CBG participated actively and frequently in a robust dialogue process. Strong leadership by both community leaders and City staff led to an open and transparent information exchange which included City staff, City consultants with IEN facilitating most of the meetings.

One of the more important aspects of this dialogue process was the continuous participation by both community members and City staff. Following a somewhat rocky start to the engagement, members began to understand both the technical issues such infrastructure protection as well as learning to trust each other that the information presented was both accurate and considered the viewpoints of the community. An example of this would be the acceptance that a large wood option could work in certain places within the TR stream channel. On the community side, members better understood the need for strong infrastructure protection as a responsibility of the City to its citizens.

Furthermore, we witnessed a “scaling up” of viewpoint and perspective by community members meaning that initially, community members were concerned about this particular practice being used or that practice but toward the end of the dialogue, when trust was established, community members began to offer a more generalized, relaxed approach to resolving the issues within TR. An example would be shown above on the sewer pipe protection where community members relaxed their interest to seeing what the City would design for those pipes knowing they were an integral part of the ongoing design process and would have frequent, substantive input.

TR community members frequently discussed the concept of better utilizing upland stormwater practices within the TR watershed and across the City. At several of the TR informational meetings, City staff presented data regarding the use of upland practices throughout the TR watershed. This culminated in a report by City Staff, *Taylor Run Watershed Analysis: The Effects of Implementing Stormwater Facility Best Management Practices (BMPs) in the Watershed on the Stream Channel* shown in Appendix D, where staff analysis showed that BMPs target water quality and while some runoff reduction is provided by infiltration, BMPs are not the right tool to address immediate erosion impacts in the stream. While it is clear that the City is required to focus on upland practices when development is occurring through established regulatory mechanisms, there was a strong desire by community members to enhance these practices for TR. There continues to be a disconnect in understanding there may be little room to enhance these practices above and beyond the current regulatory framework**.**

Lastly and most importantly, the TR community group took ownership of the dialogue process. They evolved their thinking to adopt a responsibility for the outcome(s) that could be possible for this stream improvement project. This evolution of group thought is a result of their shared initial goal setting, elevated trust in both their own group and with the City, superior community leadership and an increasing understanding of the “why” it needs to be done and technical knowledge gained in the dialogue.

The following recommendations agreed upon by consensus of the TR CBG are summarized below. Please see Appendix E for the full recommendation's worksheet:

- **Construction practices:** Work on the infrastructure protection shall be done within the portions of the stream shown on the engineering proposals presented to the CBG in a manner calculated to have minimal impact on the wetlands and key forest communities adjacent to the stream and on the stream bed and banks. Selected options should be engineered to withstand flow rates. Construction paths should be clearly outside the boundaries of the wetlands. Between the upper sewer line crossover and the mid-stream crossover, trees on the Chinquapin Park side of the footpath should not be cut or harmed by affecting their root structure or otherwise.

  Similarly, the large (City champion) red maple on the stream side of footpath should not be cut or otherwise harmed. Other trees that should not be cut or otherwise harmed were identified by the CBG and are listed by their tag numbers within the worksheet reflected in Appendix E.

  Construction equipment access and work between the two sewer line crossovers should take place, to the extent possible, on the path in the middle of the park coming down the hill from Chinquapin Circle to the mid-stream crossover, and along the stream bed between the crossovers.

- **Design review**: The current community members of the CBG should be recognized as a stakeholder group that will participate in the design consultation process at the 30%, 60%, 90% and 100% design stages. The City desires to open up and increase engagement to the larger community as appropriate during the design process.

- **Upper Culvert protection:** A stone covering of the culvert walls facing the stream should be put in place and concrete rubble removed as appropriate.

- **Upper & Lower Sewer Pipe Protection:** City staff should select from the options presented to the CBG. See “Other Considerations” below.

- **Manhole Cover Protection:** City staff should select from the options presented to the CBG as well as the following option: Consider removal of the “skirt” of concrete from base, install several large stones at base of the cone and the lower stream bank to prevent erosion of the bank.

- **Post-work Restoration:** The City and community group will work together throughout the design and work process to develop and accomplish a comprehensive ecological restoration plan for TR that the City and the community will be proud of. Adequate funding for the restoration should be part of the funding for the improvement project.

- **Lower culvert protection:** No repair work is needed at this time. Culverts should be cleared as needed to allow for free flow of the stream through the culvert.

- **Other Considerations:** Seven community members of the CBG believe the City should consider including a large wood component in its package of infrastructure maintenance techniques, if the construction can be done consistently with the construction practices set out above. Two community members of the group believe that Large Wood components should not be placed in TR. The City should advise the community members of the CBG of its reasons for selecting its proposed maintenance techniques.

Section 6: Strawberry Run - Process and Outcomes

The Strawberry Run (SR) stream improvement project is part of the City's stormwater infrastructure system and involves approximately 900 linear feet section of stream located west of Fort Williams Parkway, east of Taft Avenue, and north of Duke Street. The project limits are approximately 500 feet north of Duke Street and continue north (upstream) to the culvert under Fort Williams Parkway. A more complete description of SR is found on the City's Strawberry Run Stream Restoration website.[6]

From September 2022 to March 2023, IEN facilitated four SR CBG consensus-building meetings by Zoom in addition to the initial in-person meeting. The CBG meetings were interspersed with two facilitated meetings for community members, as well as phone calls and emails to SR community leaders. The SR CBG membership is listed in Appendix C. A stream walk with community residents, City staff, and Dr. Fields was held in November 2022.

Community members began their IEN-facilitated discussions with City staff lacking trust in the City's prior engagement process and with concerns that T&ES may not be fully open to answering their questions about City objectives, addressing their interests, and supporting alternative approaches put forth by the community.

Although these concerns kept the SR CBG from identifying goals and objectives during the first SR CBG Meeting on September 10th, both community residents and City staff continued to participate in subsequent meetings. During this engagement process, the SR community members consistently articulated the interests and concerns most important to their members.

The SR community group offered an initial narrative explaining their perspective. This is shown in Appendix F.

These included (1) exploring alternatives to natural channel design, especially Dr. John Field's large wood approach, to improve water quality and reduce storm flow; (2) protecting the one private property from erosion, (3) minimizing work in the stream to protect flora and fauna in and around the stream, with the most of their focus on protecting trees, and (4) exploring the impact of upland best management practices on the stream. These objectives informed the community's direction and their contributions to the consensus-building process for the SR Recommendations.

Of the three AECOM alternative approaches presented to the community at the meeting on September 10, 2022, the minimal intervention approach was described as the least likely – during implementation – to disturb flora and fauna in the stream and around it and, especially, to minimize harm to trees – key objectives expressed by all members of the SR community. The SR community group, however, continued to be most interested in Dr. Field's use of large wood for his description of its ability to (1) support aquatic flora and fauna with less damage to trees during implementation, (2) reduce the velocity of stream flow, and (3) using a wooden crib wall on the one impacted private property to stabilize the banks of the stream

To further support the SR community in its decision-making process, City staff enabled IEN to invite both AECOM and Dr. Field to further explain their proposals and especially allow Dr. Field to provide more details on the impact of the large wood approach on limits of disturbance, tree loss, and maintenance costs, all of which had also been provided by AECOM. Dr. Field conducted a stream walk with community members and City staff during his second site visit in November

[6] https://www.alexandriava.gov/stormwater-management/project/strawberry-run-stream-restoration

2022. Although City staff expressed concerns with some of Dr. Field's conclusions, they provided community members with schematics on the City website[7] showing not only AECOM's approaches but also Dr. Field's approaches in key locations in Strawberry Run.

Reflection on the SR CBG Meetings and Dialogue Process

As reflected in the TR reflection piece above, several circumstances threatened to derail collaboration early in the engagement process. A lack of trust between community members and City staff had developed before members joined the SR CBG. The community also lacked clarity on City staff's current intentions and objectives for the stream. The lack of clarity resulted not only from departures from initial concerns about water quality and TMDLs, but also from Dr. Field's statements that erosion in Strawberry Run was natural and slowing down. In contrast, engineers on City staff believed strongly in erosion's potential to harm the stream banks, the trees along the stream, and private property.

City staff also wished for clarity when community members of the SR CBG were hesitant to commit to goals for the stream without additional information on City goals for the stream. The fact that both the community and staff had been hoping for a resolution since 2021 added to the frustration felt by everyone.

Furthermore, despite City staff attempts to share how new engineering practices would be implemented and used with much less disturbance of natural habitat, the failure of the prior downstream restoration also weighed on members of the community familiar with that area.

Moreover, community members were keenly aware of the enormous impact they perceived the original natural channel design would have had on the stream and surrounding area, which was for several – their own backyard.

All of the above makes for understandable differences of opinion, any of which could have permanently stymied ongoing discussions. Notwithstanding and albeit with some delays between meetings, the community and City staff kept at the consensus-building process. They learned about the private property currently damaged by erosion and explored the applicability of the various alternative approaches together. To the community and City staff's credit, no participant allowed differences to keep them from contributing to solutions during the final consensus-building process. They aired their different concerns and worked with others to address them in the solutions they agreed to support. The participants in the final two meetings worked together to tweak proposals for 15 recommendations, working until every participant was comfortable with the proposal, at which point, consensus was reached.

Finally, leadership in the community kept passionate and dedicated members focused on a path forward over many months while City staff spent countless hours weaving adaptive, responsive, collaborative process into a formal structure of City administrative practices. The result for those committed to this process is not only workable solutions, minimal impact on the ecosystem, protection for private property, and the future potential for the development of urban, effective, wood structures to reduce stormwater flow and erosion where specified but also the beginning of a successful ongoing relationship framed by the recommendations in this report.

[7] https://www.alexandriava.gov/sites/default/files/2023-01/Strawberry%20Run%20Packet_01242023_compressed.pdf

Community Interests Supported in the Recommnedations

After learning the strengths and weaknesses of each alternative, the community continues to express a strong interest in having as little repair, as few access roads, and as minimally sized equipment as are necessary in Strawberry Run -- to minimize impact on the ecosystem. To the extent necessary to repair the east and west stormwater outfalls and to the extent necessary to repair areas along the stream and adjacent gullies to manage hydraulic stream flow, the SR community strongly supports the use of the large wood conceptual designs proposed by Dr. Field. In fact, the community supports the large wood approach for the structural elements of any necessary instream restoration structure. The community desires this approach as opposed to the use of more hardened approaches.

Collaborative Effort Reflected in the Recommendations

Although City staff had shared its original preference for natural channel design two years before, and then shared new City-approved alternatives created by AECOM in response to interests expressed by the combined communities of TR and SR, City staff recognizes the SR community's strong support for the large wood approach and has stated their willingness to explore the suitability of this approach in SR in their next steps for design and implementation. The consensus-based recommendations pertaining to the use of large wood in general, and wood basket structures and log jams, specifically, reflect the staff's commitment to working with the SR community to explore the appropriateness of this approach in the stream.
Likewise, the community's commitment to working with staff is demonstrated by the community agreeing to repairs in specific locations of the stream, even as the community requests the repairs be done with as minimal an impact on the ecosystem as possible. Similarly, the community also trusts that it will be able to continue to provide input as the conceptual designs are developed and implemented in specific locations in SR.

City Staff Ongoing Commitment with the Community Reflected in the Recommendations

City staff will continue to engage the SR community during the design and implementation stages at 30, 60, 90 percent completion levels. Staff will reach out to the community to request their comments and questions. In addition, City staff has committed to reaching out directly to the owners of properties adjacent to any stream-related activity conducted by the City for further input during these stages. The staff will also invite the larger Alexandria community to participate along with the SR community and adjacent property owners.

Although the SR community did not achieve full consensus as indicated by the failure to reach consensus on the appropriate mechanisms for repair at the north end of the stream, 15 of the 18 proposed recommendations initiated by community members were developed into final recommendations to the City through the consensus-building process. After the SR CBG had completed its recommendations, the community leader stated to all staff and community members present that she hoped the rest of the process would result in a win-win for everyone.

SR CBG Consensus-Based Recommendations

Community and City staff members of the SR CBG offer the following consensus-based recommendations:

General Recommendations

- **Overarching Recommendation**: To the extent that work is deemed necessary by the work group, the large wood option approach presented by Dr. John Field, Field Geology Services, will be utilized. The resulting design, contracting, and implementation have to

follow City regulations, engineering ethics principles, and show a good stewardship of public funds.

Specific Request for Dr. Field: The CBG strongly recommends that Dr. Field be significantly involved in the design and execution of the project, and we urge the City to enable that in compliance with the VPPA.

- **Ongoing CBG and Community Engagement**: The current CBG and the broader community (City residents) will participate and provide input before decisions are made at all stages of the project including initial design and the city-led 30%, 60% and 90% designated design stages.

- **Minimal Size of Access Road**: Access road length and width in the SR riparian zone will be kept to an absolute minimum to allow direct access to do the necessary work.

- **Minimal Impact of any Access Road**: Any temporary road leading into and across the riparian zones will be designed and constructed to minimize ecosystem impact, including to protect tree roots for equipment crossing.

- **Protection of Trees**: High value trees identified by the community in consultation with a certified arborist with a specialty in urban forestry will be marked for preservation and will be avoided during project implementation. Where possible and recommended by a certified arborist, pruning should be considered as an alternative to removal.

- **Minimal Size of Equipment**: To minimize disruption to the ecosystem and adjacent neighbors to the stream, the smallest equipment able to accomplish the work will be utilized.

- **Practical and Beneficial Removal of Broken Pipe, Concrete, and Unnecessary Rip Rap:** Only when practical and beneficial to the SR ecosystem, legacy broken pipes, concrete, and unnecessary rip rap will be removed from the stream and riparian zone within the work areas, including in front of and in close proximity to the private properties.

Miscellaneous Practice Recommendations:

- **Fencing**: Replace the damaged safety fence around the culvert at the Ft. Williams Parkway. Place a safety fence around the culvert on Duke Street. Both new fences should consist of aesthetically pleasing materials per the Park Facilities Standards Manual.

- **New Name and Signage**: The CBG would like to discuss renaming the area, as well as consideration for new signage, by participating in the standard naming process described on the City's website.

Recommendations Pertaining to Specific Locations:

- **Wood Basket Structures**: Repair scouring of the west stormwater outlet and repair as needed the east stormwater outlet, placing wood basket structures under both the west and east outfalls. Any work in the west outlet should utilize the wood option and shall be

executed via collaborative consultation between the City and the stakeholders, particularly proximate property owners.

- **Log Jams**: Investigate placing log jams along the stream and in the adjacent gullies to manage the hydraulic stream flow regime. If determined to be necessary, access should occur only where it has already been established.

- **Existing Non-natural Debris Blockages:** Remove where necessary, practical, and where work is already occurring -- to prevent bank scouring, particularly broken cement slabs.

- **Property Bank Erosion:** Investigate stabilizing options with the stakeholder group and specifically the adjacent property owners

Recommendation for a Consultation with the City Attorney:

At a point in the design process where there is sufficient information, City staff will consult with the City attorney for guidance if the City may use City funds and funding obtained from non-City entities, such as grants provided by the Commonwealth of Virginia, regional government entities, and the federal government, to repair erosion on the private properties.

Proposals Where No Consensus Was Reached Due to Lack of Community Support

The following proposed recommendations were not agreed to by consensus because three members of the community were unable to support them.

- **North Outfall**: Repair the scouring of the north six-foot stormwater pipe outfall (culvert).
- **Plunge Pool**: Slow the velocity of the stormwater as it exits the pipe with a plunge pool primarily with a wood structure.
- **Crib Walls**: Shield the outfall's nearby banks from the water's velocity by wooden crib walls of short distance.

While most City and community members supported these proposals, three community members said they would like to know if these interventions are necessary, and, if so, what minimal intervention would best solve the problem. The underlying interest expressed by these members was a desire to learn what is causing the increased flow of water in the stream. They did not achieve consensus on these issues until a study had been done to determine this, and so they hesitated to choose an option that might not be best for this situation.

Proposals Where Community Consensus Was Reached but No SR CBG Consensus Due to Lack of Time at the Final SR CBG Meeting

Community members supported two additional upland BMP practices. These proposals are included in SR Worksheet in Appendix G for review because – due to lack of time – the SR CBG (consisting of both staff and community members) did not have the opportunity to confirm approval or revise them through the consensus-building process in the hope that a resolution suiting all members could be reached.

IEN Recommendations to the City

The following are our recommendations for future community engagement regarding environmental or engineering improvements with the City of Alexandria and for these two stream improvement projects:

Recommendation #1: Create an email Listserv for updating on project progress

Recommendation #2: Continue the CBG groups participation till project conclusion. (The City has indicated that this will include the broader Alexandria community as well).

Recommendation #3: Create a standing Community and City staff group which addresses community engagement and follows the 2014 City Handbook for Civic Engagement.[8]

Recommendation #4: With City support and incentives, create a local stream advocacy group for TR including the local schools in the group.

[8]What's Next Alexandria. Handbook for Civic Engagement. January, 2014. https://www.alexandriava.gov/sites/default/files/2021-11/Whats-Next-Alexandria-Handbook-Civic-Engagement-English-2014.pdf Accessed March 22, 2023.

Appendices

Appendix A - Stakeholder Advisory Group (SAG) Members

Roy Byrd
Carter Flemming
Kathie Hoekstra
Kurt Moser
Steve Walz
Erin Winograd

Appendix B

UNIVERSITY of VIRGINIA | INSTITUTE for ENGAGEMENT & NEGOTIATION
Shaping Our World Together

Stakeholder Assessment Report
for Two Stream Health Improvement Projects in the City of Alexandria

Prepared for the City of Alexandria Transportation and Environmental Services, Stormwater

Prepared by the Institute for Engagement & Negotiation (IEN), University of Virginia

May 2022

Assessment Background

The University of Virginia's Institute for Engagement & Negotiation (IEN) was asked to assist the City of Alexandria in two stream health improvement project(s) implementation. Initial efforts to implement these projects were not successful due to opposition to the original stream restoration design. In addition, City residents, including environmental advocates, were not satisfied with the City's work on engaging the public, being transparent with their stream restoration plans, and keeping residents informed on City plans, progress, and funding commitments.

IEN proposed conducting a stakeholder assessment in the form of stakeholder interviews, in order to surface stakeholder concerns, hopes, and suggestions for what might be done to support and protect the health of these two streams, as well as to learn how stakeholders might wish to be engaged to influence decision-making about these two streams. As a first step, IEN formed a stakeholder advisory group (SAG) to provide IEN guidance for stakeholders to be interviewed, the questions to be asked, and the community engagement process that might be proposed as an outcome of this assessment. The SAG comprised seven representatives of different community interests, including the City's Environmental Protection Commission (EPC), the Environmental Council of Alexandria (ECA), Seminary Ridge Civic Association, Wakefield-Tarleton Civic Association, and stakeholders of Taylor Run and Strawberry Run. Appendix Two shows the SAG members. Guidance from both the SAG and the City project team led to identification of both City staff and community stakeholders for interviews, which were conducted in February and March 2022. Appendix Three lists those interviewees. During this time, IEN delivered three different presentations to the City's Environmental Protection Commission (EPC) outlining the project's progress. Following the March 2022 EPC meeting where interim recommendations were presented, IEN developed a more detailed proposal for a consensus building approach with community engagement to address both technical and non-technical issues surrounding the stream health goals.

The following information summarizes IEN's findings from the interviews of both City and community stakeholders. Notes from the interviews are included in Appendix One.

Assessment Process

As a part of the City of Alexandria stream health improvement projects for Taylor Run and Strawberry Run, IEN conducted a stakeholder assessment comprised of 17 stakeholder interviews. Guided by consultation with both the SAG and City project team, six of these

interviews were conducted with city staff and 11 with community stakeholders. Due to the continued consultation of SAG members throughout the project, members of the SAG were not included in those interviewed. The purpose of these interviews was to achieve the following:

- Elicit the range of stakeholder perspectives on the history and status of these projects, their concerns, hopes, and suggestions about what might be done to support and protect the health of these two streams.
- Gain an understanding of how stakeholders might wish the community to be engaged to influence decision-making about these two streams.
- Develop a set of recommendations for City consideration for a community engagement process to develop a community-supported strategy for protecting the two streams.

The interviews were conducted as qualitative interviews. During qualitative interviews, the interviewer uses a set of questions to guide the conversation but is not strictly bound by the questions. The goal is to fully explore with the interviewee's perspectives, concerns, hopes, and suggestions. As part of this process, to create a space where people may speak freely, interviewees are told that their comments will be synthesized with others and not attributed to specific individuals. To assure this, interview notes were logged by the IEN team in one single Google Doc without names attached. The interview questions were as follows:

(1) What is your current role and how are you involved with these two streams?

(2) Is there any specific history relating to these two streams, their uses, their role in the neighborhoods or community that you would like to share … or would be important for us to understand?

(3) What are your concerns – and your hopes – for the future of each of these streams? Taylor Run? Strawberry Run?

(4) What kinds of information would be helpful or important for you and others to be able to participate meaningfully in creating a collaborative strategy for Taylor and Strawberry Run?

   (a) For example, presentations about different methods of addressing stream degradation, field trips, data, etc.?

   (b) And who would you like (or trust) to provide this information? Specific types of experts, or state agencies, or the PDC, or university scientists or engineers?

      (i) Is there a specific person - - or type of person – that you think would be trusted by ALL participants in the process?

(5) What are different options for the streams that you would like to be explored in moving forward? Or that you would like to learn more about?

(6) How might we best engage the different communities and stakeholders for each stream?

   (a) Presentations, listening sessions, open houses with experts, workshops with maps, focus groups, field trips, different languages, timing to ensure equity and inclusivity

   (b) Taylor Run community and stakeholders – i.e., people who are impacted by it, and use it or enjoy it?

   (c) Strawberry Run community and stakeholders?

(7) What would success look like to you? In terms of the streams? For the communities? For equity and inclusivity?

    (a) Taylor Run success?

    (b) Strawberry Run success?

(8) What else might be important for us to know in order for us to design a successful collaborative, equitable, and inclusive decision-making process for Alexandria?

(9) Who else would you suggest we talk to?

    (a) at the city level?

    (b) other stakeholders in the community?

IEN conducted all 17 interviews and, where possible, two staff were present at all interviews. A considerable amount of common ground emerged during these interviews. While there was a range of views about how the city might protect stream health, all interviewees expressed a willingness to work out solutions for the streams in a way that could be supported by the community and City.

Similarly, many similar concepts and ideas emerged from the interviews, indicating significant common ground. All interviewees were open in discussing the history of the effort to date, the history of community tension over these restoration projects, and the management of information by the City. They also shared a desire for protecting stream health and preserving city infrastructure, recreational opportunities, and the conservation of homeowner property. The following is a synthesis of findings and common themes from these interviews. Detailed notes from the interviews are shared in Appendix One.

Key Findings

The overall key findings from the interviews, below, reflect common shared perspectives rather than actual quotes from stakeholders. They are not presented in any priority order, and each is a synthesis of numerous comments.

- Taylor Run contains good biodiversity and unique environmental components.
- The City did not conduct a transparent community engagement process regarding the stream projects.
- Adopting a minimal intervention yet holistic approach to stormwater impacts and stream health will be essential for progress.
- The original natural channel design (NCD) was not acceptable to the community due to the loss of biodiversity and tree canopy cover that would be incurred.
- A smaller group of technical experts collaborating with an informed community should come together and resolve the stream restoration design issues.
- Other City departmental staff and their expertise were not utilized effectively with these projects.
- The community understands the importance of maintaining city infrastructure that exists along Taylor and Strawberry Run, with a conservation-minded approach to protect the diverse habitat of these streams.
- City residents want to be engaged with these projects and desire continued involvement.

- Civic associations can play a leadership role in the community engagement process.
- An expanded community engagement process is needed to heal from past engagement processes.

In addition to the above key findings, the following are a synthesis of interviewee concerns, interests, informational needs, and additional ideas relating to the future of the two streams. Concerns and interests can be aligned and often overlap, as reflected below. For each topic a short summary of interviewee comments is provided, and bulleted points reflecting interviewee comments are offered as a further window into their perspectives. These bulleted points are either a synthesis of combined interviewee comments and/or direct quotes.

Stakeholder Concerns

The stakeholders interviewed overwhelmingly emphasized the value of Taylor Run, and, to a lesser extent, Strawberry Run. The concerns reflected in the interviews were focused largely on disagreement about the approach to take to improve these areas, and frustration with the community engagement process to this point.

1. Engagement Process

There is the perception of a lack of acknowledgement from the City about the value of Taylor Run in terms of ecosystem services and also the limited amount of natural space City residents can access within the City's borders. Given the rarity and uniqueness of such a natural area within Alexandria, many stakeholders noted frustration that the original plans proposed by the City would likely have dramatically altered the character of Taylor Run to the detriment of the City and its residents. Several interviewees noted that the space is used as a living classroom for local teachers and students, serving as an educational resource in a way that would be irreplicable elsewhere in the City.

- "TES (Transportation and Environmental Services) has been very condescending about the tree loss and dismissive of the ideas of trees as critical infrastructure."

There is a broad perception that the City has operated without transparency in their process which has left many stakeholders feeling disappointed and distrustful. Some examples mentioned include long periods without updates regarding the projects, instances where presentations from the City were provided without the opportunity for public comment, questions, or input, and in cases where feedback was solicited, lack of communication about how the input was used. Stakeholders expressed overwhelmingly the desire for improved communication with the City, and opportunities for more regular engagement in addition to information sharing.

- "I hope the City could have a more fluid relationship with the Community, identify shared values, and involve scientists with expertise in these streams."
- "There has been little communication from the City since the legislative session last year"
- "What happens to the suggestions put forward, how are they vetted? If they weren't accepted and included, we'd like to know why. How many times do you want us to show up and then we don't know what happens to our input?"
- They can say "we had community meetings, we had community input." "But you feel like the staff just does what it wants to do.'

- "Trying a lot of options for outreach and posting it physically in these places (at the high school, in Chinquapin Park, at the churches), not just online. There are going to be some people on both sides of this who are very entrenched. Reaching and engaging everyone else would be important to come to a consensus. Not just addressing the loudest people in the room."

Initial frustrations and breakdown in communication for all parties has impeded constructive dialogue for moving forward. All interviewees are passionate about this issue and feel that they have the best interests of the City at heart. Like all projects, the plans for Taylor Run and Strawberry Run were impacted by the pandemic, which contributed to the challenges in communication between parties. Many interviewees were optimistic that a good working relationship could be established moving forward with effort, intention, and transparency.

- "It's unfortunate that there are some very vocal minority opinions that have been in many different contexts disparaging of City staff. The struggle is that when City staff attempts to facilitate, cooler heads don't prevail. City staff gets [criticized] quite a bit and they work very hard to do good work for the City." Because some folks are biased against them, it would be helpful to have a third-party facilitator for discussions.

There is a lack of understanding on the part of stakeholders regarding the parameters of the Virginia Department of Environmental Quality (DEQ) funding and what steps might be required in order for the City to use it. Several stakeholders mentioned the DEQ funding in their interview, noting that they had inquired but not received a response to their inquiry, or others who thought they were aware of the parameters offered their interpretation, which varied from interviewee to interviewee. *This represented a specific point of frustration for those stakeholders who are aware of the extent to which this funding influences the outcome of this process.*

There is concern that engagement to this point has not reached all communities, particularly those that have been historically underserved. A few interviewees noted that engagement on this front typically centers around those who have the time and knowledge on this topic, and who might already be familiar with organizations like the EPC where they can learn more. Some interviewees observed that the process could benefit from the inclusion of voices who aren't typically engaged, but who are just as invested in the health of the City.

- "Alexandria is extremely transient. Some really vocal residents will be gone in three years. Others who have lived here forever won't say a word. Immigrant populations often live in apartments, anecdotally they stay here longer than the higher earning professionals. It's very difficult to reach that community, but they need to be engaged. We have a significant Ethiopian population, so we started posting more in Amharic. More work like that is called for."
- "The African American community has often been pushed around. They were displaced in the 60s for Fort Ward Park. It's important to engage with that community, we're talking about long term residents."

2. Safety

The concrete slabs, dead trees, and eroding areas could impact the safety of area users. The concrete also detracts from the aesthetics of the space. Many interviewees noted that there are lots of ways that Taylor and Strawberry Run could be improved that don't involve stream

restoration. Most frequently mentioned were the concrete slabs in both areas which can be unwelcoming to new visitors and impact the safety and aesthetics of the spaces.

3. Presenting and Using Unbiased, Science-based Data and Other Expertise

Many interviewees expressed concern that the City relies heavily on engineering expertise and discounts or fails to utilize the experience of the City's Natural Resources staff. The Natural Resource staff are broadly recognized by stakeholders as knowledgeable resources who are experts in the fields, and the perception that they have not been consulted throughout these processes has contributed to the distrust felt by many stakeholders. This point combined two common themes that resonated through the interviewees: 1) disagreement about the data being used (where Natural Resources staff might have refuted data or offered points of information not being considered, if they had been consulted), and 2) frustration about the treatment of those involved who are seen by many as obvious resources for this decision-making.

- "We're being told the streams aren't that healthy, but from my perspective there's no data to back it up."
- "The City has used models developed for other streams that do not apply to these streams."
- "The City has relied on its own people with vested interests who are good engineers but who are not biology experts. These projects require a deeper understanding of the science pertaining to these streams – on biodiversity, birds and other animals, plants, and human health.

4. Options to Address Increased Stormwater Surges in Taylor Run and Strawberry Run and the Resulting Impacts on the Sewer Line, Erosion, and the Environment.

The stormwater volume of the streams exceeds their capacity which has negative ramifications for each space and will be further exacerbated by climate change and development. This point was mentioned by several interviewees who felt that any implementation of natural channel design would be erased by the extreme stormwater flows, and that it would be more logical to invest in stormwater measures upstream (retention ponds, bioswales, etc.) that would alleviate the volume.

Stream restoration requires significant maintenance to remain viable and some are concerned that the City might not commit sufficient attention or resources to that effort. A few interviewees noted this point in conjunction with the question about the DEQ funding (above), speculating that maintenance of any project using the funding would only be required in the short term and not maintained in perpetuity. There was concern that the City would have to allocate resources to maintain any stream improvement work and that other City departments were resource-limited, such as City Parks.

The sewer lines are essential infrastructure, though it is not widely understood what types of intervention are required (as opposed to preferred) by the City in order to do this work. Many interviewees expressed understanding of the need to maintain the sewer line, but viewed the footprint needed for that maintenance as significantly smaller than what was originally planned for the Taylor Run restoration. Several interviewees expressed confusion around this topic and interest in learning about the specific components of the sewer maintenance and plans for the stream.

- "The City needs to tell us exactly what needs to be done to the sewer line. It's understood that the sewer line needs to be maintained, but the City needs to be clear about what that means. And the sewer line is only on a portion of the stream, not the full length, so is much smaller than the project that was planned."
- "The City needs to tell us what they think needs to be done. No one will stand in the way of a legitimate fix to a sanitary sewer. From daily water testing we know that the stream is usually a trickle but fluctuates a lot with rain. That needs to be fixed because historically the stream was up on the surface and more of the water was absorbed on the land, not runoff."

Erosion is a threat to the safety of Strawberry Run residents and the value of their homes and property. The interviewees who spoke about Strawberry Run noted this concern of great significance to those who live in the area. Some interviewees also noted the desire to avoid the negative impacts of heavy machinery and no ability to receive redress for damages in the contract provided by the City. Also, City staff had delivered a contract to Strawberry Run landowners but then waited nearly a year before coming back to check with those landowners.

5. Other Concerns

There is a perception that City residents in Strawberry Run don't know the boundaries between their land and what belongs to the City. This lack of awareness can contribute to activities that are detrimental to the stream and surrounding natural space. Landowners, in not knowing these basic facts, use the stream either as a dumping ground or work to positively impact the stream valley. Those who mentioned this concern noted the need for improved communication around this issue.

Stakeholder Interests

The following interests include bulleted entries that are either paraphrased or directly quoted statements of the stakeholders.

1. **The Engagement Process**

All stakeholders expressed a strong interest in an inclusive, transparent, professional engagement process for City of Alexandria staff and community residents. Stakeholders expressed interest in meetings structured to allow openness to community perspectives and meaningful collaboration on mutually satisfactory objectives, options, and solutions for stream health. Their interests included:

A Consensus-based, Decision-making Group where-

- City staff meets directly ("face-to-face") with stakeholders to hear their concerns with give and take so questions can be asked of both sides.
- "IEN or other third-party" facilitates.
- "Workshops are held with facilitated discussion, topic by topic."
- Trust is built.
    - "For the communities, their interests are best upheld if they feel their government works for them, fiscally and competently, and that their government is protecting their parks for them."

- A task force classifies and prioritizes projects.
- A transparent and professional process has a round table of professional, trusted technical expertise.
- “A transparent and open process.”
- All City departments connected with the project participate.
- “A more engaged, multi-disciplinary approach”
- A small group of in-house people meets over time, with Independence and transparency being critical.
- Ground rules are established.
- Trusted experts are brought together to help with consensus-based decision-making.
- Information is peer-reviewed and science-based, state-of-the art and engineering-based, and / or considered best practices.
- “Community can steer this process, but we need a nuts-and-bolts technical staff to solve the design issues. To design a successful process, it cannot turn into a political arena.”
- A lot of education will be necessary.
- “I’d like to see data and transparency written in plain English so that the average person can understand it.”

Including stakeholders who are-

- Members of the Environmental Policy Commission, the Environmental Council of Alexandria as well as civic associations, such as Alexandria Federation of Civic Associations, West End Coalition of Civic Associations, Seminary Hill Association, Ridge Civic Association, Strawberry Hill Civic Association would be the way to reach the Strawberry Run community and Taylor Run Citizen’s Association.
- Members of community religious organizations.
- Affected and interested residents who have not already expressed interest in these issues, or who have been unrepresented historically
- Involved in local schools – teachers, students, parents, student organizations, school property, school programs, and spaces for school presentations (A significant number of interviewees wanted to have schools involved in this process.)
- Others contacted through the use of “statistically valid surveys” with an information packet.

Collecting and Reviewing Feedback from the Community-

- “Hearing back what was done with the comments, what filtered through, what was thrown out.”
- “When Parks is working on a Park Plan, they will have a phase where they have feedback from the community, and they have a listening board with sharpies at the park to write what they want to see in the park, so it targets park users. The board is a really good idea because you can really get the full breadth of park users. Something like that would be helpful.”
- The public should have the opportunity to comment on the new plans. There needs to be face-to-face discussion, and the opportunity to work with everyone in the room.

Ways to Engage the Community-

- “Field trips, listening sessions, open house with experts, workshops with maps. Having the presentations so that the explanations can be made for people who aren’t aware of

issues. Not just one field trip to check a box. We need to make repeated efforts to engage a community. Listening sessions are important for community feedback."
- Additional ways to reach the greater community – Zoom meetings, talking in a coffee shop, using a newsletter, going door-to-door in Strawberry Run, posting information in Chinquapin Park and Forest Park, and social media platforms (Instagram, and twitter), even including a webpage not affiliated with the Stormwater webpage, to avoid bias.
- Going door-to-door in the Strawberry Run area.

2. **Learning Each Other's Interests**

Community stakeholders expressed a serious and pressing interest in learning the City's interests in Taylor Run and Strawberry Run, and City staff indicated an equal interest in learning what the community cared most about in these streams. All community stakeholders wanted to learn the City's objectives for the streams. City staff expressed sincere interest in learning more about the community's perspectives on alternatives to natural channel design, erosion, the acidic seepage swamp, and the trees in and around the streams, among other issues.

3. **Safety**

Stakeholders expressed an interest in the safety of individuals using public and private property in and near the streams. Many expressed interests in protecting the safety of the public by maintaining sewer lines, addressing muddy paths and signage in the park and erosion on private property, and removing fallen tree limbs and dead trees from areas in and around the streams. A few mentioned an interest in restoring bridges and roads at risk to erosion. One interest entailed providing up-to-date information on a website on the timing of construction activity and on the stages and location of construction, with an aim to keeping the public safe from those areas during that time.

- Making the streams a safe place for people to come.
- "Making it as accessible and inviting as possible. There are real co-benefits if you restore streams and make them as accessible as possible."

4. **Presenting and Using Unbiased, Science-based Data and Other Expertise**

Many stakeholders expressed a keen interest in having the City incorporate not only engineering data, but also science-based data on streams and flora and fauna in its decision-making processes for the streams. Stakeholders were interested in focusing on science-based data and not public opinion or predictions based on data from other areas. Many emphasized the importance of having unbiased, science-based experts present to educate and advise. There was no agreement on any one particular expert. Nearly everyone recommended including individuals with scientific expertise, including trusted individuals in the community and in academia. There was one mention of a state agency, but another expressed interest in the possibility of using a paid consultant who had not been previously involved in this project. There was also an interest in having a few City staffers involved and one resident was requested. Stakeholders conveyed a strong affinity for the following:

- Peer-reviewed, science-based, best practices, data-driven information for the best outcome. (Although stakeholders disagreed on whom to include, all were interested in these criteria.)
- Experts with a deeper understanding of the science pertaining to these streams – on biodiversity, birds and other animals, plants, and human health.

- A fluvial geomorphologist, hydrologist, such as John Field
- Wildlife biologists, and ecologists.
- Trusted academics with practical experience, such as Joe Schilling, formerly with Virginia Tech.
- Christian Jones, PhD, is a Professor in the Institute for Sustainable Earth at George Mason University and a Director of the Potomac Environmental Research and Education Center (PEREC)
- Other academics from the University of West Virginia, Virginia State, and the University of Maryland, which have "good forestry programs."
- "I do not have a good idea of what to do technically but if it came from academia, it would be more trusted."
- "A representative from the Virginia Department of Forestry."
- A consultant with no involvement in original stream restoration plans.
- Ron Simmons with the Natural Resources Division
- John Marlin, City Arborist
- Resident Russ Bailey

5. **Options to Address Increased Stormwater Volume and Surges in Taylor Run and Strawberry Run and the Resulting Impacts on the Sewer Line, Erosion, and the Environment.**

All stakeholders were keenly interested in determining the best options for addressing excessive stormwater volume and surges. Most stakeholders wanted to learn about possible alternatives to natural channel design. Interests in several options were shared. These included a conceptual design for an armored version with rip rap along a stream; a conceptual design for a bio-engineered version using plunge pools with planted grasses to keep the streams in place instead of rip rap; and a version of natural channel design. Many stakeholders supported another option: a concerted effort to address issues upstream, such as by retrofitting stormwater ponds in a way to mimic nature and minimize the damaging impact of stormwater and erosion. This option was envisioned to be coupled with an in-stream effort to increase the sewer line's effectiveness while minimizing impact on the stream and supporting conservation of the natural area.

There was extensive Interest in upstream solutions for both streams. These stakeholders were interested in building upstream stormwater retention ponds as opposed to downstream changes, such as natural channel design. A stakeholder showed an interest in placing stormwater catchments throughout the City. Another interest was in inlet filters. A majority expressed a pointed interest in addressing stormwater runoff in upstream development.

- "There are density issues all over the City and developers run over the entire area."
- Looking at upstream solutions, such as an armored plunge pool and a weir, which dissipate water velocity.
- Using a package of strategies to address the streams in a holistic manner.
- "A multi-pronged intervention process would encourage upstream thinking. Transportation & Environmental Services and Recreation, Parks, and Cultural Activities Culture should work better together. We need a task force that includes climate change working together across the City."
- Learning more about run-off. "What else is contributing to the runoff? Where is it coming from? How can be it slowed down or stopped?"

- Looking at laws and regulations to address impact on streams from upstream development.
    - Making local laws more effective.
    - Following MS4 Permit goals.
    - "I don't know if the City has explored working with DEQ to adjust meeting percentage requirements for the MS4 permits. It seems like when you have this much at stake it's probably worth exploring that."
- "Sewer lines should be protected in as environmentally sensitive manner as possible, above and beyond best management practices. There will be debate on how to do this."
- Reducing stormwater flow in a sustainable manner.
- Everyone shared their interest in controlling water velocity during storms.
- Many wanted to "re-examine the entire system of stormwater runoff" because the current system can no longer handle increased flow of stormwater – too much water flow and pollutants.
- "As rainfall ratchets up, uncollected water increases, and pollutants increase. The best way to address this is with upstream Stormwater ponds and the least effective is stream restoration. Climate change is pushing us to look at all the models in terms of water volume."
- "Standards set for the Bay cannot be met."

6. **Reducing Disturbance to Natural Areas**

Nearly all stakeholders conveyed a serious interest in reducing disturbance to the areas around and in the streams during work to reduce the effects of stormwater surges. These stakeholders conveyed their interest in conservation and care for natural resources, which, several stated, necessitate care for flora and fauna and removing only hazardous trees while maintaining the tree canopy. Another different interest focused on the need to remove trees for public safety and sewer line work while also including planting even more replacement trees than were removed.

- The minimum in intervention – using the minimum gray and green infrastructure needed to make these streams functional, safe and sound.
- Conservation in perpetuity.
- "The plan would be biocentric and conservation-oriented with ongoing quality stewardship."
- Removing cement slabs, shoring up the banks and hillsides, and generally stabilizing the area.
- "Work on the trail and sewer would be done carefully using BMPs, not what an engineering consultant advises, but a plan that includes ecological concerns."
- "I don't know all of the different types of options, but something that gets it close to its pre-development state would be best."
- "Some medium ground… something between demolishing trees and not taking any trees down."
- Knowing where worksites should be entered to minimize harm to trees and other plants.
- Protection for acidic seepage swamps. Avoiding bringing in invasive plants during stream improvement.
- Working together on irreplaceable plants and trees.
- "The public is attached to these trees but may not realize that the trees will be falling into the streams if they are not removed. The idea would be to replace the trees taken out, several times over. An open dialogue will be helpful."
- "The public is focused on the mature trees, not the new, younger ones. All kinds of factors must be accounted for. When's the best time to plant a tree, the first time is 100 years ago, and the second time is right now!"

7. **Interests Particular to Taylor Run**

Most stakeholders were familiar with Taylor Run and the nearby Chinquapin Park. They conveyed numerous interests in reducing stormwater runoff particular to the Taylor Run area. Most pertained to possible upstream efforts in the area with a few minimal efforts in-stream. One of the stakeholders mentioned that the holistic ideas stakeholders have expressed interest in may already be included in the City's environmental Action Plan. Contrary to these views was the interest in improving the sewer line in a way that required more extensive in-stream effort. The interests encompassed the following:

- Minimum intervention to improve the sewer line and stop erosion.
- Taylor Run has value as it is – "It could really benefit from some small fixups. It's Alexandria's gem, but it's rough cut. If you come in from the high school side, that's the most degraded part of the stream. Every two weeks Taylor Run becomes a different stream because of the foliage blooming. High School uses that stream as a laboratory."
- "Armoring the stream is not a bad way to go. One of the things that would help with stormwater would be to daylight the streams that are culverted and create habitat. That big grassy area in front of Chinquapin Rec Center, why not create habitat there? These big extensive projects are just prone to failure, and they cost so much money. In some cases, just armor the stream bank. I don't think you need to do as much as they've done. Remove channelization where it's been channelized."
- "Would be nice to see more flowering plants, to have it be a little more inviting than trees down and weeds around it."
- Replating/regrading the area between King Street and Taylor Run to address erosion.
- Using a retention pond and plantings to address the velocity of the water flow in Taylor Run to the extent determined by the gauges placed in Taylor Run.
- A concerted effort is needed upstream, though it is more complicated. We do not want to flood everyone's basements.
- "Leave the interior Taylor Run alone – just need to slow the water and do upstream work. Lots of things that are very doable."
- "Years ago, when there was not a plan to do the interior of Taylor Run, there was a plan to build a retention pond right at the high school. That plan was on the right path. We need to do this upstream and not use critical resource areas as stormwater projects."
- Water retention areas on upstream properties
- Specific ideas generated regarding Taylor Run:
    - "Make a bioswale area, 100 linear feet directly connected to Taylor Run and receive double credit due to the flow directly into Taylor Run." (Bradley Shopping area)
    - Fix the cistern at Alexandria City High School and add water retention measures
    - Create a large dry bed for filtration at the Aquatic Center.
    - Manage stormwater at the Minnie Howard High School campus.
    - Use the large dry bed for filtration at the Aquatic Center next to Chinquapin Park.
    - The Chinquapin Park area can be addressed more easily because it is not a development or otherwise privately owned.
    - Give First Baptist Church stormwater tax abatement using a French drain to reduce runoff from impervious surfaces.
    - DEQ gives sizable credits for native tree planting, and these could be used for planting trees in the flood plain areas (not over planting in the forest.)
    - Add trees as buffers. Remove the concrete. Reduce mowing such as Holmes Run Trail. "These are very low-hanging fruit."

    - "Reduce mowing to let more areas grow wild and reduce stormwater damage. There is no need to worry about crime near the path from a wild area here because there are two football fields that would separate the forest from the walking path."
- "No slabs of concrete, have it look like a park, no natural channel design."
- "Are some of the items we've heard mentioned -- plantings in median, addressing upstream development, etc. -- already included in the Environmental Action Plan? Yes. I don't think someone could say that the City hasn't tried to think about these things holistically. There are an overwhelming number of them, and they're all things that have been thought about. The Plan is supposed to be revisited every 5-10 years. The Energy and Climate group is under the purview of the City Manager."
- "What has to be done? Protect the sewer lines. Move the trail or protect it. Forest Park could serve as an alternate trail. Have an expert to talk about a remedy for this situation."

8. **Interests Particular to Strawberry Run**

Stakeholders familiar with Strawberry Run had particular interests too. The overarching interest was to minimize impact on the stream while protecting the flora and fauna in and around the stream – the natural habitat. There was an interest in evaluating the extent of need in reducing stormwater surges in the stream. One stakeholder expressed a keen interest in learning velocity flow from the gauges inserted in the stream. Everyone was interested in stopping the erosion of private property.

- "Need good policy and process. It should be safeguarded and done right."
- "The main interest for Strawberry Run is avoiding property degradation!"
- "How do you preserve the delicate ecosystem?'

9. **Intra-departmental Collaboration**

The majority of stakeholders were interested in having representatives from Natural Resources and Recreation, Parks and Cultural Activities consulted in this project from its inception through implementation. Although a formal process exists, the community experienced a lack of communication and collaboration among the relevant City departments. Stakeholders expressed interest in the views of individuals in these departments and expressed a desire for Transportation & Environmental Services (T&ES) to include them in its decision-making process. These stakeholders felt those they had consulted in these departments represented their interests. These stakeholders conveyed their interest in City staff recognizing the value in the views of individuals in these departments, in more collaboration among these departments and T&ES, and in a more mutually satisfactory decision-making process.

- Meeting during business hours in a professional manner.
- Including staff in these departments in community meetings
- "I would like to see the Natural Resources division receive more respect."
- Improving coordination of communication among City departments and with the Public.
- "Transportation and Environmental Services (T&ES) had done clearcutting outside of the library on the original channel of Holmes Run without informing the public or even telling Natural Resources or Parks."

10. **Ongoing Community Outreach**

A few stakeholders were excited to express an interest in more active ongoing engagement between City staff and the community. Although the City already makes presentations to civic organizations and publishes its views on its website and in written articles, stakeholders expressed an interest in more interactive ongoing activities between City staff and clubs, organizations, and youth in the community. Stakeholder suggestions included:

- Involve City of Alexandria High School and other high schools as well as middle and elementary schools in stream work. Include youth organizations such as the Boy Scouts. Reconnect students to the stream.
- Include Northern Virginia Community College students.
- Utilize an Adopt-a-stream Program, a Friends of Taylor Run and Strawberry Run.
- Offer healthy streams and programs such as tours and walks.
- Provide more coverage in both Alexandria newspapers and on social media.

Informational Needs

During an assessment process, it is important to ask about stakeholder informational needs as a way to provide a basis for meaningful participation and to "level the playing field." These requests for information may not be adequately addressed under stakeholder concerns or interests. During the IEN interviews, stakeholders indicated that they would want to learn more about:

- Stream restoration techniques.
- The role of the DEQ grant in relation to the stream improvement project design criteria.
- Other stormwater management techniques for these streams to keep them healthy.
- Flexibility within City funding mechanisms for project work.

Additional ideas

As with additional information, other ideas not related to key stakeholder concerns or interests emerged during the interview process. The following additional idea was generated by stakeholders:

- A more complete approach to the stewardship of stream valleys across the City should be considered and supported by the City. Organizations such as Four Mile Run have demonstrated a keen sense of stewardship and care for environmental concerns and can be helpful to the City. Organizational grassroots involvement in environmental issues and stream health can be a galvanizing method to build trust and ensure City infrastructure is maintained and cared for.

Conclusion

The City of Alexandria initiated restoration efforts for two streams, Taylor Run and Strawberry Run, using a natural stream channel design approach. Community residents opposed this initial design and restoration effort because they believed the original design sacrificed too many trees, jeopardized the biodiversity and unique environmental aspects of Taylor Run, and disregarded landowner concerns in Strawberry Run.

A Stakeholder Advisory Group was formed by IEN to provide guidance on the assessment process, specifically the selection of stakeholders to be interviewed and questions to be asked. Stakeholder interviews were conducted in early 2022, and the overwhelming sentiment expressed by interviewees was a lack of trust in the City's approach and intent, compounded by its lack of transparency and insufficient engagement efforts. Many interviewees expressed their desire to see the stream improvement work move forward to protect City infrastructure, improve habitat, and enhance the recreational components of these stream corridors. Community stakeholders recommended an expanded community outreach approach including workgroups to facilitate engagement and resolution of the technical issues around stream improvement.

IEN believes a rebuilding of the relationship between City stakeholders and City staff is possible. In addition, the level of expertise within the City's residents can be a strength for the City to lean on to accomplish this and other environmental efforts. This rebuilding effort will take some time, with the City committing to transparency and deep listening to residents throughout the stream improvement work and process.

Next Steps

IEN is working with the City to determine next steps, to be determined in early May 2022, and has submitted a revised scope of work to facilitate the development of a community supported approach for improving long-term stream health.

Note from IEN: Appendices from the *Stakeholder Assessment Report for Two Stream Health Improvement Projects in the City of Alexandria* have been removed for clarity within this larger final report document. The full report with appendices can be found at https://www.alexandriava.gov/sites/default/files/2022-08/COAFINALInterviewReportMay2022.pdf

Appendix C – Consensus Building Group Members

Taylor Run

Russ Bailey, private citizen, Workgroup Co-Chair
Jack Browand, Deputy Director, Park Services (RPCA)
Roy Byrd, private citizen
Bill Gillespie, private citizen
Jeremy Flachs, private citizen
Carter Flemming, private citizen
Syed Imran, Associate Technical Project Manager, Project Implementation (DPI)
Kathie Hoekstra, EPC Chair
Andrew Macdonald, private citizen
Jesse Maines, Division Chief, Transportation & Environmental Services (T&ES), Workgroup Co-Chair
Kurt Moser, private citizen
Michael Olex, EPC Representative
Rod Simmons, private citizen
Anne Sullivan, private citizen

Strawberry Run

Lyn Allen, private citizen
Eldon Boes, EPC Representative
Dave Cheney, private citizen
Maria Cortez, private citizen
Kathie Hoekstra, EPC Chair
Jeanne Jacob, private citizen
Larry Kocot, private citizen
Camille Liebnitzky, Civil Engineer IV, Transportation & Environmental Services (T&ES)
Daniel Medina, Stormwater Program Manager, Project Implementation (DPI)
Harriett McCune, private citizen
Murphy Ng, Associate Technical Project Manager, Project Implementation (DPI)
Whitney Redding, private citizen
Joe Sestak, private citizen
Fran Vogel, private citizen
Christy Walika, private citizen
Steve Walz, private citizen
Erin Winograd, private citizen
Elizabeth Wright, private citizen
Bethany Znidersic, Division Chief, Park Services, (RPCA)

Appendix D

Taylor Run Watershed Analysis: The Effects of Implementing Stormwater Facility Best Management Practices (BMPs) in the Watershed on the Stream Channel

February 13, 2023

Prepared by

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Brian Rahal, PE, CFM
Camille Liebnitzky, PE, ENV SP
Jesse Maines, MPA, PMP

Purpose

This technical memorandum (TM) was prepared in response to suggestions by the Taylor Run Census Building Group (CBG) for staff to explore whether the implementation of green infrastructure stormwater facility best management practices (BMPs) that provide water quality and runoff reduction benefits would improve the portion of the Taylor Run Watershed that drains to the approximate 1,900 linear feet of stream segment by addressing the a subset of the goals of the restoration project focused on addressing ongoing erosion and stabilization of the exposed sanitary sewer infrastructure. This TM analyzes the removal of impervious area in the sub-watershed as a surrogate for the implementation of these BMPs, with the results determining if BMPs would illicit a sufficient positive impact to address the ongoing erosion of the channel and protect the exposed sanitary sewer infrastructure from potential failures, aside for the water quality benefits. This analysis also looks at the effectiveness adding a large detention facility before runoff enters Taylor Run.

Background

The Taylor Run Stream Restoration project was prioritized for implementation based on the City's Phase III Stream Assessment: Stream Restoration and Outfall Stabilization Feasibility Study (February 2019) that assessed conditions of five separate streams and three storm sewer outfall locations and prioritized these using a multi-decision criteria matrix. The Taylor Run stream was the second priority project out of the five locations. The Phase III Stream Assessment is built on stream identification and assessment of problem areas in the Phase I Stream Assessment (2004) and Phase II Stream Assessment (2008). The project location for the potential stream restoration is approximately 1,900 linear feet that extends from the culvert at Chinquapin Recreation Center for approximately 1,000 linear feet where it reaches the First Baptist Church of Alexandria property and extends an additional approximate 900 linear feet and terminates at the dual culvert downstream.

Staff commenced outreach on the draft results of the Phase III Stream Assessment and this proposed project in September 2018 and with the approval of City Council, applied for a FY 2019 Virginia Stormwater Local Assistance Fund (SLAF) grant later that month; with outreach continuing through February 2020. While design slowly progressed during the COVID global pandemic, public engagement around the projects was interrupted and restarted in September 2020 and continued through April 2021. A stream restoration work session was held on April 27, 2021, City Council legislative session that included a presentation on the stream restoration progress and a public comment period. At this session, City Council directed staff to pause progress on the stream restoration project and collaborate further with the community on alternative methods to the proposed method of Natural Channel Design (NCD), an approach used and endorsed by Virginia Department of Environmental Quality (VDEQ) and revised in 2021.

To facilitate the collaboration, City staff engaged the neutral third party – the Institute of Engagement and Negotiation (IEN) with the University of Virginia – in July 2021 to begin working with the community on these alternatives. Throughout the engagement, community stakeholders, staff, and consultants have discussed the efficacy of BMP implementation to address project goals. The current phase of this collaboration includes working with the Taylor Run Consensus Building Group (CBG) where discussions

have focused on alternative methods to meet the project goals, to include whether the implementation of BMPs can meet those goals to reduce urban runoff and flows into the stream to reduce erosion. The CBG has requested further information about the near and long-term feasibility of these upstream BMPs and their efficacy to meet the runoff reduction goals.

Beginning in the early 1990s, all development and redevelopment must meet state water quality and water quantity requirements in the zoning ordinance, in addition to treating the first ½" of stormwater runoff over all impervious surfaces. Because of this, about 51% of the 244-acre upper Taylor Run watershed currently drains to BMPs. See more information in Appendix D.

While the City has shared the existing conditions, the CBG has requested a more in-depth analysis for the potential of implementing BMPs to address project goals. To accomplish this analysis, a hydrologic and hydraulic (H&H) model was developed to provide quantitative results to help determine the level of substantive changes needed in the sub-watershed to reduce erosion along the project reach. The analysis compares existing conditions for flow and velocity in the Taylor Run stream channel with reductions in impervious surface in the watershed as a surrogate for the implementation of BMPs.

General Approach and Assumptions

The most general question this technical memo attempts to address is that if nothing is done to stabilize the stream banks of Taylor Run, how much change can be affected on the flows in the Taylor Run channel by only making changes to the upstream watershed?

The general approach was to choose an accepted model for the hydrologic and hydraulic analysis of rainfall, runoff, and channel flow/velocity. Therefore, the US Army Corps of Engineers' Hydrologic Engineering Center's (HEC) Hydrologic Modeling System (HMS), or HEC-HMS version 4.10 was selected to perform this study. This model also provided an opportunity to incorporate as much previously studied data and modeling parameters determined by other authorities, such as the FEMA Cameron Run Watershed Study (2007), as was appropriate for the purposes of the comparisons developed below. FEMA's previous study is still valid in so far as it is considered the effective regulatory source for the flood data shown on the FEMA FIRM maps used by the city to regulate development in the Special Flood Hazard Areas (SFHA).

It is recognized that since 2007 there are anomalies apparent in the local weather patterns that are not yet incorporated in FEMA's models. However, for the purposes of this study and comparisons of qualitative changes in the Taylor Run watershed, it was considered acceptable. In other words, a working model with reasonable results for existing conditions should also return reasonable results for change scenarios in the watershed. It was also assumed, much like FEMA's runoff HEC-HMS model, that there is no storm sewer in the model and is as such a pure runoff model with routing the travel of runoff from the individual sub-watersheds to the outfall.

Two separate configurations of HEC-HMS were run to determine effectiveness of two methodologies for reducing runoff potential in the upper Taylor Run watershed. The first analysis focused on the overall runoff reduction by altering the land surface and reducing the percentage of impervious surface from the existing conditions found today. The second analysis focused on the reduction of peak erosive velocities entering Taylor run by short circuiting the runoff in a detention type storage facility which controlled the release of runoff into Taylor Run.

It should be noted that only the tributary sub-watersheds contributing runoff to the outfall point were analyzed. In addition, only a short section of Taylor Run was analyzed for flow/velocity observations. In addition, a single cross section was used to calculate the velocity in Taylor Run. It is recognized that the velocities produced by this analysis do not represent every point along the reach of Taylor Run in question. As in a natural channel, velocity will vary from place to place. However, the cross section selected is in the location where the highest known velocities occur. Hence, various scenarios considering different land imperviousness conditions were entered into the model to see how flow and velocity are affected by BMPs and a large detention facility.

An additional analysis was added to PART1 using the Virginia Runoff Reduction Method was also performed to determine the scope, scale, and cost of implementing water quality BMPs for a given area.

For the purposes of this analysis and comparisons of changes in the land surface, it was assumed that a conversion from impervious to pervious areas by a percentage of the whole land surface was an acceptable allegory to adding water quality BMPs to the watershed when looking at a reduction to runoff potential.

Based on the US Department of Agriculture's Natural Resources Conservation Service's Stream Restoration Design National Engineering Handbook, Chapter 8 – Threshold Channel Design, a target maximum velocity range in Taylor Run was selected between 4-feet-per-second and 6-feet-per-second. This is the target allowable velocity to reduce runoff given the soil material present in the stream banks. It was assumed that these maximum allowable velocities, if achieved for storms equal to or greater than the 10-yr 24-hr storm, would significantly reduce the erosive potential of the flow in the channel affecting the banks of Taylor Run.

Model Setup and Parameters

The primary model program used for this analysis was the US Army Corps of Engineers Hydrologic Engineering Center (HEC) Hydrologic Modeling System (HMS), latest version. For the first look at how BMPs affect the runoff potential from the upper Taylor Run watershed, we take the existing conditions and create a baseline for comparison. The first step involved in setting up the HMS model was to define and introduce the scope of the problem to the model with required data input that included City's most updated LiDAR imagery data for the upper sub-watershed of Taylor Run. A 1' x 1' resolution Digital Elevation Model (DEM) for sub-watershed was used to delineate sub-basins tributaries to the sub-watershed for hydrological analysis. The main components of HMS model consist of a basin model, meteorological model, and control section. The precipitation used in the HMS meteorological model was taken from FEMA's "Hydrologic and Hydraulic Analysis for the Cameron Run Watershed in Northern Virginia" (2007) study. The precipitation from that study remains the basis of analysis for the effective FEMA Flood Insurance Rate Maps (FIRMs) in Alexandria and surrounding municipalities. Using this data gives us a direct comparison for existing conditions developed by FEMA for verifying our baseline. FEMA's precipitation, or design storms, were used to create the meteorological model using the storm frequency method. The selected storms were the 10-yr, 24-hr and 100-yr, 24-hr storms.

The runoff computations in the model were performed through using the Soil Conservation Service (SCS) TR-55 Curve Number methodology, a widely accepted runoff methodology and is considered an industry standard. The SCS curve number method is a simple, widely used, and efficient method for determining the approximate amount of runoff from a rainfall event in a particular area. The Curve Number is a

dimensionless parameter indicating the runoff response characteristic of a drainage basin. In the Curve Number Method, this parameter is related to land use, land treatment, hydrological condition, hydrological soil group, and antecedent soil moisture condition in the drainage basin. More information on the SCS TR-55 Curve Number method is included in Appendix BA. The model is a dynamic model that computes runoff at defined timesteps to a concentration point for each sub-watershed. The model also computes routing of runoff for each sub-watershed as the runoff travels downstream and intersects with other sub-watersheds' concentration points before being released into Taylor Run at Chinquapin Park. FEMA's effective HEC-HMS model developed a single drainage area for Taylor Run in the area of interest. This was too coarse for the purposes of this study. We separately determined a set of individual drainage areas, or sub-watersheds (refer to Table 1), that included parameters for land cover type (SCS Curve Number) and impervious surface for each from the city's Geographic Information System (GIS) data. A schematic of the determined drainage areas is shown below in Figure 1.

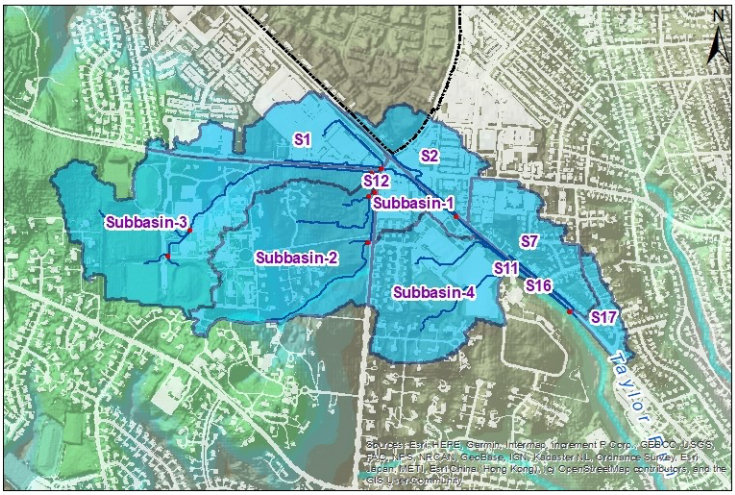


Figure 1. Upper Taylor Run Watershed

All the sub-watersheds drain to a single discharge point, coincidental with the culvert discharge into Taylor Run south of the Chinquapin Park.

Existing Conditions:

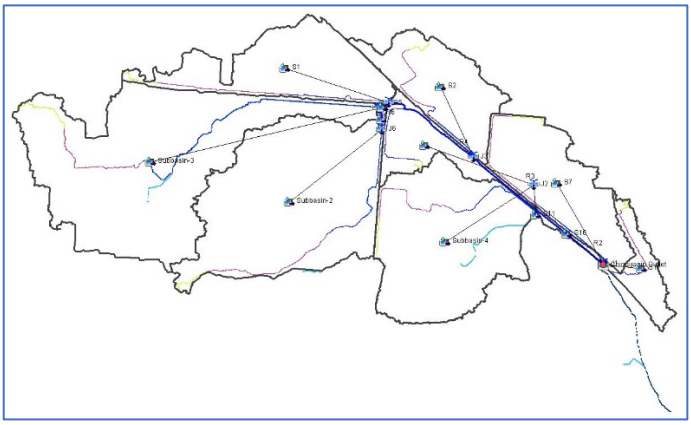
The following Table 1 shows the basic parameters of each sub-watershed in the model.

Table 1 – Sub-Watershed Details

Sub-Basin	Area (Acre)	Longest Flow Path (FT)	Basin Slope (FT/FT)
Subbasin-1	10.62	2967.73	0.011
Subbasin-2	52.78	3529.68	0.021
Subbasin-3	66.02	5345.47	0.016
Subbasin-4	40.97	2899.09	0.013
S1	24.77	2997.46	0.027

S2	18.62	2146.27	0.010
S7	22.34	2782.24	0.019
S11	0.06	90.66	0.027
S12	0.26	263.58	0.012
S13	0.19	209.77	0.014
S16	0.96	1007.53	0.025
S17	6.91	1623.81	0.028

Figure 2. Model Schematic



Storm Events:

Rainfall data from FEMA's previous flood insurance study (2007) was used to analyze runoff in the watershed based on 10-Year, 24-Hour and 100-Year, 24-Hour storm events. Table 2 and Table 3 represent rainfall depth with respect to its duration for both storm events.

Table 2: 10-Year, 24-Hour Storm Event

Rainfall Duration	Rainfall Depth (in)
5 Minutes	0.57
15 Minutes	1.16
1 Hour	2.18
2 Hours	2.57
3 Hours	2.57
6 Hours	3.34
12 Hours	4.09
24 Hours	4.84

Table 3: 100-Year, 24-Hour Storm Event

Rainfall Duration	Rainfall Depth (in)
5 Minutes	0.76
15 Minutes	1.53
1 Hour	3.23
2 Hours	3.93
3 Hours	4.27
6 Hours	5.34
12 Hours	6.82
24 Hours	8.37

Proposed Scenarios:

PART 1: Water Quality BMPs

In the first part of this study, six scenarios were introduced to the model to observe how the change in impervious surface affects streamflow in the outlet point (located in Chinquapin Park) in the upper Taylor Run sub-watershed. Change in impervious surface will be synonymous in this exercise for BMPs implementation in the watershed. Table 4 shows all scenarios with respect to reduction in the impervious surface. The existing condition as it is known today, shows the sub-watershed as 37% impervious of the 244 acres. This existing condition is Scenario 1.

For Scenario 6, the final configuration of the upper Taylor Run watershed was 100% converted to pervious surface, and a Curve Number associated with a natural area was used. This last scenario is to show ideal conditions where no development has occurred.

Table 4 - A Summary of BMP Scenarios for Taylor Run Sub-Watershed

Scenario	Total Sub-Watershed Area (Acre)	Impervious Surface (Acre)	Impervious Surface (%)	Impervious Surface Reduction (%)
1	244	91	37	0
2	244	74	30	7
3	244	67	27	10
4	244	43	17	20
5	244	18	7	30
6	244	0.00	0	37

PART 1: Results

Based on the different imperviousness scenarios considered for hydrological analysis of the upper Taylor Run watershed, following results are summarized below in Table 5.

Stormwater discharges were simulated for each upper Taylor Run sub-watershed leading to the total flow to Taylor Run in Chinquapin Park. Six scenarios (Table 2) were observed for variations in streamflow characteristics. Maximum discharge and velocity at the outlet of the upper Taylor Run watershed entering Taylor Run were calculated for each scenario.

Table 5 - Summary of BMP Scenarios Results for **10-Year**, 24-Hour Storm Event

Scenario	Hydrologic Element	Percent Impervious	Peak Discharge (cfs)	Peak Velocity (fps)
1	Watershed Runoff to Taylor Run	37	579.10	7.41
2	Watershed Runoff to Taylor Run	30	554.80	7.28
3	Watershed Runoff to Taylor Run	27	544.60	7.24
4	Watershed Runoff to Taylor Run	17	511.60	7.11
5	Watershed Runoff to Taylor Run	7	480.40	6.99
6	Watershed Runoff to Taylor Run	0	238.00	5.71

Table 6 - Summary of BMP Scenarios Results for **100-Year**, 24-Hour Storm Event

Scenario	Hydrologic Element	Percent Impervious	Peak Discharge (cfs)	Peak Velocity (fps)
1	Watershed Runoff to Taylor Run	37	954.10	8.66
2	Watershed Runoff to Taylor Run	30	932.80	8.55
3	Watershed Runoff to Taylor Run	27	924.20	8.52
4	Watershed Runoff to Taylor Run	17	897.40	8.45
5	Watershed Runoff to Taylor Run	7	871.50	8.37

6	Watershed Runoff to Taylor Run	0	596.60	7.47

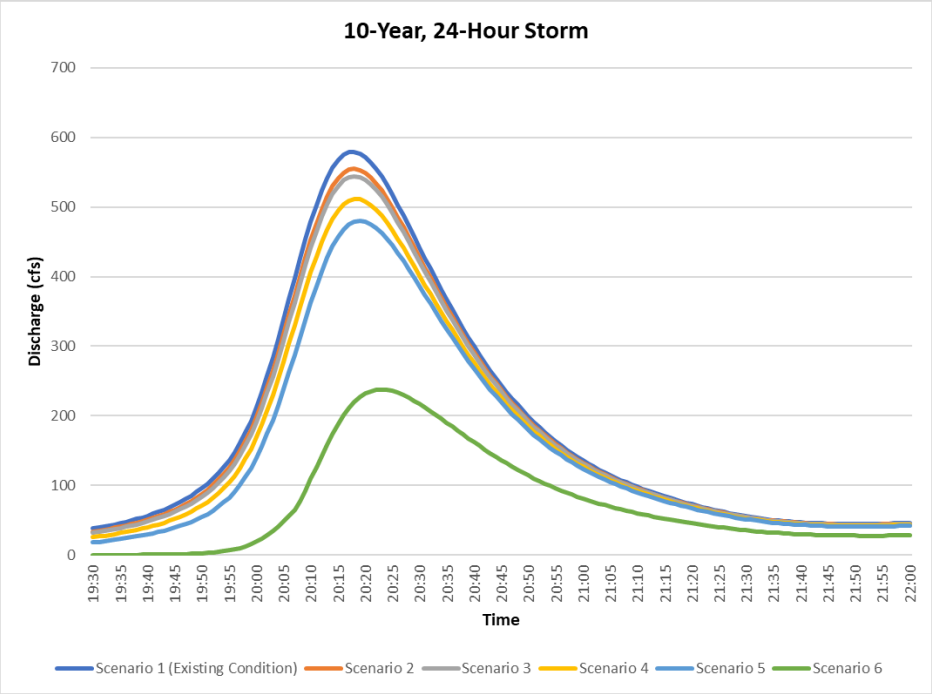


Figure 2. Simulated Peak Discharge at Chinquapin Outlet for 10-Year, 24-Hour Storm

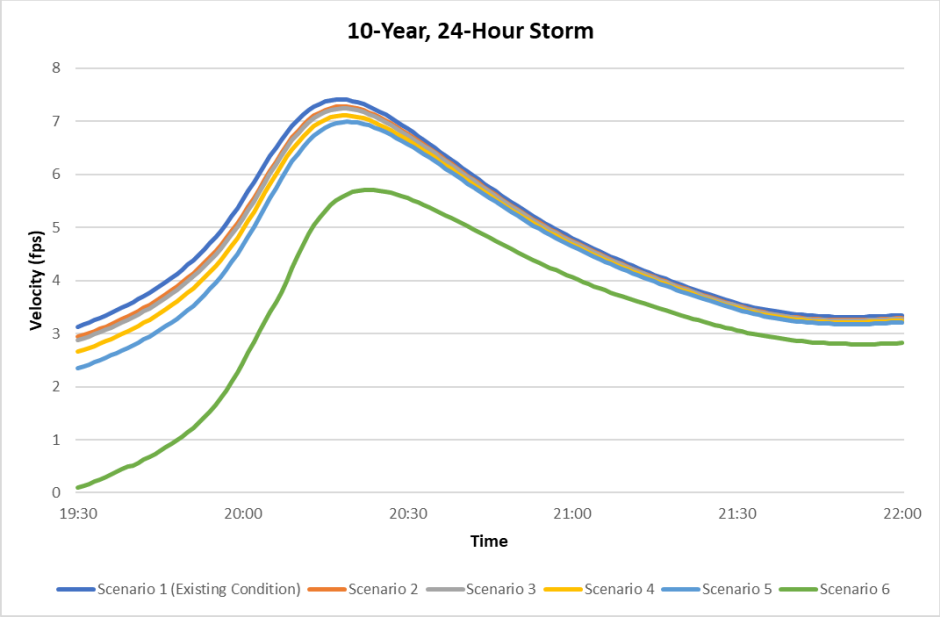


Figure 3. Simulated Peak Velocity Upstream Chinquapin Outlet for 10-Year, 24-Hour Storm

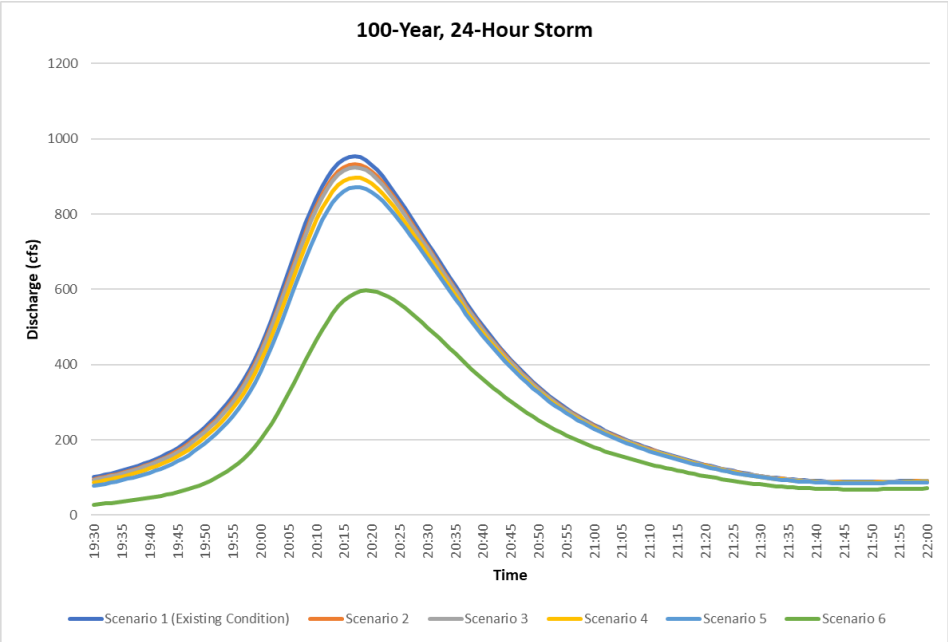


Figure 4. Simulated Peak Discharge at Chinquapin Outlet for 100-Year, 24-Hour Storm

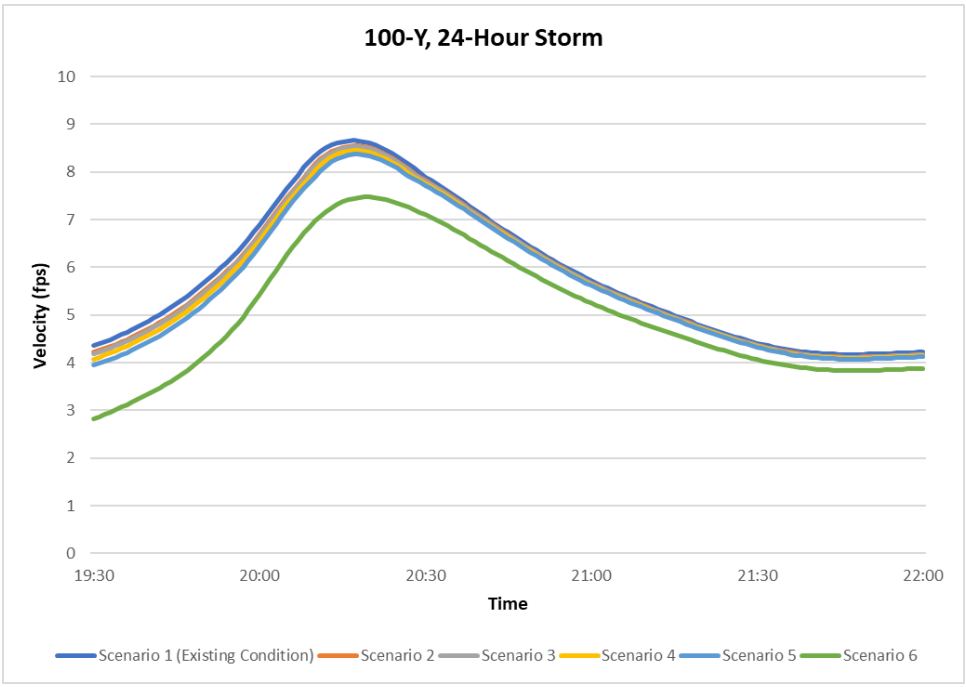


Figure 5. Simulated Peak Velocity Upstream of Chinquapin Outlet for 100-Year, 24-Hour Storm

PART 1: Modeling Conclusions

The purpose of PART 1 of this study was to develop a HEC-HMS based hydrological model to observe streamflow characteristics under different impervious conditions in the Taylor Run upper sub-

watershed. The study focused on how and to what extent water quality BMPs may affect the streamflow characteristics in Taylor Run for scouring and erosion prevention purposes in the watershed.

The results from all six scenarios including existing impervious conditions of the upper Taylor Run watershed indicate that even adopting BMPs into an extent of 90.94-acres may not stop scouring and erosion along the Taylor Run stream because velocity based on the simulated model is more than still outside the range of acceptable velocities in the Taylor Run channel, being between 4-fps and 6-fps.

1. These results lead to a conclusion that there must be other factors involved that act as constraints limiting the overall effects of these drastic changes to the watershed. In fact, there are two factors at play in this analysis that do limit the effects of the changes modeled:
   Soils Type. This modeling technique uses factors associated with soils type and the soils' ability to infiltrate rainfall before it becomes runoff. The ability of several differing soil classes to infiltrate rainfall is calculated as part of the model's computations for every timestep. In Alexandria, the soils are very resistant to infiltration and lack capacity to infiltrate rainfall for medium to large storms. Once that capacity is reached, every following raindrop hits impervious surface and runs off. The modeling factor for a specific type of land use, such as Urban Residential, has four Curve Numbers based on four soils classes determined by the National Soils Conservation Service (NRCS) from A to D. A being highly permeable, to D being highly non-permeable. It's easy to imagine that water passes much easier through sand rather than clay. FEMA generously used a Curve Number based on Class B soils in their study and this analysis copies those parameters. However, the conversion of concrete or asphalt surfaces to pervious still has a limited effect when the permeability of the soils is accounted for in reducing runoff.

2. Channel Cross Section. Velocity in any channel is based on three variables: Flow (cfs), the cross-sectional area of the cross section and channel slope.

   The equation: Q(flow) = V(velocity)*A(area)

   In a deep and narrow channel with the same slope as a shallow channel with a wide overbank area, the velocities in the deep channel are much higher than the shallow channel with the wide overbank, due to the cross-sectional area being much bigger than the wide channel. In the case of Taylor Run, the channel is deep and narrow, and the cross-sectional area doesn't change much with a change in flow, leading to small changes in velocity.

   The figure below, used only for illustrative purposes, shows an actual surveyed cross section of Taylor Run with the cross-sectional area for both the 10-year and 100-year flows. The respective velocities were 8.5-fps and 10.1-fps in this HEC-RAS hydraulic model.

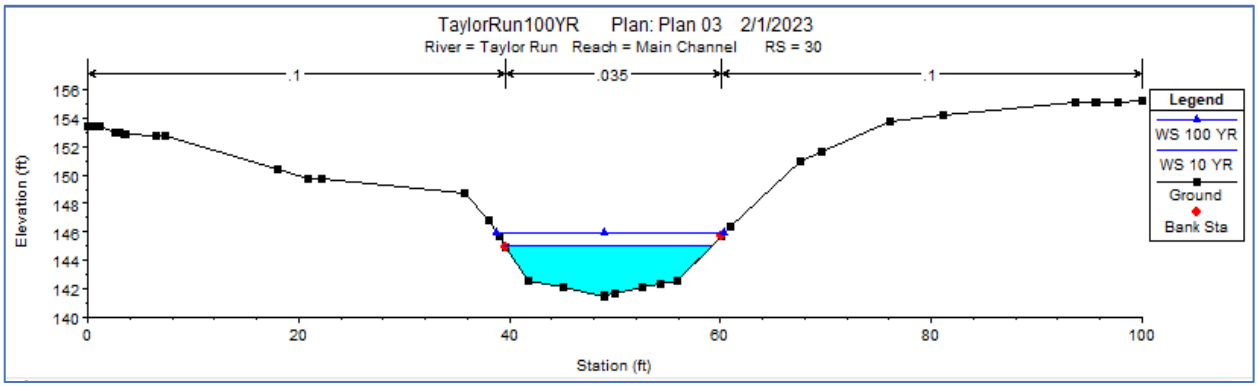


Figure 6 – Actual surveyed cross section from a recent hydraulics model of Taylor Run

PART 1: BMPs – Using Virginia Runoff Reduction Method (VRRM)

A theoretical reduction in impervious surface is perhaps difficult to imagine in a built-out watershed. To gauge the scope and scale of achieving this by implementing BMPs, the VRRM spreadsheet method may give us some basis for understanding the feasibility of big changes in the watershed for general discussion without consideration of feasibility of siting of these practices.

There are currently 51 BMPs in the upstream Taylor Run watershed due to the requirements in place since that early 1990's that any development or redevelopment must meet requirements to implement BMPs. The correlation between the analyzed reduction of impervious surface and the implementation of water quality BMPs can be somewhat estimated using the VDEQ Virginia Runoff Reduction Method (VRRM) water quality spreadsheet used in the design of water quality BMPs for a lesser design storm. The VRRM also calculates the amount of runoff reduction achieved through green infrastructure BMPs. Using the VRRM, the 51 existing BMPs previously installed as a condition of development capture 38.68 acres of impervious area and reduce 51.09 lbs./year of Total Phosphorus (TP), 307.09 lbs./year of Total Nitrogen (TN), and 23,971.43 lbs./year of Total Suspended Sediment (TSS), while reducing the runoff volume by 0.8 acre-ft. With a total of 90.94 acres of impervious area in the upstream watershed and existing BMPs capturing 38.68 acres leaves 52.26 acres of impervious area uncaptured. Using the above model approach, these BMPs effectively reduce the impervious area to 21% for the upstream watershed.

Given that about 40 acres of impervious area are currently treated with BMPs and the upstream watershed has 90 acres of impervious area, it leaves about 50 acres of impervious area untreated. The VRRM was used to analyze the runoff reduction provided by green infrastructure (GI) BMPs. This general discussion uses Bioretention Level 1 (or Urban Bioretention) with ½ acre draining to each BMP for a total of 100 BMPs implemented overall to treat the remaining 50 acres of impervious area. The VRRM calculates the 50 impervious acres would reduce 59.52 lbs./year of TP, 495.44 lbs./year of TN, and 27,926.78 lbs./year of TSS in

stormwater runoff. The runoff reduction provided by these additional BMPs equals 1.58 acre-ft. The cost of the 100 urban bioretention systems using approximately $250,000 per facility would be about $25 million dollars.

Additional information on this method may be found in Appendix D.

PART 1: BMPs Conclusions

This general consideration of BMPs shows the value of GI to provide water quality benefits. There are also co-benefits such as reduced heat island effect, creation of micro-habitats, and overall greening and increase in the City's tree canopy associated with implementing GI. While there is a great water quality and 'greening' benefits from implementing these BMPs, the reduction in runoff is minimal compared to the detention discussion in Part 2. Based upon the above model, we could consider that existing plus additional BMPs effectively reduces impervious area to 0% by implementing BMPs on the total 90 acres of impervious and provides a total of 2.38 ac-ft of runoff reduction for the design storm. However, BMPs are designed to capture runoff from the first 1" of rainfall that drains to the facility and are not meant to mitigate flooding. Any additional runoff generated beyond the first 1" is designed to bypass the BMP facility. The first 1" in a 10-year storm and a 100-year storm occurs within about the first 15 minutes of those storms (see Tables 2 and 3, respectively). So the reminder of the stormwater runoff from those storms are not treated nor reduced by the implementation of BMPs. Given this information, implementing the 100 GI BMPs at a cost of $25M would not address the continued erosion impacting critical sanitary sewers and other infrastructure.

PART 2: Detention and Runoff Reduction

The second part of this study looked at the modeling of storage to detain and control the release of runoff into Taylor Run from the watershed. A storage basin was added between the final junction and the Taylor Run reach to the existing conditions model discussed above.

The storage basin was sized to accommodate a large range of runoff between the 10yr and 100yr storm model runs and configured to allow overflow from the storage given a reasonable depth constraint of 12-feet maximum storage and would begin to overflow at a depth of 8-feet. The following table was used in the model controlling the discharge out of the detention facility. A 2-acre initial footprint of the storage pond was selected. However, there only appears to be approximately 1.5-acre footprint currently available at the Chinquapin Park. See Figure 7, below.

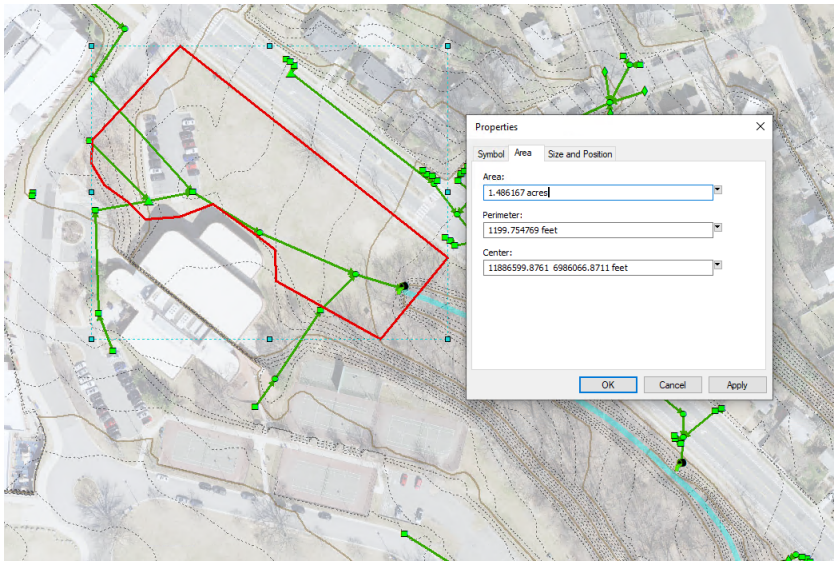


Figure 7 – Map of Chinquapin Park Available Area

Table 5 – Storage Outlet Rating Table

Headwater Elevation (ft)	Total Discharge (cfs)	48" Outlet Discharge (cfs)	Spillway Discharge (cfs)
132.50	0.00	0.00	0.00
137.21	90.00	90.00	0.00
140.95	180.00	152.29	27.71
141.50	250.00	159.19	90.81
142.15	360.00	167.03	192.96
142.60	450.00	172.28	277.71
143.01	540.00	176.89	363.11
143.39	630.00	181.08	448.92
143.74	720.00	184.81	535.19
144.08	810.00	188.33	621.66
144.39	900.00	191.64	708.35
140.50	146.30	146.30	0.00 - Overflow Point

The table above was used to create the second table used is the relationship between depth, storage volume and discharge and input into the HEC-HMS model, shown below in Table 6.

Table 6 – Storage Rating Table

DEPTH	Storage (acre-ft)	Outlet Q (cfs)
0	**0**	**0**
4	**8**	**90**

8	**16**	**180**
9	**18**	**250**
10	**20**	**450**
11	**22**	**720**
12	**24**	**900**

Details of the storage calculations may be found in Appendix B.

PART 2: Results

The two points of interest in this part of the analysis are the velocities in Taylor Run and the amount of storage needed. The following table shows the resulting changes in Taylor Run vs the existing conditions for both the 10-yr and 100-yr storms.

The target maximum velocities to reduce erosive forces in the channel at Taylor Run is between 4-fps and 6-fps.

Table 7 – Storage Results

DETENTION STORAGE

10-YR	**Storage (acre-ft)**	**Peak Flow into Storage (cfs)**	**Peak Flow to Taylor (cfs)**	**Velocity in TR (fps)**	**Existing V (fps)**
	19	**562**	**315**	**6.1**	**7.2**
100-YR	**Storage (acre-ft)**	**Peak Flow into Storage (cfs)**	**Peak Flow to Taylor (cfs)**	**Velocity in TR (fps)**	**Existing V (fps)**
	23	**925**	**799**	**8.1**	**8.5**

Part 2: Conclusions

These results show some improvement in the Taylor Run channel where significant storage is provided in the watershed before the runoff reaches Taylor Run. The nearly 23-acre-ft analyzed for the 100-yr storm may not be feasible or have a favorable benefit/cost ratio. As modeled the 23-acre-ft facility is approximately 11-ft deep and would have a footprint of 2-acres, yet only reduces the peak velocity about 12% for the 10-year and about 8% for the 100-year storm and only reaches the target maximum velocity in Taylor Run for the 10-year storm. Under this scenario, any storm event larger than the 10-year storm would bring erosive velocities to the channel and may continue to erode the banks of Taylor Run.

This analysis shows that a reduction in peak velocities is possible in theory, without considering any practical applications or cost. For example, Arlington County completed installation of 12-acre-ft of stormwater storage at Cardinal School in 2022 at a cost of $18M. Using that project as a baseline cost of $1.5M per acre-ft, the 19-acre-ft storage to control the 10-year is estimated to cost $28.5M and the 23-

acre-ft storage, as a single facility, has an overall estimated cost of approximately $34.5M, nearly an order of magnitude greater than the total cost of any of the proposed work to stabilize the stream banks of Taylor Run.

According to the VRRM, the existing BMPs provide about 0.8-acre-feet of stormwater runoff reduction. Also, according to the VRRM, additional BMPs to treat the remaining 90 acres of impervious would provide an additional 1.58-acre-feet of runoff reduction, for a total of 2.38-acre-feet of runoff reduction. are calculated. the implementation of numerous water quality BMPs may not be the right tool to achieve the goal as stated, which is to reduce erosive velocities in Taylor Run for the storm events that deliver those erosive velocities. Given this information, implementing the 100 GI BMPs at a cost of $25M would not address the continued erosion impacting critical sanitary sewers and other infrastructure.

However, it is clear that the major benefit for water quality BMPs is nutrient and sediment pollution, along with the co-benefits in an urban setting of reducing heat island effects, creating micro-habitats, and increasing canopy coverage. Because of this, staff will continue to pursue opportunities to implement BMPs in the Taylor Run Watershed to enhance water quality in the stream and downstream.

References

US Department of Agriculture's Natural Resources Conservation Service's Stream Restoration Design National Engineering Handbook, Chapter 8 – Threshold Channel Design - https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17784.wba

US Army Corps of Engineer's Hydrologic and Hydraulic Analysis for the Cameron Run Watershed in Northern Virginia (2007) Available upon request.

US Army Corps of Engineer's Hydrologic Engineering Center's Hydrologic Modeling System software https://www.hec.usace.army.mil/software/hec-hms/

US Army Corps of Engineer's Hydrologic Engineering Center's Hydrologic modeling system HEC-HMS, Technical Reference Manual https://www.hec.usace.army.mil/confluence/hmsdocs/hmstrm

US Army Corps of Engineer's Hydrologic Engineering Center's Hydrologic modeling system HEC-HMS, User's Manual https://www.hec.usace.army.mil/confluence/hmsdocs/hmsum/4.10

US Department of Transportation Federal Highway Administration Bridges and Structures HY-8 software https://www.fhwa.dot.gov/engineering/hydraulics/software/hy8/

NOAA Atlas 14 Point Precipitation Frequency Estimates https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=va

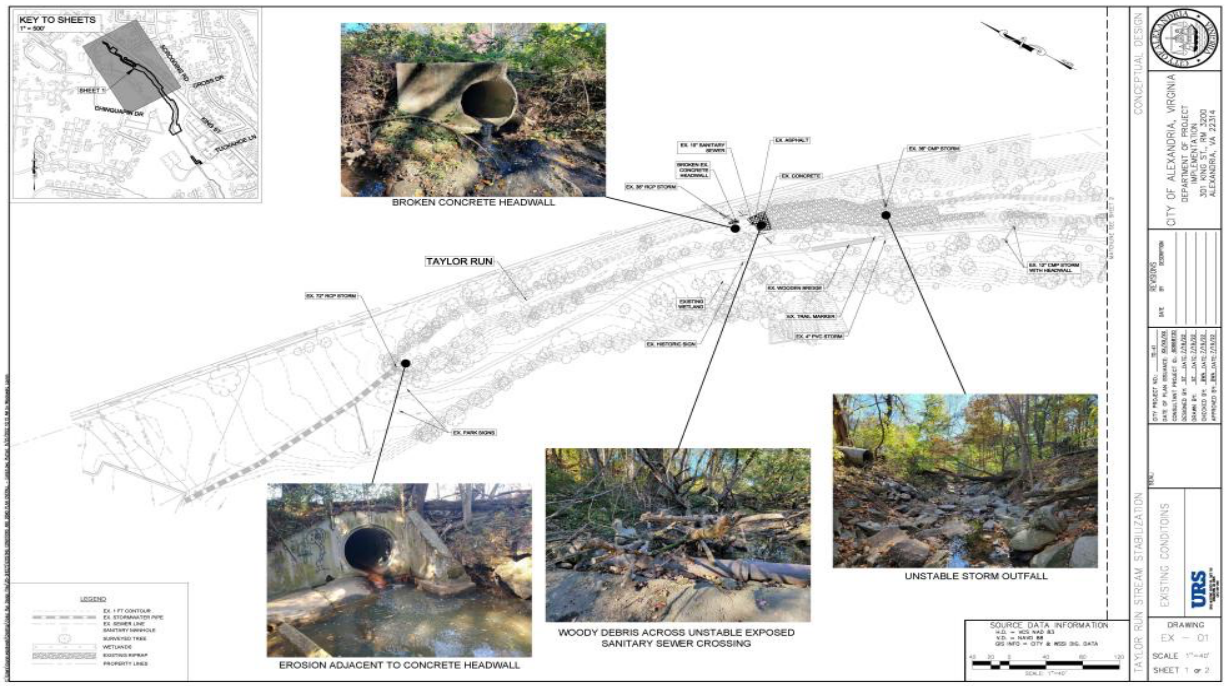
Texas A&M University's Soil & Water Assessment Tool (SWAT) https://swat.tamu.edu/

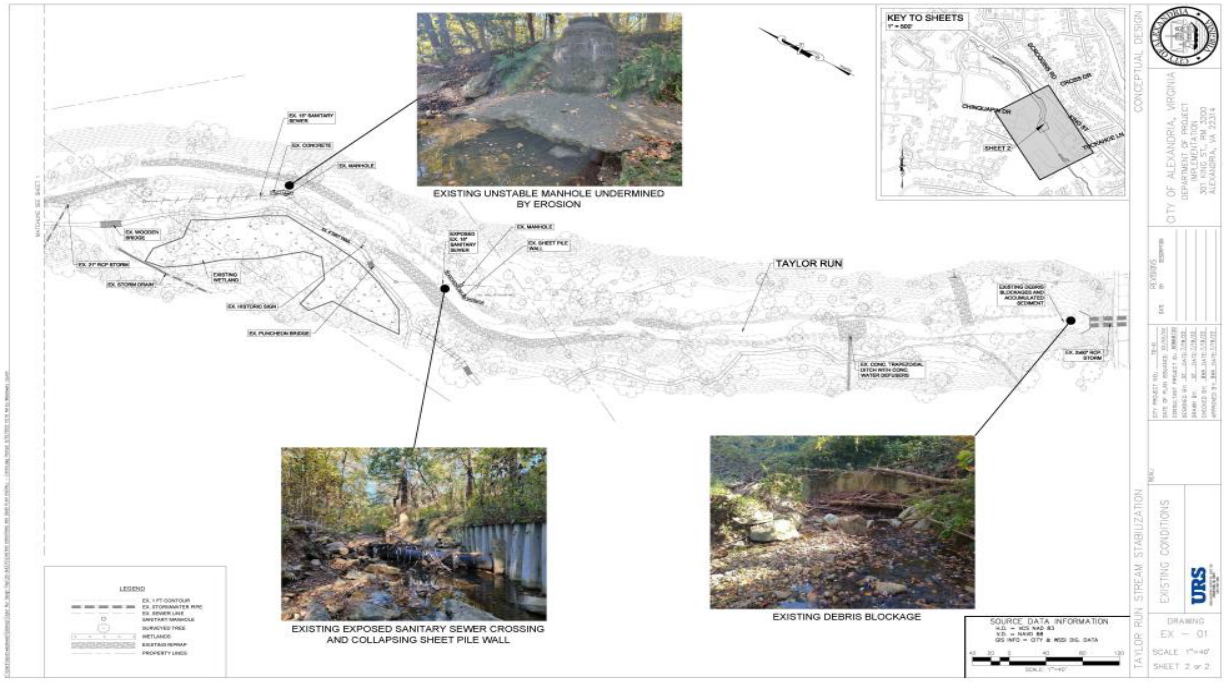
Virginia Department of Environmental Quality – Virginia Runoff Reduction Method https://www.deq.virginia.gov/water/stormwater/stormwater-construction/guidance-vrrm

Virginia Department of Environmental Quality – BMP Design Specifications https://www.deq.virginia.gov/water/stormwater/stormwater-construction/bmp-design-specifications

Appendix E - Taylor Run Worksheet

Figures One and Two: Taylor Run Schematic





CBG Recommendations to the City

The TR CBG recommends the following practices:

Construction practices:

Construction Practices: Work on the infrastructure protection shall be done within the portions of the stream shown on the engineering proposals presented to the CBG in a manner calculated to have minimal impact on the wetlands and key forest communities adjacent to the stream and on the stream bed and banks. Selected options should be engineered to withstand flow rates. Construction paths should be clearly outside the boundaries of the wetlands. Between the upper sewer line crossover and the mid-stream crossover, trees on the Chinquapin Park side of the footpath should not be cut or harmed by affecting their root structure or otherwise.

Similarly, the large (City champion) red maple on the stream side of footpath should not be cut or otherwise harmed. Other trees that should not be cut or otherwise harmed were identified by the CBG and are as follows:

Tag numbers 646, 647, 648, 619 (and untagged red maple immediately behind), 613 (and untagged red maple immediately to right), 608, 609, 136, 138, 139, 141, 142, and 143.

By description, they are:

- 646 (white oak), 647 (hickory), and 648 (white oak) - three trees on the right hand at the bottom of the path coming down the hill from Chinquapin Circle.
- 619 (black cherry) and an untagged red maple right behind it - streamside on Chinquapin Circle side of TR.
- 613 (big tulip poplar tree with netlike root structure in stream). On King St. side of TR, and untagged red maple to its left.
- 608 and 609 (red maples).
- 138 (tulip poplar), 139 (elm), 141 (tulip poplar), 142 (ash) and 143 (ash). Grove of trees on King St. side of TR.
- 136 (tulip poplar). On King St. side of TR.

Each of these trees was not affected by the lower sewer line crossover and sheet wall project of a decade ago and we believe it should be possible for them to be left unaffected by the proposed line crossing and manhole projects that are now being considered. All of them are near, but not within the proposed lower line work area.

Construction equipment access and work between the two sewer line crossovers should take place, to the extent possible, on the path in the middle of the park coming down the hill from Chinquapin Circle to the mid-stream crossover, and along the stream bed between the crossovers.

Design review:

The City Manager's January 5, 2023, Memorandum to City Council (Appendix H) on the status of the community collaboration on stream improvements states that the design consultant for the TR improvements would "work closely with City staff and the identified stakeholder groups. . . "to allow for input at the 30%, 60%, 90% and 100% design stages." The current community members of the CBG should be recognized as a stakeholder group that will participate in the

design consultation process. The City desires to open up and increase engagement to the larger community as appropriate during the design process.

Upper Culvert protection:

A stone covering of the culvert walls facing the stream should be put in place and concrete rubble removed as appropriate.

Upper Sewer Pipe Protection:

City staff should select from the options presented to the CBG. See “Other Considerations” below.

Lower Sewer Pipe Protection:

City staff should select from the options presented to the CBG. See “Other Considerations” below.

Manhole Cover Protection:

City staff should select from the options presented to the CBG as well as the following option: Consider removal of the “skirt” of concrete from base, install several large stones at base of the cone and the lower stream bank to prevent erosion of the bank.

Figure Three shows a general example:

Post-work Restoration:

The City and community group will work together throughout the design and work process to develop and accomplish a comprehensive ecological restoration plan for TR that the City and the community will be proud of. Adequate funding for the restoration should be part of the funding for the improvement project.

Lower culvert protection:

No repair work is needed at this time. Culverts should be cleared as needed to allow for free flow of the stream through the culvert.

Upland Stormwater Practices:

See "Recommendations of the Community Group on Stormwater Control Measures" below

Other Considerations:

Seven community members of the CBG believe the City should consider including a large wood component in its package of infrastructure maintenance techniques, if the construction can be done consistently with the construction practices set out above. Two community members of the group believe that Large Wood components should not be placed in TR.

The City should advise the community members of the CBG of its reasons for selecting its proposed maintenance techniques.

Community Perspective on Upland Stormwater Control Measures (did not reach consensus)

Erosion in TR is largely due to stormwater runoff that surges through the stream during heavy rains. The storm surges are caused by runoff in the stream's Alexandria watershed, which has been increasingly covered by impermeable surfaces.

The "infrastructure fixes" to protect the sanitary sewer line in the stream valley and efforts to reduce erosion in TR, including the recommendations by the Consensus Building Group, are short-term responses to a long-term problem.

Our recommendations provide an opportunity to educate Alexandria's City Council, City staff, and City residents about the cause of the erosion along TR and that the solution lies not with stream reconstruction, but with the implementation of Best Management Practices (BMPs) upstream to control the stormwater surges during periods of heavy rain.

The community members appreciate the work that the City has done to evaluate the cost of flow reduction options and BMPs upstream. We thank the City for exploring the construction of a stormwater retention pond or underground cistern adjacent to the Chinquapin Recreation Center to hold as much water as possible before the water is released into TR. We understand that a retention structure will not prevent a surge if the City receives a 100-year deluge, but we believe retention pond or cistern will provide a valuable holding area for lesser and more frequent deluges which otherwise will flow unimpeded into TR. We recommend that the City fund and install the Chinquapin Recreation Center cistern or retention pond and other stormwater BMPs in other areas of the TR watershed including:

- Along King Street from South Taylor Street to the cistern or retention pond that will be installed adjacent to the Chinquapin Recreation Center,
- In or along the Bradlee Shopping Center,
- Along Braddock Road from North Early Street to Quaker Lane,
- At Minnie Howard School,
- In Chinquapin Park along the Chinquapin Drive and downhill from the garden plots, and

- In other locations in the Taylor Run watershed.

The City should also ensure that the water retention cistern at Alexandria City High School be returned to full working order promptly. In addition, the City needs to retrofit existing detention basins, wherever possible, with devices that reduce the erosive power of frequent storm events.[9]

Upstream BMPs offer the best hope of addressing the long-term problem we face. We should move forward in a new direction. We should begin installing upstream BMPs that reduce stormwater surges that channel water into the stream via the stormwater sewer system. Upstream BMPs are critical for protecting downstream infrastructure including the City's sanitary sewer line, King Street, and other City infrastructure further downstream.

Finally, we recommend strengthening the regulations designed to prevent stormwater run-off at the site of all new construction. We also recommend that the City increase the credits property owners receive on their storm water taxes or even real estate taxes to further incentivize property owners to retrofit their properties with BMPs.

City Response on Community Members Upland Stormwater Control Measures

As discussed during the March 8th, 2023 TR CBG meeting, the City appreciates the list of potential locations for additional stormwater control measures. Staff is always supportive of BMPs and implementation of BMPs to reduce stormwater flow into our streams and rivers. We will continue to identify locations of BMPs both for regulatory purposes and where they make sense in the City. The green infrastructure BMPs are excellent for water quality and have other co-benefits but we do not believe it is the best approach for this stream stabilization required for Taylor Run.

We attempted to lay out our reasoning at the February 13th CBG meeting with a presentation and a final report (Appendix D).[10] Based upon our extensive modeling including the 10-year and 100-year storms as well as taking the watershed back to a natural state and removing all impervious area, velocities will continue to erode the stream channel causing disturbance to City infrastructure.

In 2018 the City worked with the state and developer to create a Memo to Industry that 65% of water quality requirements need to be met through green infrastructure.[11] [12]Today, typically developers in Alexandria will attempt to do the most green infrastructure practices on sites they can. We also have a higher standard than the state requirement to treat the first ½" of rainfall runoff.

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[9] Hawley, R. J., James A. Goodrich, Nora L. Korth, Christopher J. Rust, Elizabeth V. Fet, Craig Frye, Katherine R. MacMannis, Matthew S. Wooten, Mark Jacobs, and Rajib Sinha, 2017. Detention Outlet Retrofit Improves the Functionality of Existing Detention Basins by Reducing Erosive Flows in Receiving Channels.

[10] https://www.alexandriava.gov/sites/default/files/2023-02/Taylor%20Run%20BMPs%20In%20the%20Watershed.pdf

[11] https://www.alexandriava.gov/sites/default/files/2023-02/Taylor%20Run%20Watershed%20Analysis%20TM%20Final_wAppendices.pdf

[12] https://media.alexandriava.gov/docs-archives/tes/info/memotoindustry01-18=use-of-manufactured-bmps.pdf

As far as incentives, in 2022 the City has increased the Stormwater Utility (SWU) credits that property owners can receive along with added-in new flood mitigation practices and mature tree credits. Now property owners can receive up to 50% off their SWU Fee. The SWU credit program does not provide credits to property owners on their Real Estate taxes.

We do appreciate the community members' efforts in putting this important information together. The City will continue to look for BMP opportunities throughout all the City's watersheds where it makes sense, both environmentally and economically. Unfortunately, BMPs will not reduce erosive velocities enough to warrant not using stabilization practices.

Appendix F - SR Initial Narrative Perspective

Note from IEN: The SR worksheet included recommendations that became the starting point for CBG discussions and ultimately developed into the consensus recommendations noted in the report. The following paragraphs preceded any consensus-based work within the CBG process and structure. Due to time constraints, the following ideas that were part of the original community member perspective worksheet were not able to be discussed by the full CBG group as they worked on consensus recommendations.

A Strawberry Run Community Consensus Building Group (CBG) was formed in Fall 2022 to represent the community interests in resolving the stream improvement issues in Strawberry Run. Strawberry Run has two infrastructure issues: the two private properties on Taft Avenue, and the underscoring of the north six-feet diameter storm water outlet. The small stormwater outlets high above the west and east sides of Strawberry Run are definitely not threatened by the stream's erosion. In addition, the west outlet structure is in particularly excellent condition.

There is minimal underscoring of the cement's vertical drop with limited corrosion of the bottom of its lower lip. However, this is a minor sewer maintenance task -- certainly not stream restoration. Any suggestion to "demolish and replace" this sturdy outfall is unnecessary and imprudent. Nevertheless, if deemed prudent, the placement of a wood basket structure in the gully (it is not a tributary) underneath the existing outlet -- along with possible log jams in the gully -- to slow the stormwater outlet's flow in heavy precipitation, could be considered. However, that is not true for the use of rip-rap which always does damage to riparian and instream habitats, contrary to the use of large wood. The same might be done on the east side. Elsewhere, Strawberry Run's erosion is nearing a stable equilibrium along its reaches as it reveals ancient sandstone that does not erode.

At an initial community meeting in September 2022, three alternative options along with their separate engineering designs were shown by AECOM. Dr. John Field had been asked by the city to present a general overview of the use of large wood as functional elements in stream restoration -- but without supporting engineering plans. The Strawberry Run CBG then requested that Dr. Field prepare wood engineering plans as options, and he subsequently presented two wood options. The intent of all options was to focus on less hard engineering practices such as Natural Channel Design, minimal construction in roads and set-up areas and minimizing environmental damage such as tree loss, while addressing needed infrastructure issues.

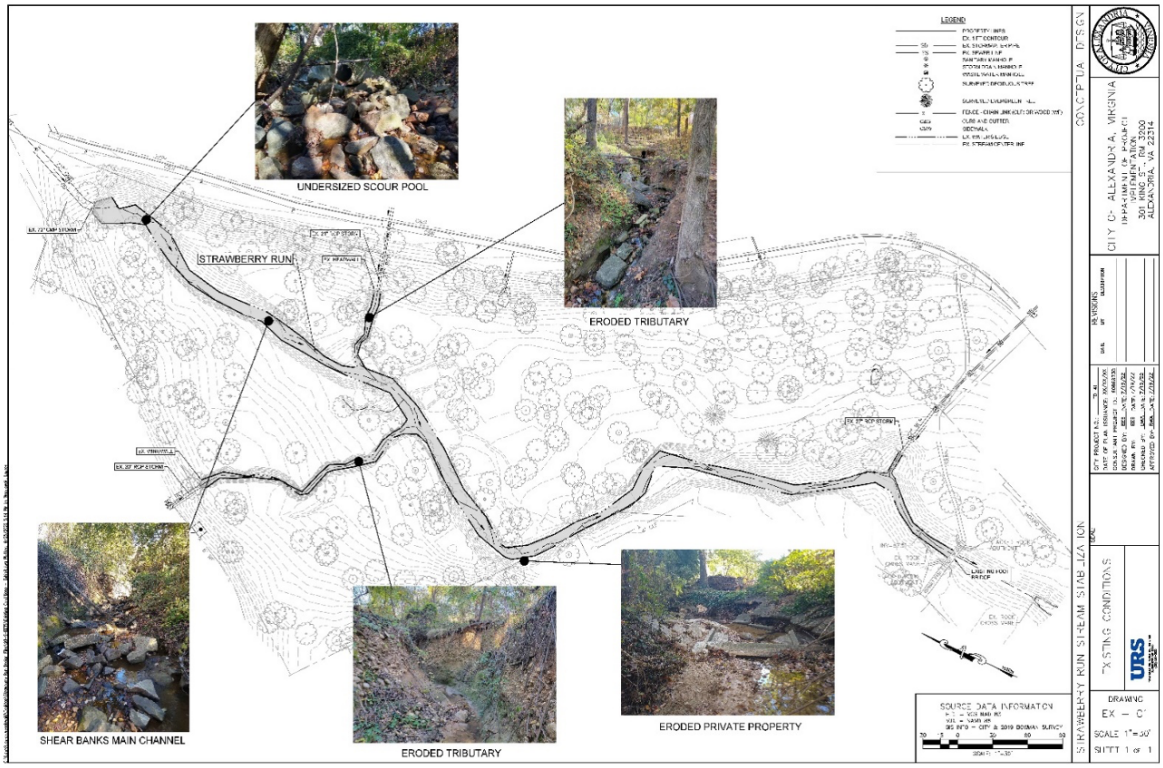
Of these options, the large wood option, which uses wood as an erosion stabilization techniques and streamflow stability tool has received large community support. This is because, as opposed to the ecological damage done from the use of rip-rap, wood serves as a food resource for microbes, fungi, and macroinvertebrates, with a role in habitat formation, aquatic food webs, and biogeochemical processes. Furthermore, wood actually improves water quality by trapping sediment, as well as by increasing uptake of phosphate and buffering pollutants. Importantly, wood also creates bedform roughness (resistance to flow, or drag) that effectively slows flow down. In fact, the Army Corps points out that large wood stream restoration has been extensively done, lasting over 30 years, particularly in the Northwest. And the Army Corps

shows that Northern Virginia has the same excellent “Climate Index” – or the “decay rate” for wood – as does Oregon and Washington.

Only conceptual designs have been presented to the CBG. The City will continue to include robust community input throughout this process.

Appendix G – Strawberry Run Worksheet

Figure Four: Strawberry Run Schematic



<u>The City Staff and Community's Consensus-Based Recommendations</u>

Community and City staff members of the SR CBG offer the following consensus-based recommendations:

- **Overarching Recommendation**: To the extent that work is deemed necessary by the work group, the large wood option approach presented by Dr. John Field, Field Geology Services, will be utilized. The resulting design, contracting, and implementation have to follow City regulations, engineering ethics principles, and show a good stewardship of public funds.

- **Specific Request for Dr. Field**: The CBG strongly recommends that Dr. Field be significantly involved in the design and execution of the project, and we urge the City to enable that in compliance with the VPPA.

- **Ongoing CBG and Community Engagement**: The current CBG and the broader community (City residents) will participate and provide input before decisions are made at all stages of the project including initial design and the city-led 30%, 60% and 90% designated design stages.

- **Minimal Size of Access Road**: Access road length and width in the SR riparian zone will be kept to an absolute minimum to allow direct access to do the necessary work.

- **Minimal Impact of any Access Road**: Any temporary road leading into and across the riparian zones will be designed and constructed to minimize ecosystem impact, including to protect tree roots for equipment crossing.

- **Protection of Trees**: High value trees identified by the community in consultation with a certified arborist with a specialty in urban forestry will be marked for preservation and will be avoided during project implementation. Where possible and recommended by a certified arborist, pruning should be considered as an alternative to removal.

- **Minimal Size of Equipment**: To minimize disruption to the ecosystem and adjacent neighbors to the stream, the smallest equipment able to accomplish the work will be utilized.

- **Practical and Beneficial Removal of Broken Pipe, Concrete, and Unnecessary Rip Rap:** Only when practical and beneficial to the SR ecosystem, legacy broken pipes, concrete, and unnecessary rip rap will be removed from the stream and riparian zone within the work areas, including in front of and in close proximity to the Walika and Cortez properties.

Miscellaneous Practice Recommendations:

- **Fencing**: Replace the damaged safety fence around the culvert at the Ft. Williams Parkway. Place a safety fence around the culvert on Duke Street. Both new fences should consist of aesthetically pleasing materials per the Park Facilities Standards Manual.

- **New Name and Signage**: The CBG would like to discuss renaming the area, as well as consideration for new signage, by participating in the standard naming process described on the City's website.

Community Practices Recommendations Pertaining to Specific Locations:

- **Wood Basket Structures**: Repair scouring of the west stormwater outlet and repair as needed the east stormwater outlet, placing wood basket structures under both the west and east outfalls. Any work in the west outlet should utilize the wood option and shall be executed via collaborative consultation between the City and the stakeholders, particularly proximate property owners.

- **Log Jams**: Investigate placing log jams along the stream and in the adjacent gullies to manage the hydraulic stream flow regime. If determined to be necessary, access should occur only where it has already been established.

- **Existing Non-natural Debris Blockages:** Remove where necessary, practical, and where work is already occurring -- to prevent bank scouring, particularly broken cement slabs.

- **Property Bank Erosion:** Investigate stabilizing options with the stakeholder group and specifically the adjacent property owners

Recommendation for a Consultation with the City Attorney:

- At a point in the design process where there is sufficient information, City staff will consult with the City attorney for guidance if the City may use City funds and funding obtained from non-City entities, such as grants provided by the Commonwealth of Virginia, regional government entities, and the federal government, to repair erosion on the private properties.

Proposals Where No Consensus Was Reached Due to Lack of Full Community Support

The following proposed recommendations were not agreed to by consensus because three members of the community were unable to support them.

- **North Outfall**: Repair the scouring of the north six-foot stormwater pipe outfall (culvert).
- **Plunge Pool**: Slow the velocity of the stormwater as it exits the pipe with a plunge pool primarily with a wood structure.
- **Crib Walls**: Shield the outfall's nearby banks from the water's velocity by wooden crib walls of short distance.

While most City and community members supported these proposals, three community members said they would like to know if these interventions are truly necessary, and, if so, what minimal intervention would best solve the problem. The underlying interest expressed by these members was a desire to learn what is causing the increased flow of water in the stream. They did not achieve consensus on these issues until additional research had been done to determine the true need, and so they hesitated to choose an option that might not be best for this situation.

Community Perspective on Upland Stormwater Control Measures (did not reach consensus)

- The property behind 3729 Templeton Place has a portion of Strawberry Run running through it. The City used to clean out the stream and pond regularly but has not done so in over 10 years. As a result, sediment, trees, and other debris have built up in the area, preventing water from "settling" or "resting" and permeating into the ground. This area must be rehabilitated and maintained to create a deeper pool that serves as a "holding pond" for storm water runoff, helping to prevent a surge of water traveling downstream into lower Strawberry Run.

- To increase the permeability of the land uphill from Strawberry Run, replace the two concrete “hot lane” turns from Fort Williams Parkway onto Colonel Ellis Avenue and Fort Worth Avenue by widening and extending the existing grass/tree lined parkway islands in these two areas or create swales to include low-maintenance, low growing native grasses to absorb nutrients such as nitrogen and phosphorus. Then, the tops of the existing islands can be “opened” to catch water by replacing the solid concrete curbs with ”V” cut curbs that allow water to flow into the islands (and mini-swales) instead of downhill directly into storm drains that flow into SR. These changes will help reduce water flowing into SR and also reduce grass mowing on the islands, which spews exhaust into the air and deposits nutrient rich grass clippings into the stream.

Upland Stormwater Control Measures (City Perspective):

As discussed at the March 14th meeting, in general upland BMPs are for 1 year to 2-year storm events. The “first flush” or first inch of rain captures the majority of pollutants which is the reason that green infrastructure BMPs are built for that level of stormwater runoff. Any storm that is bigger, will have runoff bypass the BMP once filled. The bigger storms in Strawberry Run that will produce erosive velocities are the 10-year and 100-year storms.

For the TR watershed, we created a model and authored a report, *Taylor Run Watershed Analysis: The Effects of Implementing Stormwater Facility Best Management Practices (BMPs) in the Watershed on the Stream Channel* (Appendix H). This report also speaks in general to the upland BMP situation in SR as well.

Modeling additional BMPs took the velocity from 8 feet per second to 7 feet per second when the recommend velocity in streams to not cause erosion is 5 feet per second. Another model in the study removed 100% of the impervious area to conceptually place the watershed back to a natural state. However, this still showed erosive velocities in the stream channel. The reason is the soil type. The soil types dictate the absorption of stormwater. Our area has tight soils not very good at rainfall infiltration. Any rain after the 1st inch will cause the soil to be saturated and thus additional rain will simply runoff. The City will continue to look for BMP opportunities throughout where it makes sense. Unfortunately BMPs will not reduce erosive velocities in the stream enough to warrant not conducting stabilization practices.

Appendix H – January 2023 Memo to City Council

City of Alexandria, Virginia

MEMORANDUM

DATE: JANUARY 5, 2023

TO: THE HONORABLE MAYOR AND MEMBERS OF CITY COUNCIL

THROUGH: JAMES F. PARAJON, CITY MANAGER

FROM: YON LAMBERT, INTERIM DEPUTY CITY MANAGER

SUBJECT: PROGRESS UPDATE FOR STREAM RESTORATION COMMUNITY COLLABORATION

ISSUE: At the April 27, 2021, Legislative meeting, the City Council directed staff to pause the Taylor Run and Strawberry Run stream restoration projects to conduct community engagement and collaborate on alternative designs for the streams. The purpose of this memorandum is to provide a progress update for that effort.

BACKGROUND: The City contracted with the University of Virginia's Institute for Engagement & Negotiation (IEN) to help facilitate a consensus on an alternative approach to the original stream restoration design. During the first phase of collaboration, IEN formed a Stakeholder Advisory Group (SAG) comprised of Environmental Policy Commission, civic association, and community members and conducted interviews with the SAG and select City staff. Findings were presented to EPC in March 2022 and captured in the Stakeholder Assessment Report for Two Stream Health Improvement Projects in the City of Alexandria.

Phase 2 of the collaboration is to focus on consensus building for a desired alternative approach that was kicked off at a public meeting on September 10, 2022, that included speaking slots from the EPC chair and representatives from the community, and presentations by the City staff, the City's consultant, invited outside technical experts, and Dr. Field (as requested by the community) on potential alternative approaches. At the end of the meeting, people self-selected to join either a Taylor Run or Strawberry Run Consensus Building Group (CBG) to focus individually on alternatives for each stream. The City Manager also spoke at the beginning of the event to kick off this phase.

Additional meetings have been held to further discuss the three different alternatives designs including bioengineering, hard armoring, and a minimal approach, with estimated costs, and potential trees impacts presented by the City's consultant for each alternative.

DISCUSSION: In response to requests from these workgroups, the City has contracted again with Dr. Field (through IEN) to create concept sketches of his "Large Wood Option" as a fourth alternative. Dr. Field will be presenting his alternative to the groups in mid-January. City staff will also be presenting some specific approaches to protecting the sanitary sewer infrastructure in Taylor Run in February.

Following this, IEN will facilitate a process to reach a consensus alternative for each stream. With respect to the engagement process, a final report will be delivered, and Staff will provide an update to City Council around Spring 2023. Staff notes the 'consensus alternative' could be a hybrid that includes a combination of techniques found in the alternatives. If the Council supports the 'consensus alternative' identified for each stream and directs staff to pursue the 'consensus alternative,' City staff will develop a process for the community to remain engaged in the design of the alternatives. This process would include procuring design services to create an engineering design that will take roughly 6-9 months and extend through winter 2023/2024. The procured design consultant would work closely with City staff and the identified stakeholder groups for roughly 10-12 months to allow for input at the 30%, 60%, 90%, and 100% design stages that would be completed winter 2024/2025. After that time, construction procurement would take roughly 4-6 months and completion of the work would take roughly 7 months and be completed around the end of fall/winter 2026.

FISCAL IMPACT: The state Stormwater Local Assistance Fund (SLAF) matching reimbursement grants awarded for the Taylor Run Stream Restoration ($2,255,000) and Strawberry Run Stream Restoration ($800,000) projects require that the City execute grant agreements prior to December 31, 2022 to remain eligible. Given the extended outreach and that the grant agreement requires that a construction contractor has been procured by the December 31, 2022 deadline, the grant funding will no longer be available. While the City can reapply for future SLAF grants, the alternatives being considered for Taylor Run and Strawberry Run will most likely not meet the eligibility requirements for SLAF funding. Therefore, the City will need to fund implementation of the chosen design alternative unless other grant sources can be identified.

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