

Taylor Run Sanitary Sewer Crossings

November 15, 2022



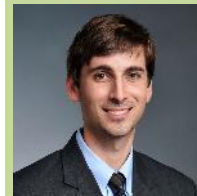
GREELEY AND HANSEN

Introductions



Erin Bevis-Carver, PE
Division Chief, T&ES/Sanitary
Infrastructure Division

- Erin Bevis-Carver has more than 20 years of experience in civil engineering related to sanitary sewer systems and has been with the City since 2010



Dustin Dvorak, PE
Associate, Greeley and Hansen

- Greeley and Hansen has worked for over 100 years primarily on water and wastewater infrastructure and planning
- 15 years of experience with collection systems and condition assessment of sewers both locally and nationally

Agenda

- Overview of State Regulations
- Can Stream Crossings Fail?
 - Why do they fail and what are the consequences?
 - Past sewer crossing failures in the City
- How do we assess stream crossings in the City?
 - How do Taylor Run crossings fare?
- Next Steps

9VAC25-790-360. Water Quality and Public Health and Welfare Protection

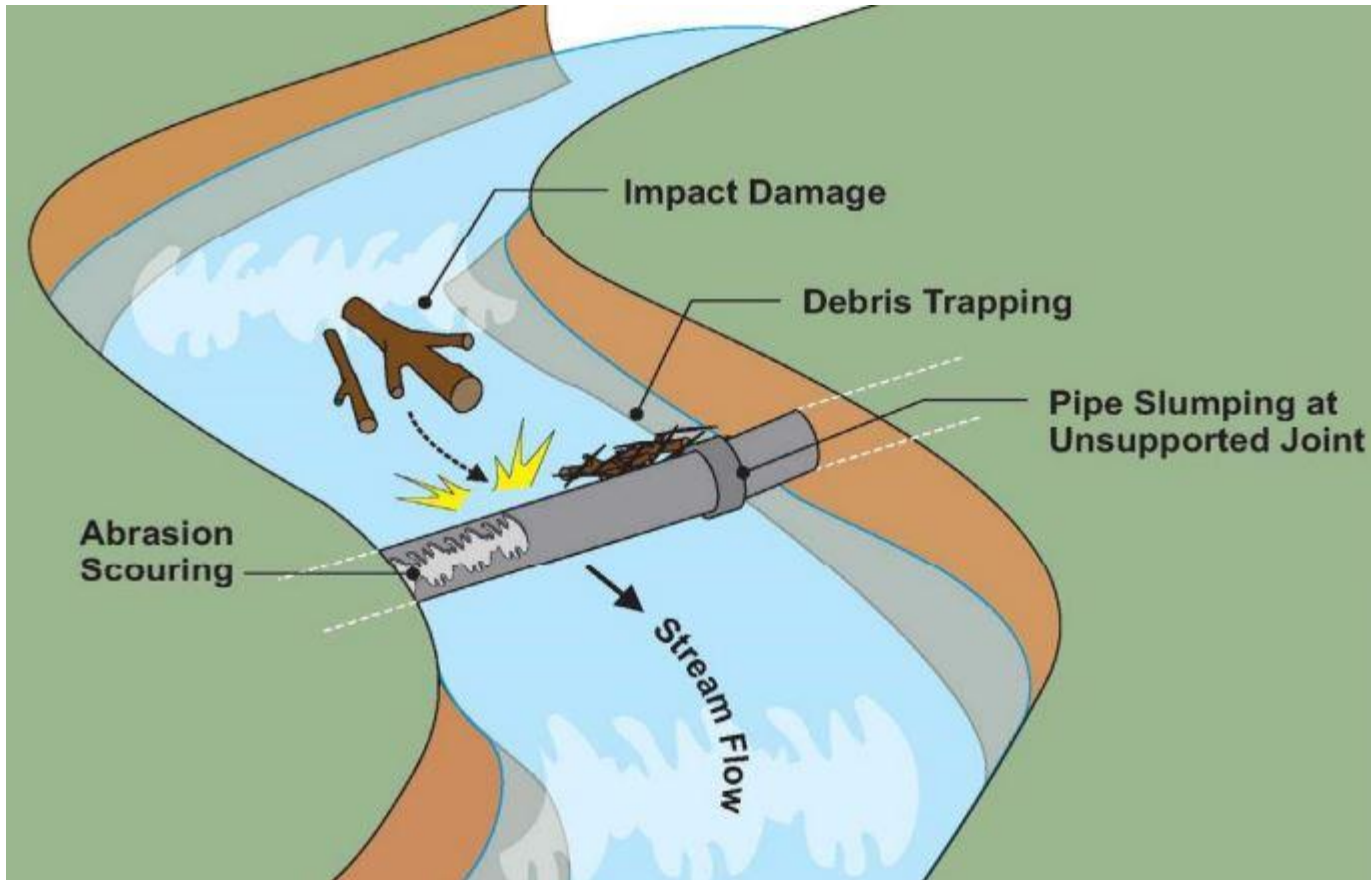
- “Tops of all sewers entering or crossing streams shall be at sufficient depth below the natural bottom of the streambed to protect the sewer line.”
 - 1-3 feet minimum cover depending on streambed material, less cover considered if sewer crossing is encased in concrete
 - Sewers laid on piers across streams allowed only when it can be demonstrated that no other practical alternative exists

Can Stream Crossings Fail?



GREELEY AND HANSEN

How do stream crossings fail? Consequences?

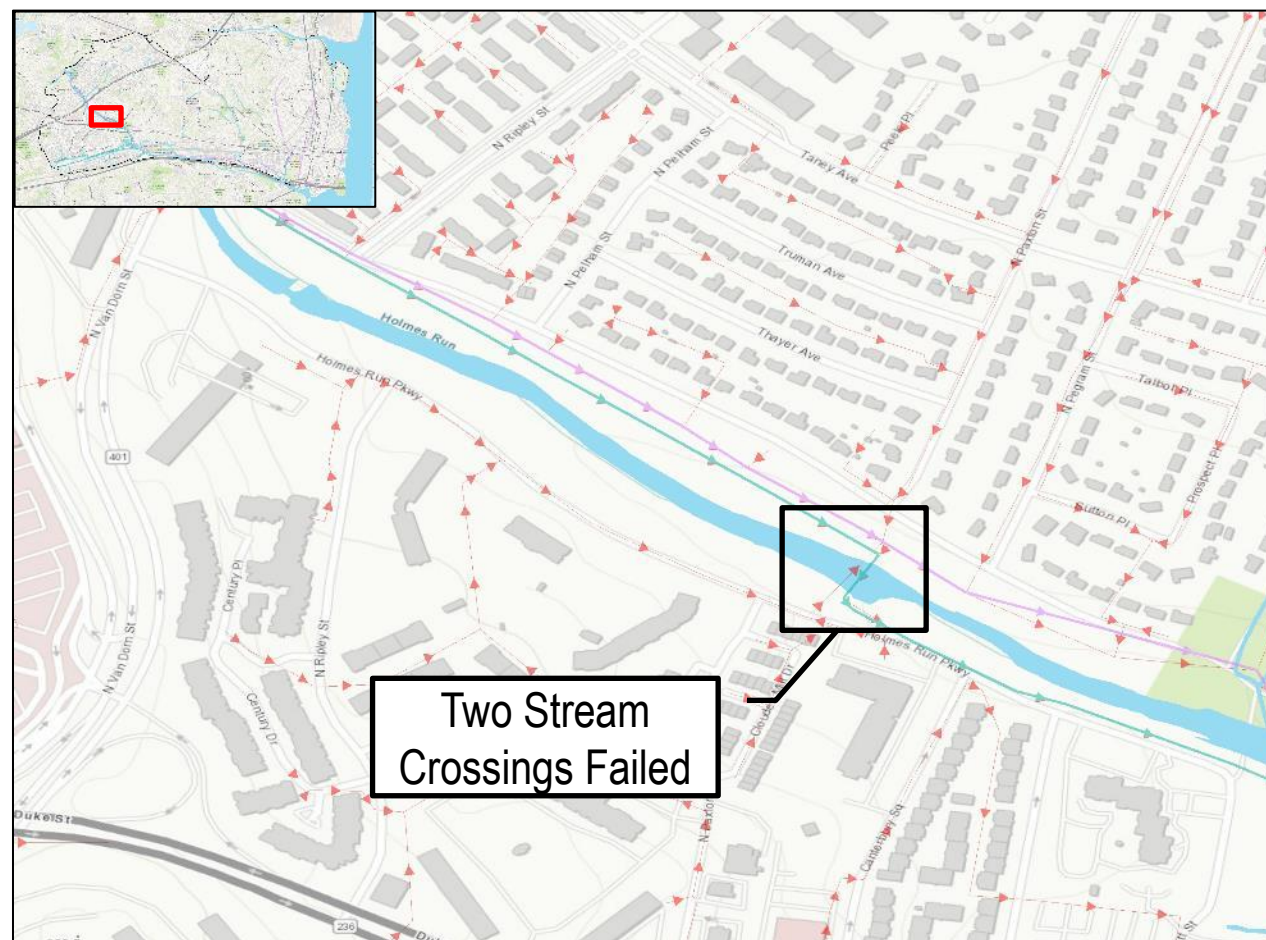


Consequences

- Sewage being discharged into stream
- Stream flows in sewer resulting in sewer backups into homes
- Potential fines and/or enforcement action from Virginia Department of Environmental Quality (VDEQ)
- Costly emergency repairs
- Disruption to the community

Holmes Run Sanitary Sewer Crossings

- Sewers as a result of a flood event during Tropical Storm Lee in 2011
 - Two sewers were undercut by high water velocities
 - Also impacted by debris
- Emergency construction was required to prevent further sewage in the stream



Failure Prior to Emergency Construction



- Two sewers that failed were a 30-inch diameter Fairfax County pipe and a 12-inch diameter City pipe

Emergency Repair

- Additional infrastructure was needed to bypass the sewage from entering the stream during construction



Emergency Repair

1. Bypass sewer(s)
2. Bypass stream
3. Reconstruct sewer(s)
4. Remove temporary construction bypass
5. Restore disturbed areas



Emergency Repair



Post-Construction

- The pipes were secured to steel supports, encased in concrete and rock, and the weir was reconstructed



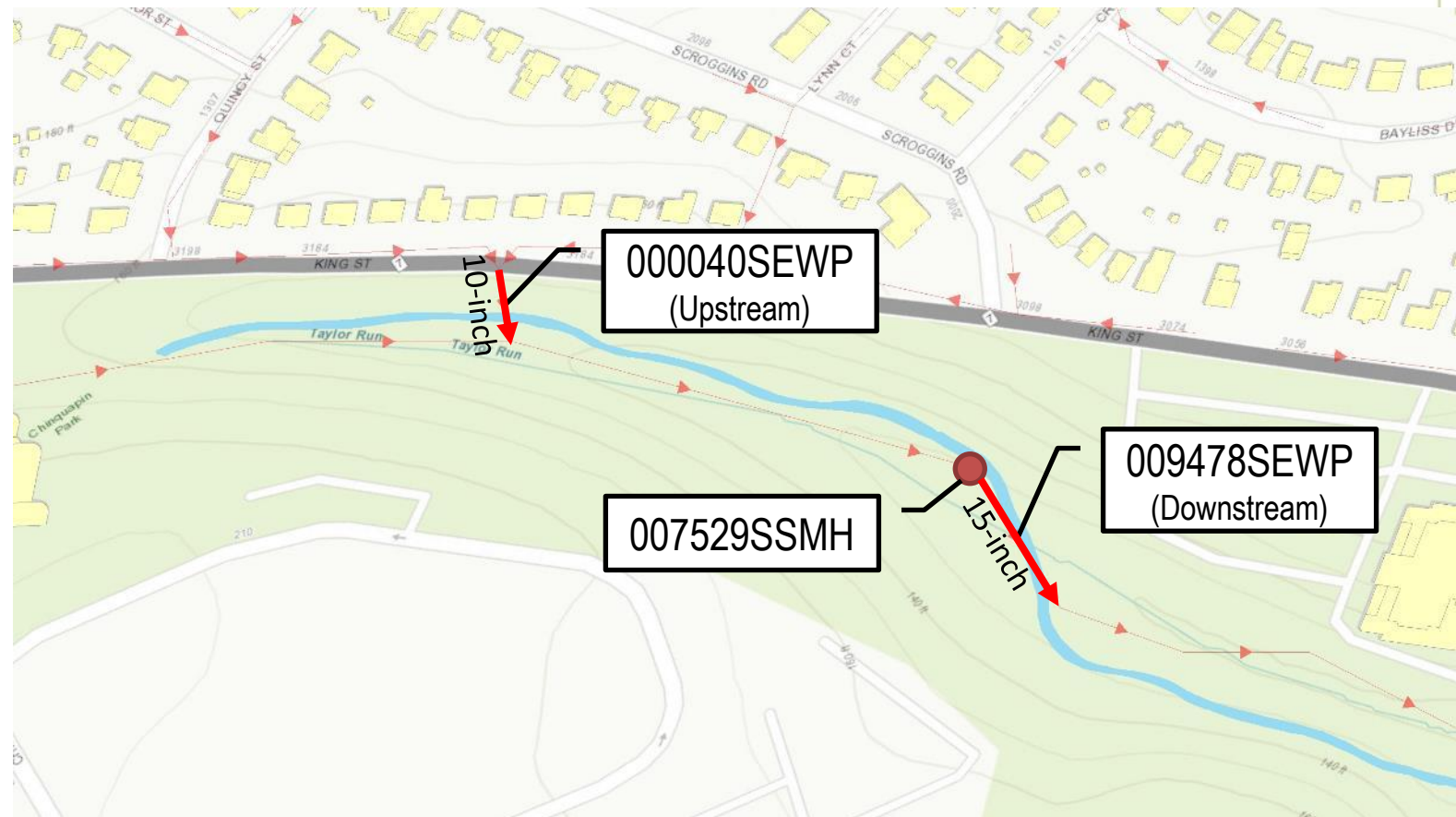
Taylor Run Sanitary Sewer Crossings



GREELEY AND HANSEN

Taylor Run Crossings Location

- Two sewer crossing locations
 - Upstream
 - Serves 82 homes
 - Downstream
 - Serves 200 homes
- One manhole



History of Sewer Crossings

- Sewers were constructed in the 1940's
- Rehabilitated with Cured-In-Place Plastic (CIPP) in Aug 2009
- Damage occurred in 2014 that broke the downstream pipe and replacement was required



2009 Cured-In-Place Pipe (CIPP) Lining



2014 Taylor Run Sanitary Sewer Crossing Failure

Concrete pipe broken and Cured-In-Place Pipe (CIPP) lining exposed



2015 Taylor Run Crossing Interim Solution



Stream Crossing Assessment Discussion



GREELEY AND HANSEN

Investigation of Sewer Pipelines in Stream Areas 2020-2021

- Performed both internal and external evaluations
- Developed overall score based on
 - Consequence of Failure (CoF)
 - Likelihood of Failure (LoF)
 - External Factors scores
- All pipes were prioritized based on their overall scores

City of Alexandria, Virginia
Department of Transportation and Environmental Services

Task Order G19-07
Investigation of Sewer Pipelines in Stream Areas

TECHNICAL MEMORANDUM

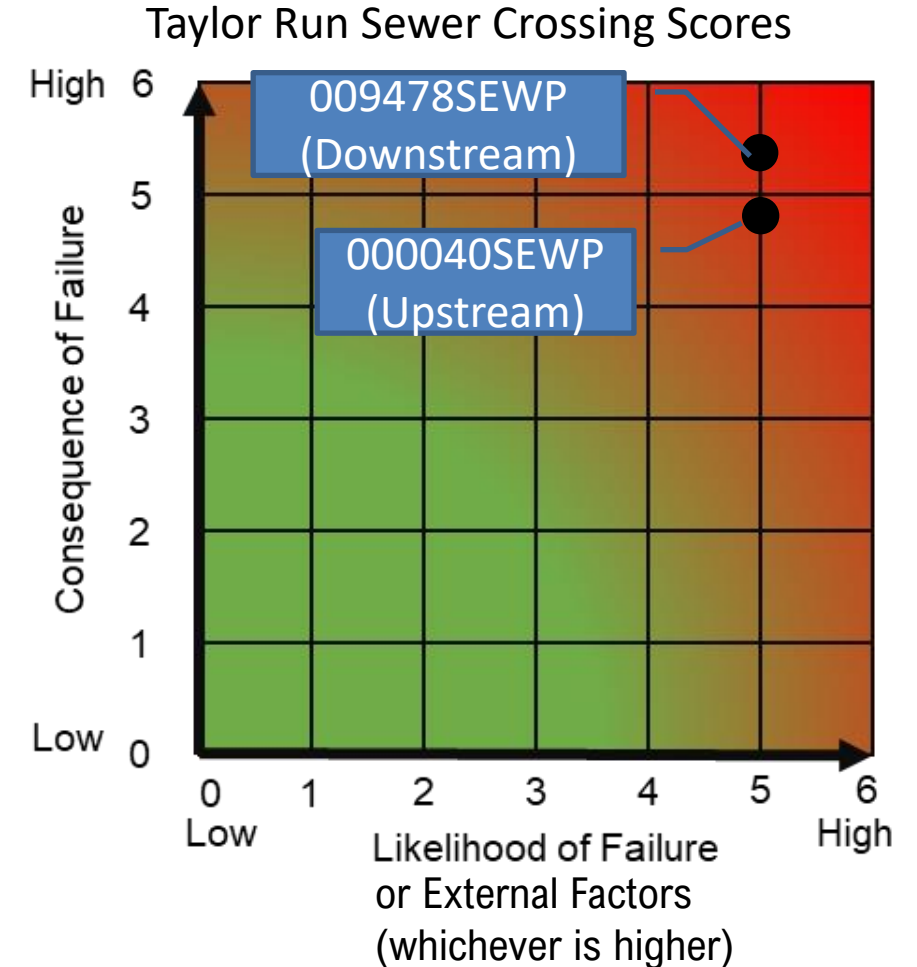
DRAFT

October 2021



Investigation of Sewer Pipelines in Stream Areas 2020-2021

- Consequence of Failure (CoF) based on:
 - Size of the pipe
 - Location of the pipe relative to other infrastructure
 - Proximity to waterbodies or resource protection areas
 - Proximity to significant upstream service
 - Accessibility of the pipe
- Likelihood of Failure (LoF) based on:
 - Condition of the pipe internal and external
 - Material and date installed
 - Has the pipe been rehabilitated recently?
- External Factors based on:
 - Stream bank erosion
 - Pipe encasement
 - Internal CIPP lining



Investigation of Sewer Pipelines in Stream Areas 2020-2021

- Based on the scores, pipes were prioritized to focus on the pipes that had the highest combination of scores
- There were a number of other pipes that didn't have completed inspections yet, we are working through those inspections now
- Will re-prioritize all pipes once those inspections are completed in January 2023

Taylor Run Stream Crossings

Sewer ID	Pipe Material	Diameter (Inch)	External Risk Factor	Likelihood of Failure (LoF)	Consequence of Failure (CoF)	Overall Risk Score
000040SEWP (Upstream)	CIPP	10	5	2.1	4.80	24.0
009478SEWP (Downstream)	DIP	15	5	1	5.32	26.6

000040SEWP



000040SEWP



009478SEWP



009478SEWP



000040SEWP – Upstream Pipe



000040SEWP – Upstream Pipe



Concerns for Upstream Crossing

- There is a joint in the middle of the pipe which is a weak point. Could be a point of failure if struck by debris.
- Support at the north end is eroded and water is now flowing underneath the support. Further erosion may cause the support to fail.
- Concrete and asphalt intended to protect the crossing is beginning to wash out. This is no longer protecting the crossing and shows the power of the stream against the pipe.

009478SEWP – Downstream Pipe

Construction Completed 2015



Stream Crossing Inspection 2020



009478SEWP – Downstream Pipe (Oct. 2022)



Concerns for Downstream Crossing

- Some of the metal supports are beginning to rust
- Debris is building up behind the crossing and acting as a dam. This causes a lot of force to push against the pipe and will continue to increase as more debris builds up and larger storms occur.

007529SSMH - Manhole



Concerns for Manhole

- Manhole is severely undercut. It seems to only be supported by the popes connected to it. As the stream continues to erode the banks, the manhole will fall into the stream
- Large pieces of debris around the manhole show the strength of the stream during wet weather. A large piece of debris striking the manhole could cause it to fail.

Asset Armoring



GREELEY AND HANSEN

8-inch Aerial Sewer Crossing



30" Buried Sewer Crossing

Before



After



Multiple Lateral Sewer Crossings



Next Steps

- Future meetings will discuss potential ways to protect the Taylor Run infrastructure
- Goal will be to develop concept design for asset armoring