City of Alexandria

Taylor Run Sanitary Sewer Crossings

Sewer Protection Concepts
February 13, 2023

GREELEY AND HANSEN

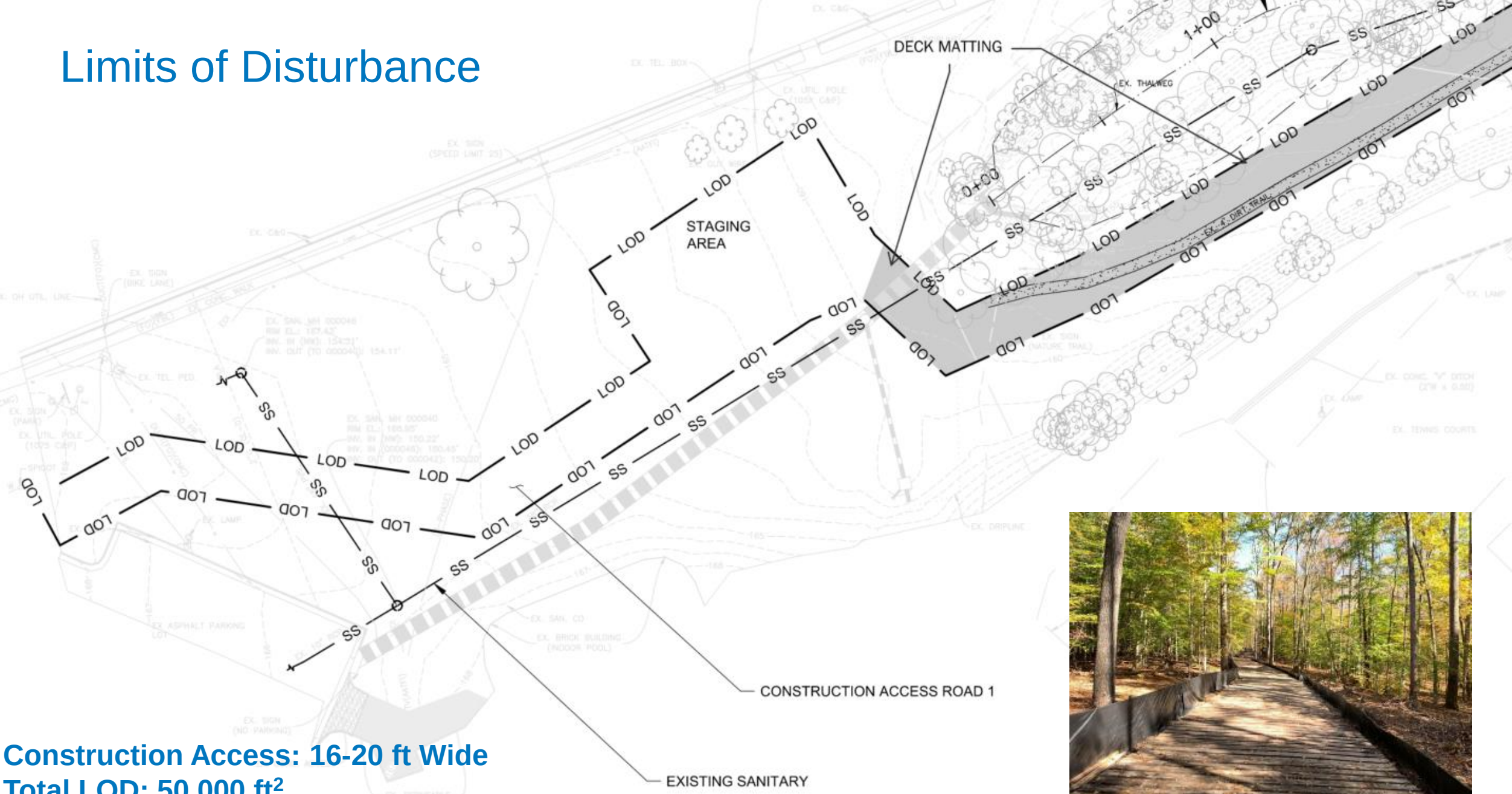
Agenda

- Design Considerations
  - Limits of Disturbance
  - Construction Access in Chinquapin Park
  - Wetland Protection
  - Tree Protection & Removal
  - Level of Infrastructure Protection
- Asset Protection & Armoring Examples
- Conceptual Design & Architectural Renderings
  - Upstream Crossing: 000040SEWP
  - Exposed Manhole: 007529SSMH
  - Downstream Crossing: 009478SEWP
- Preliminary Cost Estimate
- Open Discussion

Photo Credits: Greeley and Hansen

Design Considerations

Limits of Disturbance



Construction Access: 16-20 ft Wide
Total LOD: 50,000 ft^2
Estimated Tree Removal Count: 54

Photo Credit: WSSC Water

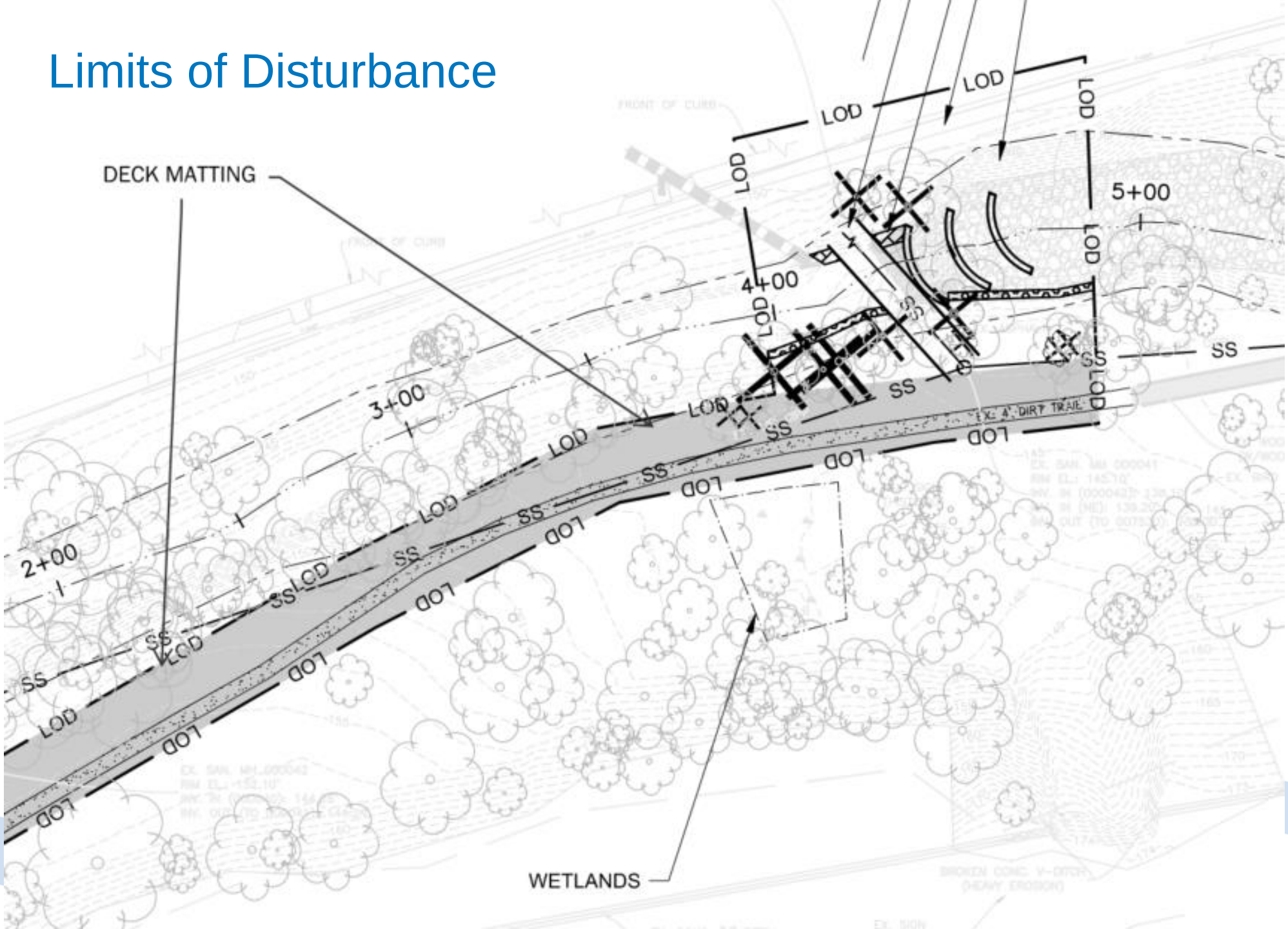
Upstream Sewer Crossing Construction Access

Access along Alexandria Heritage Trail

Material Drop Off & Loading from King Street

Photo Credits: Greeley and Hansen

Limits of Disturbance



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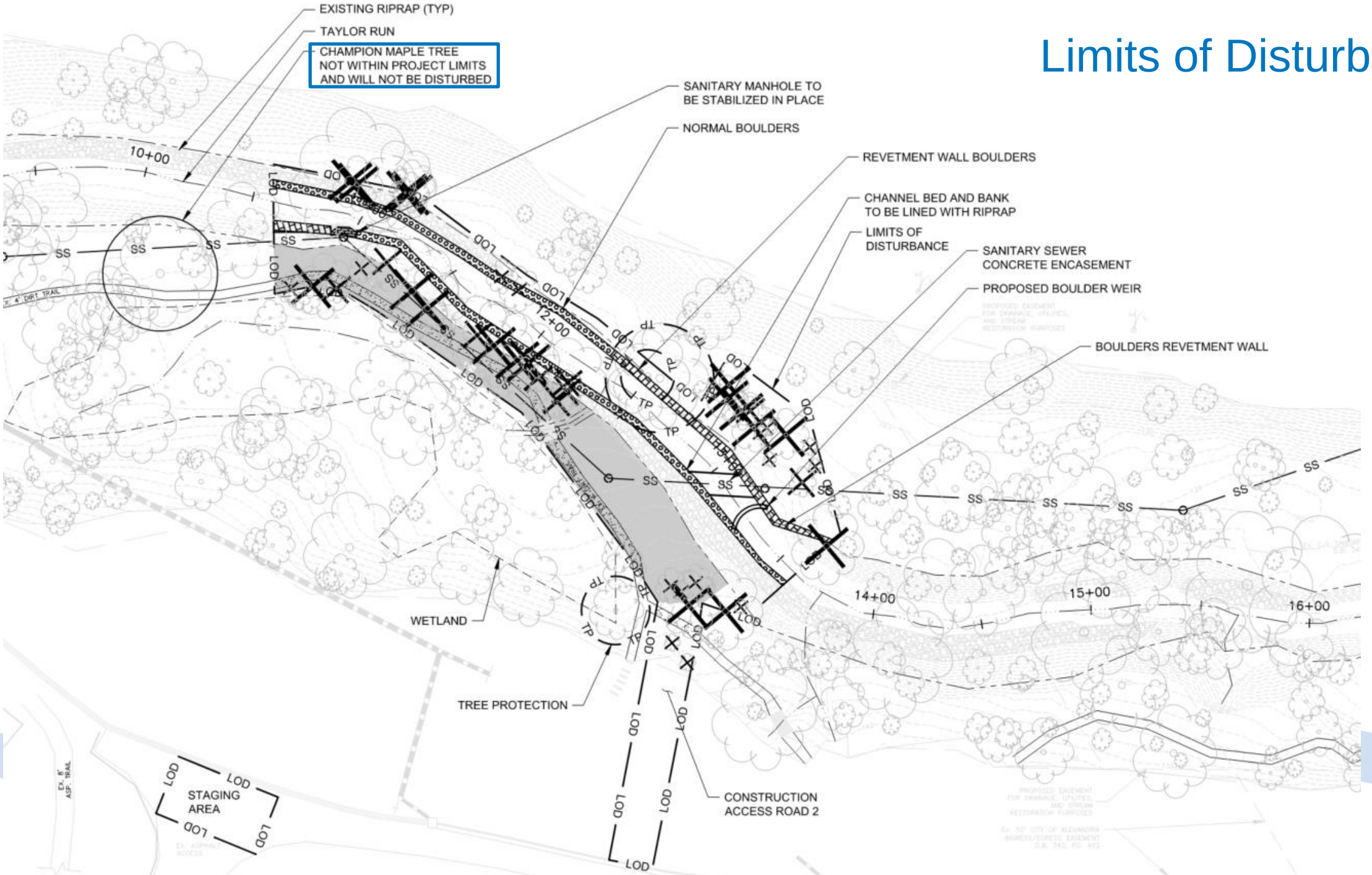


Downstream Sewer Crossing & Exposed MH Construction Access

Fill Needed for Similar Construction Access as 2015 Taylor Run Crossing Interim Solution Project

2015

Photo Credit: Rod Simmons

Current

Photo Credit: Greeley and Hansen

Chinquapin Park Acidic Seepage Swamp Protection

- 69 recorded species
- Mainly located south of Alexandria Heritage Trail
- Wetland areas excluded from LOD
- Use combination of chain link fence and silt fence to protect wetlands from being disturbed

Photo Credits: Rod Simmons

Photo Credit: Greeley and Hansen

Utilize Similar Protection as 2015 Taylor Run Crossing Interim Solution Project

Tree Protection near Access Road #2

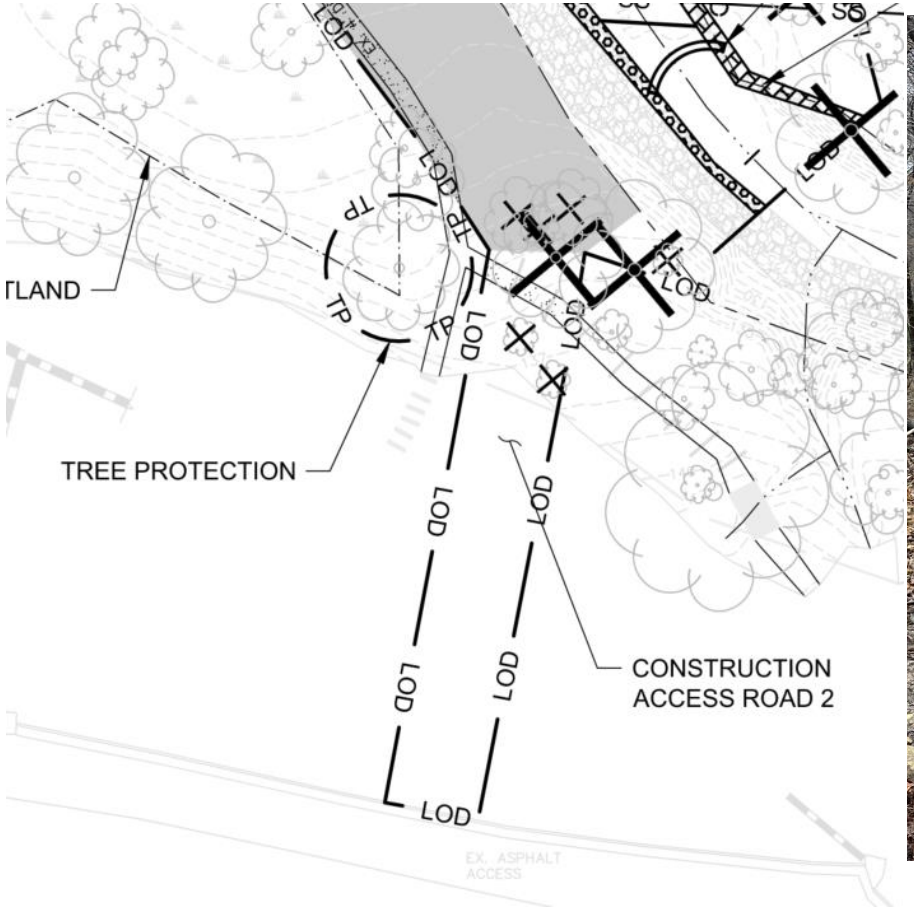
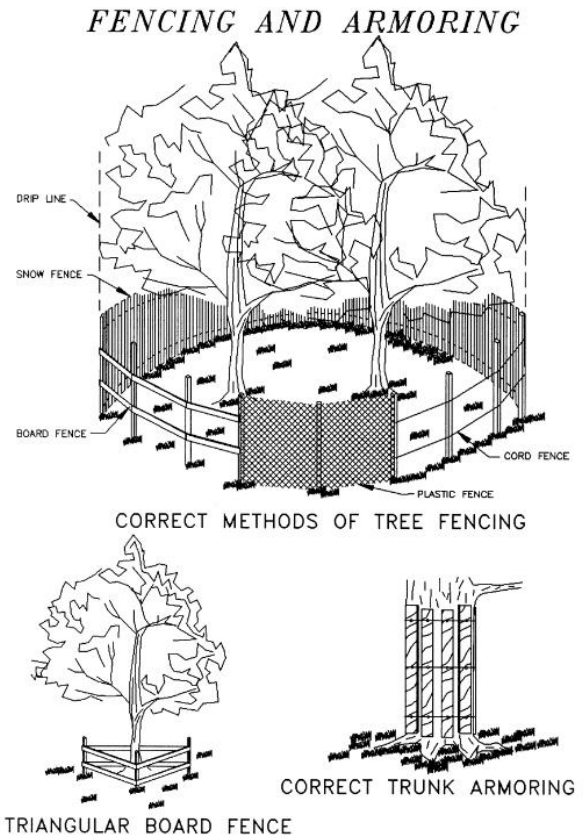


Photo Credit: Greeley and Hansen



Level of Infrastructure Protection

Relocate or Bury Asset Under Streambed

- Long-term solution to protecting infrastructure
  - Excavation & relocation of sewers
  - Includes stream restoration

Asset Protection & Armoring

- Varying Useful Life of Material Chosen for Asset Protection
  - Reinforced Concrete Encasement & Boulders: 50-100 Years
    - ➢ Less Maintenance
  - Large Wood: 30 Years
    - ➢ Continual maintenance
    - ➢ Replace 30% structures every 10 years

Exposed Sewer Assets

- High Risk of Failure
- Potential for Stream Contamination

Asset Protection & Armoring Examples

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Streambank Stabilization – Boulders

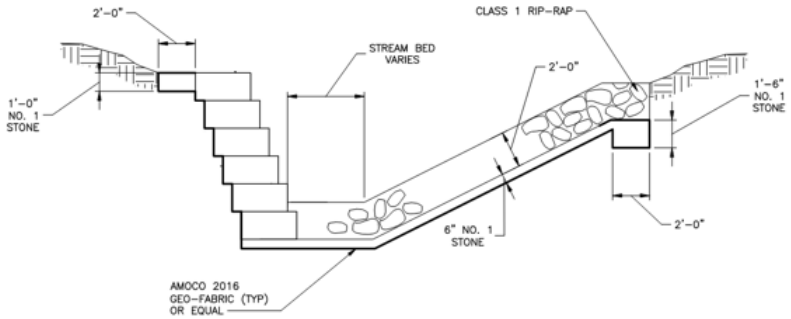
Boulder Revetment

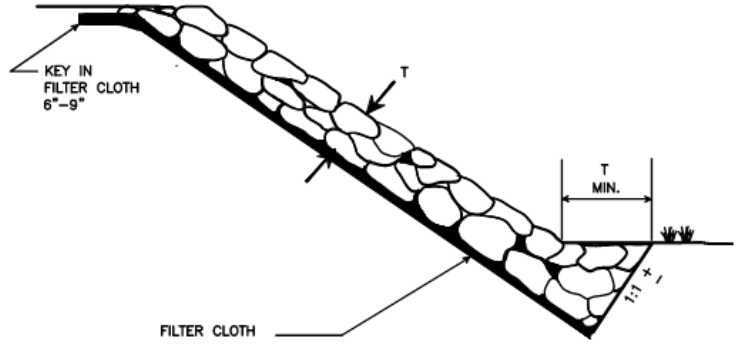
Photo Credit: AECOM

Photo Credit: WSSC Water

Boulder Streambank Protection

Photo Credit: Watson Excavating, Inc



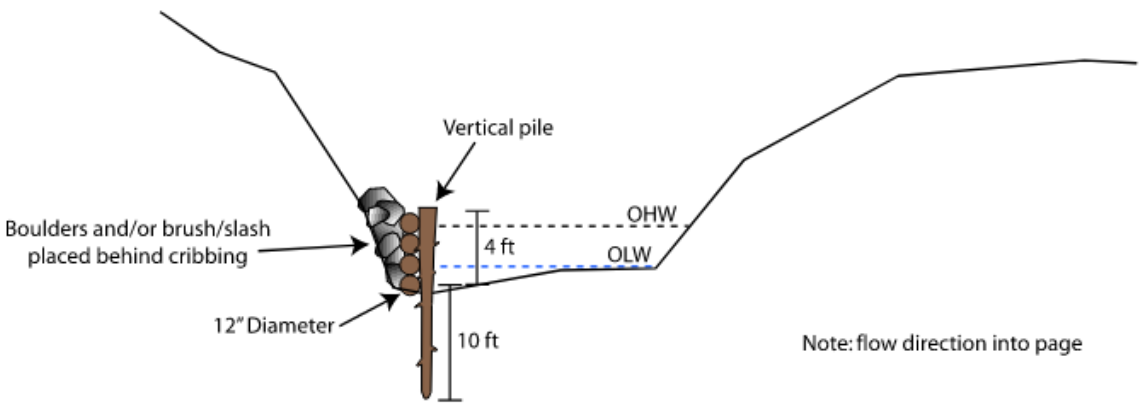


VESCH Std & Spec Plate 3.19-1

Streambank Stabilization - Log Cribbing

From John Field's Presentation

Cross section view



Longitudinal view

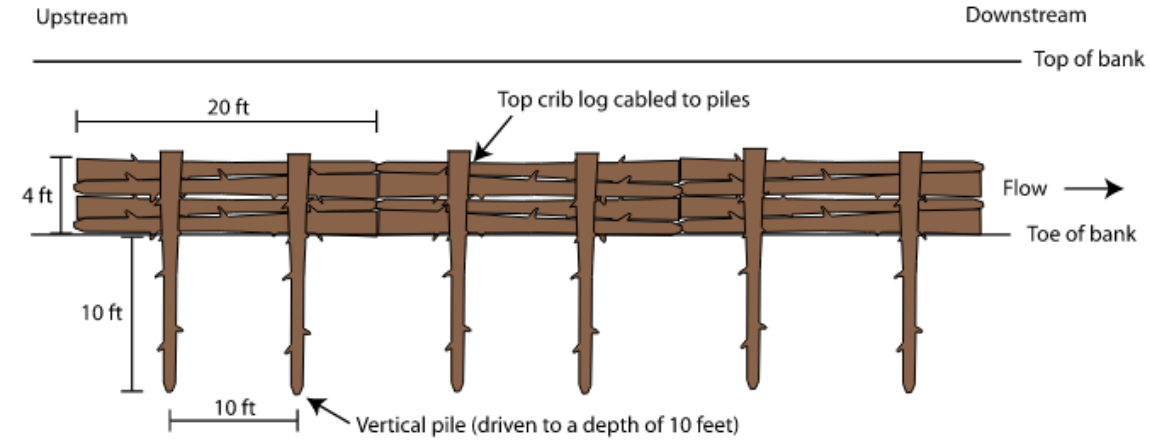
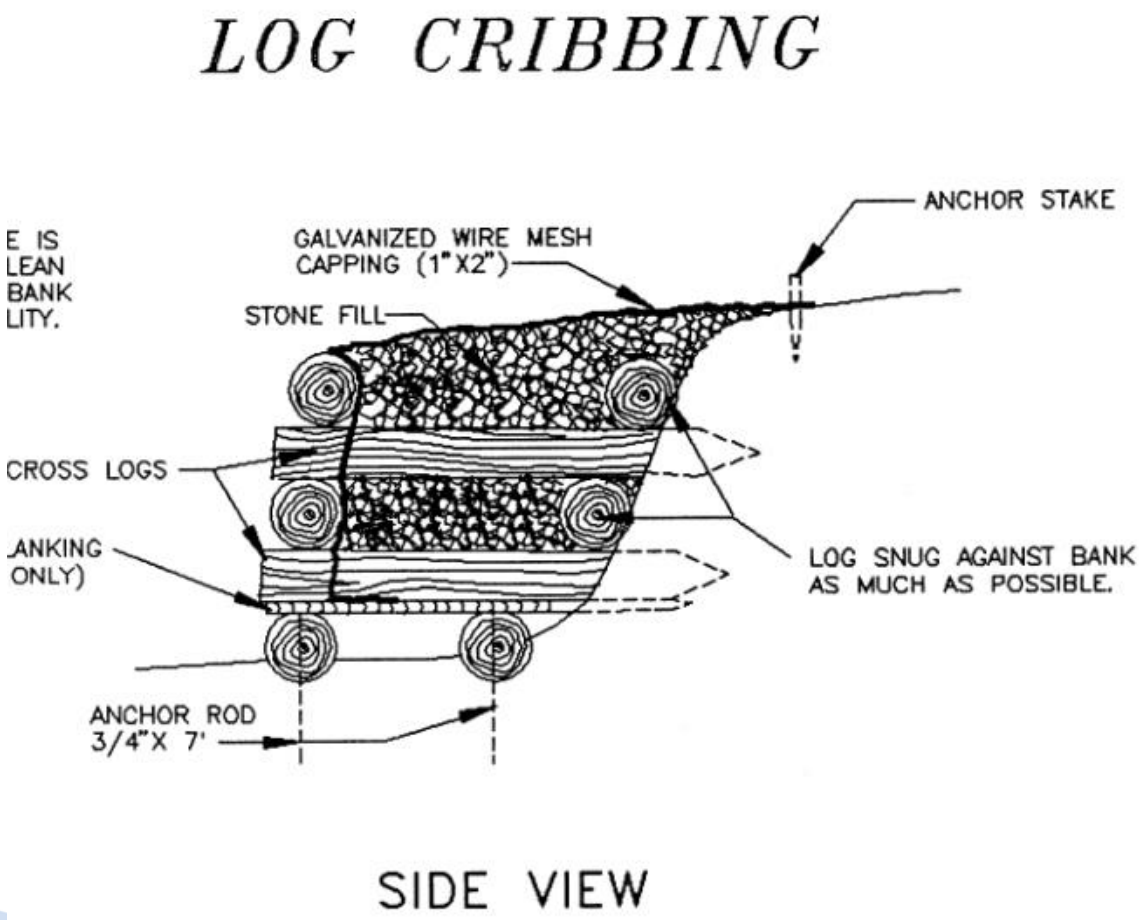
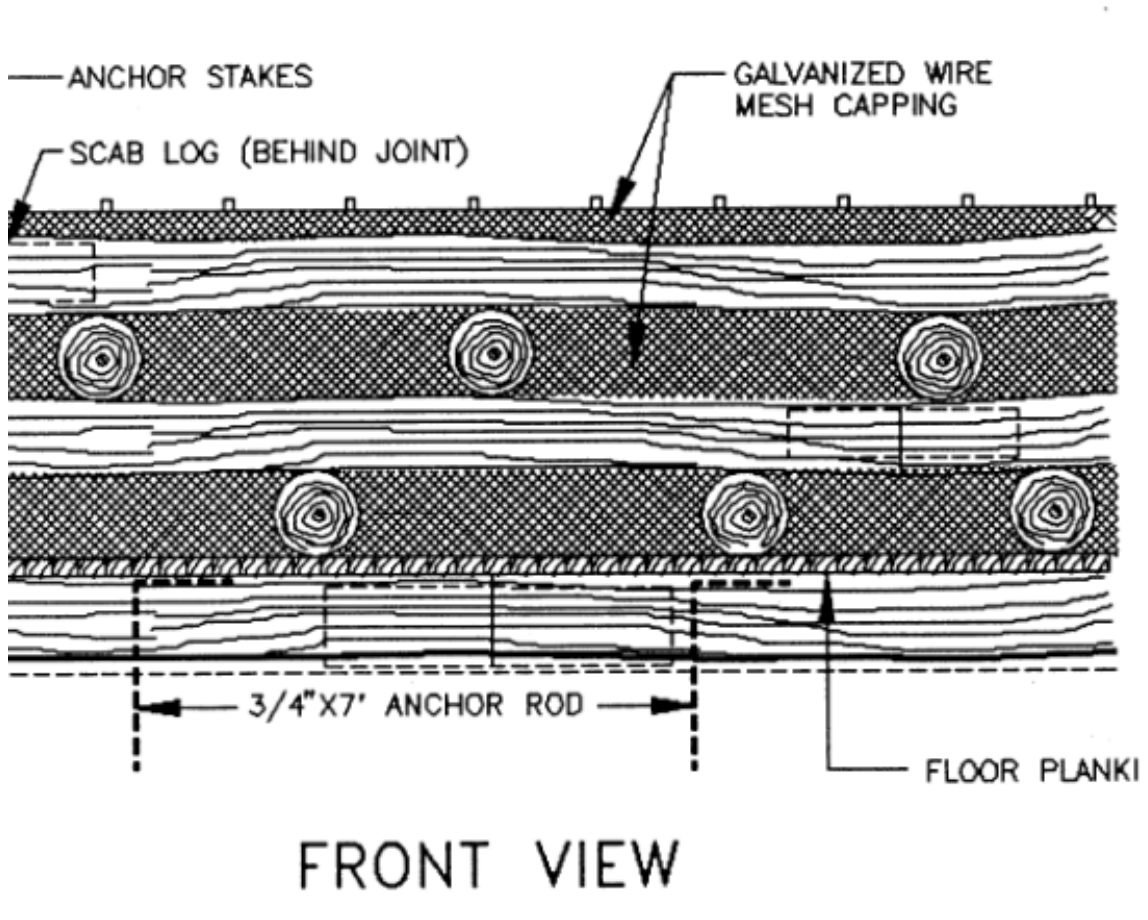


Image credits: John Fields

Streambank Stabilization - Log Cribbing

VESCH Std & Spec Plate 3.23-3





In-Stream Techniques used for Asset Protection

Boulder Weir

Cross Vane

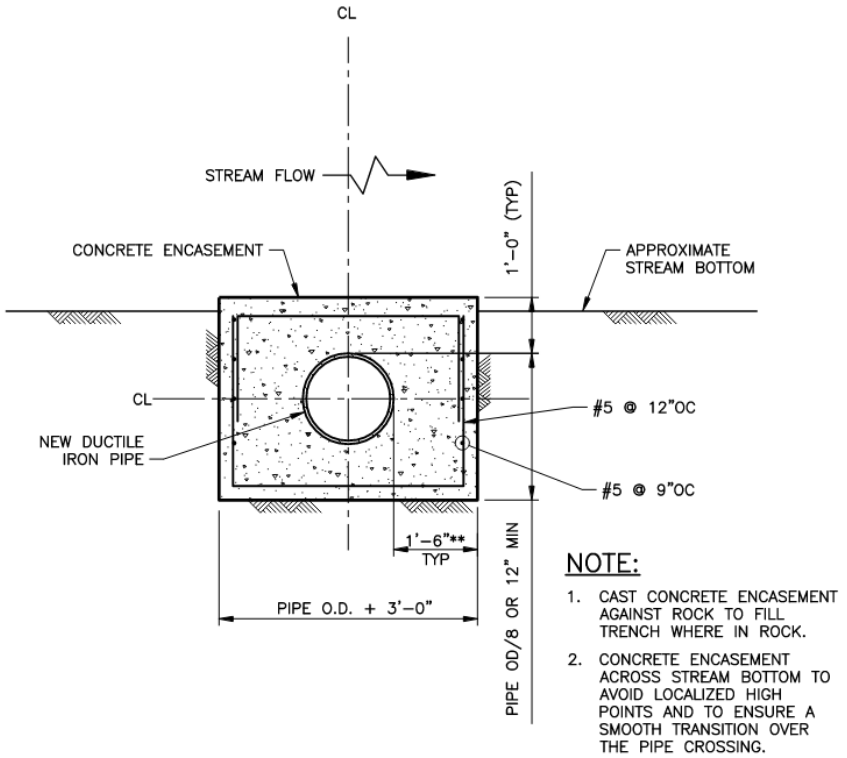
Step Pools

- Advantages
  - Slows down stream flow
  - Energy dissipation
  - Re-directs water away from banks to reduce erosion
  - Often used to protect sewer crossings

Left Photo Credit: AECOM
Middle & Right Photo Credits: Montgomery County, MD DEP

Sewer Crossing Protection

Sanitary sewer in concrete encasement protected by boulders



Concrete Encasement

Photo credits: Fairfax County South Van Dorn Street Project

Conceptual Design & Architectural Renderings

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Upstream Crossing – Existing Conditions

Photo Credits: Greeley and Hansen

Upstream Crossing: 000040SEWP

Boulder Weir with Step Pool

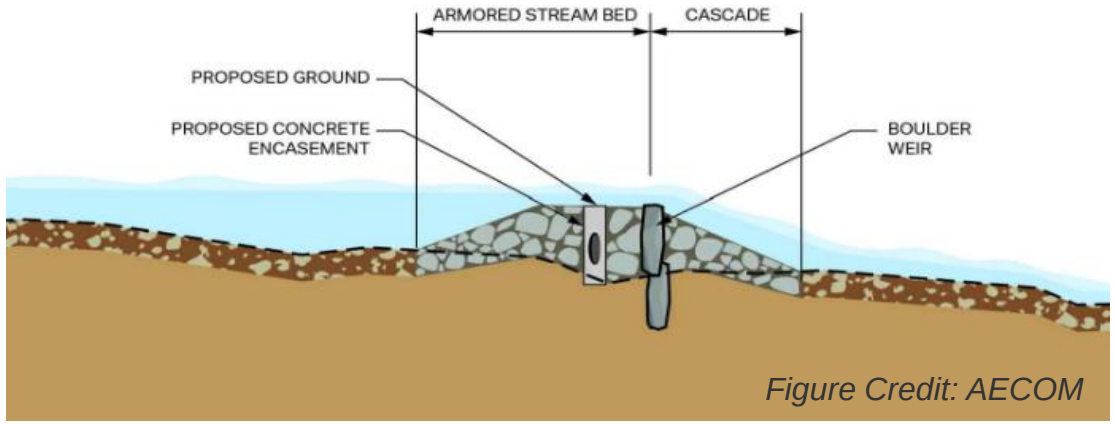
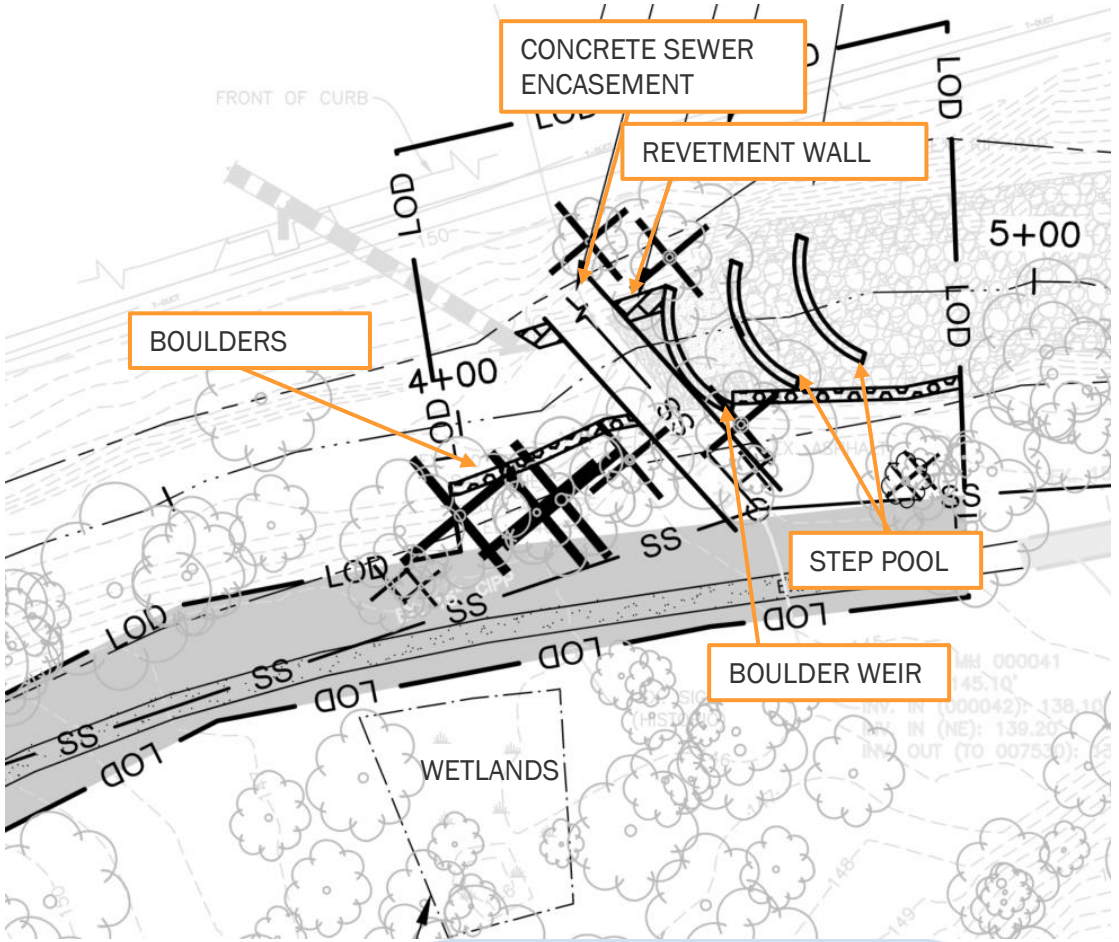


Figure Credit: AECOM

- Encase the sanitary sewer with reinforced concrete
- Ramp of boulders to allow water to flow over the encasement
- Downstream will have a boulder weir and step pool to dissipate energy and divert flow from streambank
- Prevent flow from undercutting the sewer and eroding streambank



Upstream Crossing Before & After

Before

After

Photo Credit: Greeley and Hansen

Upstream Crossing – Large Wood Alternative

Before

After

Photo Credit: Greeley and Hansen

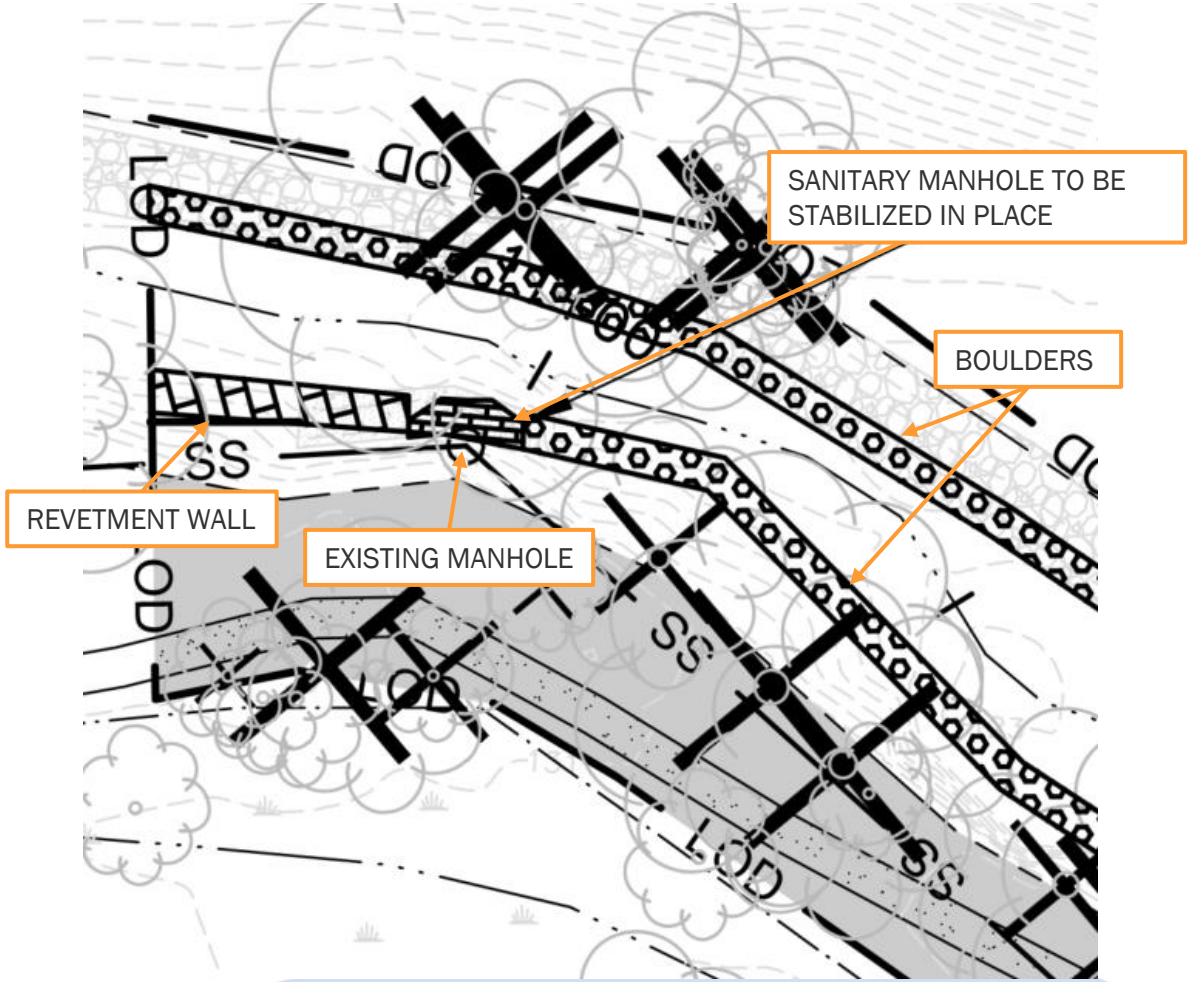
Manhole – Existing Conditions

Photo Credits: Greeley and Hansen

Exposed Manhole: 007529SSMH

Photo Credit: AECOM

- Semicircle of engineered boulders around manhole tied into the engineered boulder revetment along streambank for stabilization and asset protection
- Fill with graded stone



Manhole Before & After

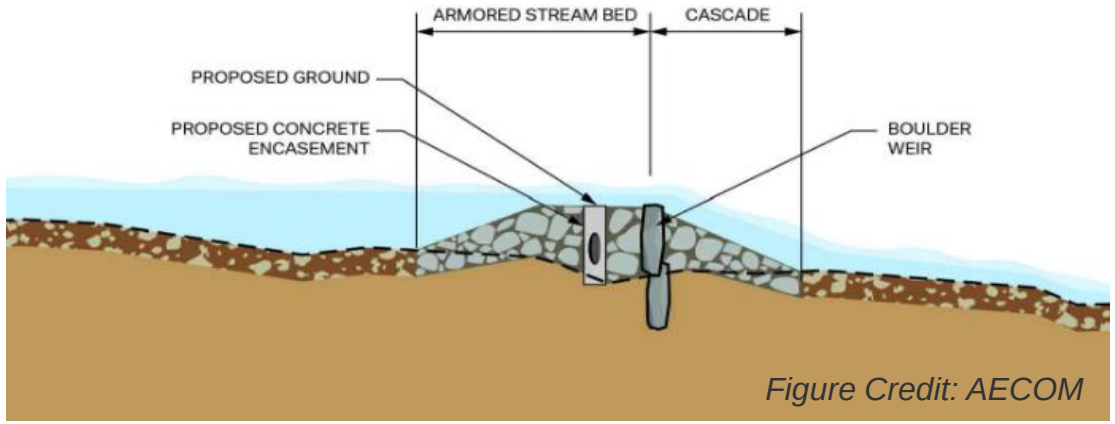
Photo Credit: Greeley and Hansen

Downstream Crossing – Existing Conditions

Photo Credits: Greeley and Hansen

Downstream Crossing: 009478SEWP

Boulder Weir



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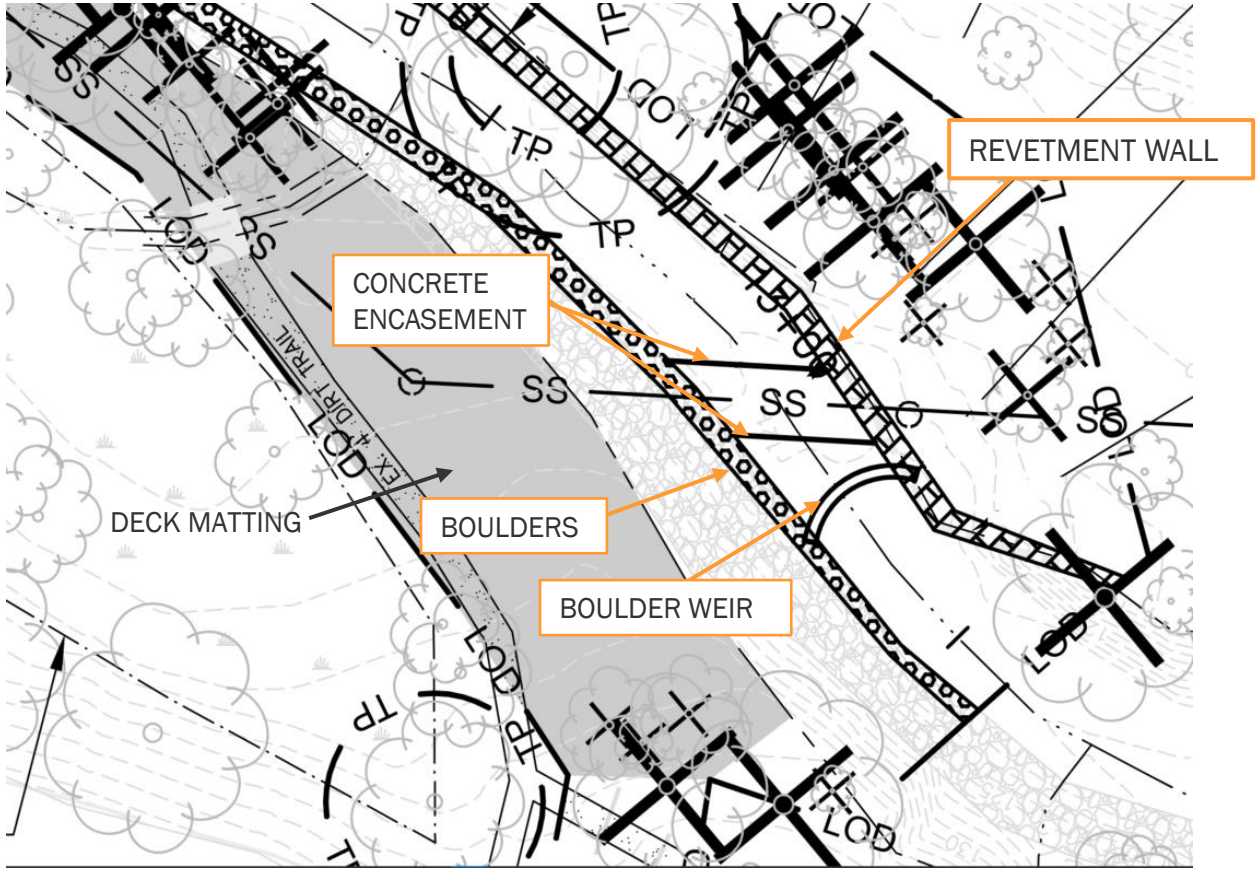

Downstream Crossing Before & After

Before

After

Photo Credit: Greeley and Hansen

Downstream Crossing – Large Wood Alternative

Before

After

Photo Credit: Greeley and Hansen

Preliminary Cost Estimate

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Preliminary Cost Estimate

Tree Impacts	Hard Armoring	Bioengineering	Minimal Intervention	Large Wood	Sanitary Sewer Protection
Limit of Disturbance (in acres)	2.82	2.63	1.06	0.92	1.13
Number of Trees To Be Cleared	202	190	53	40*	54*
Total Trees to Be Planted	1692	1578	636	552	678**
Net Trees Gained	1490	1388	583	512	624

*Includes all tree trunks that are within the LOD. Any canopy extending into the LOD will have require pruning and not removal.

** Disturbed areas will be replanted at 600 stems/acre

Cost Estimate	Hard Armoring	Bioengineering	Minimal Intervention	Large Wood	Sanitary Sewer Protection
Construction	$2.6 million	$3.4 million	$915,000	$1.0 million	$773,000
Mitigation	$1.2 million (1,410 LF)	$930,600 (1,410 LF)	$193,000 (220 LF)	$282,000 (320 LF)	$322,000 (370 LF)*
Maintenance	$130,000	$51,000	$395,000	$428,000	$286,000*
Grand Total	**$3.9 million**	**$4.4 million**	**$1.5 million**	**$1.8 million**	**$1.4 million**

*Infrastructure maintenance maybe exempt from mitigation. However, permitting fees and approval from environmetnal permitting agencies are required

** Maintenance should not be required for another 50-100 years

- Compensatory mitigation likely not required for streambank and crossing stabilization for protection of sewer assets
  - Permit coverage under ACOE Nationwide Permit #3 or #58
  - Thresholds or limitations for linear footage of stabilization

OPEN DISCUSSION

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