




Maintaining and Restoring Aquatic Life Passage in an Urban System

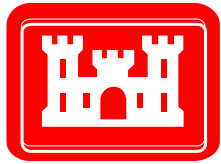
October 5, 2023

Kristen O'Reilly
401/404 Permitting Supervisor
Charlotte Storm Water Services

Presentation Objectives

- 
- Learn about 401/404 Permitting
 - Learn about Charlotte's permitting program
 - Learn about common issues and lessons learned

What is 401/404 Permitting?



U.S. Army Corps
of Engineers

Section 404 requires authorization from the Secretary of the Army, acting through the Corps of Engineers, for the discharge of dredged or fill material into all waters of the United States.



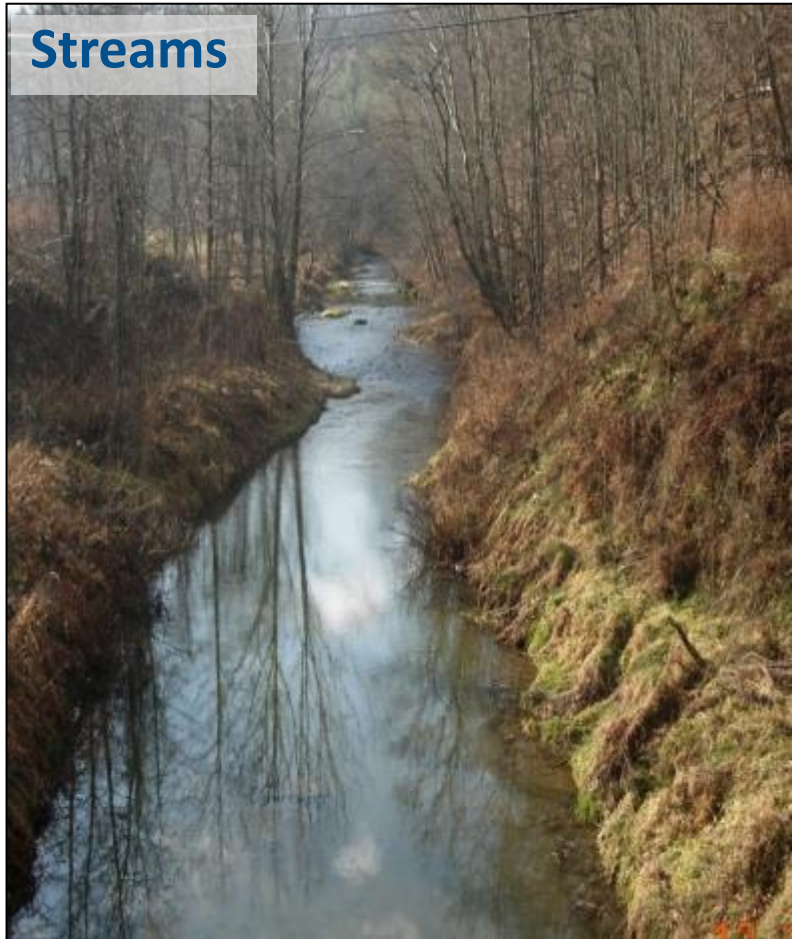
Section 401 requires a Water Quality Certification for any federally permitted or licensed activity that may result in a discharge to waters of the U.S.

Other federal regulations triggered if 404 permitting is required:

Endangered Species Act	Bald and Golden Eagle Protection Act
Migratory Bird Act	National Historic Preservation Act

What is 401/404 Permitting?

Jurisdictional
delineations



What is 401/404 Permitting?

Jurisdictional
delineations



What is 401/404 Permitting?



Jurisdictional Determination - USACE

Identification and location of aquatic resources and determination of whether they are WOTUS.

Nationwide Permit (NWP) - USACE

Issued nationwide to streamline the authorization of activities that result in no more than minimal individual and cumulative adverse environmental effects.

- Many require notification to the district engineer before commencing activities.
- NWP 3 and NWP 27 are most commonly used for stormwater utility and stream restoration projects.

Regional General Permit (RGP) - USACE

Developed regionally within each USACE district to address local issues. These differ across the state.

Water Quality General Certifications (WQGC) - NCDEQ

Issued statewide to maintain water quality standards. There is a WQGC that corresponds to each NWP or RGP.

Charlotte Storm Water Services

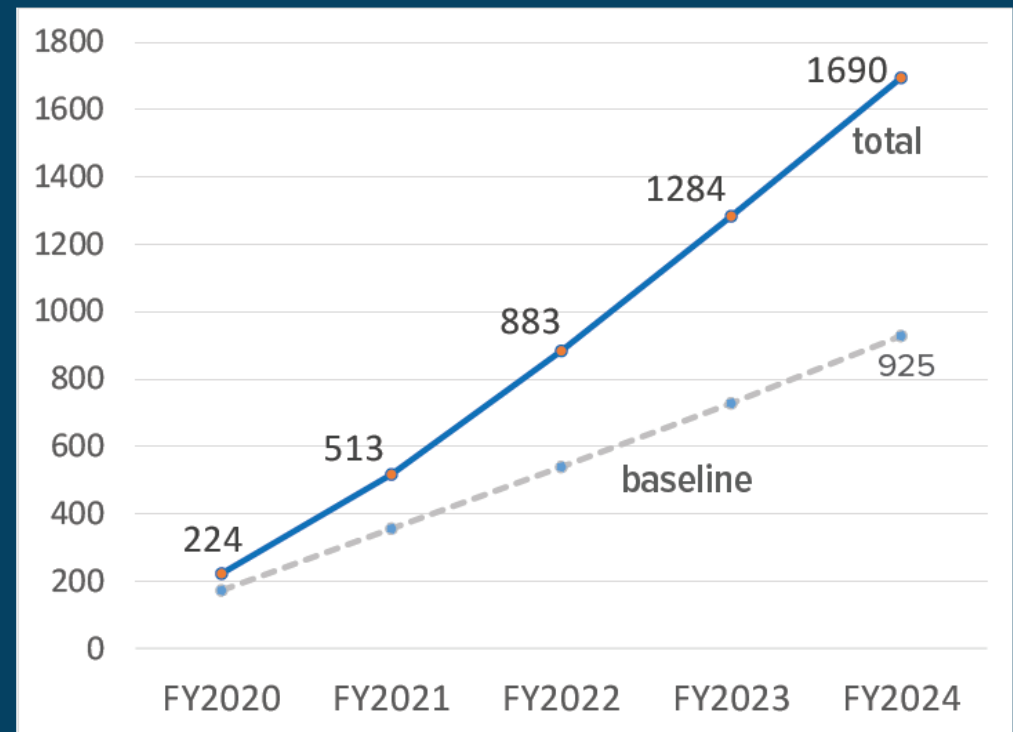
City of Charlotte

- largest municipality in North Carolina
- 15th largest city in the U.S.
- population of ~ 900,000 residents

Charlotte Storm Water Services

- 100,000+ existing storm drains
- 3,800+ miles of pipe
- 2,400 miles of open drainage and streams
- 210 staff
- FY2024 capital budget is \$91M
- Surface Water Quality Team - 23 staff including 4 permitting staff.

REPAIR PROJECTS PLANNED FOR COMPLETION BY FISCAL YEAR



Charlotte Storm Water Services

City of Charlotte

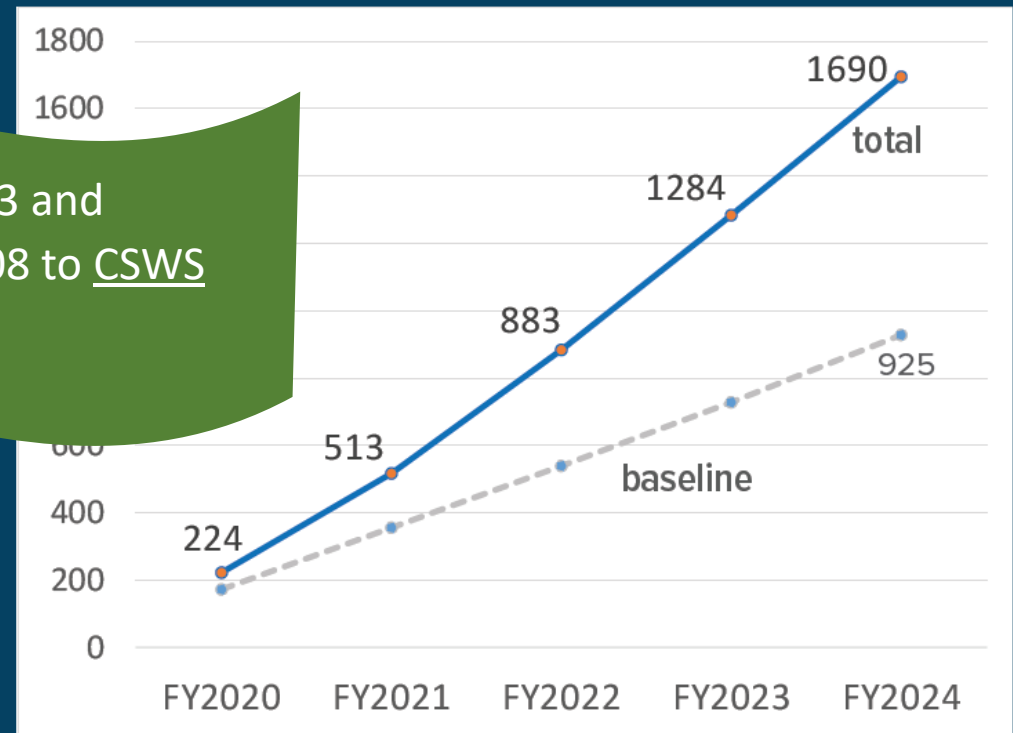
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In 2017...
the USACE issued RGP 163 and
NCDEQ issued WQGC 4508 to CSWS

REPAIR PROJECTS PLANNED FOR COMPLETION BY FISCAL YEAR



Charlotte Storm Water Services Regional General Permit



Examples of Activities Covered:

- Replacing and repairing culverts
- Rip rap and in-stream structures
- Stream channel relocations
- Streambank stabilization
- Pond maintenance

Example Thresholds for Notification:

Streams

- Permanent Loss: 150LF
- Permanent Impacts 500LF
- Temporary 1,000LF

of Projects Permitted:

- FY17 - FY23 191
- FY23 41



Charlotte Storm Water Services Regional General Permit



A few RGP and GC Conditions:

- **Aquatic Passage:** Bury culverts. Maintain stream width
- **Rip Rap:** Minimize, sufficient size, keyed in, water must flow over
- **Headcuts:** Minimize destabilization
- **Riparian corridors:** Retain/reestablish tree and shrub cover.
- **Soft bank stabilization and natural channel design:** where practicable
- **Pump arounds.** Work in the dry.
- **Erosion control.** Compliance with NCG01. No plastic mesh.



Charlotte Storm Water Services Regional General Permit



Purpose and Need
Avoid and Minimize
Maintain or Restore Aquatic Passage



Charlotte Storm Water Services Regional General Permit

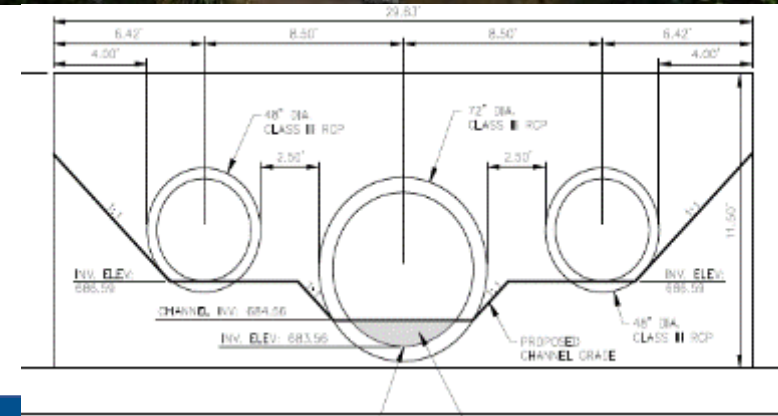


Aquatic Life Passage

- Bury culverts
 - $\geq 48''$ culvert – bury 1'
 - $< 48''$ culverts – bury 20%
 - Maintain stream width through the culvert
 - Slopes $< 2.5\%$

Culvert Study

- Bottomless are most successful. RCP are the least
- Multiple barrels are better than single barrels
- Slopes $< \sim 1.4\%$ are most successful



Charlotte Storm Water Services Regional General Permit

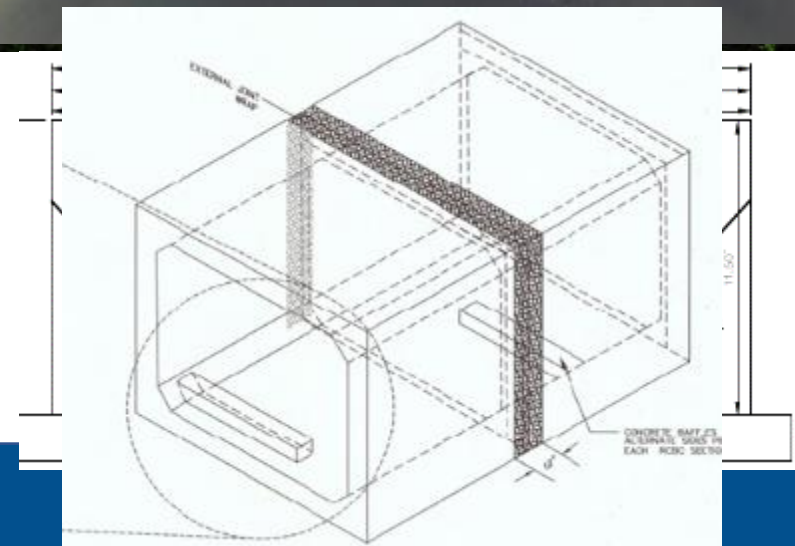


Aquatic Life Passage

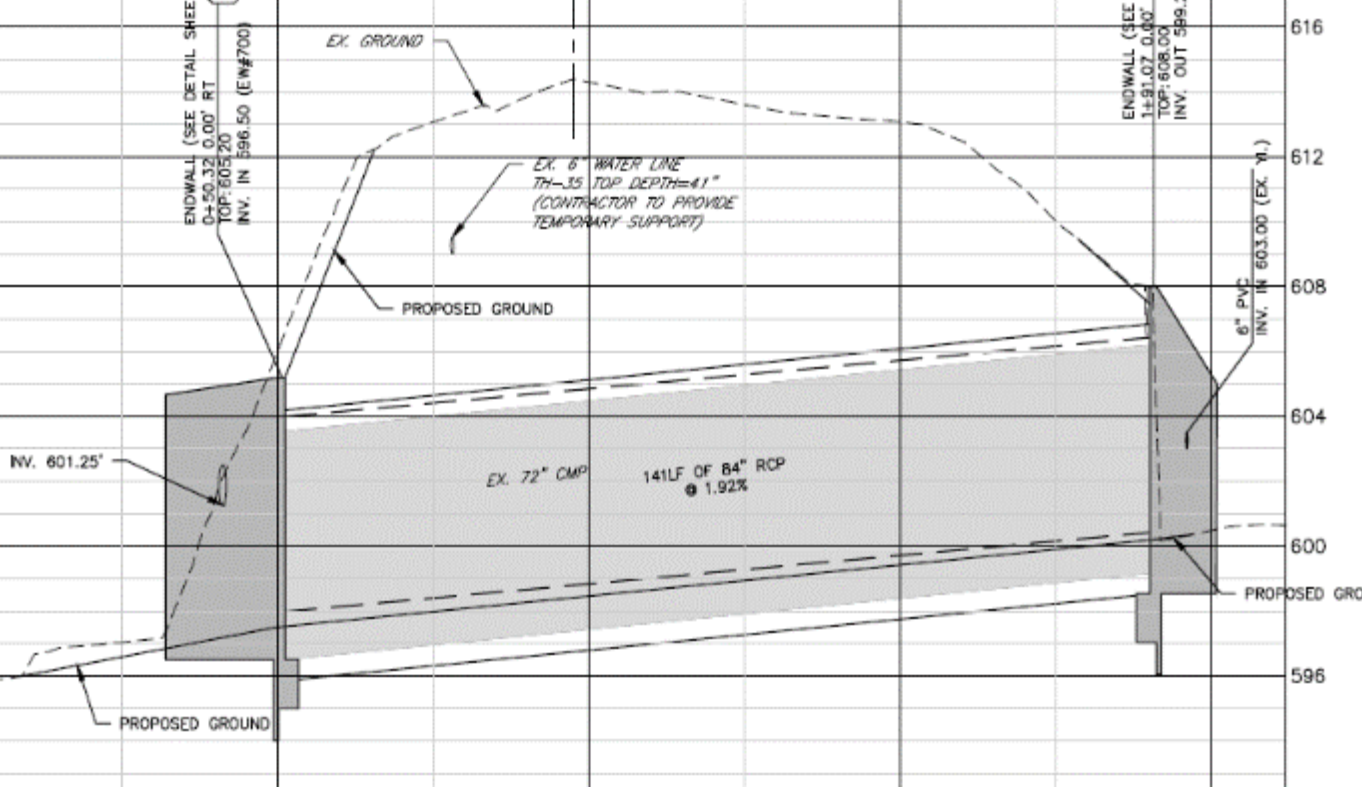
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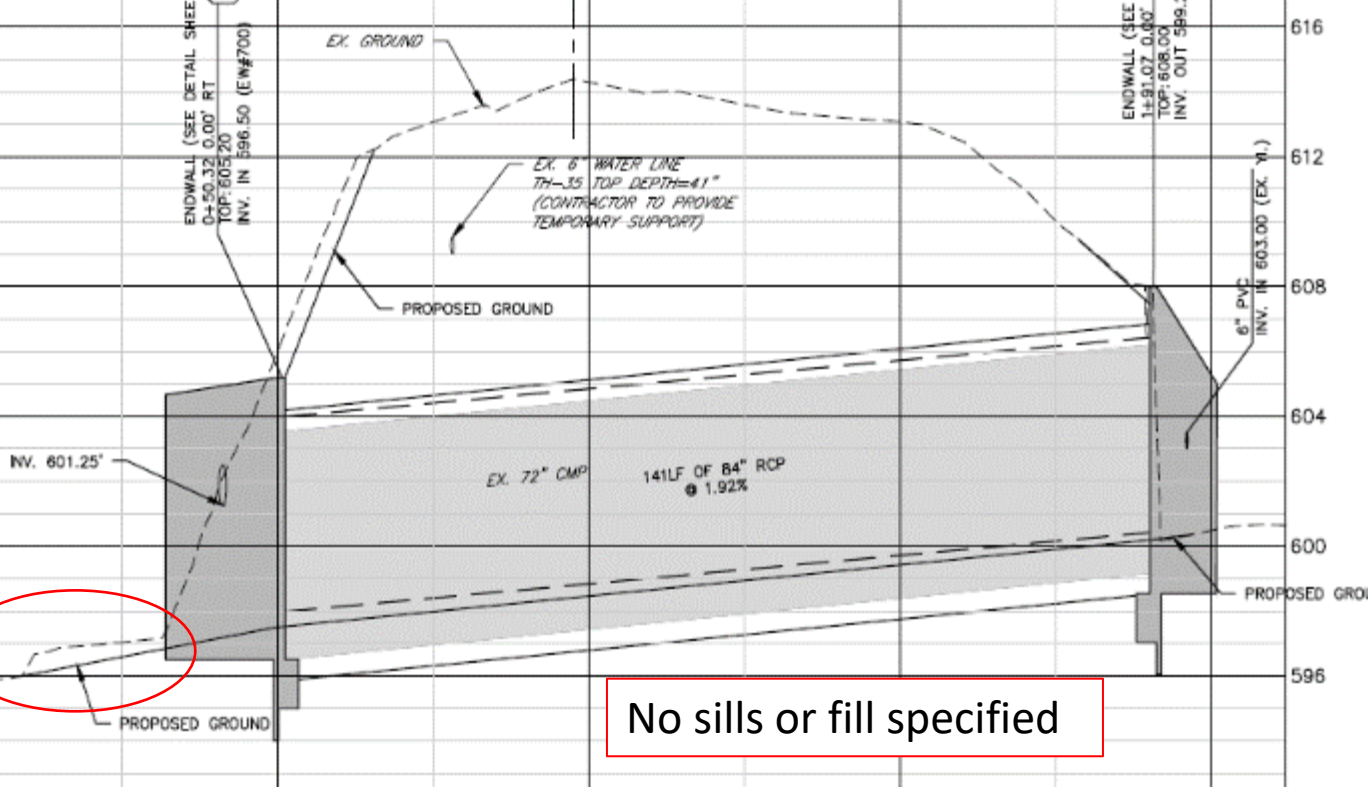
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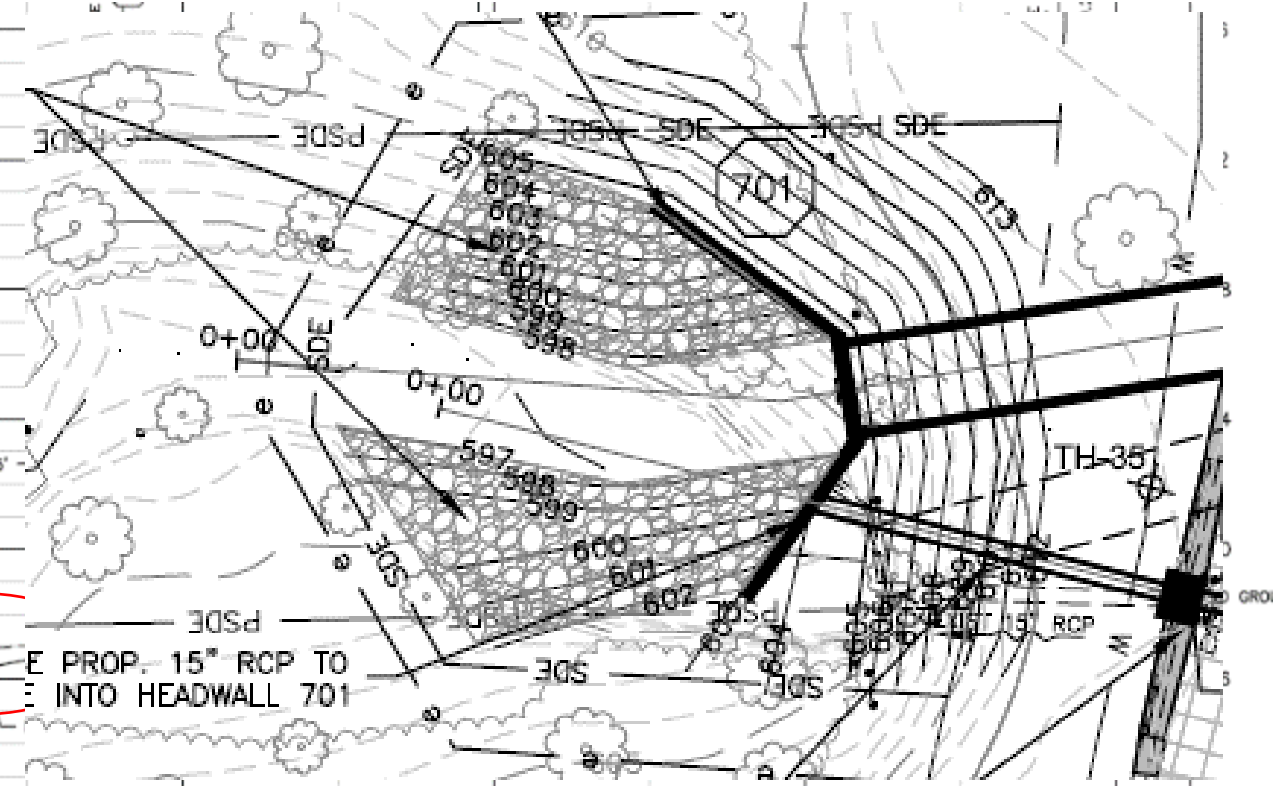
Culvert Burial



Culvert Burial

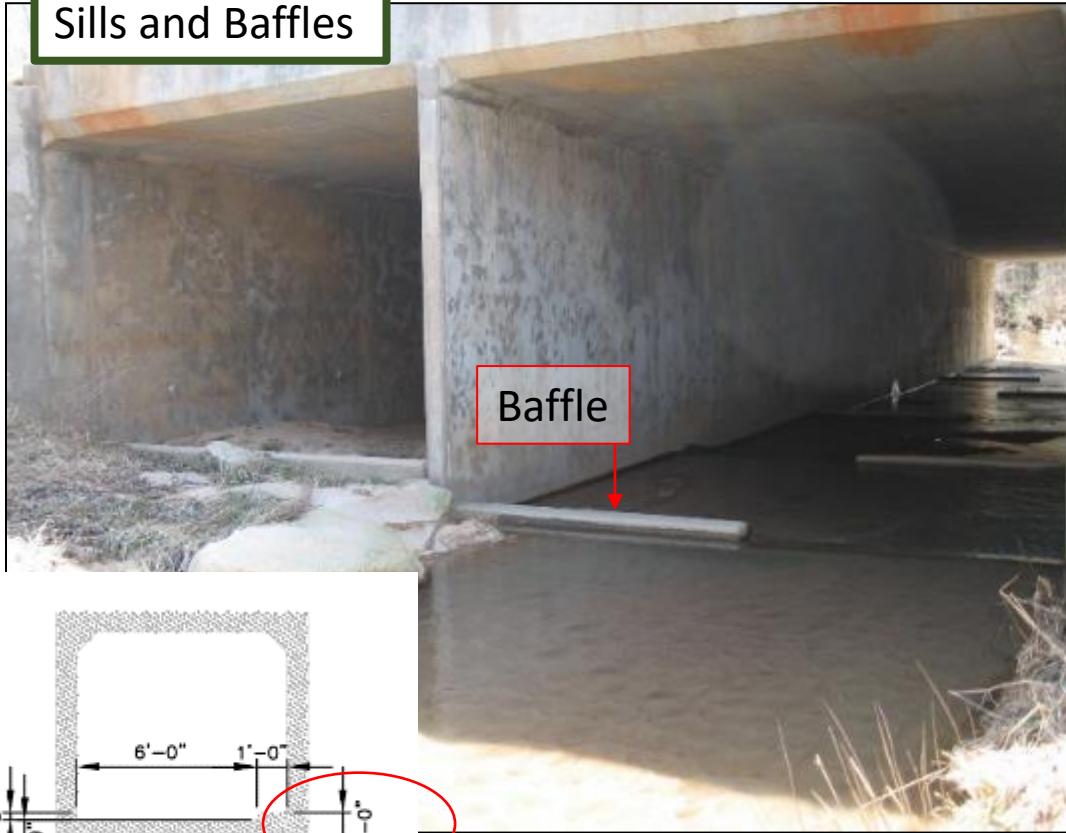


Culvert Burial

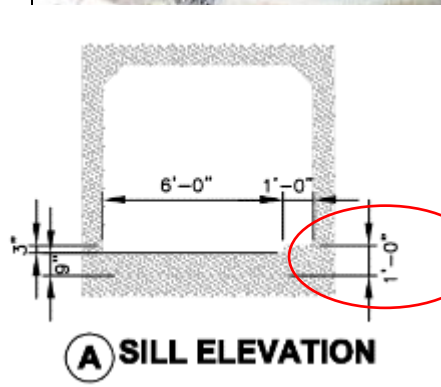


Baffles and drops

Sills and Baffles

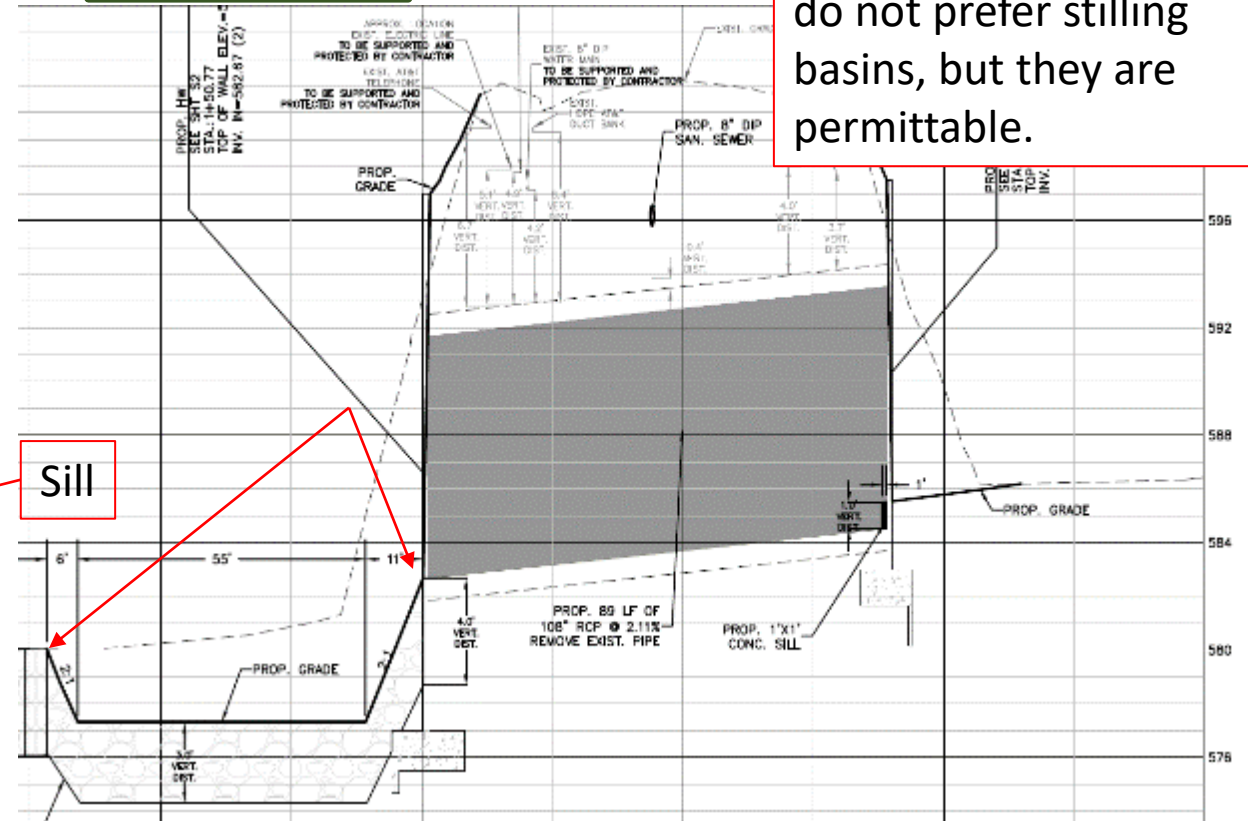


Baffle



Baffles need to be > 1'

Stilling basins



Currently, the agencies do not prefer stilling basins, but they are permissible.

Drops cannot be > 6"

Stilling Basin

October 2019



January 2021



Stilling Basin

October 2019



January 2021

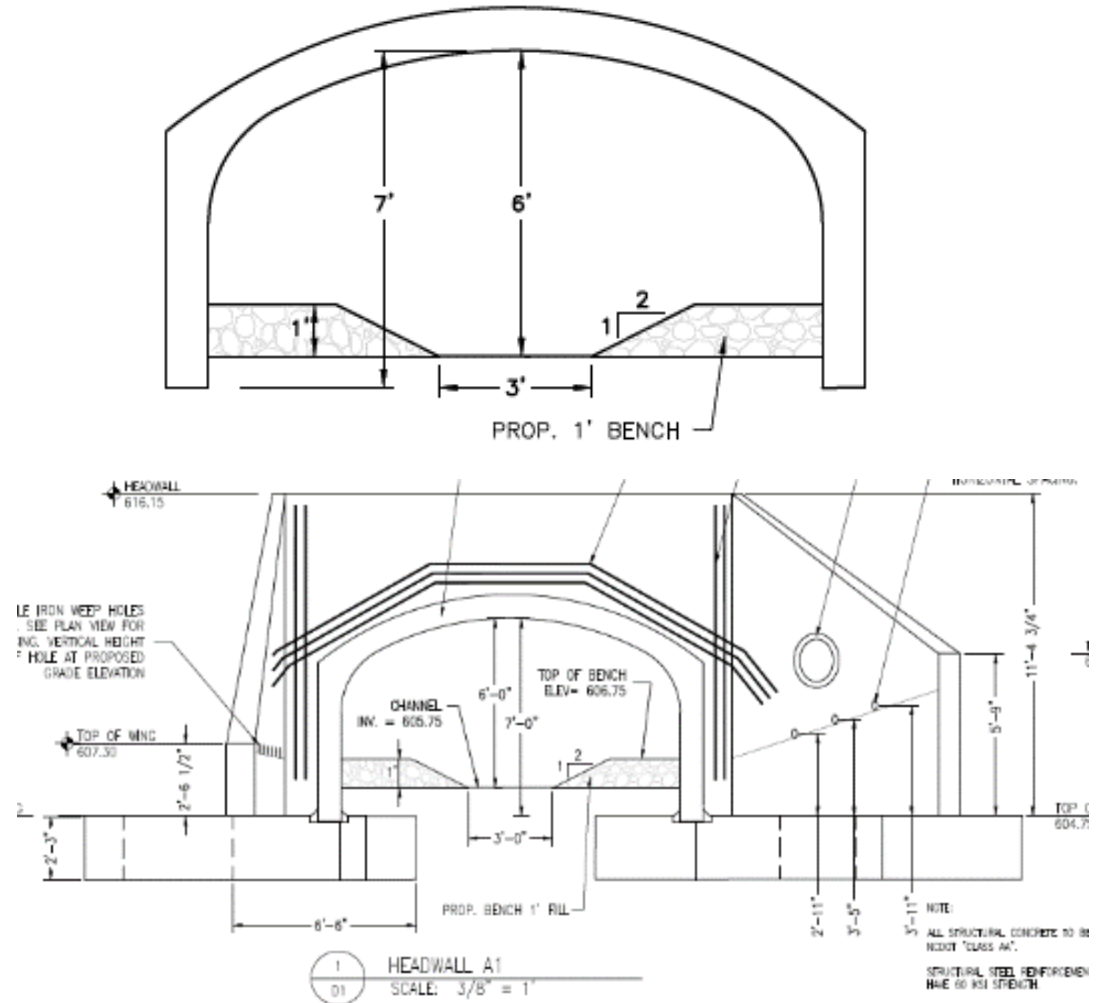


Three-sided culverts

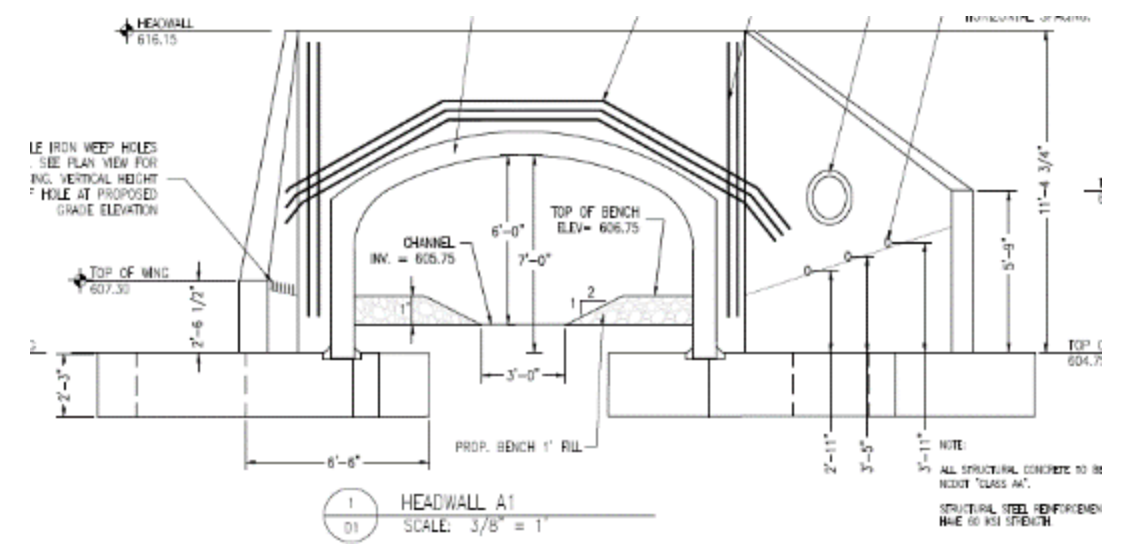
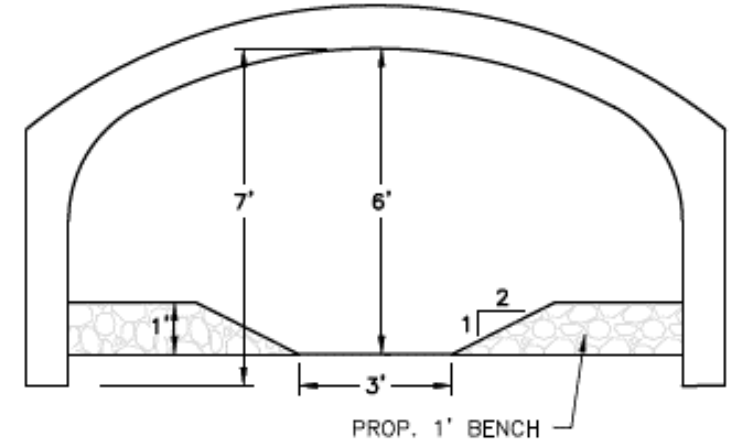
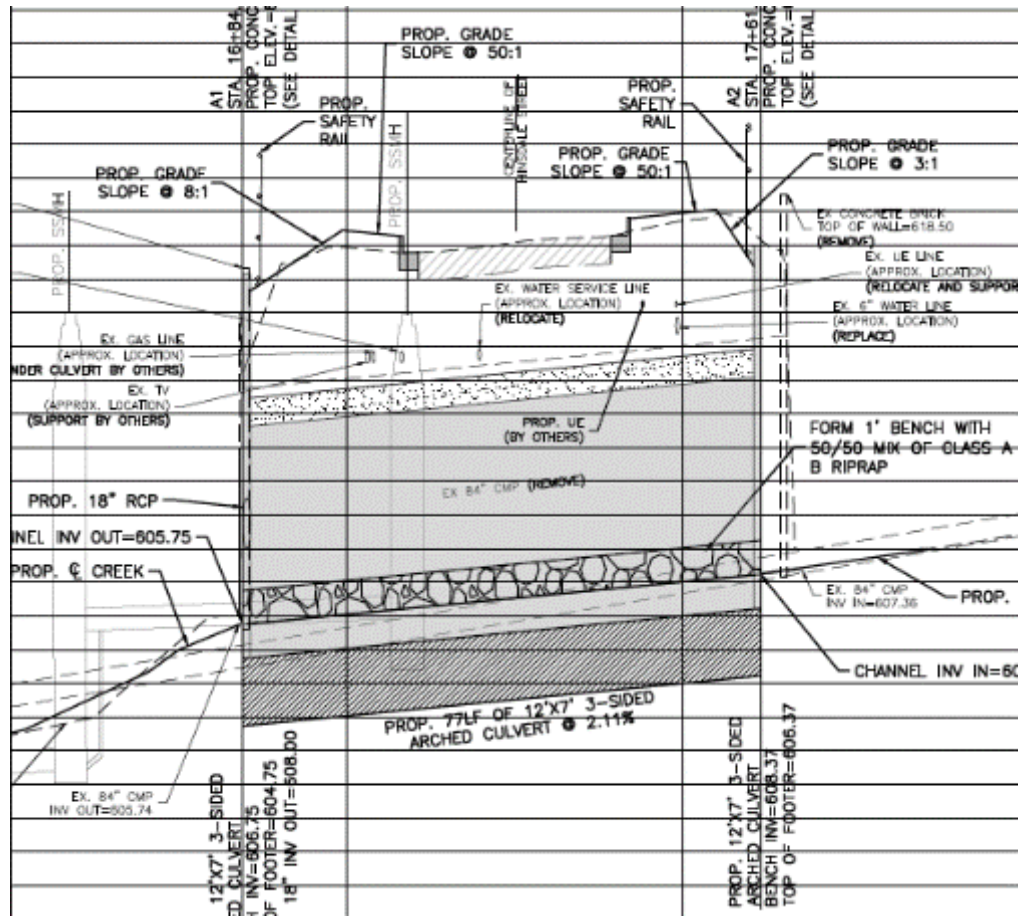


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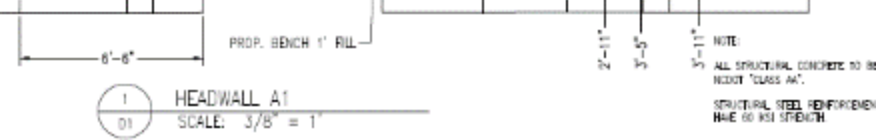
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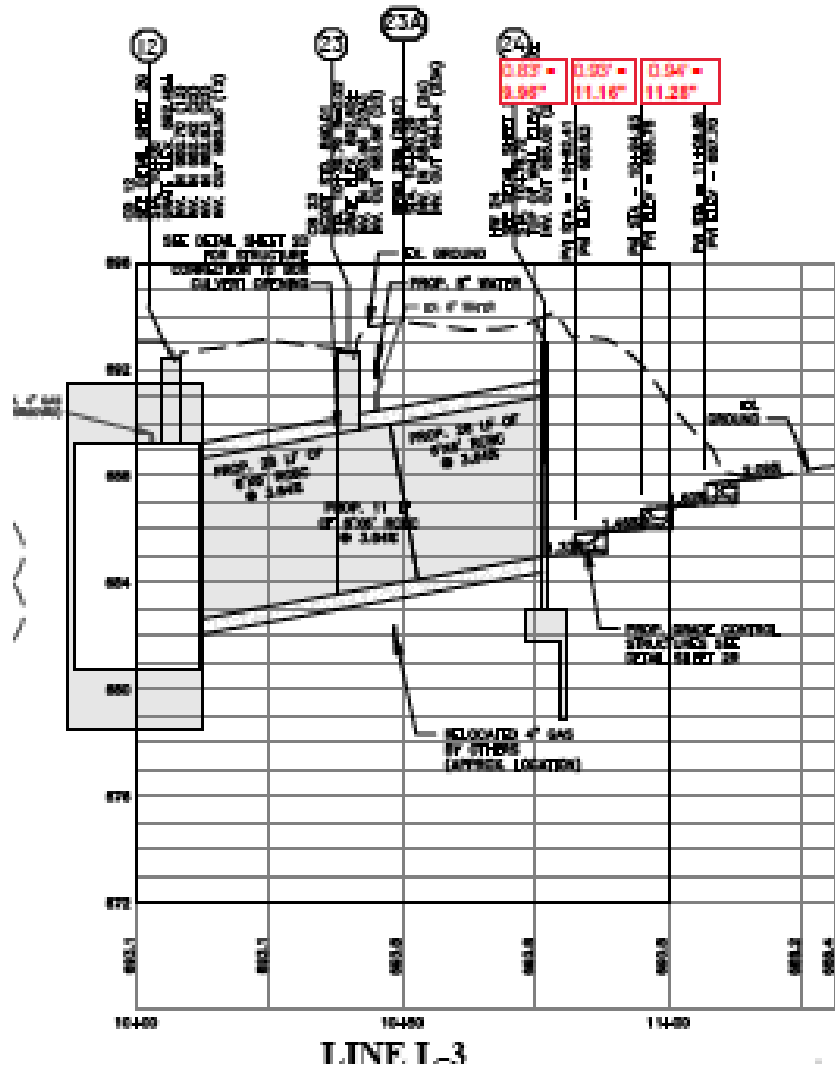
Three-sided culverts



Three-sided culverts



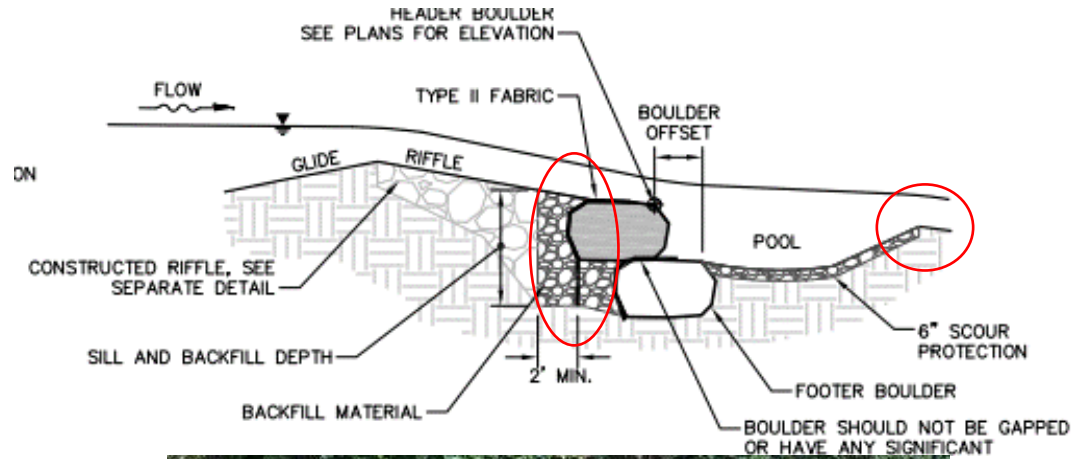
Redi Rock & 6" drops



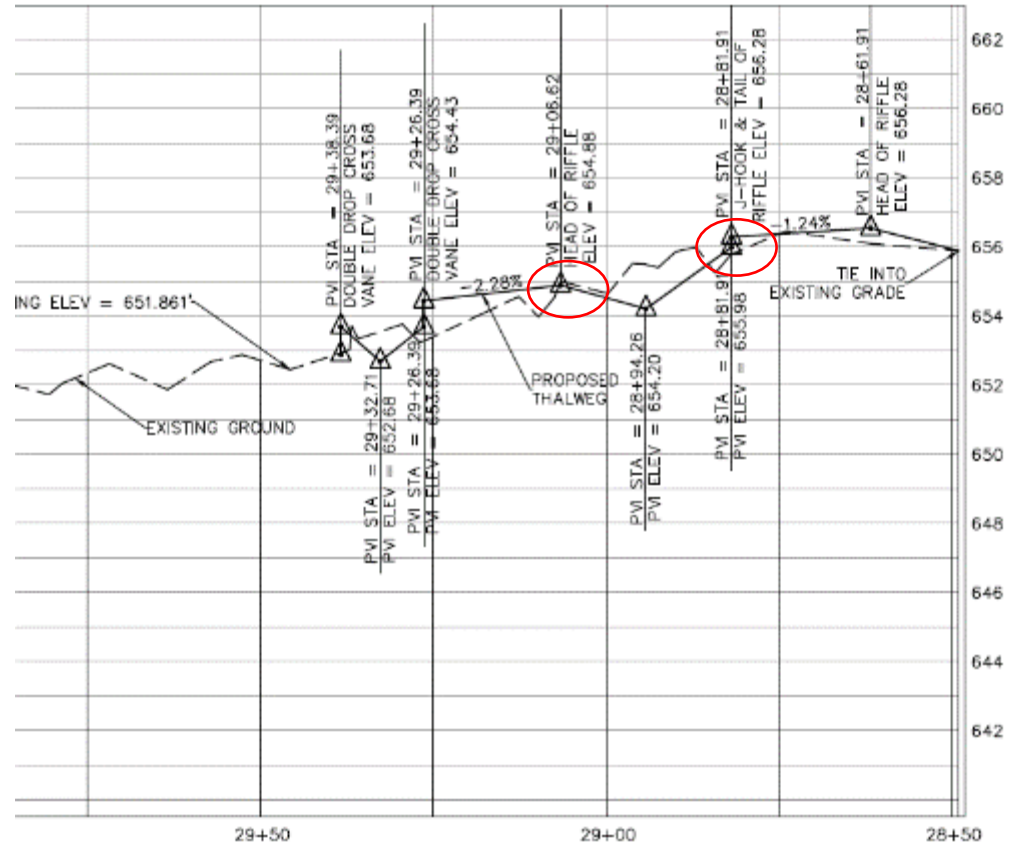
Smooth transition in & out of culverts



Rock Sills



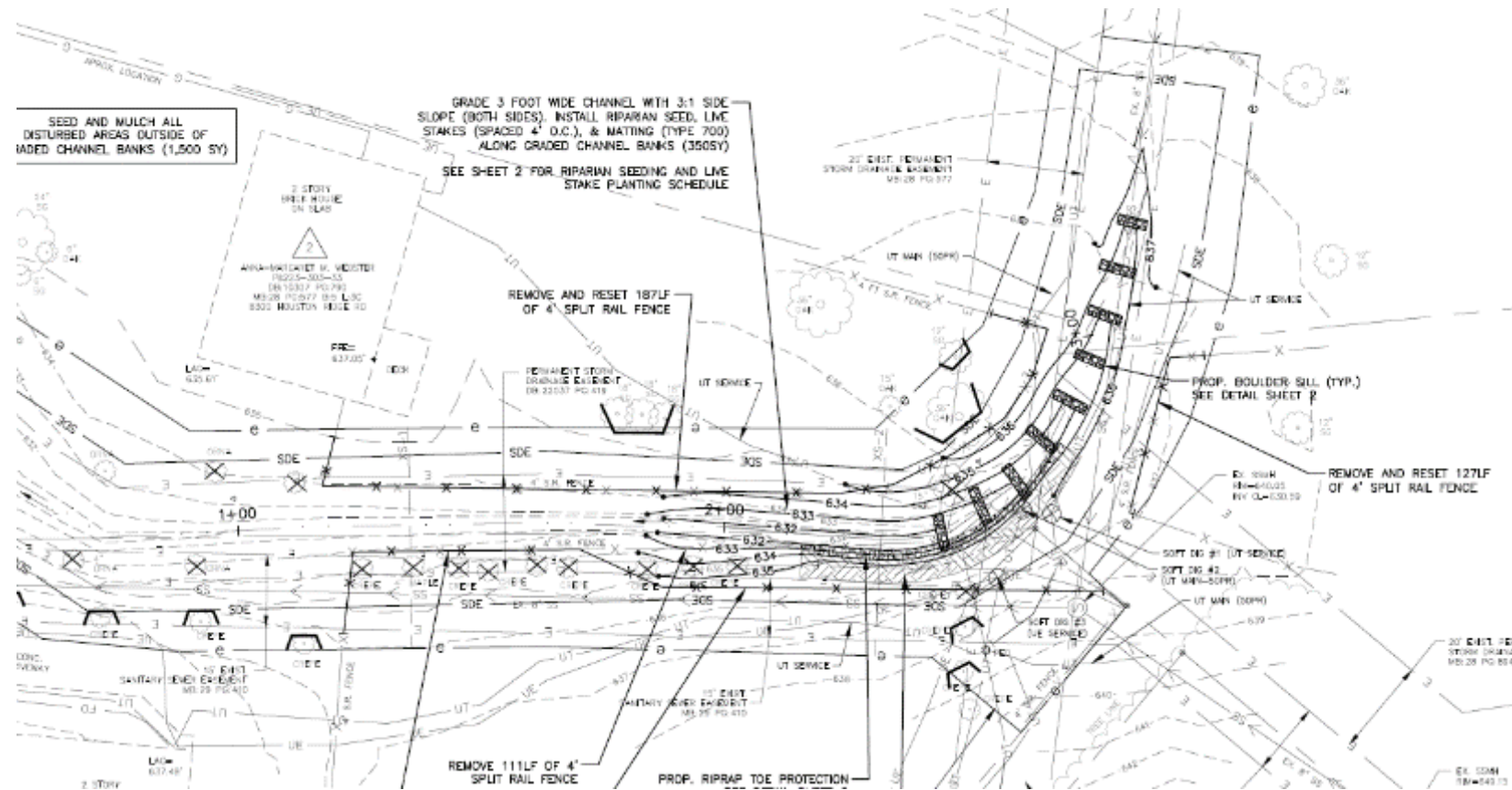
Livestakes needed



Rock Sills

Rock sills

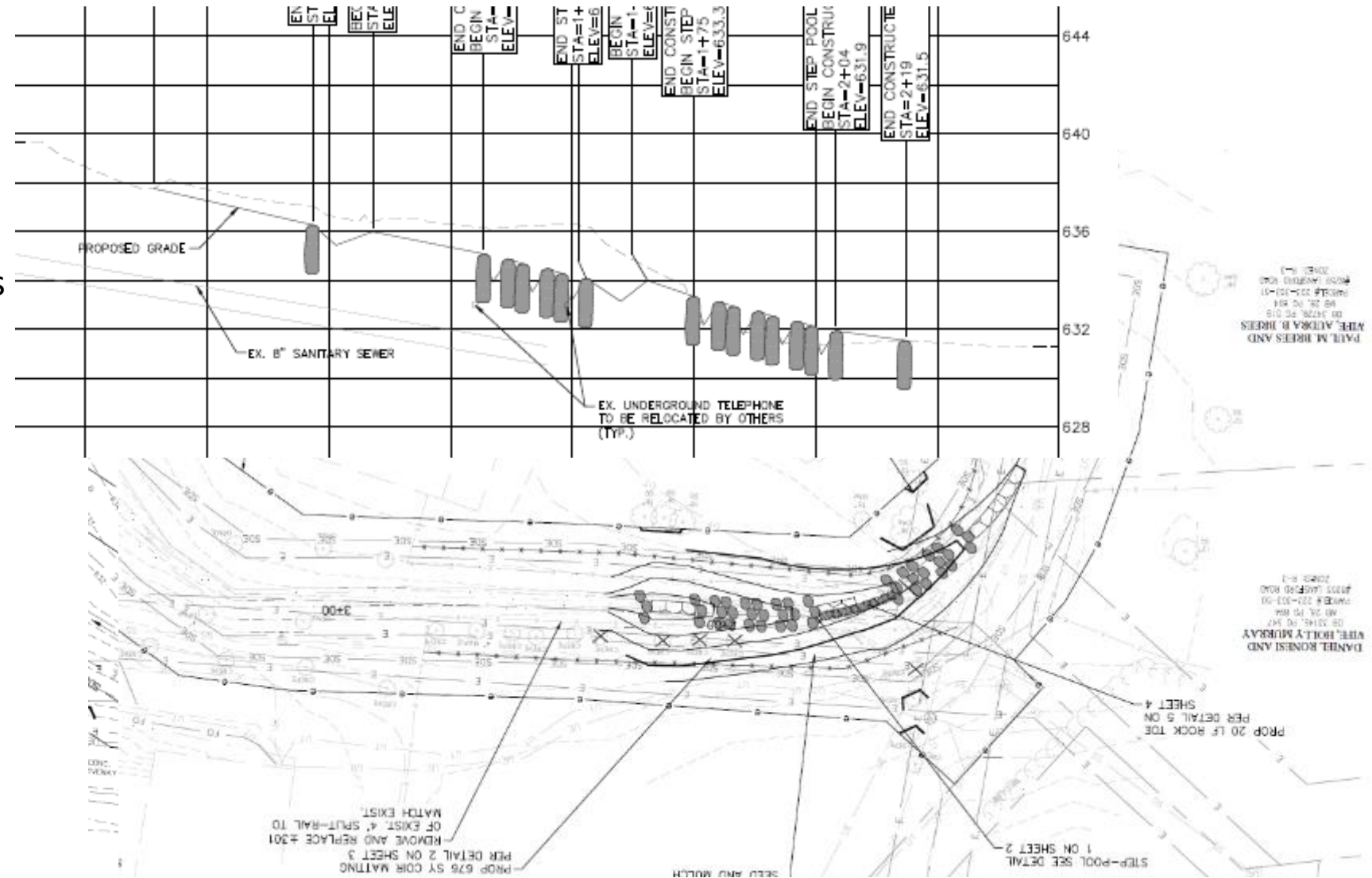
- Do not work well on bends or spaced close together.
- Ideally, they need pools, riffles and runs between them to diffuse energy.
- Floodplain benches around rock sills also help diffuse energy.
- Live stakes on banks around sills helps prevent erosion around the structures



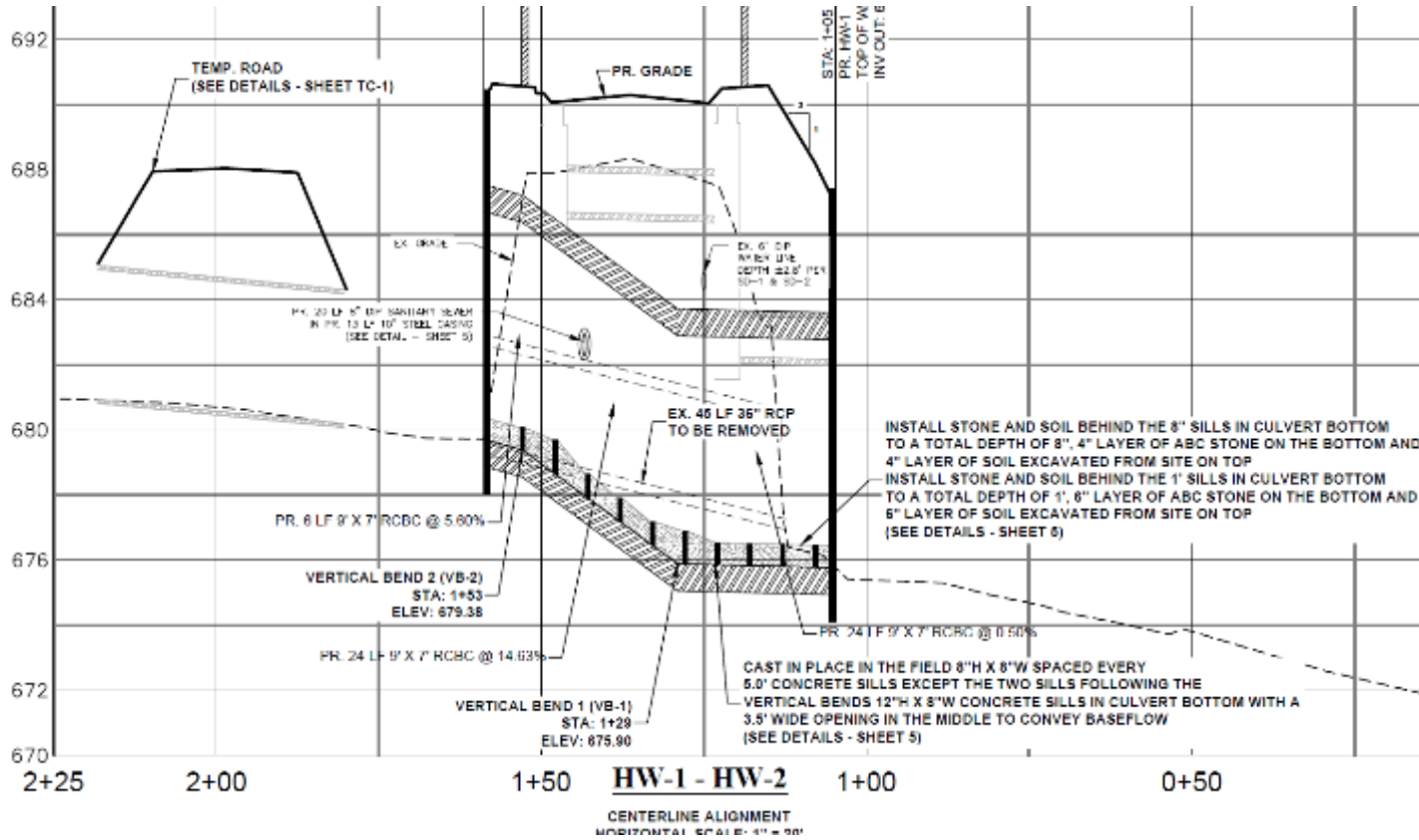
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Culvert slopes < 2.5%



Rip Rap

Rip Rap

- Size, specs and extent match the plans.
- Keyed into the banks.
- Sized not to move.
- Water flows over rip rap.



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Rip Rap



Rip Rap



Minimize removal of vegetation & reestablish native species

Live Stake



Bare Root



Tubeling



Containerized



Balled and Burlapped



Live stakes are great for stabilizing banks.



- The goal is to reestablish a healthy woody buffer.
- Invasives make it difficult.
- Ensure planting plans and nursery replacements are native to NC.
- Stick to the planting season.

Bank Stabilization



Hard bank Stabilization



Rock toe with a vegetated Geogrid

Bank Stabilization



ogrid

Stabilization – no plastic netting



Proper installation of natural biodegradable matting is critical.

Stabilization – no plastic netting



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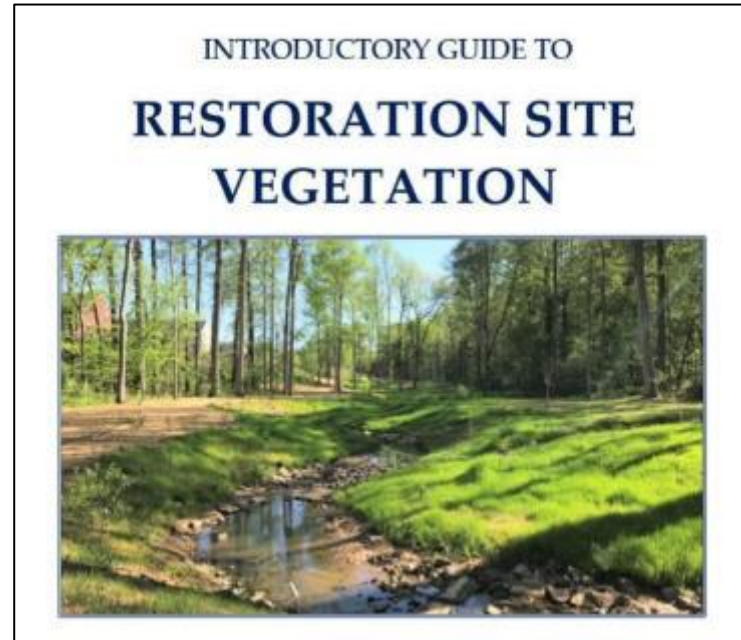
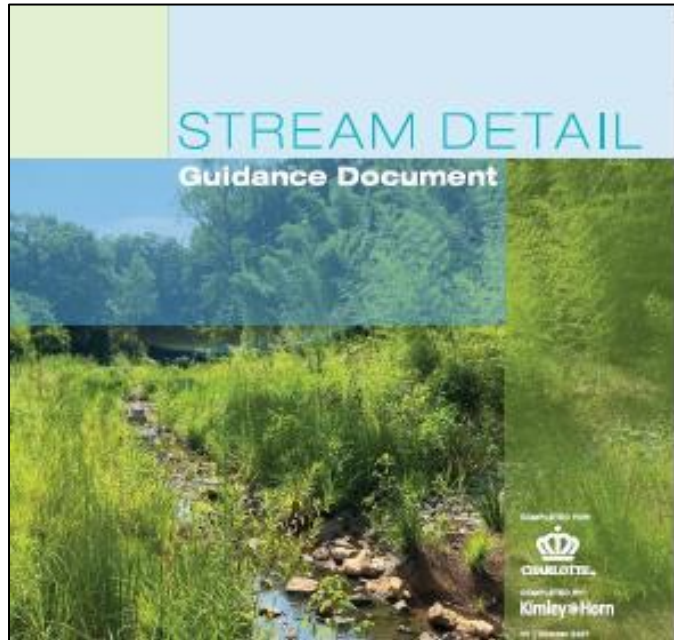
Work in the Dry - Pump Around



Work in the Dry - Pump Around



Internal Guidance & Outreach



1. **Sills**—Rock and Log
2. **Riffles**—Constructed and Variable
3. **Vanes**—Rock Cross Vane, Boulder J-Hook Vane, Double Drop Boulder Cross Vane, Log Cross Vane, and Angled Log Vane
4. **Bank Stabilization**—Boulder/Rock Toe, Toe Wood, Vegetated Soil Lift
5. **Rock Drop Structure**

Questions?



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