

Things to Remember for Your Next Green Infrastructure Retrofit Project

Jeremy Pratt, Gwinnett County Department of Water Resources

Ross Ellis, Geosyntec



SESWA 2023 Annual Conference



Watershed Improvement Program



- WIP Goals

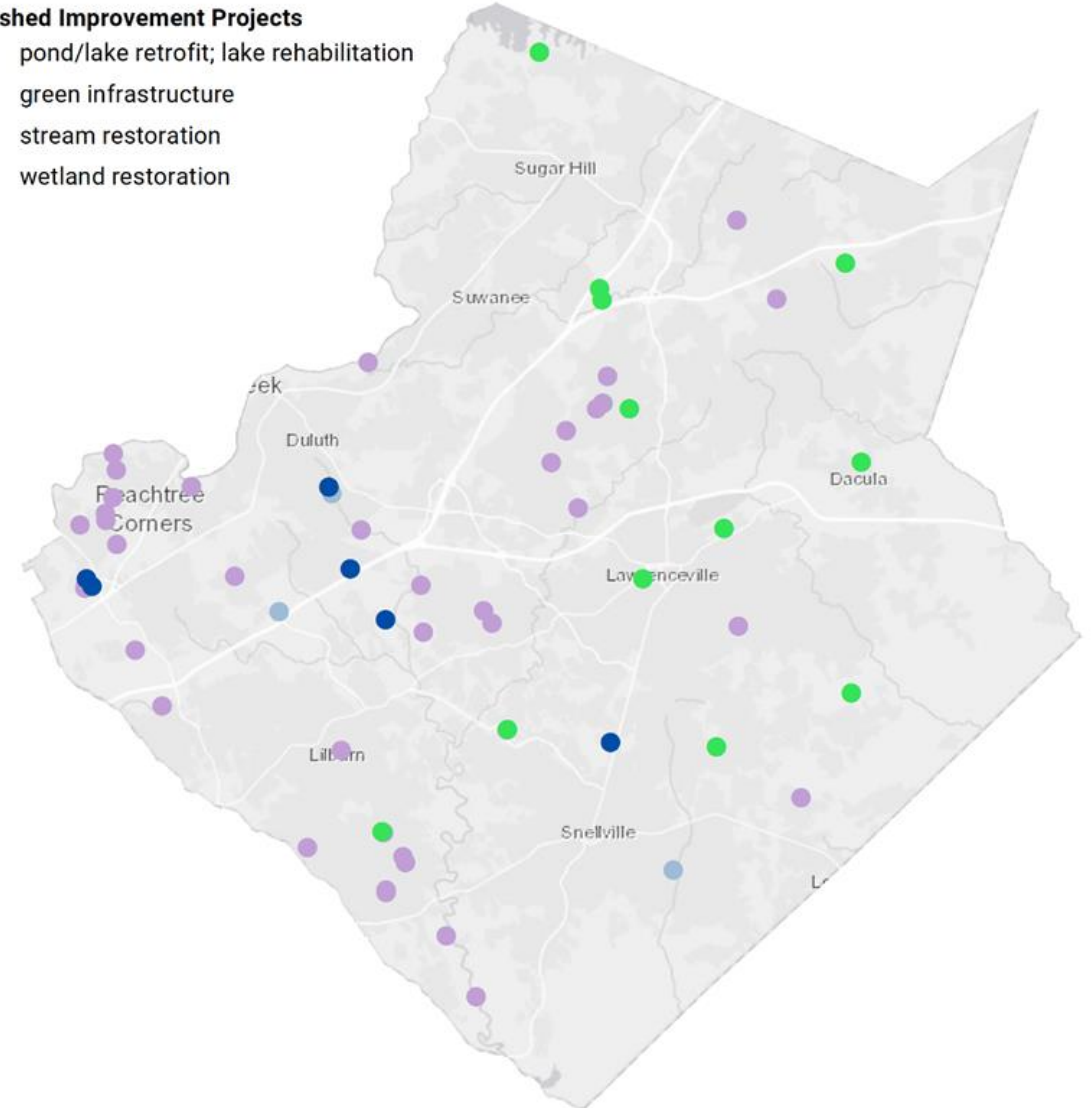
- Protecting and improving the water quality and aquatic habitat in the County's rivers, streams, and other surface water bodies
- Implementing new and retrofit LID-GI practices
- Developing design and guidance/performance standards for stormwater best management practices (BMPs)
- Demonstrating to stakeholders that LID-GI practices are feasible/cost effective

- WIP Program Timeline

- 2000 - developed the Watershed Improvement Program (WIP), WIP Specifications and WIP Annual Contractors
- 2005 - stormwater utility fee introduced
- 2007 – first WIP project completed
- 2017 – Gwinnett County Stormwater Management Manual (GCSMM)

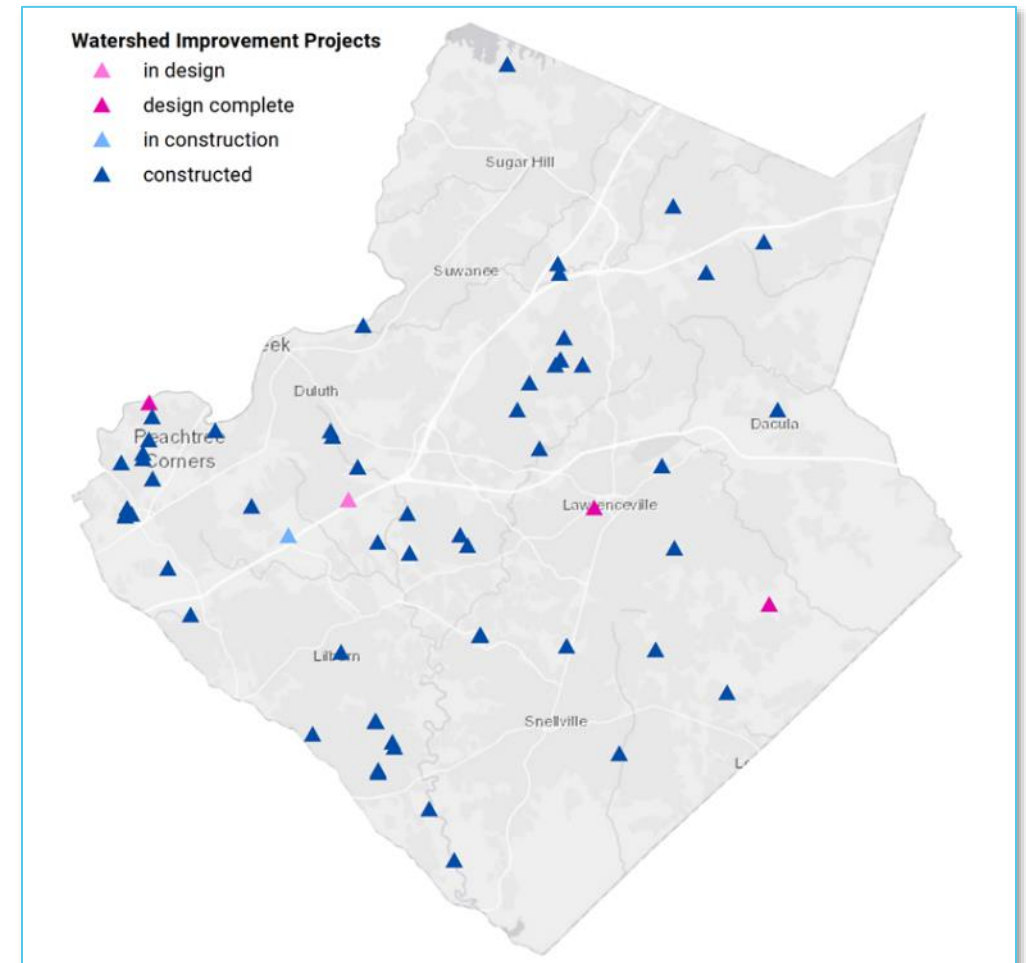
Watershed Improvement Projects

- pond/lake retrofit; lake rehabilitation
- green infrastructure
- stream restoration
- wetland restoration



WIP Capital Projects

- LID-GI Retrofitting
 - 12 GI retrofit projects constructed to date with 34 total BMPs installed
 - Collaborations with:
 - GC Parks and Recreation
 - GC Public Libraries
 - GC Water Resources
 - Municipalities within GC



GCSMM BMPs

Project	Site	Bioretention	Bioslope	Downspout Disconnect	Dry Detention Basin	Dry Extended Detention	Dry Well	Dry/Wet Enhanced Swale	Grass Channel	Gravity (Oil-Grit) Separator	Green Roof	Infiltration Practice	Multi Purpose Detention Area	Organic Filter	Permeable Paver Systems	Pervious Concrete	Porous Asphalt	Proprietary Systems	Rain Garden	Regenerative Stormwater Conveyance	Sand Filter	Site Restoration / Revegetation	Soil Restoration	Stormwater Planters / Tree Boxes	Stormwater Ponds	Stormwater Wetlands	Submerged Gravel Wetland	Underground Detention	Vegetated Filter Strip
Dacula Park	Park	✓						✓	✓																				
Duncan Creek Park	Park	✓						✓																					
Lilburn City Park	Park	✓														✓													
Collins Hill Park	Park																									✓			
Ronald Reagan Park	Park	✓																											
F. Wayne Hill Water Resources Center	DWR Facility	✓																	✓	✓									
DWR Central	DWR Facility	✓																	✓										
Shoal Creek Filter Plant	DWR Facility	✓				✓																							
Collins Hill Library	Gwinnett Library	✓																											
Grayson Library	Gwinnett Library	✓						✓																					
Garner Creek / Parkview High School	Schools / Neighborhoods	✓																								✓			
Shannon Way	Schools / Neighborhoods																										✓		
Other Projects Designed or Underway		✓						✓		✓	✓				✓	✓	✓	✓	✓		✓			✓	✓				

Why retrofit?

Challenges of GI Retrofitting

- **Small footprints**
Small-scale projects working around existing infrastructure complicates material storage, site access, and construction schedules



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- **High visibility**
Working in public settings means that the project is highly visible to members of the community who may observe construction and ask questions



Why retrofit?

Challenges of GI Retrofitting

- **Small footprints**
Small-scale projects working around existing infrastructure complicates material storage, site access, and construction schedules
- **High visibility**
Working in public settings means that the project is highly visible to members of the community who may observe construction and ask questions
- **Uncertainty**
Utilities, groundwater, bedrock, and old construction debris can all present a challenge to constructing the GI as planned



Why retrofit?

Benefits of GI Retrofitting

- *Solving drainage issues*
Addressing existing drainage issues with creative GI solutions demonstrates the efficacy of GI principles



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Why retrofit?

Benefits of GI Retrofitting

- **Solving drainage issues**
Addressing existing drainage issues with creative GI solutions demonstrates the efficacy of GI principles
- **Practice makes perfect!**
Retrofit projects are an opportunity for designers, contractors, inspectors, and maintenance personnel to get more familiar with GI while beautifying public spaces



Why retrofit?

Benefits of GI Retrofitting

- **Monitoring opportunities**
GI maintained by the County provides opportunities for observation, monitoring, and case studies to influence guidance for implementing GI in Gwinnett County



Why retrofit?

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- **Public engagement**
Demonstration projects in high-visibility locations engages the community and helps spread water quality awareness

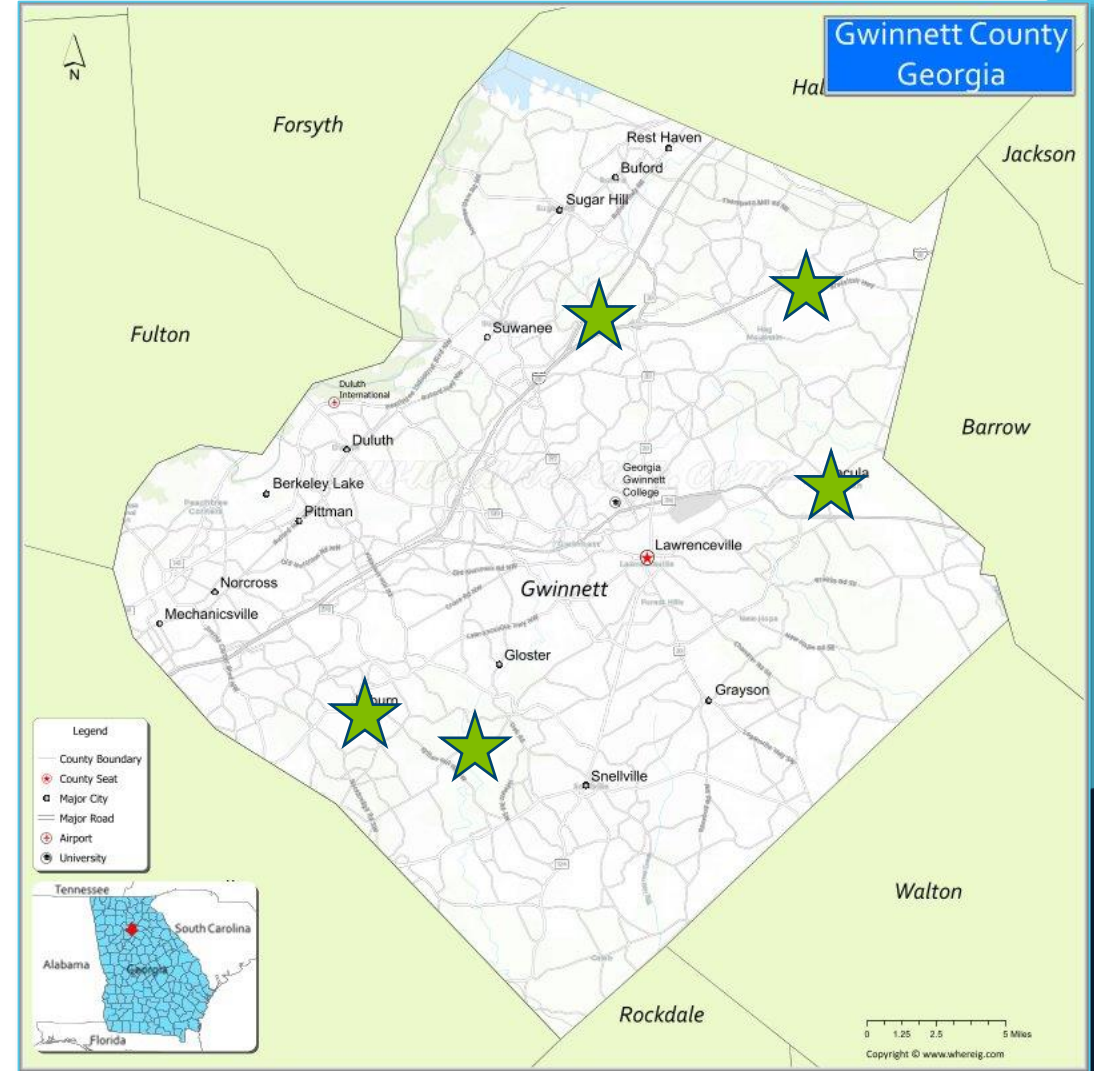


GCDWR and Geosyntec



- Variety of roles on WIP projects
 - Developing GI retrofit concepts
 - Conducting feasibility studies from WIP master plans
 - Detailed design packages for GI retrofits and stormwater improvements
 - Construction management at GI retrofit projects

Project	Concept	Feasibility	Design	Construction
F. Wayne Hill Water Resources Center		✓	✓	✓
Dacula Park			✓	✓
Duncan Creek Park	✓	✓	✓	✓
Lilburn City Park		✓	✓	✓
Yellow River WWTP	✓			



Concept Phase

- Watershed-level analyses
- Keep an open mind, but consider site and funding limitations
- Focus on highest priority and utilize a phased approach

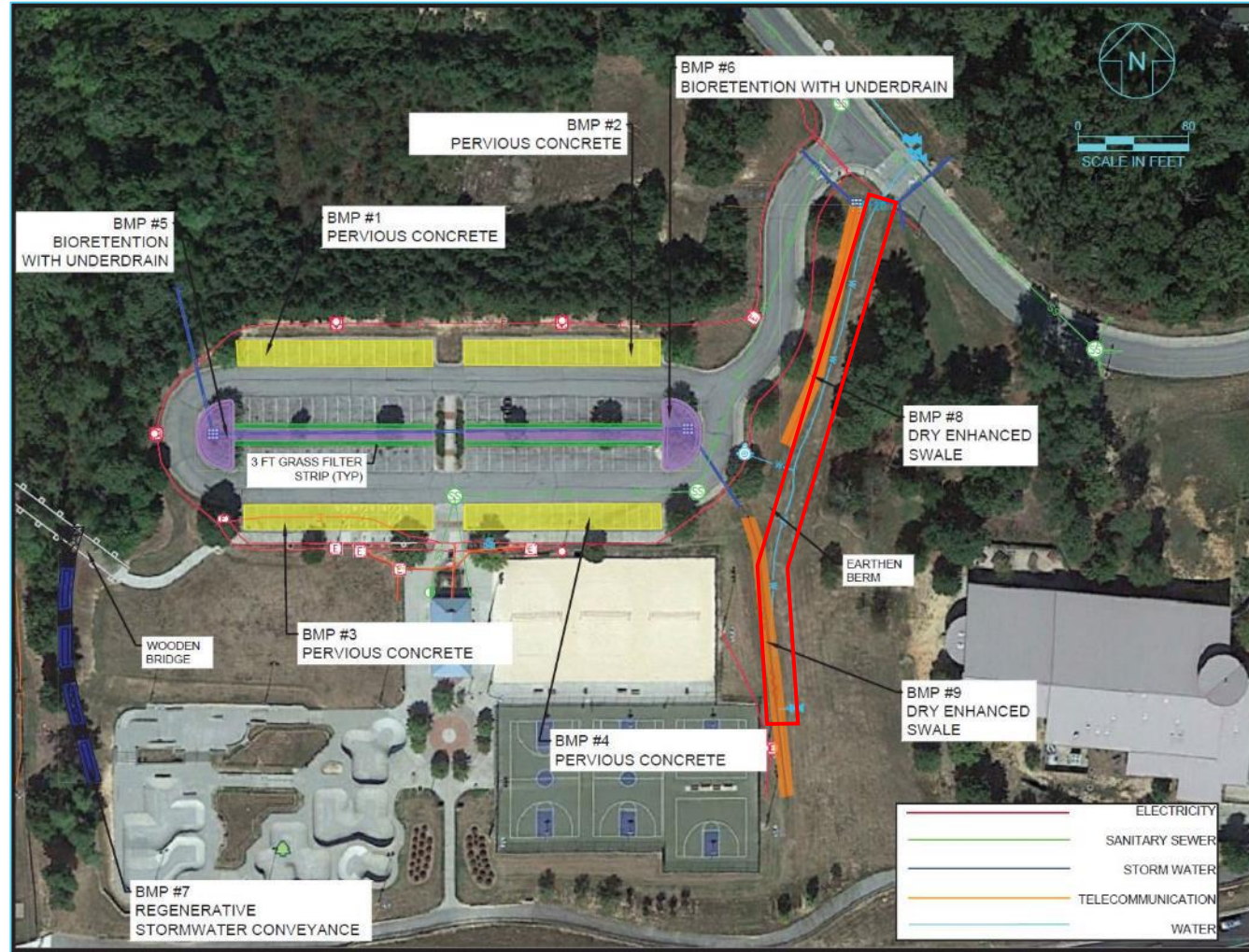
Project	Concept	Feasibility	Design	Construction
F. Wayne Hill Water Resources Center	14	5	2	2
Duncan Creek Park*	19	16	8	4
Dacula Park	5	4	4	3
Lilburn City Park	5	3	3	3



Feasibility Phase

Can the BMP be constructed?

- Fully understand the site before design and construction
- Resolve any discrepancies between site data and field observations
- Trust but verify:
 - *Utility surveys*
 - Compare utility surveys with available historical design drawings and as-builts

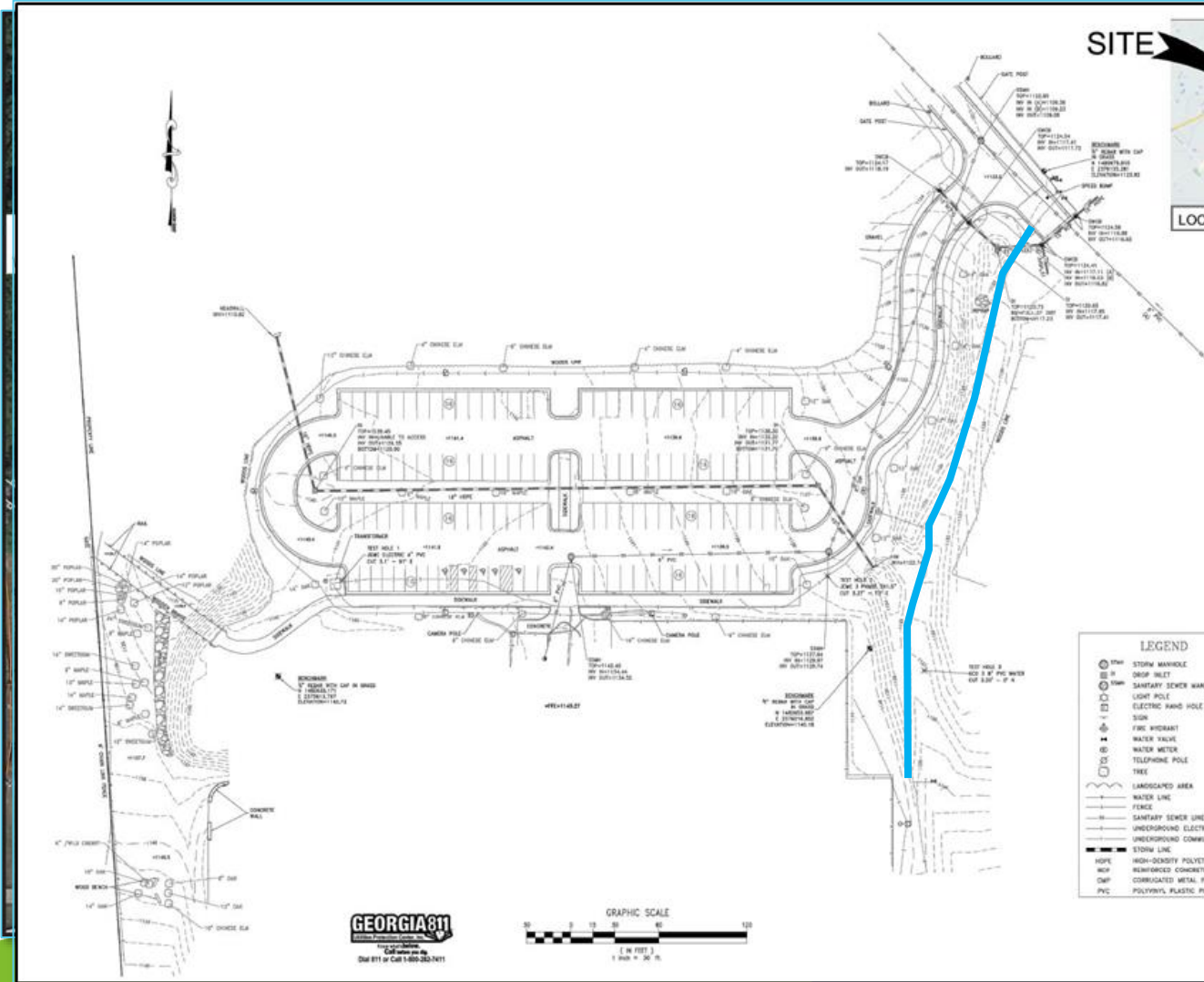


Feasibility Phase



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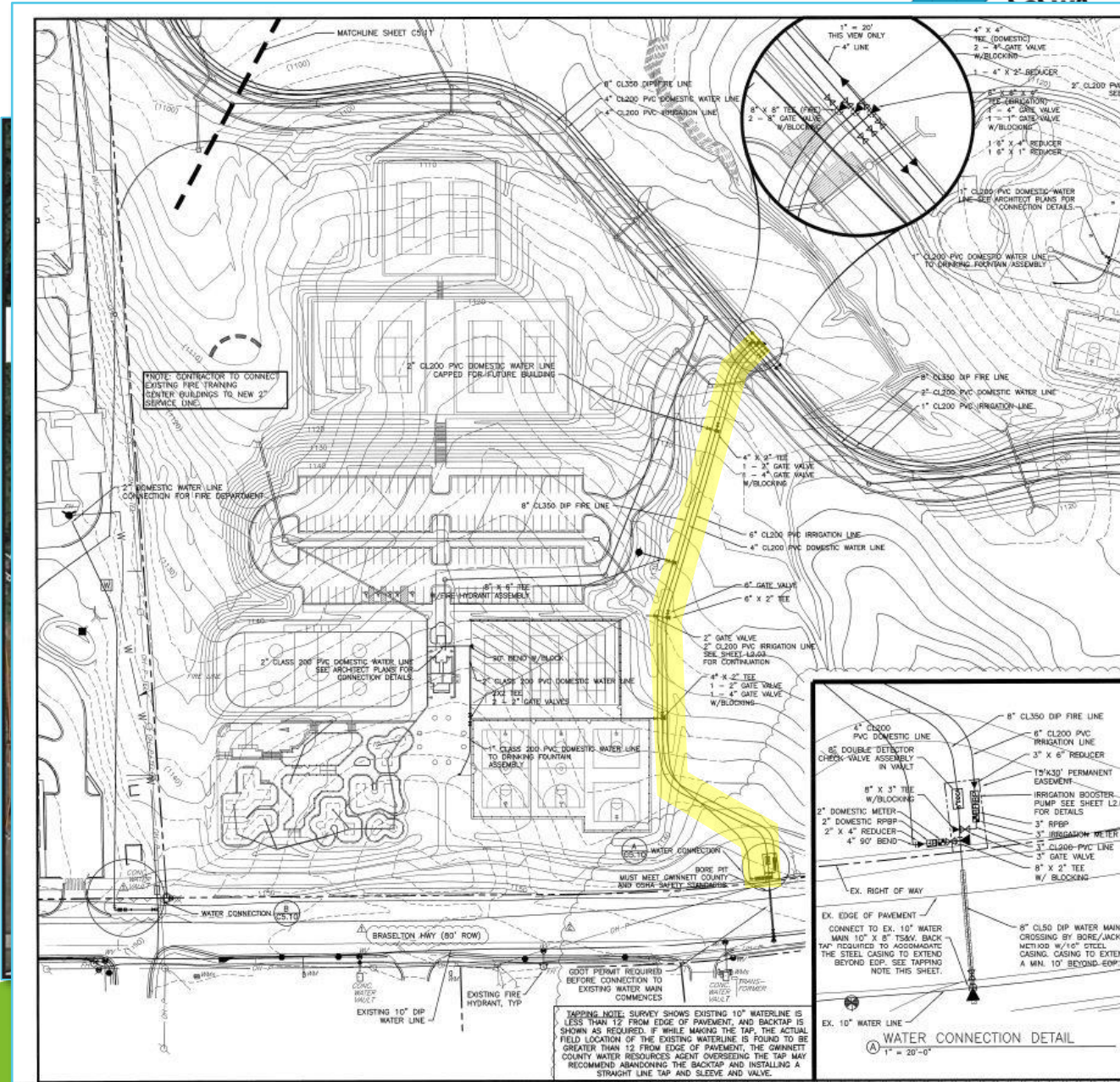
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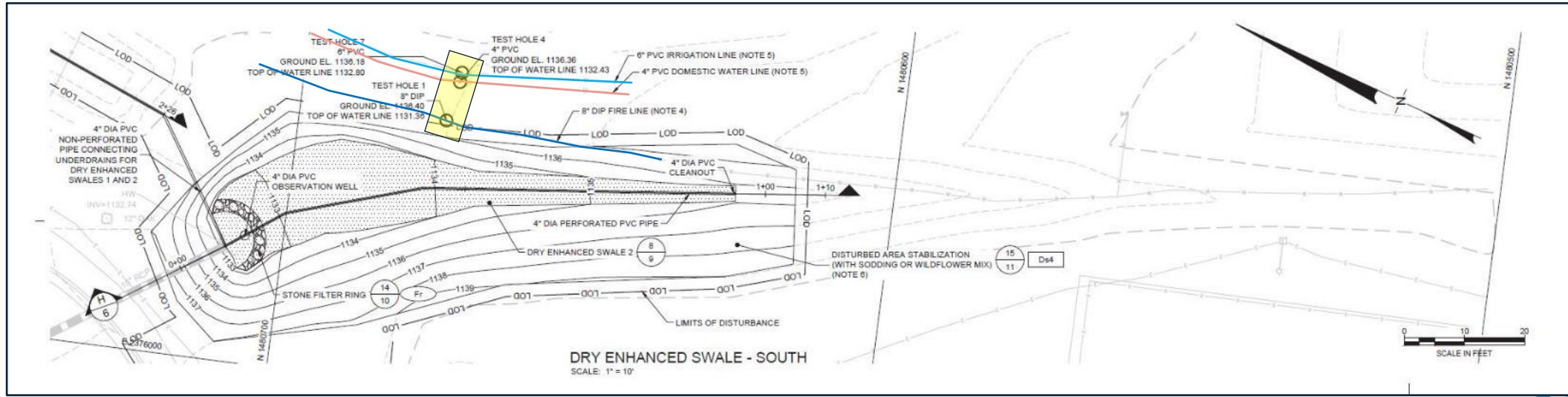
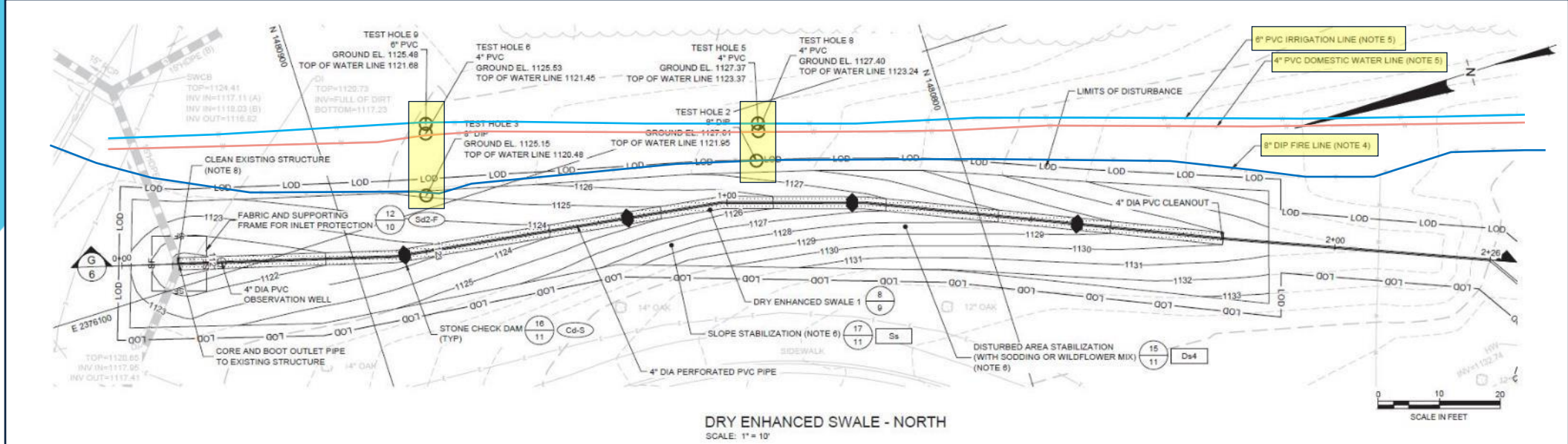


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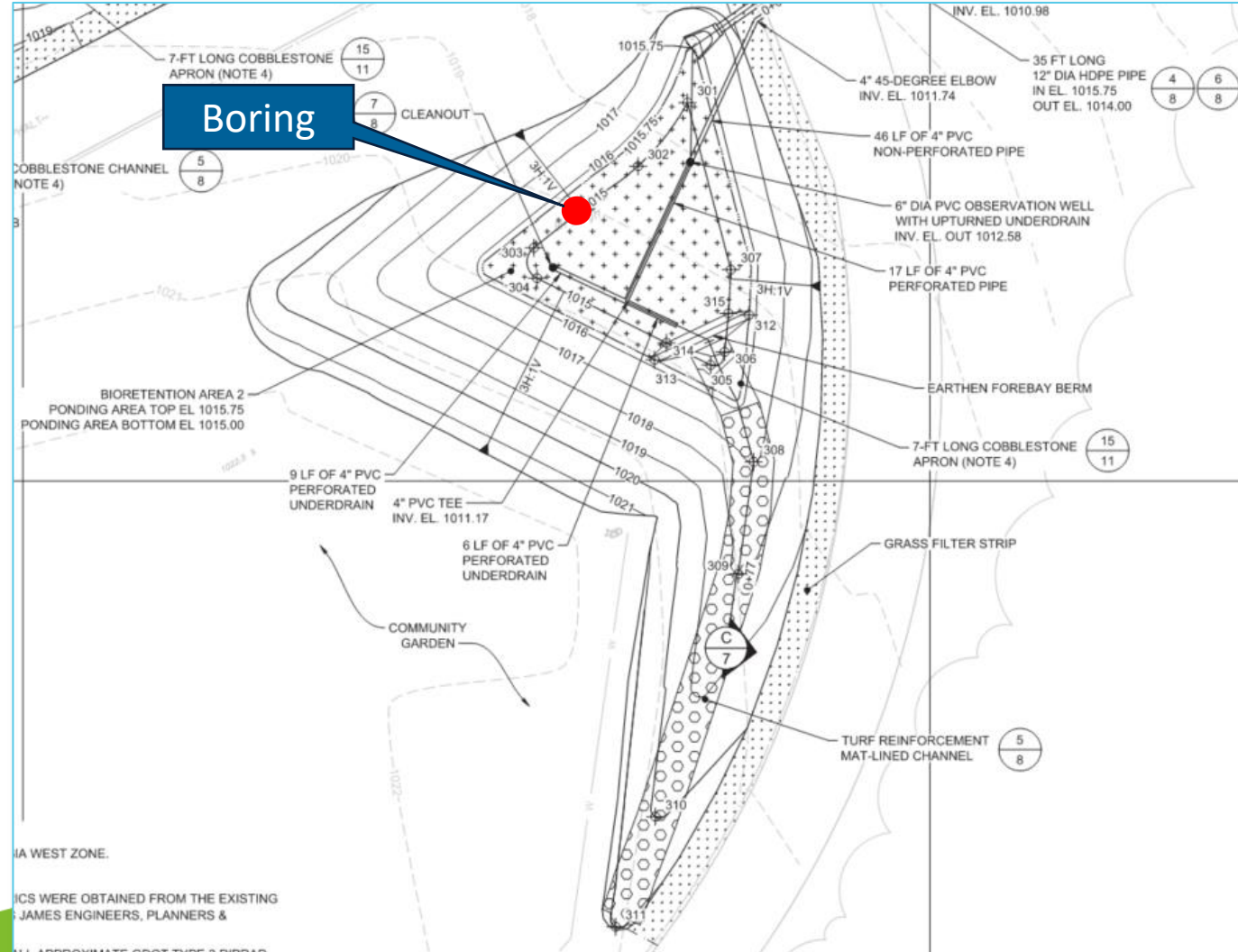


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- Trust but verify:
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 - *Geotechnical studies*
 - Dig test pits



Gwinnett

Geosyntec
consultants

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Feasibility Phase

Can the BMP meet design criteria?

- Communication

- Understand stakeholders' level of tolerance for variation from standards and determine constraints
- Reconcile goals:
 - Public engagement
 - Improving water quality
 - Demonstrating GI-LID efficacy

! KEY CONSIDERATIONS

DESIGN CRITERIA

- Maximum contributing drainage area of 5 acres
- Treatment area consists of ponding area, organic/mulch layer, planting media, and vegetation
- Requires landscaping plan
- Standing water has a maximum drain time of 24 hours
- Pretreatment is required to prevent clogging of underdrains or native soil
- Ponding depth should be a maximum of 12 inches, preferably 9 inches

ADVANTAGES / BENEFITS

- Applicable to small drainage areas
- Effective pollutant removals
- Appropriate for small areas with high impervious cover, particularly parking lots
- Natural integration into landscaping for urban landscape enhancement
- Good retrofit capability
- Can be planned as an aesthetic feature and meet local planting requirements

DISADVANTAGES / LIMITATIONS

- Requires landscaping
- Not recommended for areas with steep slopes
- Medium to high capital cost
- Medium cost maintenance burden
- Soils may clog over time (may require cleaning or replacing)

MAINTENANCE REQUIREMENTS

- Inspect and repair or replace treatment area components such as mulch, plants, and scour protection, as needed
- Ensure bioretention area is draining properly so it does not become a breeding ground for mosquitos
- Remove trash and debris
- Ensure mulch is 3-4 inches thick in the practice
- Requires plant maintenance plan

POLLUTANT REMOVAL

85%	Total Suspended Solids	95%	Metals - Cadmium, Copper, Lead, and Zinc removal
80% 50%	Nutrients - Total Phosphorus / Total Nitrogen removal	90%	Pathogens - Fecal Coliform

STORMWATER MANAGEMENT SUITABILITY

- ✓ Runoff Reduction
- ✓ Water Quality
- ★ Channel Protection
- ★ Overbank Flood Protection
- ★ Extreme Flood Protection

✓ suitable for this practice
★ may provide partial benefits

IMPLEMENTATION CONSIDERATIONS

- L Land Requirement
- MH Capital Cost
- M Maintenance Burden

Residential Subdivision Use: Yes
High Density/Ultra-Urban: Yes
Roadway Projects: Yes

Soils: Engineered soil media is composed of sand, fines, and organic matter

Other Considerations: Use of native plants is recommended

L=Low M=Moderate H=High

RUNOFF REDUCTION CREDIT

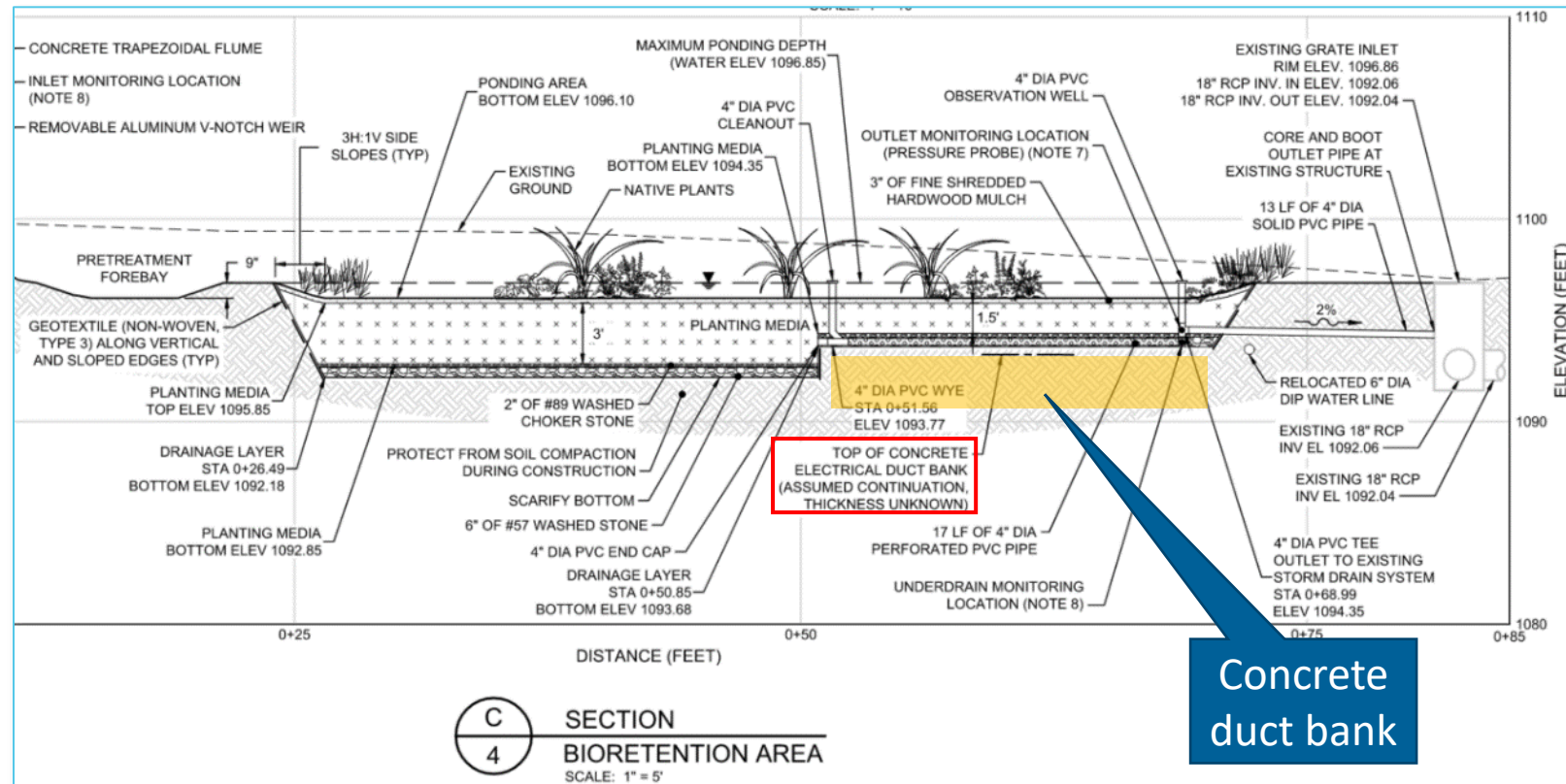
- 100% of the runoff reduction volume provided (no underdrain)
- 75% of the runoff reduction volume provided (upturned underdrain system)
- 50% of the runoff reduction volume provided (underdrain)

Feasibility Phase

Can the BMP meet design criteria?

- Flexibility

- What can we do to keep a BMP from being eliminated?
- Get creative with:
 - Media thicknesses
 - Ponding depths
 - Utility impacts



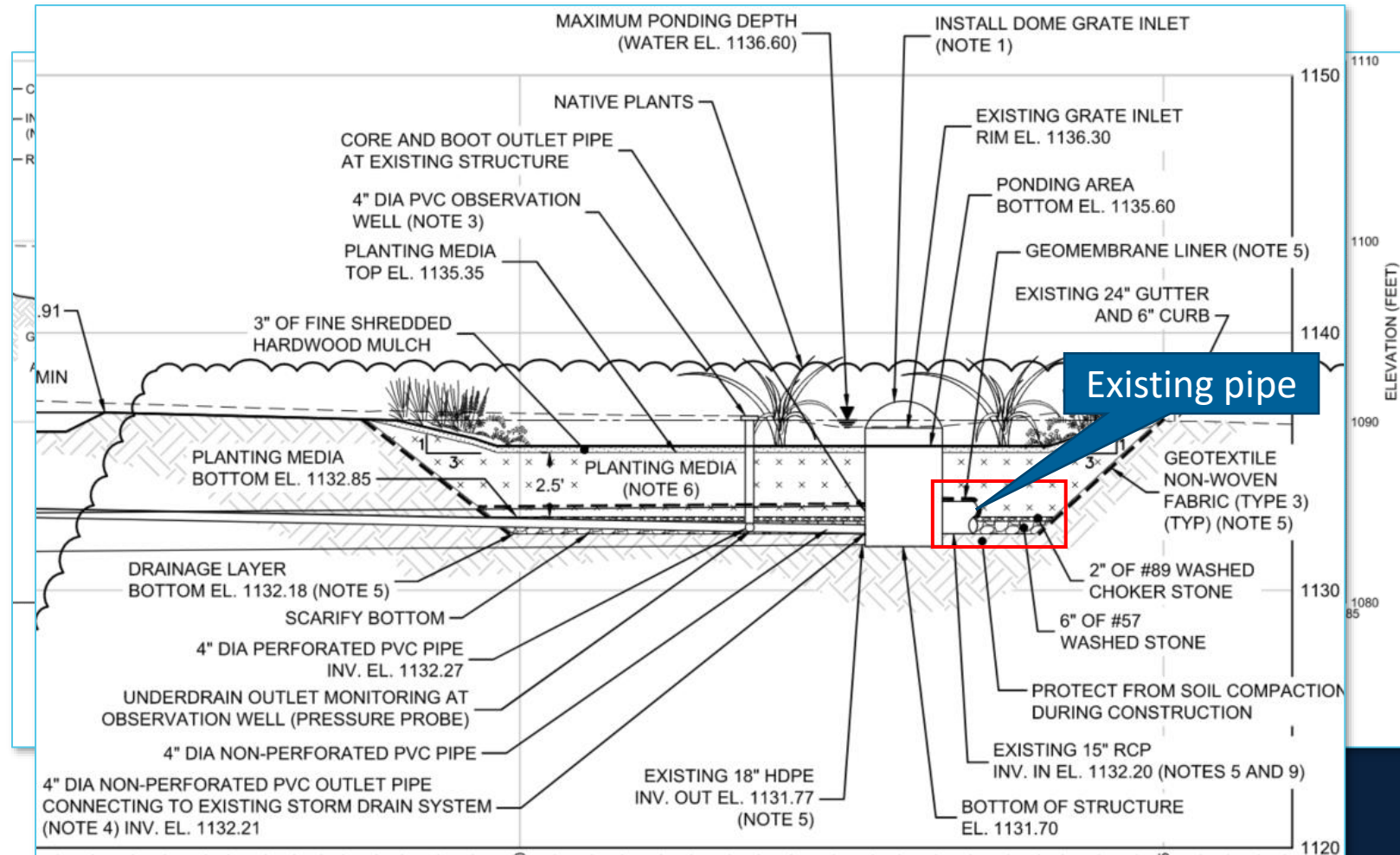
Feasibility Phase



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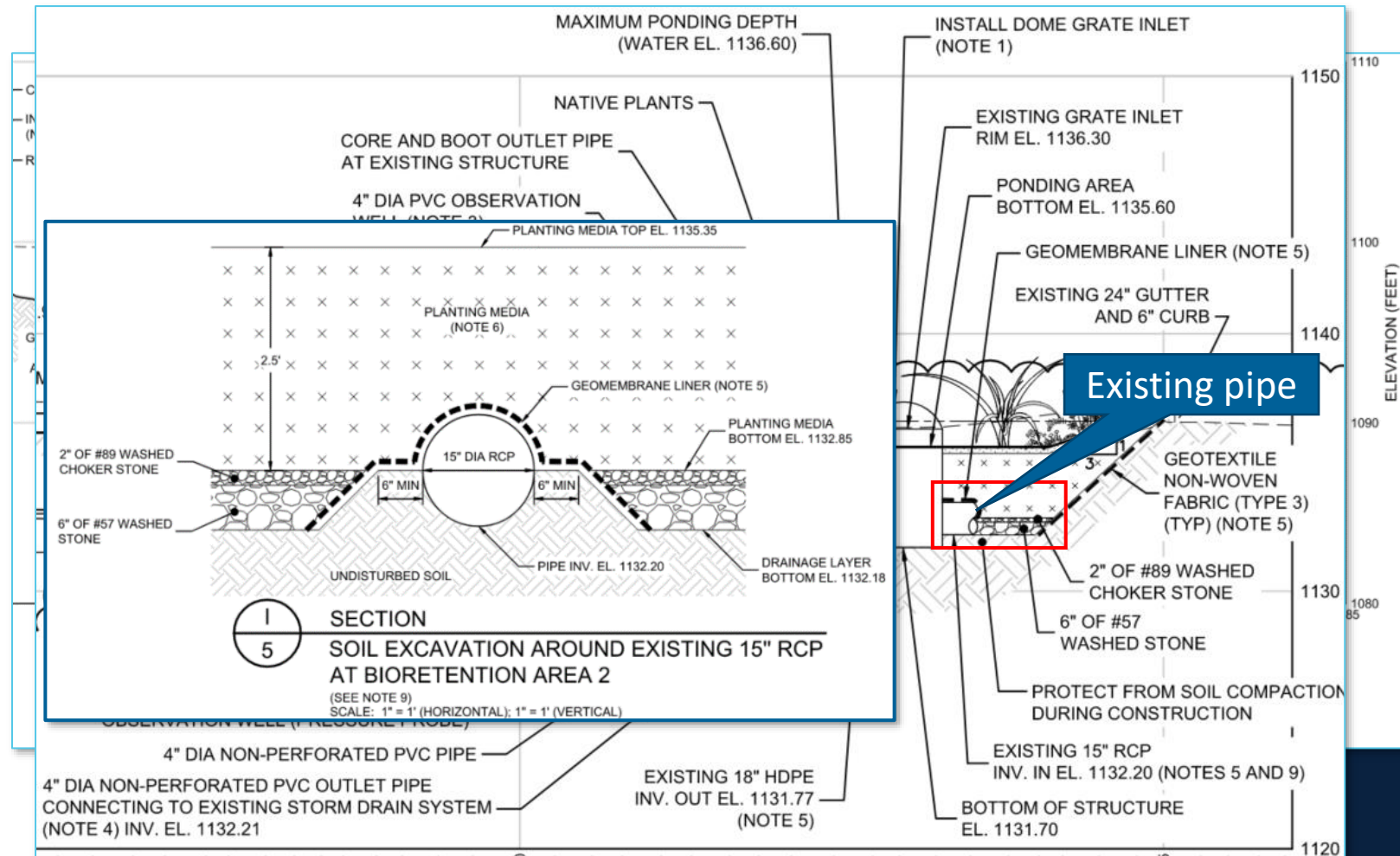
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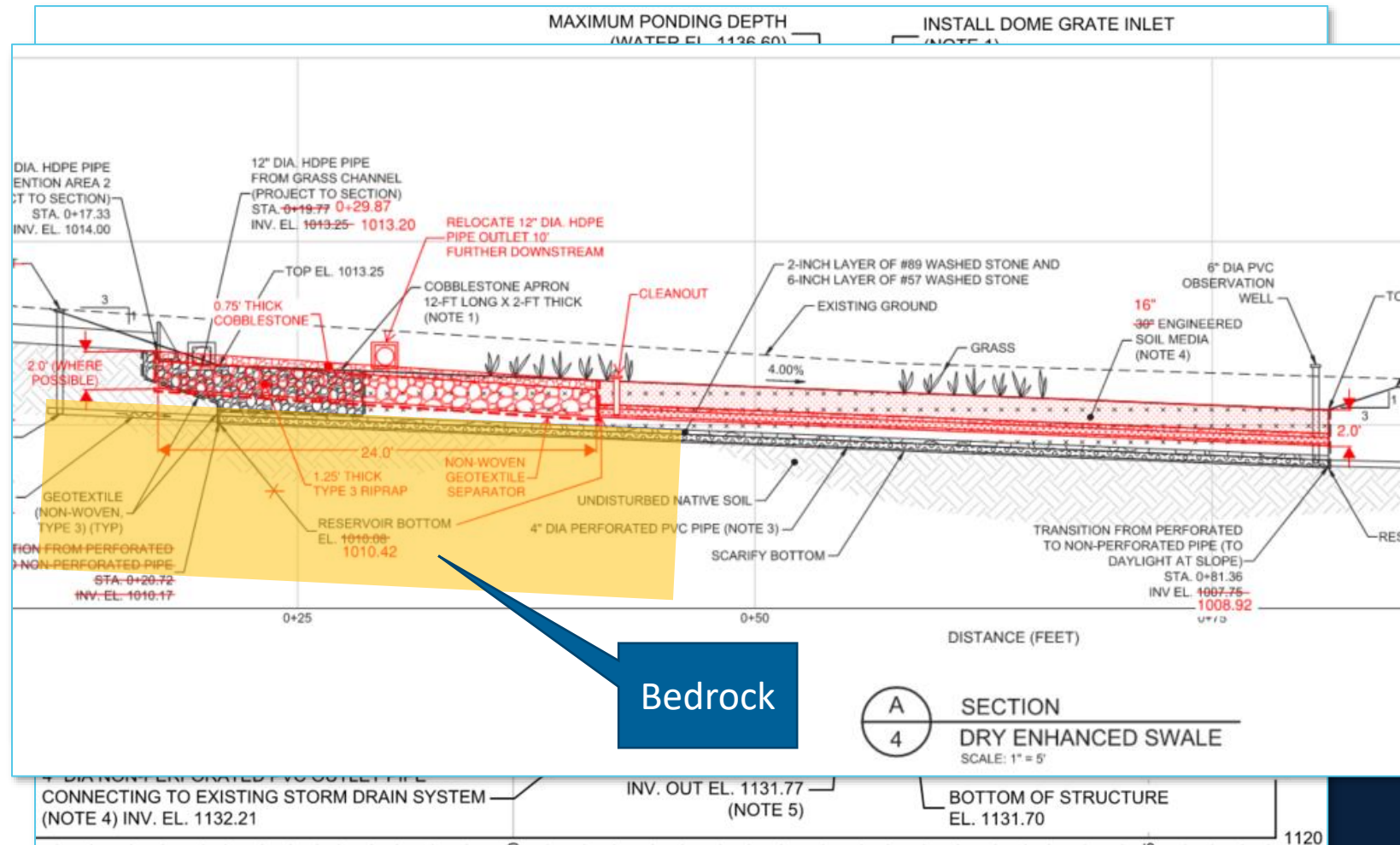


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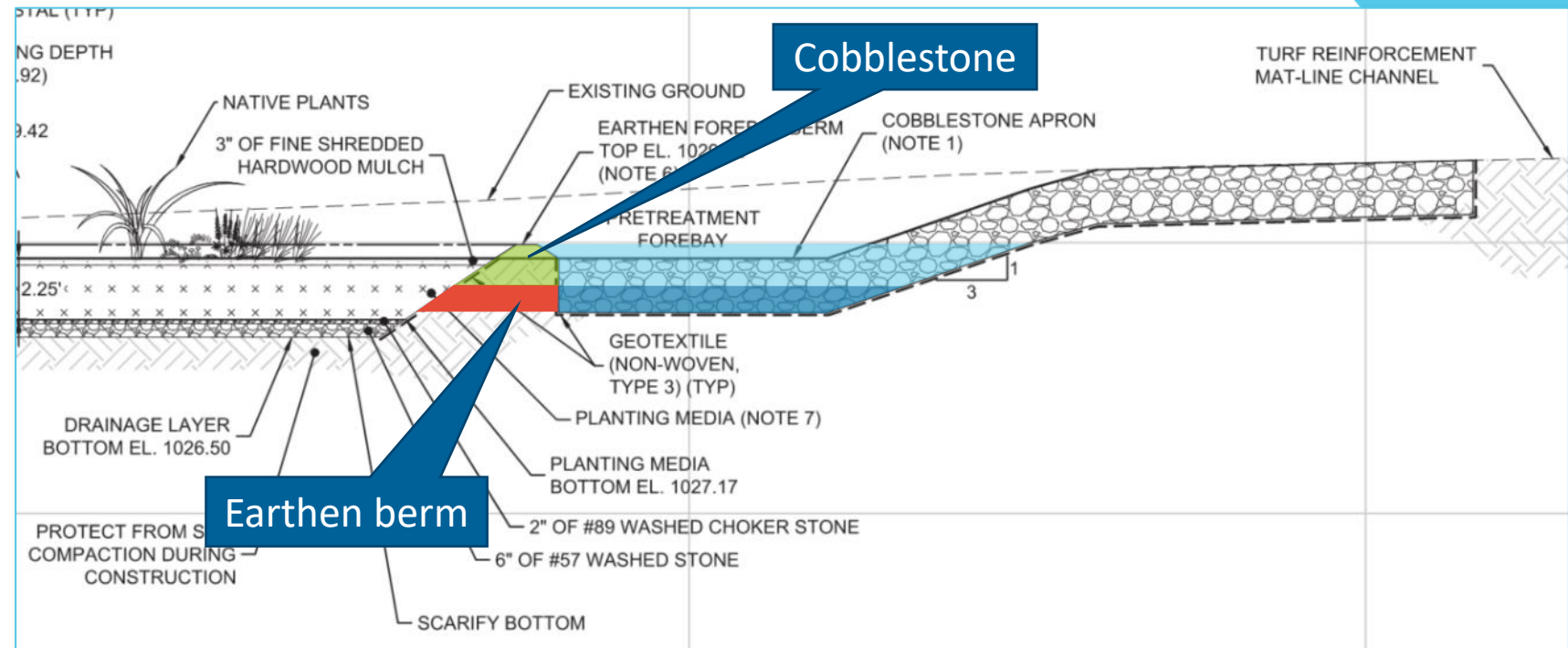


Bedrock

Design Phase

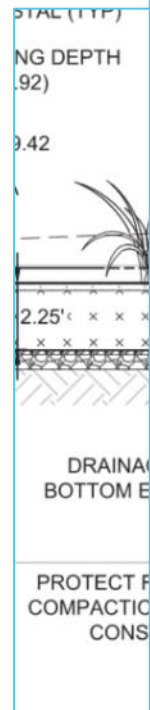
- Stakeholder Engagement

➤ *Parks – Forebays*



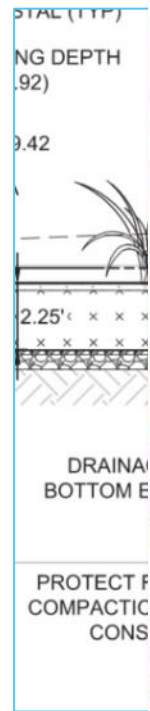
Design Phase

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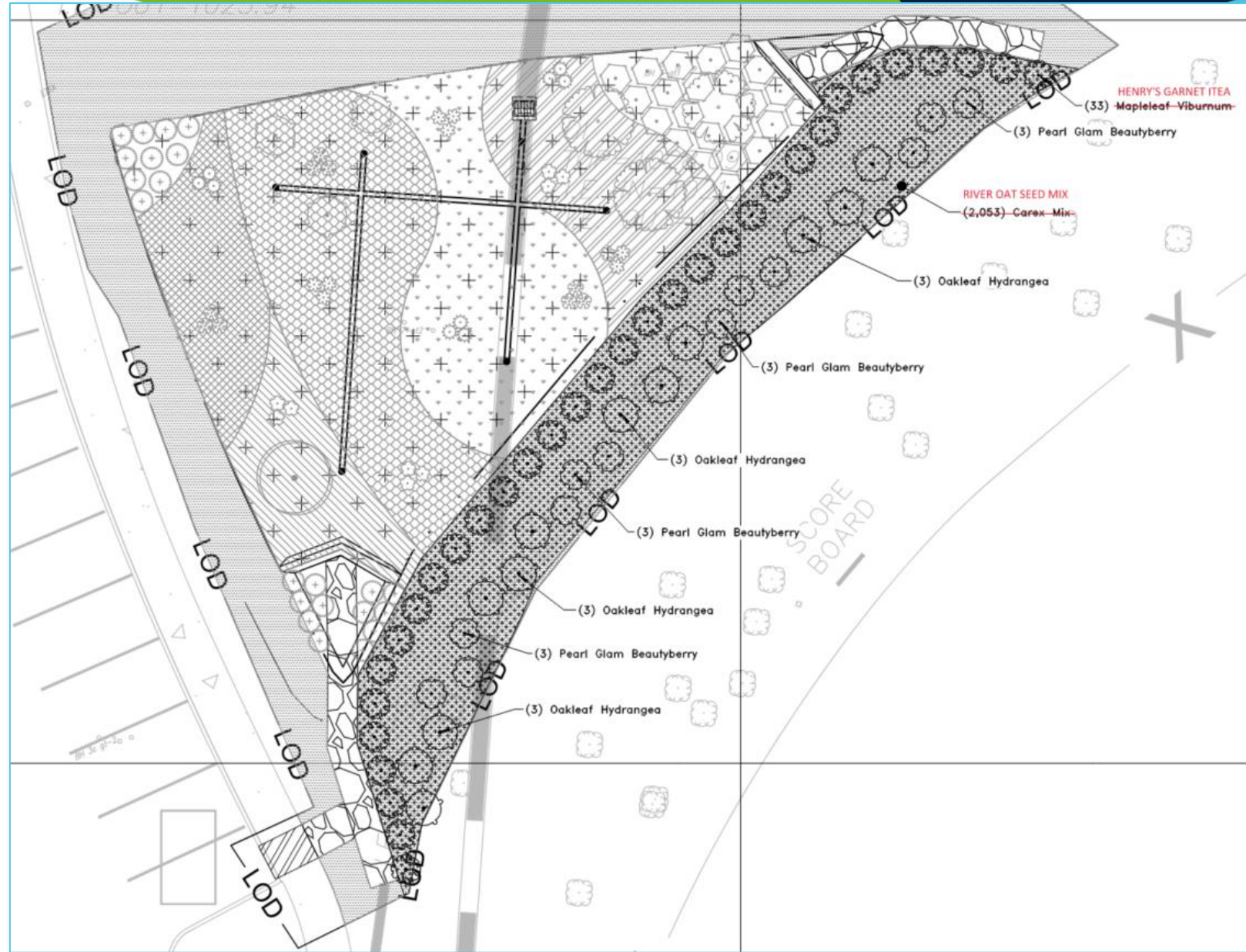
Design Phase

- Stakeholder Engagement
 - Parks – Forebays
 - Contractor – Slope landscaping



Design Phase

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Design Phase

- Stakeholder Engagement
 - *Parks* – Forebays
 - *Contractor* – Slope landscaping

Flexibility & Communication



Construction Phase



- Communication

- Not everything is going to go according to plan
- Establish diverse methods of communication:

- *Daily field reports*

DAILY FIELD REPORT		
PROJECT AND SITE INFORMATION		
PROJECT: Dacula Park BMPs Phase 1 – North Parking Lot Area	DATE: Tuesday, May 16, 2023	
DESCRIPTION: Stormwater BMP Retrofit Demonstration	PROJECT NO.: F-1329-07	PHASE NO.: 1
CLIENT: Gwinnett County Department of Water Resources (GCDWR)	LOCATION: Dacula, GA	
CONTRACTOR(S): Clean Water Consultants (CWC)		
WEATHER: Sunny, 85 degrees F		
INSPECTOR: Ross Ellis	TIME IN: 9:45 AM	TIME OUT: 4:00 PM
ON-SITE PERSONNEL		
NAME	COMPANY	POSITION
Ross Ellis	Geosyntec	Senior Staff Engineer/Construction Oversight
Jeremy Pratt	GCDWR	Engineer III/Project Manager
Tommy Sorrow	CWC	Project Manager/Construction Superintendent
Jared Eubanks	Geosyntec	Principal/Project Manager
N/A	N/A	N/A
N/A	N/A	N/A
N/A	N/A	N/A
VISITOR'S NAME		COMPANY
Todd Freeman		CWC
Scott Williams		GCDWR
Adanegn Woldemichael		Gwinnett Parks
Angelique Young		GCDWR
N/A		N/A



Construction Phase



- Communication

- Not everything is going to go according to plan
- Establish diverse methods of communication:
 - *Daily field reports*
 - *Biweekly progress meetings*



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Kennesaw, GA 30144
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www.geosyntec.com

Meeting Agenda

Project: Dacula Park BMPs Phase 1 – North Parking Lot Area **GCDWR Project Number:** F-1329-07
Owner: Gwinnett County Department of Water Resources (GCDWR)
Contractor: Clean Water Consultants (CWC)
Construction Oversight and Support: Geosyntec Consultants, Inc. (Geosyntec) and GCDWR
Design Engineer: Geosyntec
Meeting Title: Biweekly Progress Meeting
Date: 05/02/2023 **Time:** 10:30 AM **Location:** Dacula Park – North Parking Lot Area

1. INTRODUCTIONS

- a. Sign-In
- b. Safety Moment
- c. Approval of previous meeting minutes

2. DISCUSSION ITEMS

- a. Project Schedule
 - i. Work completed in the last two weeks
 - Bioretention Area 1 media installation, mulch installation, exterior grading and sodding
 - Pipe inlet repair at 15" diameter CMP upgradient of Bioretention Area 1 south forebay
 - Dry Enhanced Swale (DES) 12" diameter HDPE pipe replacement, tree trunk removal, and excavation
 - ii. Work anticipated for the next two weeks
 - Bioretention Area 1 landscaping and fencing
 - DES underdrain and stone installation, media installation, grading and sodding, and fencing installation



Construction Phase



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- Establish diverse methods of communication:
 - *Daily field reports*
 - *Biweekly progress meetings*
 - *Preliminary and Final punch list meetings*



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4. **PUNCH LIST** (Questions, Action Items) ***Bolded underlined items must be completed by 5/18***
(Completed items are stuck out)

Bioretention Area 1

- ~~Install cobblestone filter ring at pedestal inlet~~
- At southeast slope - remove ECB, scarify soil, spread river oat and annual wildflower mix seed, and install new ECB
- Place cobblestone supports and wire anchors at slope drain outlet in southeast slope
- Remove rock and geotextile protruding above mulch near east forebay
- **Re-set two Bald Cypress to remove mound at base**
- **Add mulch to bare areas and around trees**
- **Add mulch beds around American Beautyberry on southeast slope**
- **Remove plant tags**
- **Remove dog food bags on tree trunks**
- **Remove blown trash**
- **Trim grass on southeast slope**

15" CMP inlet area

- Repair curb damage with grout near sidewalk replacement at 15" CMP inlet
- ~~Saw cut expansion joints in sidewalk replacement~~
- Sodding at sidewalk replacement
- Replace 3'X7' area of damaged asphalt near sidewalk replacement
- ~~Remove stray cobblestone on slope upgradient of 15" CMP inlet~~

- DES underdrain and stone installation, media installation, grading and sodding, and fencing installation

Construction Phase



- Communication

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- Establish diverse methods of communication:
 - *Daily field reports*
 - *Biweekly progress meetings*
 - *Preliminary and Final punch list meetings*
 - *Description of Modification forms and Redline Drawings*



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DOM #7 - Description of Modifications

Project	Dacula Park BMPs Phase 1 – North Parking Lot Area	Project Number
Owner	Gwinnett County DWR (GCDWR)	F-1329-07
Contractor	Clean Water Consultants (CWC)	
Construction Manager	GCDWR / Geosyntec Consultants, Inc. (Geosyntec)	
Design Professional	Geosyntec	

Make the following additions, modifications, or deletions to the Work described in the Contract Documents:

Bioretention Area 1:

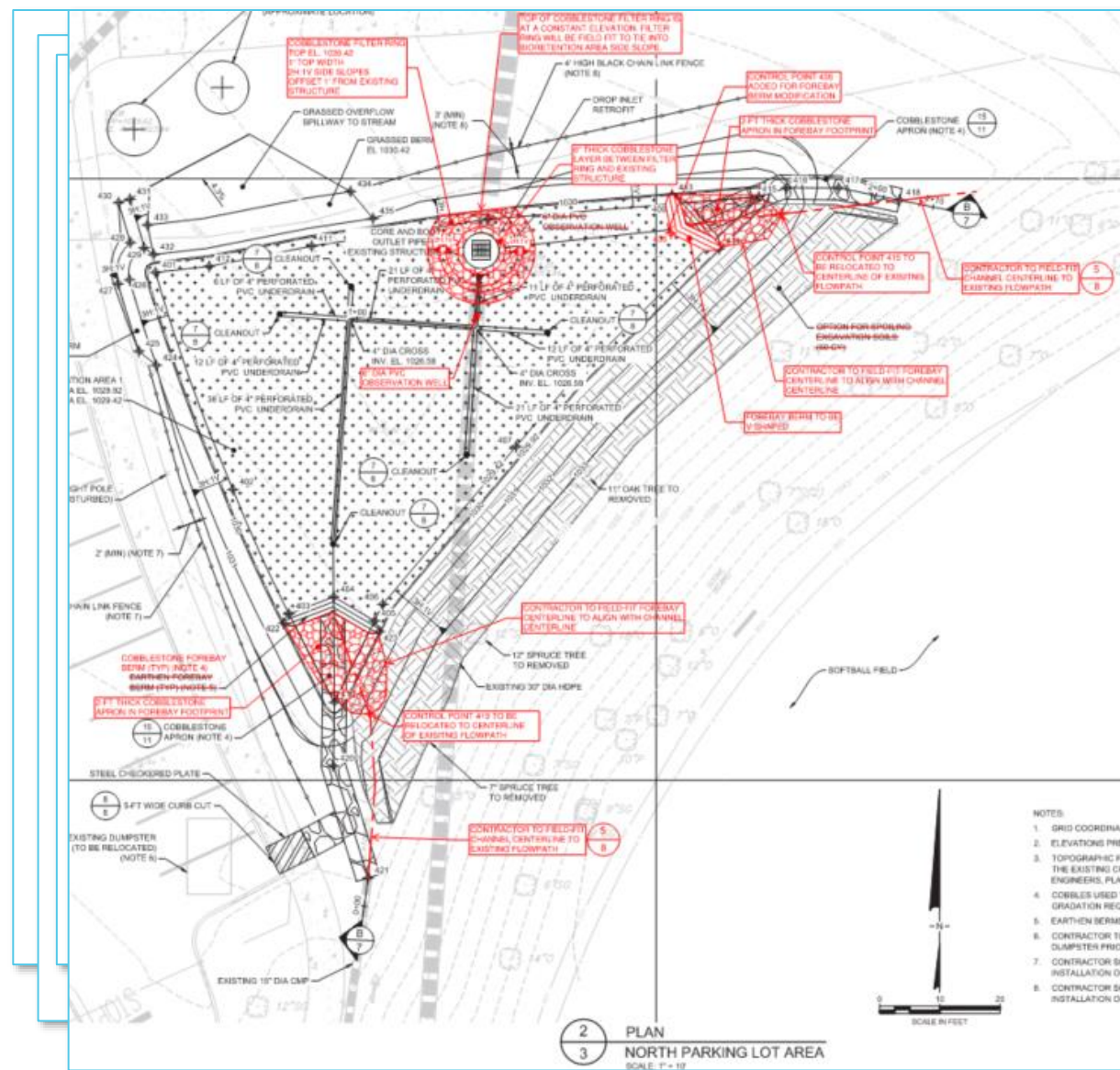
- CWC will construct compacted earthen berms on top of the subgrade just downstream of the toe of the cobblestone forebay berms. The earthen berms will have a top width of 3', a top elevation of 1028.17, and 1H:1V side slopes. The earthen berms will be wrapped in geotextile. Additionally, the #57 stone and #89 stone drainage layer will terminate 2' away from the downstream toe of the earthen berm, and biomedica will be installed within this 2' wide area instead. Lastly, #57 stone will be used to separate the biomedica from the cobblestone/riprap forebay berms instead of a geotextile separator. See Redline Drawing Sheet 7.
- Fencing will be installed along the western edge of Bioretention Area 1 adjacent to the sidewalk. Fencing will be 4' high black chain link, offset 2' from the sidewalk, extending from the crepe myrtles in the north to wrap around the 15" CMP outlet in the south. The fence will have a boxed-out section to allow access to the light pole, offset 3' from the light pole to the north and south, and offset 2' from the light pole to the east. **An underground electrical utility and a 15" CMP are located in the immediate vicinity of the fence alignment. Fence posts shall not be installed greater than 18" deep. Hand tools only shall be used to dig post holes.** See Redline Drawing Sheet 5.
- Fencing will be installed parallel to the asphalt trail along the western and northern edge of the cobblestone apron at the Dry Enhanced Swale. Fencing will be 4' high black chain link. See Redline Drawing Sheet 4.
- An existing underdrain pipe for the baseball fields daylight in the wooded area upgradient of the southeastern slope of Bioretention Area 1. CWC will extend the underdrain pipe to Bioretention Area 1 and
 - Sodding at sidewalk replacement
 - Replace 3'X7' area of damaged asphalt near sidewalk replacement
 - Remove stray cobblestone on slope upgradient of 15" CMP inlet

- DES underdrain and stone installation, media installation, grading and sodding, and fencing installation

Construction Phase

- Communication

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 - *Description of Modification forms and Redline Drawings*



Construction Phase



- Communication

- Early stakeholder input on:

- *Site access and schedule*

2022 EVENT SCHEDULE

Event Name	Event Date	Time	Location
Lilburchaun Parade	3/12/22	3-5pm	Lilburn City Park
Spring Cornhole League	3/24/22	6:45-9pm	Lilburn City Park
Spring Cornhole League	3/31/22	6:45-9pm	Lilburn City Park
Spring Cornhole League	4/14/22	6:45-9pm	Lilburn City Park
Spring Cornhole League	4/21/22	6:45-9pm	Lilburn City Park
Great American Cleanup	4/23/22	8am-11am	City Hall Parking lot
Spring Cornhole League	4/28/22	6:45-9pm	Lilburn City Park
Spring Cornhole League	5/5/22	6:45-9pm	Lilburn City Park
Food Truck Tuesday	5/10/22	6pm - 9pm	Lilburn City Park
Spring Cornhole League	5/12/22	6:45-9pm	Lilburn City Park
Community Yard Sale	5/14/22	9am - 1pm	Railroad parking lot
Spring Cornhole League	5/19/22	6:45pm-9pm	Lilburn City Park
Rock the Park	6/4/22	7 - 9:30 pm	Lilburn City Park
Summer Cornhole League	6/9/22	6-8pm	Lilburn City Park
Food Truck Tuesday	6/14/22	6pm - 9:00pm	Lilburn City Park
Summer Cornhole League	6/16/22	6-8pm	Lilburn City Park
Summer Cornhole League	6/23/22	6-8pm	Lilburn City Park
Summer Cornhole League	6/30/22	6-8pm	Lilburn City Park
Sparkle in the Park	7/4/22	5:30pm -10pm	Lilburn City Park
Summer Cornhole League	7/7/22	6-8pm	Lilburn City Park
Food Truck Tuesday	7/12/22	6pm - 9pm	Lilburn City Park
Summer Cornhole League	7/14/22	6-8pm	Lilburn City Park
Summer Cornhole League	7/21/22	6-8pm	Lilburn City Park
Summer Cornhole League	7/28/22	6-8pm	Lilburn City Park
National Night Out	8/2/22	6-8:30pm	Lilburn City Park
Food Truck Tuesday	8/9/22	6pm -9pm	Lilburn City Park
Fall Cornhole League	9/1/22	6-8pm	Lilburn City Park
Rock the Park	9/10/22	7pm - 9:30pm	Lilburn City Park
Food Truck Tuesday	9/13/22	6pm - 9pm	Lilburn City Park
Fall Cornhole League	9/8/22	6-8pm	Lilburn City Park
Fall Cornhole League	9/15/22	6-8pm	Lilburn City Park
Community Yard Sale	9/24/22	9am -1pm	Railroad parking lot
Fall Cornhole League	9/22/22	6-8pm	Lilburn City Park
Fall Cornhole League	9/29/22	6-8pm	Lilburn City Park



Construction Phase

- Communication
 - Early stakeholder input on:
 - *Site access and schedule*

Community Corner

Dacula Drive-Thru Food Pantry Will Give 20-Pounds Of Produce

The Gwinnett County Public Library has partnered with the Atlanta Community Food Bank to distribute the free food.



Andrea V. Watson, Patch Staff

Posted Tue, Feb 22, 2022 at 12:03 pm ET

Reply



Each family will receive one package that will contain up to 20 lbs of produce in addition to shelf-stable items. (Courtesy of Rick Uldricks)

Construction Phase

- Communication

- Early stakeholder input on:
 - *Site access and schedule*
 - *Material and equipment storage*

Community Corner

Dacula Drive-Thru Food Pantry Will



Construction Phase

- Communication

- Early stakeholder input on:
 - *Site access and schedule*
 - *Material and equipment storage*
 - *Operation and maintenance*



Community Corner

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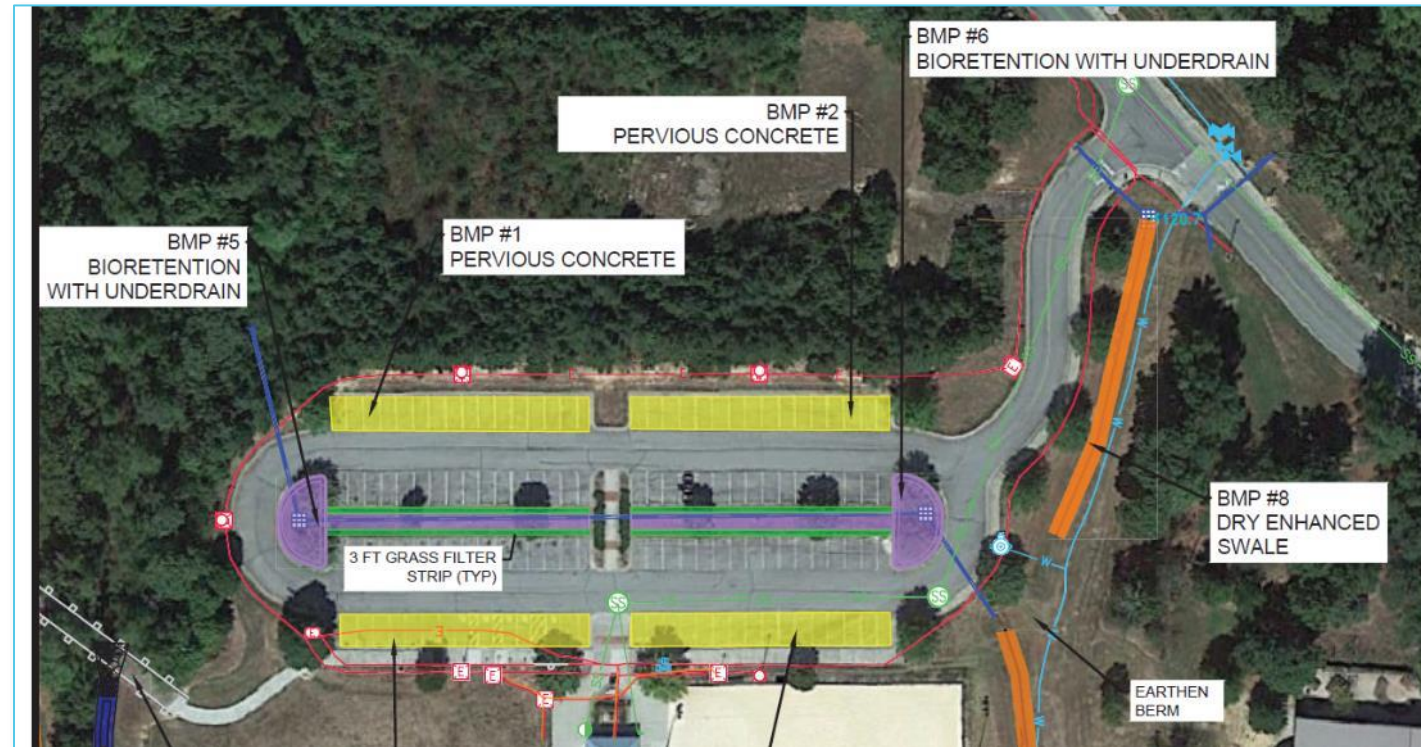
Operation and Maintenance Plan for Duncan Creek Park
BMPs Phase 1 – Skate Park Area
**Gwinnett County DWR Contract Category C – Stormwater BMP Design
and Watershed Management Services (Contract RP015-21)**

Project No.: F-1329-08



Construction Phase

- Flexibility
 - Stay focused on the goals of the project
 - *Work upstream to downstream when possible, but be flexible*



Construction Phase

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 - *Work upstream to downstream when possible, but be flexible*



Construction Phase

- Flexibility
 - Stay focused on the goals of the project
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Construction Phase

- Flexibility

- Stay focused on the goals of the project
 - *Work upstream to downstream when possible, but be flexible*
 - *Material availability and quality can be variable*



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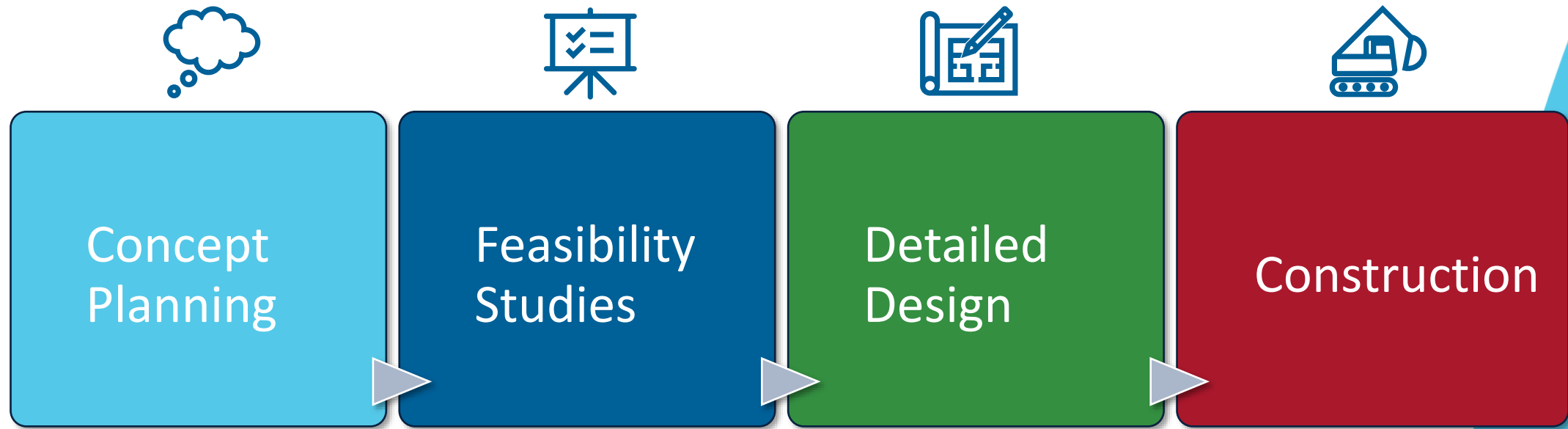
Construction Phase

- Flexibility

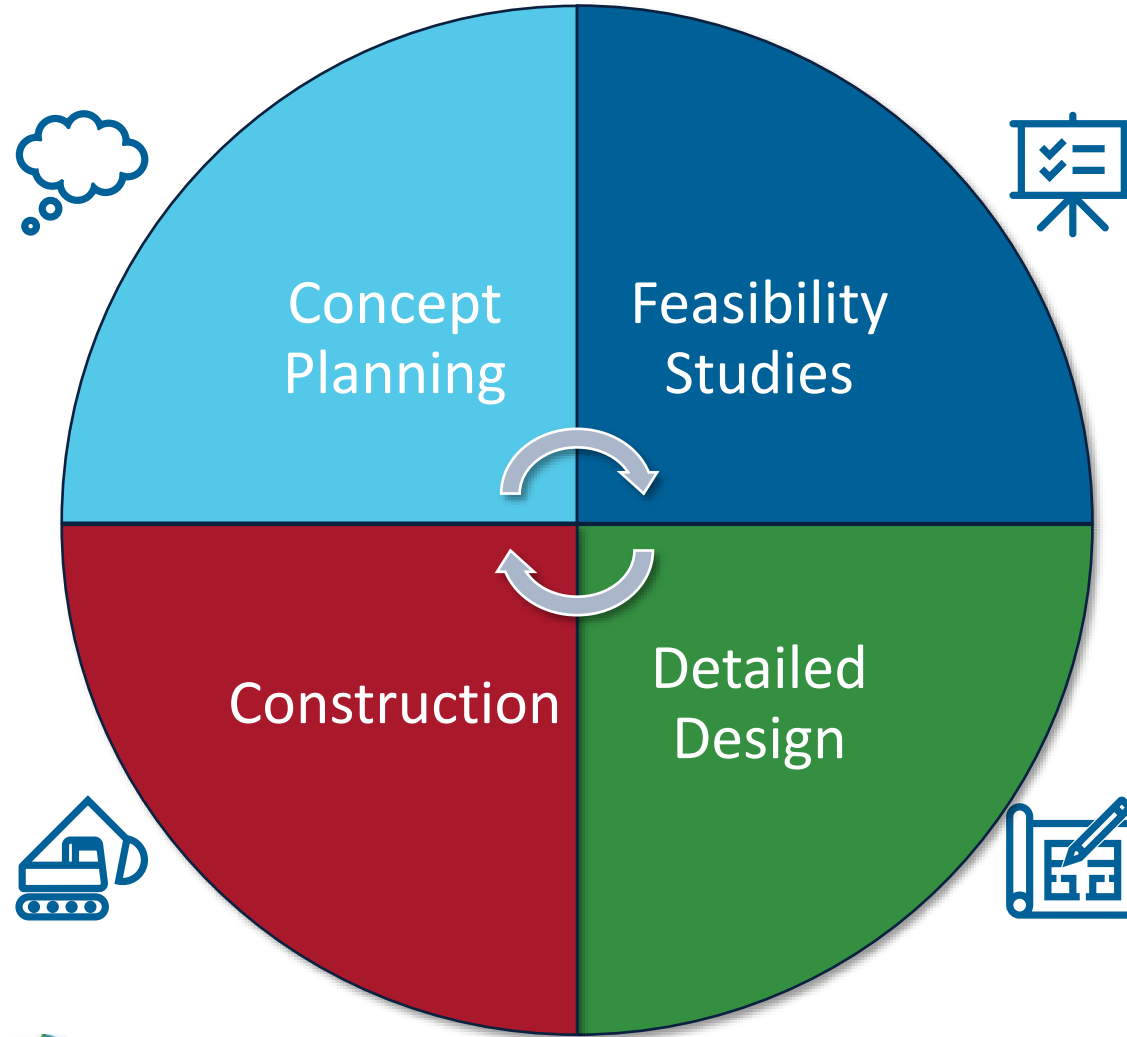
- Stay focused on the goals of the project
 - *Work upstream to downstream when possible, but be flexible*
 - *Material availability and quality can be variable*



Typical Project Approach



Better Project Approach



Conclusions

- **Why retrofit?** Demonstrating GI efficacy, Public engagement, Improving water quality
- **Continuous improvement** – Think about later stages of the project during concept and feasibility, refer to past experiences to improve project approach
- **Communication** and **Flexibility** with all stakeholders are keys to project success

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Questions?

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