



# Barberry Woods – Turning Nature-based Concepts into Reality

May 17, 2023





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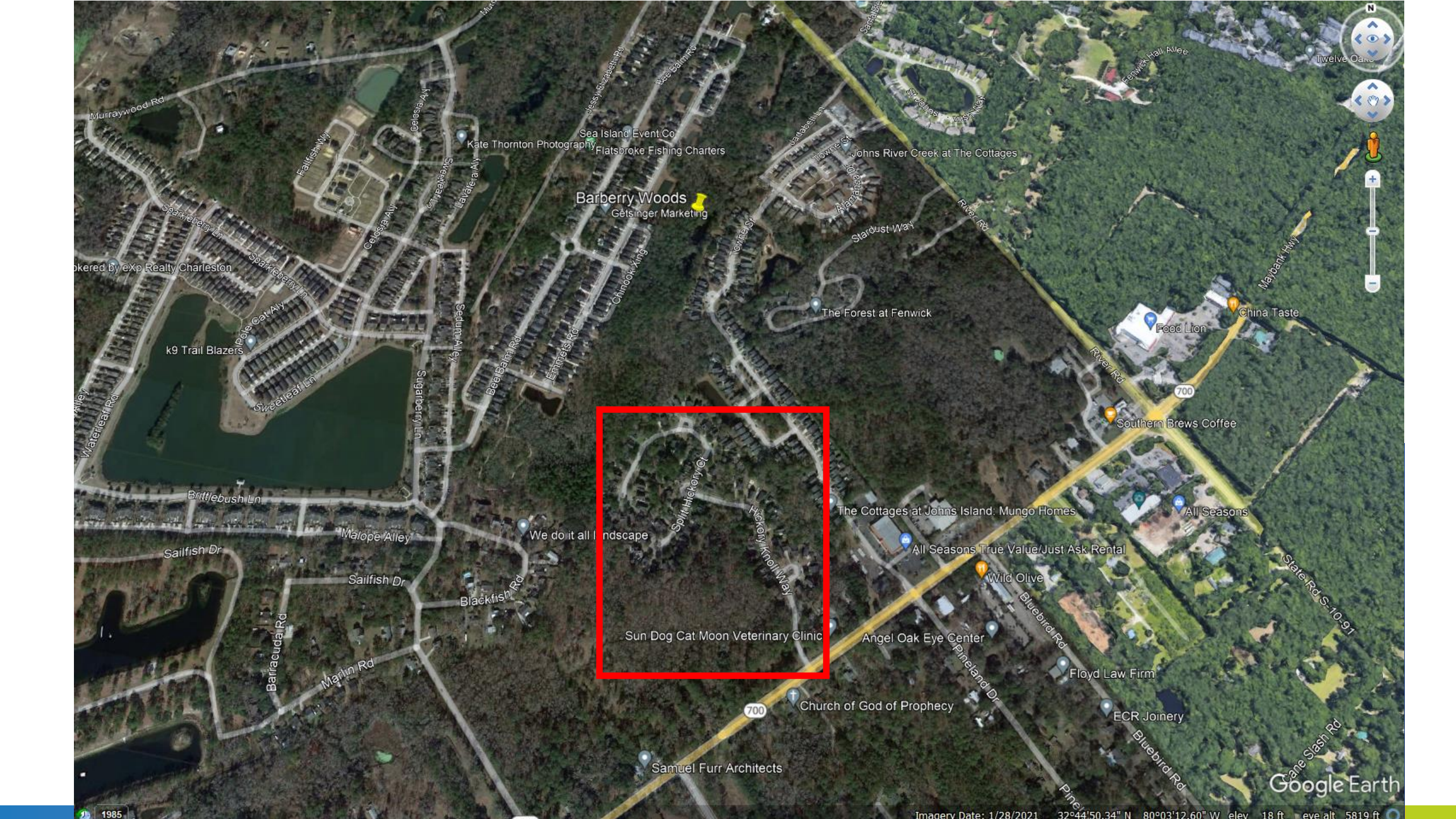
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919-256-5642 (direct)

919-215-1198 (cell)







Barbary Woods  
Getsinger Marketing

Sun Dog Cat Moon Veterinary Clinic









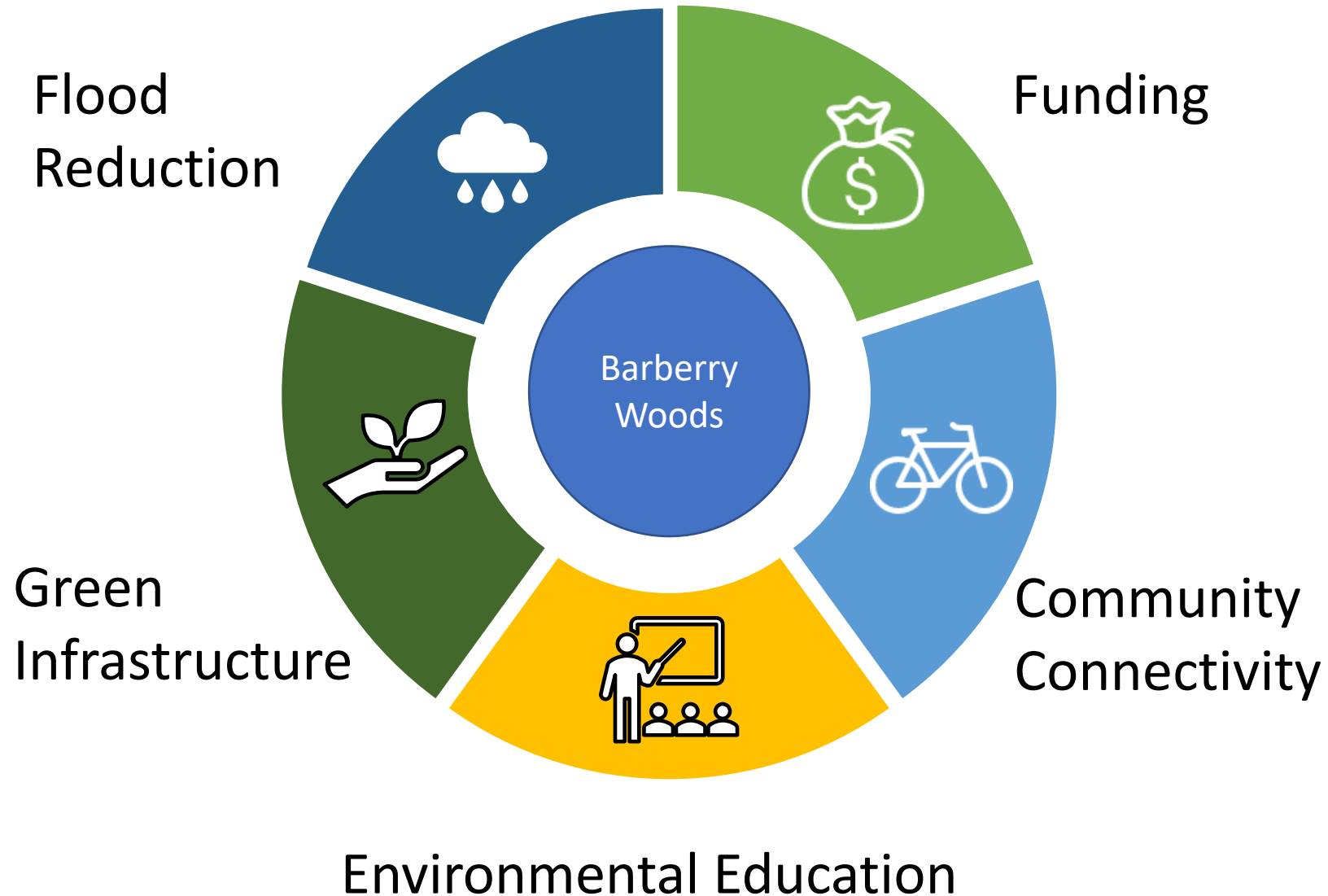


# Multiple Benefits – Slow, store and slowly convey water across the landscape



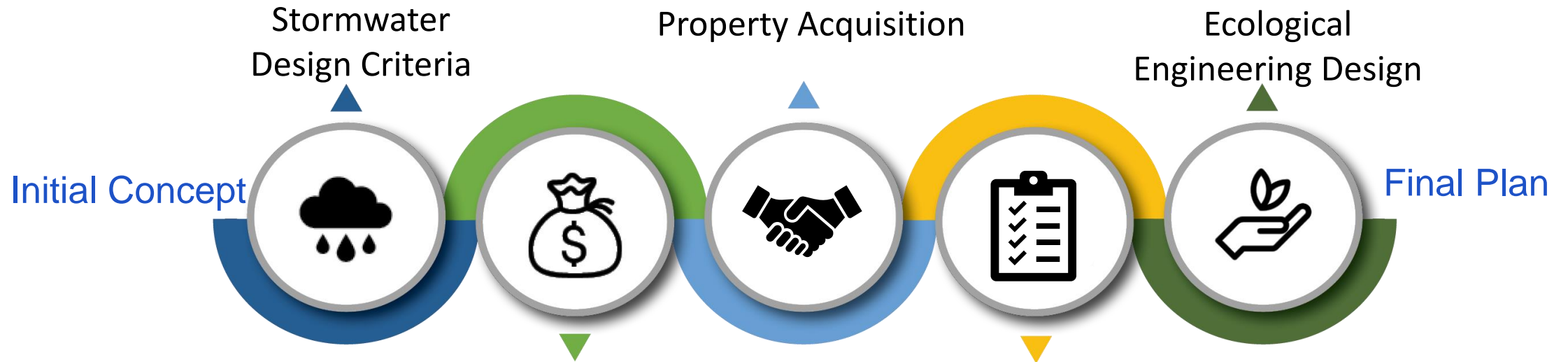


# Multi-Layer Benefits





# Project Development Curve



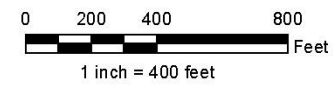
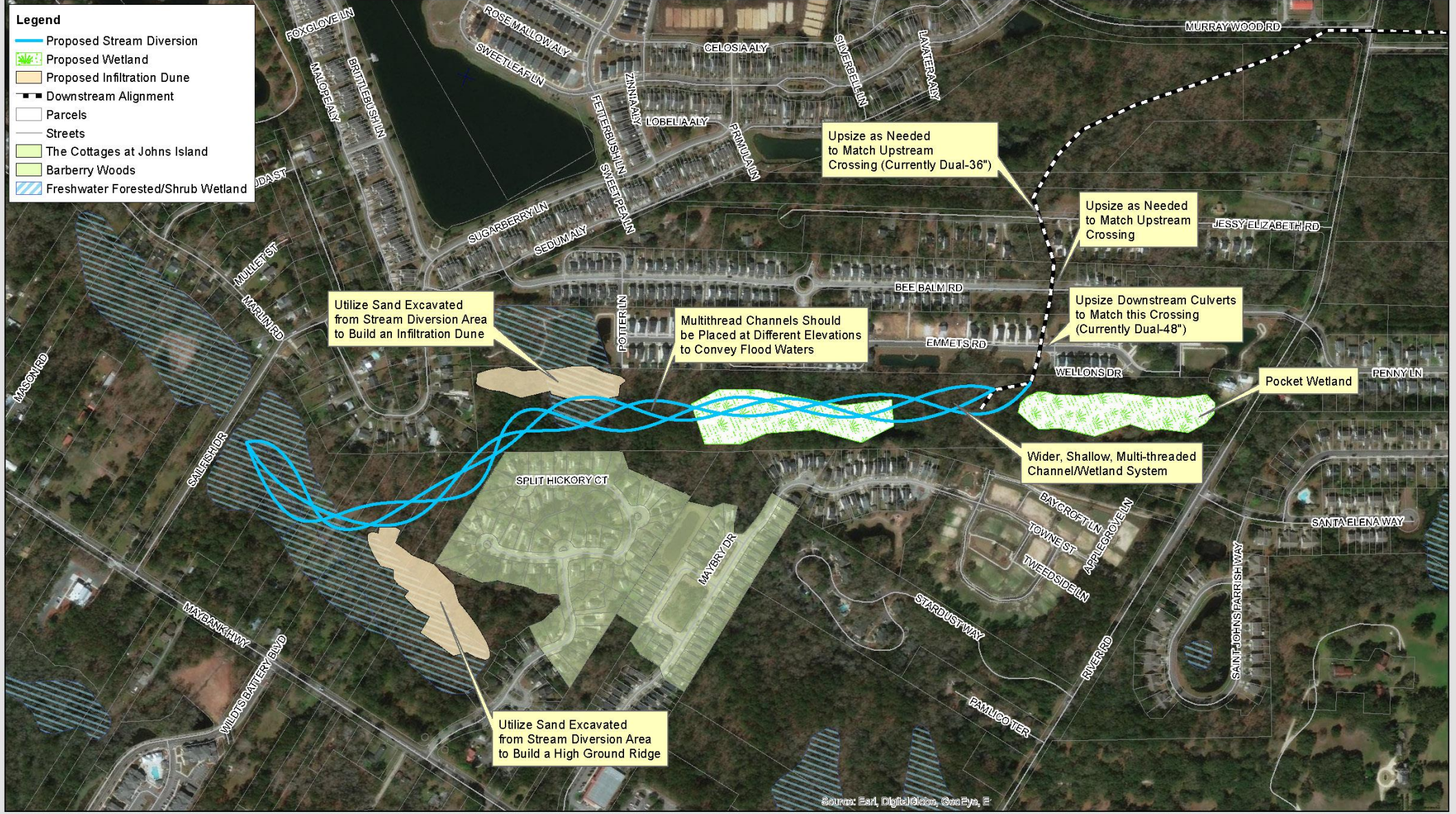
Initial Concept



Final Design



# Concept Plan

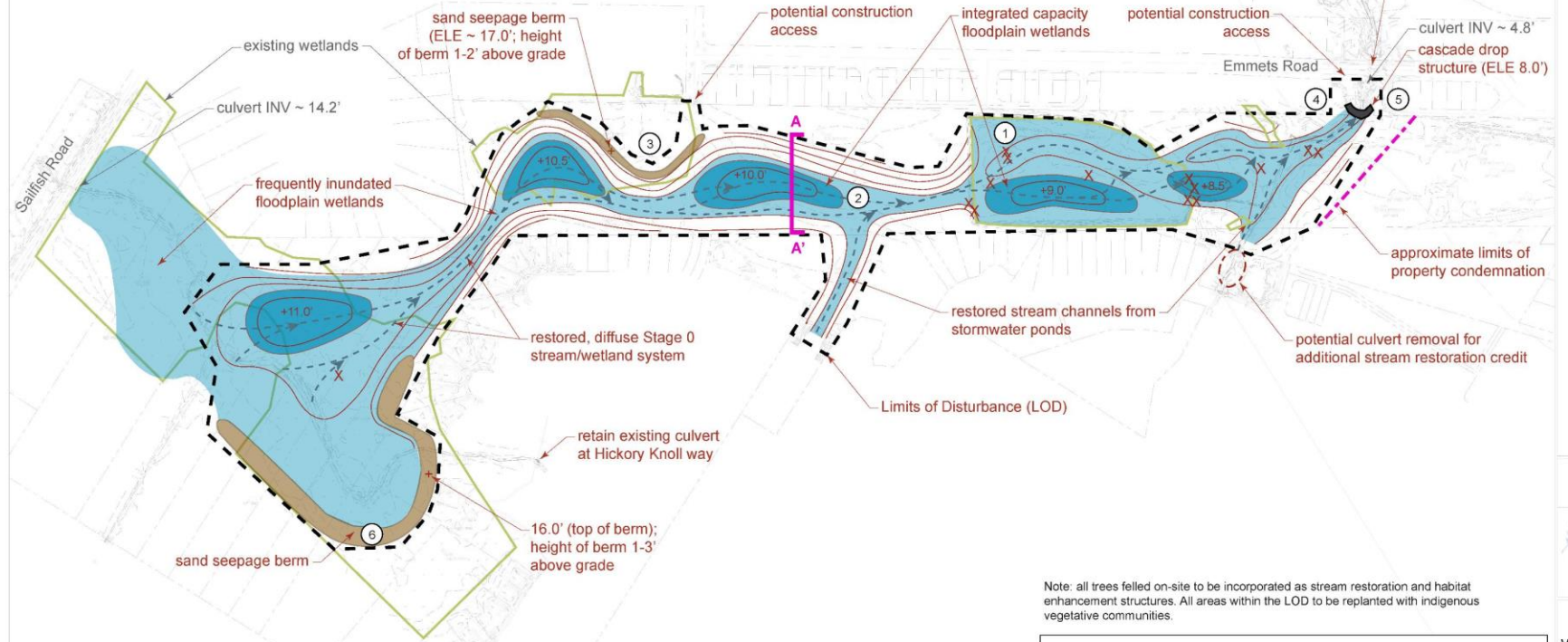
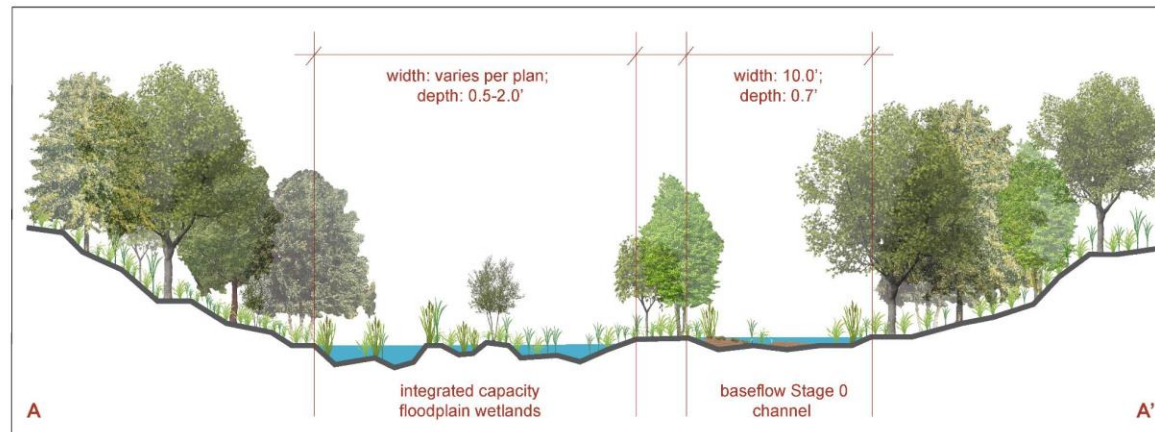


## Barberry Woods Drainage Project WKD Proposal



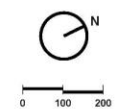


# Concept Plan



Proposed work consists of the creation of a restored Stage 0 stream system on new alignment and its adjacent riparian wetlands. Extensive wetland complexes will abut the restored stream throughout its extents within the project area, providing significant flood capacity while also promoting water quality improvement and ecological enhancements. Strategically placed sand seepage berms will result in stormwater retention and wetland enhancement. Trees removed to accommodate grading will be incorporated as grade control and habitat creation structures, creating a hydraulically complex, integrated stream and floodplain network. Topsoil will be retained and applied to graded areas, preserving the seed bed of existing forested ecosystems, which will be re-established along upland areas within the limits of disturbance. It is anticipated that the project will provide property flooding abatement, water quality improvement, enhanced ecological diversity, and community/aesthetic benefits.

Grand trees removed: 14 total  
 Approximate cut volume: 115,400 cubic yards  
 Temporary wetland impacts: 13.4 acres  
 LOD extents: 28.1 acres



**Legend**

- restored Stage 0 stream network
- 2-ft. topographic contour
- integrated capacity floodplain wetlands
- frequently inundated floodplain wetlands
- existing wetlands
- sand seepage berm
- anticipated grand tree removal
- approximate limits of disturbance (LOD)
- photographic precedent (Sheet 2)

Note: all trees felled on-site to be incorporated as stream restoration and habitat enhancement structures. All areas within the LOD to be replanted with indigenous vegetative communities.





**BARBERRY WOODS - CONCEPT PLAN**  
 CHARLESTON, SOUTH CAROLINA



DUTCH DIALOGUES CHARLESTON:

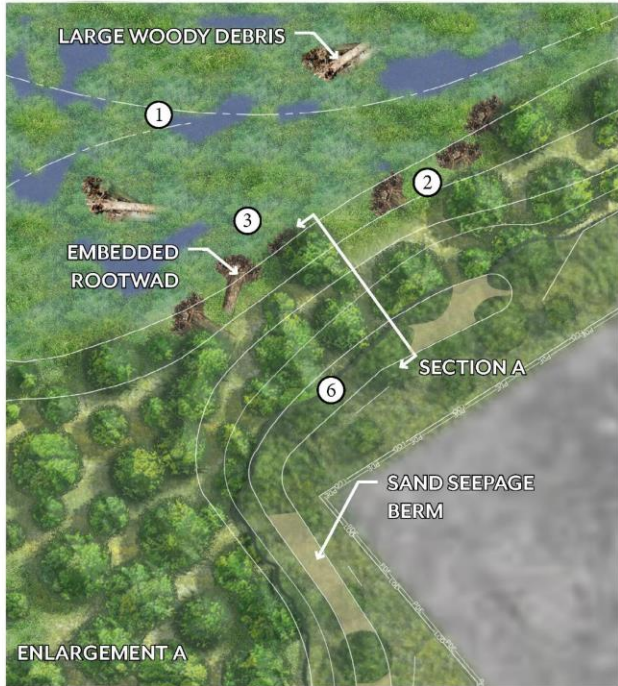


COLLOQUIUM SUMMARY

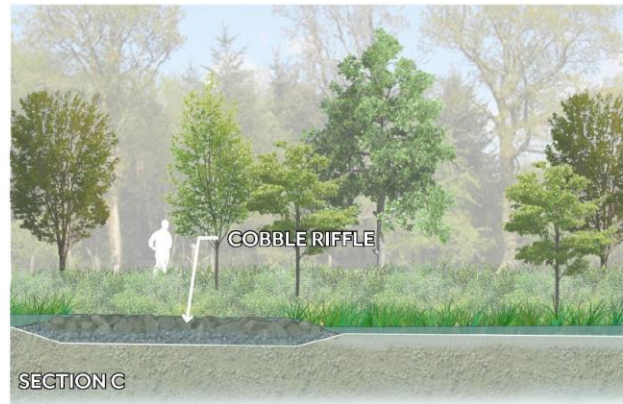
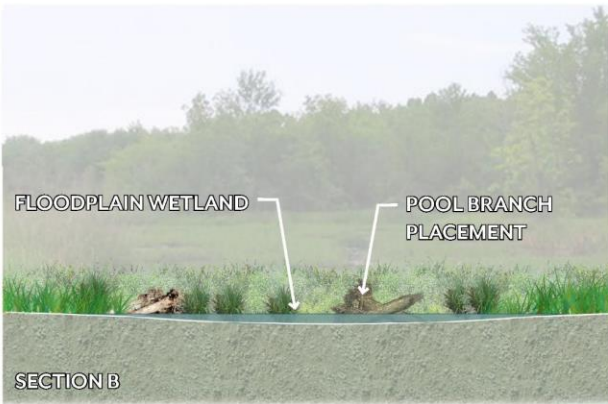
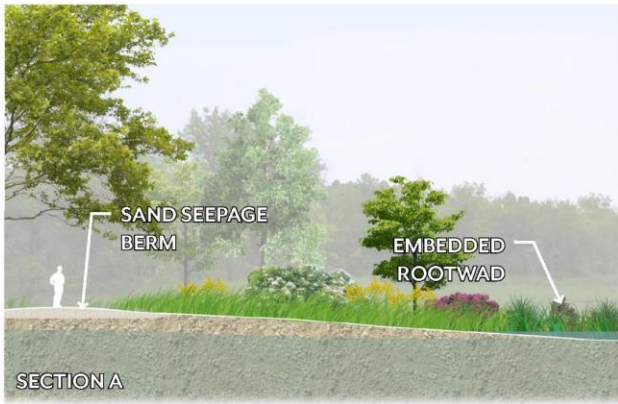


FINAL REPORT





# SEE IMAGE BOARD FOR REFERENCE HABITATS IMAGES



# BARBERRY WOODS - PLAN ENLARGEMENT & SECTIONS

CHARLESTON, SOUTH CAROLINA



DUTCH DIALOGUES CHARLESTON:



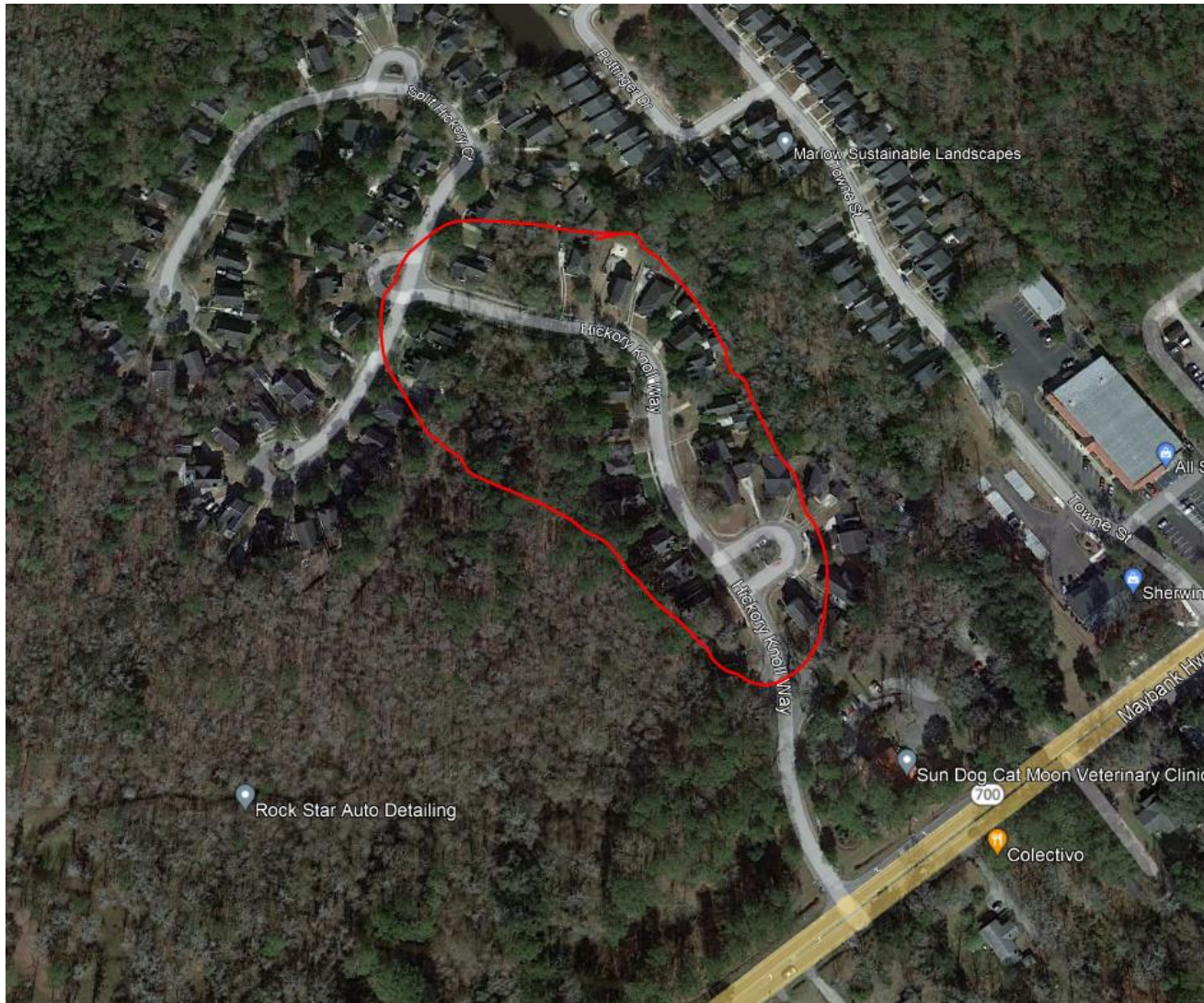
COLLOQUIUM SUMMARY



FINAL REPORT



# Stormwater Design Criteria



- Using the City of Charleston's Stormwater Design Standards Manual (January 2020)
- Flooding reduction goal of reducing overtopping elevation on Hickory Knoll Way.



# Stormwater Design Criteria



## 2598 3.7 Sea Level Rise

2599 The City has adopted a sea level rise strategy to accommodate future sea level rise and storm  
2600 surge. The Flood and Sea Level Rise Strategy (City of Charleston 2019b) can be found at:

2601 <https://www.charleston-sc.gov/slr>

2602 To accommodate sea level rise and storm surge, all designs shall use 5.5 feet NAVD88 datum  
2603 tailwater elevation as a boundary condition with roadway elevation no less than 7.5 feet  
2604 NAVD88. If the developer/designer desires to design a lower road elevation, they shall develop  
2605 a hydrologic and hydraulic model, using computational methods or software approved by the  
2606 City's Department of Stormwater Management, that demonstrates the performance of the  
2607 roads during a 1 percent AEP, 24-hour storm event that coincides with a storm surge elevation  
2608 of 5.5 feet NAVD88.



# Stormwater Design Criteria



## 2737 3.9.4 1 Percent Probability of Exceedance Storm Event Analysis

2738 Construction, development, and redevelopment activities that disturb 1 acre or more shall  
2739 include a hydrologic/hydraulic analysis to determine the impacts of the proposed development  
2740 during the 1 percent AEP, 24-hour storm event.

2741 For the 1 percent AEP Storm Event Analysis, the project shall not:

- 2742 • Increase the likelihood of dwelling flooding and property damage above current conditions.
- 2743 • Increase water surface elevations or reduce system capacity in the stormwater system and  
2744 facilities upstream or downstream of the project. An increase or reduction shall be based on  
2745 a comparison with pre-development conditions (with more stringent requirements  
2746 potentially applied in special protection areas).
- 2747 • Increase erosion potential and pollutant loads that would adversely impact the quality of  
2748 receiving waters.



# No-Rise WSELs Obtained



Table 4A: Upstream Crossings WSEL Analysis (ft)

Exceedance Probability Storm	50%	10%	4%	2%	1%
Upstream Towne Street					
Existing	11.91	12.22	12.45	12.62	12.83
Proposed	11.79	12.03	12.21	12.40	12.61
<b>Diff.</b>	<b>-0.12</b>	<b>-0.19</b>	<b>-0.24</b>	<b>-0.22</b>	<b>-0.22</b>
Downstream Towne Street					
Existing	11.83	12.08	12.29	12.46	12.67
Proposed	11.76	11.96	12.12	12.30	12.53
<b>Diff.</b>	<b>-0.07</b>	<b>-0.12</b>	<b>-0.17</b>	<b>-0.16</b>	<b>-0.14</b>
Upstream Sailfish Road					
Existing	17.12	17.86	18.13	18.28	18.38
Proposed	17.12	17.86	18.12	18.27	18.37
<b>Diff.</b>	<b>0.00</b>	<b>0.00</b>	<b>-0.01</b>	<b>-0.01</b>	<b>-0.01</b>
Downstream Sailfish Road					
Existing	16.13	16.50	16.67	16.82	17.03
Proposed	16.02	16.33	16.53	16.75	17.02
<b>Diff.</b>	<b>-0.11</b>	<b>-0.17</b>	<b>-0.14</b>	<b>-0.07</b>	<b>-0.01</b>

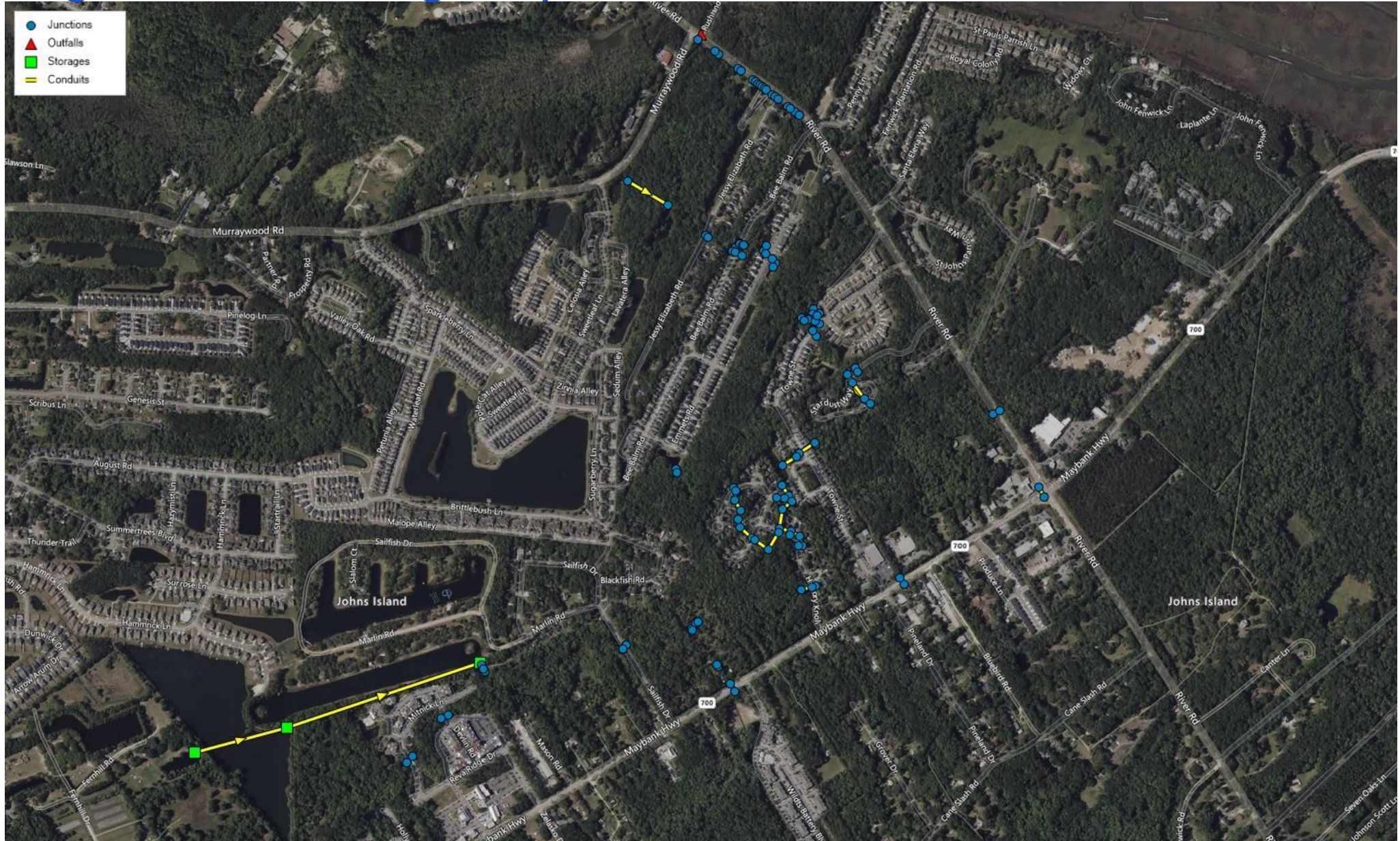
Table 4B: Downstream Crossings WSEL Analysis (ft)

Exceedance Probability Storm	50%	10%	4%	2%	1%
Downstream Emmets Road					
Existing	10.09	10.44	10.63	10.79	10.96
Proposed	10.09	10.42	10.60	10.77	10.96
<b>Diff.</b>	<b>0.00</b>	<b>-0.02</b>	<b>-0.03</b>	<b>-0.02</b>	<b>0.00</b>
Upstream Bee Balm Road					
Existing	8.95	9.50	9.80	10.07	10.34
Proposed	8.94	9.48	9.76	10.02	10.32
<b>Diff.</b>	<b>-0.01</b>	<b>-0.02</b>	<b>-0.04</b>	<b>-0.05</b>	<b>-0.02</b>
Downstream Bee Balm Road					
Existing	8.85	9.28	9.50	9.66	9.82
Proposed	8.85	9.27	9.47	9.63	9.80
<b>Diff.</b>	<b>0.00</b>	<b>-0.01</b>	<b>-0.03</b>	<b>-0.03</b>	<b>-0.02</b>
Upstream Jessy Elizabeth Road					
Existing	8.60	8.95	9.13	9.28	9.42
Proposed	8.60	8.92	9.10	9.24	9.39
<b>Diff.</b>	<b>0.00</b>	<b>-0.03</b>	<b>-0.03</b>	<b>-0.04</b>	<b>-0.03</b>
Downstream Jessy Elizabeth Road					
Existing	8.09	8.63	8.87	9.04	9.20
Proposed	8.06	8.59	8.81	8.98	9.15
<b>Diff.</b>	<b>-0.03</b>	<b>-0.04</b>	<b>-0.06</b>	<b>-0.06</b>	<b>-0.05</b>
Upstream River Road <sup>(1)</sup>					
Existing	5.50	5.52	5.52	5.53	5.54
Proposed	5.50	5.50	5.50	5.50	5.50
<b>Diff.</b>	<b>0.00</b>	<b>-0.02</b>	<b>-0.02</b>	<b>-0.03</b>	<b>-0.04</b>

(1) Per City SWDSM River Road experiences direct tidal influence (NAVD 5.5ft)



# Existing Max Ponding Depth – 10% AEP





# Existing Max Ponding Depth – 10% AEP









# Hickory Knoll Way – Only Ingress/Egress

Table 2: WSEL at Hickory Knoll Way (ft)

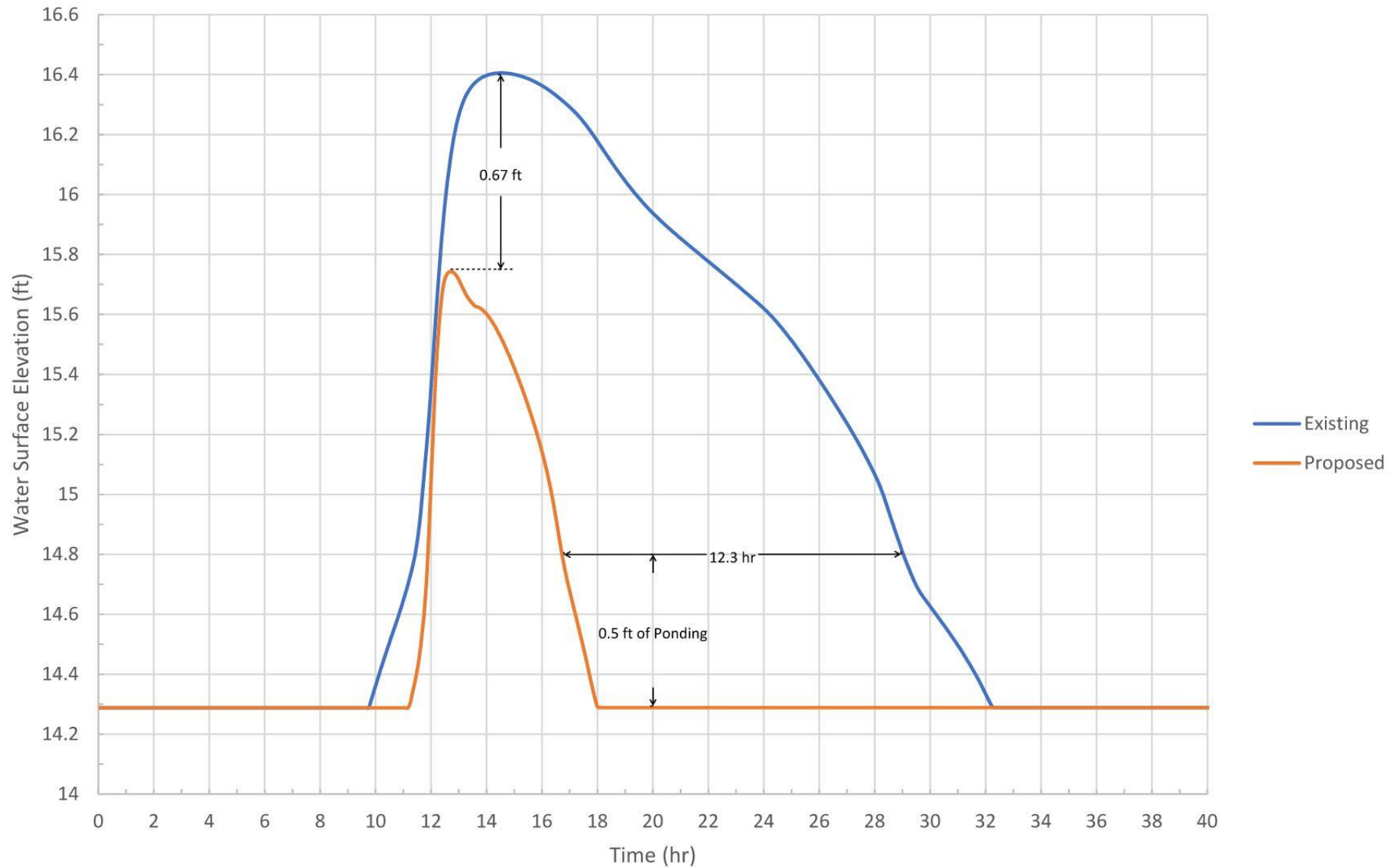
Exceedance Probability Storm	50%	10%	4%	2%	1%
Existing	16.03	16.41	16.58	16.76	17
Proposed	15.32	15.74	15.91	16.06	16.22
<b>Diff.</b>	<b>-0.71</b>	<b>-0.67</b>	<b>-0.67</b>	<b>-0.7</b>	<b>-0.78</b>

Table 3: Depth Duration >0.5 ft at Hickory Knoll Way (hr)

Exceedance Probability Storm	50%	10%	4%	2%	1%
Existing	14.72	17.67	19.14	20.21	22.99
Proposed	2.47	4.86	6.07	6.82	5.84
<b>Diff.</b>	<b>-12.25</b>	<b>-12.81</b>	<b>-13.07</b>	<b>-13.39</b>	<b>-17.15</b>



### Hickory Knoll Way 10% AEP (10-Year) Hydrograph





# Funding Restrictions/ Requirements



- Current Funding Sources
  - City Funds
  - SCOR ARPA Funding - \$4.6 Million
  - South Carolina Conservation Bank (SCCB)
  - (Potential) SCOR Revolving Loan
- Implications
  - SCOR ARPA Funding – Project funds must be utilized by end of 2026.
  - SCCB – Used for acquiring property for conservation purposes.



# Funding Restrictions/ Requirements

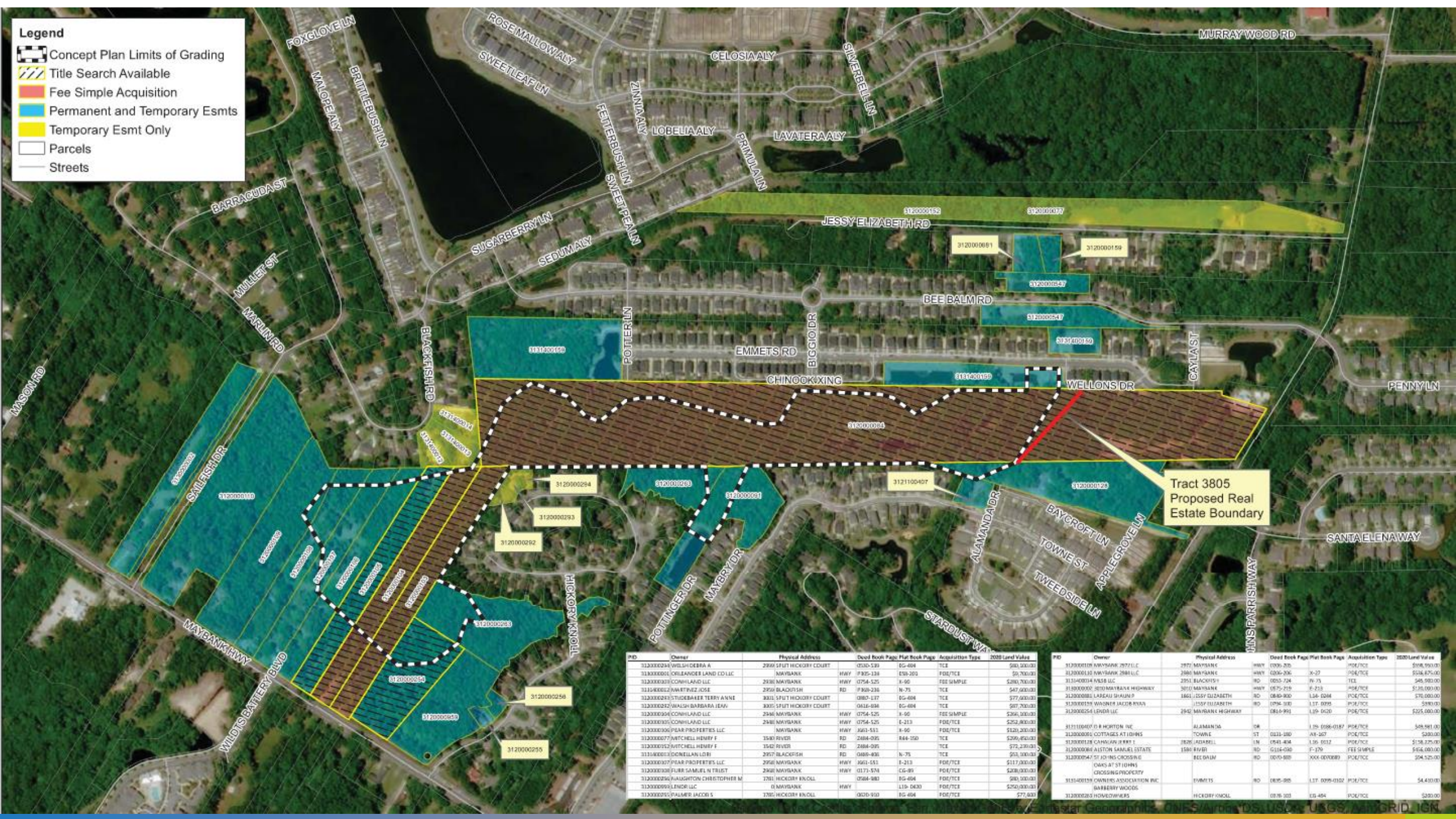


- Estimated Total Project Costs:
  - **Strategic Retreat Plan: ~\$19,300,000.00**
  - **Full Concept Plan: ~\$16,800,000.00**
  - **60% Updated Plan: ~\$8,748,000.00**
  - **90% Updated Plan: ~\$7,670,000.00**
- **Total Project Costs include construction, plant materials and property acquisition costs.**



**Legend**

- Concept Plan Limits of Grading
- Title Search Available
- Fee Simple Acquisition
- Permanent and Temporary Esmts
- Temporary Esmt Only
- Parcels
- Streets



Tract 3805  
Proposed Real  
Estate Boundary

PID	Owner	Physical Address	Deed Book Page	Plat Book Page	Acquisition Type	2025 Land Value
312000014	WILSH DEBRA A	2966 SPUT HICKORY COURT	0530-539	EG-404	TCE	\$80,000.00
312000015	ORLANDER LAND CD LLC	MAYBANK	8382-138	E88-503	FDE/TCE	\$9,700.00
312000016	COMHLAND LLC	2936 MAYBANK	0754-525	E-95	FEE SIMPLE	\$283,700.00
312000017	WATCHEL HENRY F	2954 BLACKISH RD	8308-236	N-75	TCE	\$47,600.00
312000018	STUDEBAER TERRY ANNE	3003 SPUT HICKORY COURT	0807-137	EG-404	TCE	\$77,600.00
312000019	WALSH BARBARA JEAN	3005 SPUT HICKORY COURT	0416-634	EG-404	TCE	\$77,700.00
312000020	COMHLAND LLC	2946 MAYBANK	0754-525	E-95	FEE SIMPLE	\$264,000.00
312000021	COMHLAND LLC	2946 MAYBANK	0754-525	E-213	FDE/TCE	\$252,800.00
312000022	PEAR PROPERTIES LLC	MAYBANK	3661-551	E-95	FDE/TCE	\$120,200.00
312000023	WATCHEL HENRY F	3540 RIVER	2484-095	R44-150	TCE	\$239,450.00
312000024	WATCHEL HENRY F	3542 RIVER	2484-095		TCE	\$72,239.00
312000025	CONNELLAN LORI	2957 BLACKISH RD	0480-490	N-75	TCE	\$53,300.00
312000026	PEAR PROPERTIES LLC	2956 MAYBANK	3661-551	E-213	FDE/TCE	\$117,000.00
312000027	FLUR SAMUEL M TRUST	2946 MAYBANK	0171-574	CG-85	FDE/TCE	\$208,000.00
312000028	WALSHTON CHRISTOPHER M	3761 HICKORY ENCL	0584-583	EG-404	FDE/TCE	\$85,500.00
312000029	LENDR LLC	0 MAYBANK	1119-0430	FDE/TCE	\$250,000.00	
312000030	PALMER JACOB S	3761 HICKORY ENCL	0320-910	EG-404	FDE/TCE	\$77,600

PID	Owner	Physical Address	Deed Book Page	Plat Book Page	Acquisition Type	2025 Land Value
312000031	NEWBANK 2577 LLC	2971 MAYBANK	1076-202	X-27	FDE/TCE	\$268,950.00
312000032	NEWBANK 2888 LLC	2986 MAYBANK	0206-306	X-27	FDE/TCE	\$236,875.00
312000033	WALSH LLC	2951 BLACKISH	0655-724	W-75	TCE	\$46,590.00
312000034	SETO MAYBANK HIGHWAY	3810 MAYBANK	0875-219	E-213	FDE/TCE	\$135,000.00
312000035	LARSAU SHAWN P	1861 JESSY ELIZABETH	0840-900	L34-0244	FDE/TCE	\$70,000.00
312000036	WALSH JACOB RYAN	1557 ELIZABETH	1074-180	L17-095	FDE/TCE	\$89,000
312000037	LENDR LLC	2942 MAYBANK HIGHWAY	0816-951	L19-0520	FDE/TCE	\$225,000.00
3121100407	ALAMANDA DR	ALAMANDA DR				
312000038	HORTON INC	ALAMANDA DR			FDE/TCE	\$49,981.00
312000039	COTTAGES AT IDWHS	TOWNE	0131-180	A8-507	FDE/TCE	\$280.00
312000040	CAGHAN JERRY L	3826 ADARRELL	0941-404	L16-0612	FDE/TCE	\$138,275.00
312000041	AUSTON SAMUEL STATE	1584 RIVER	G14-040	F-170	FEE SIMPLE	\$56,000.00
312000042	ST JOHNS CROSSING (PART OF ST JOHNS CROSSING PROPERTY)	BEE BALM	0070-800	X00-000089	FDE/TCE	\$54,525.00
312000043	OWNERS ASSOCIATION INC BARBERRY WOODS	EVANIS	0495-800	L17-095-0102	FDE/TCE	\$4,430.00
312000044	HOMEOWNERS	HICKORY KNOLL	0176-103	EG-404	FDE/TCE	\$293.00



# Title Search Results



Samuel (Sam) Alston purchased this property on November 11, 1893 from W.M. Williams as shown in Deed recorded in Book A36/Page 76. Mr. Alston died intestate on January 30, 1916. At that time, the known heirs were his wife, Rozina Alston, and 3 daughters: Louisa Alston Brown, Elizabeth Alston Gooden, and Lucille Alston Wright. This information was noted in preambles of subsequent deeds recorded in Book G116/ Page 30, in Book J116/Page 70 and in Book W163/Page 584. This information cannot be verified due to the fact that **there are no probated Estates in Charleston County for any of the above-referenced parties.**

No mortgages, judgments or liens were found. We have enclosed a copy of the current GIS Map and Plat recorded in Book F at Page 179.

**WITH NO RECORDED PROBATE INFORMATION FOR SAMUEL (SAM) ALSTON OR ANY OF HIS KNOWN HEIRS, WE RECOMMEND CONDEMNATION.**



**Legend**

- Parcels
- PDE
- Acquisition Type**
- Fee Simple
- Permanent Drainage Esmt



PDE Area 6.12 Acres total- included in 3/9/22 Appraisal Report  
Total Appraised Value = \$376,200.00

PDE Area 19.74 Acres total- included in 6/17/21 Appraisal Report  
Total Appraised Value = \$738,000.00

Tract 3805 Proposed Real Estate Boundary

PDE Area 1.02 Acres total- included in 6/9/22 Appraisal Report  
Total Appraised Value of New PDE Area = \$0.00

TMS	Owner	Physical Address	Deed Book Page	Plat Book Page	Acquisition Type
3120000103	CONH LAND LLC	2938 MAYBANK	0754-525	X-90	FEE SIMPLE
3120000104	CONH LAND LLC	2944 MAYBANK	0754-525	X-90	FEE SIMPLE
3120000105	CONH LAND LLC	2948 MAYBANK	0754-525	E-213	FEE SIMPLE
3120000084	ALSTON SAMUEL ESTATE ETAL	1584 RIVER	G116-030	F-179	FEE SIMPLE
3120000254	CONH LAND LLC	2942 MAYBANK	1071-644	L19- 0420	PDE
3120000263	BARBERRY WOODS HOMEOWNERS ASSOCIATION LLC	HICKORY KNOLL	0378-103	EG-494	PDE










# Permitting



## Permit Approach Plan City of Charleston - Barberry Woods Drainage Project January 2021



Regulatory Agency	Potential Permits Required	Anticipated Processing Timelines	Costs/ Fees	Contacts	Notes
 USACE Charleston District	Section 404 of the CWA: *Nationwide (NWP) 27 or an*Individual Permit (IP)	NWP 3 to 6 months IP 6- 12 Months	No fees	Charleston District Office 69-A Hagood Avenue Charleston, SC 29403 SAC.RD.Charleston@usace.army.mil	An NWP 27 is for Aquatic Habitat Restoration, Enhancement, and Establishment Activities. If the project does not qualify for the NWP 27 , an IP will be required.
 SCDHEC	Section 401 of the CWA: Water Quality Certification for a *NWP or *IP	NWP 3 to 6 months IP 6- 12 Months	\$100 or \$1000 based on permit	SCDHEC 401 Certification Program managers : Logan Ress and Eliza Thorne	A SCDHEC 401 water Quality certification will be issued with an NWP 27 authorization. SCDHEC will require their own 30-day public notice and internal review for an IP.
 FEMA	*No Rise Certification * Conditional Letter of Map Revision (CLOMR) *Letter of Map Revision (LOMR)	No-Rise 30-60 days CLOMR 90 to 120 days LOMR 90 to 120 days (after construction)	*No Rise Cert: Local Fees * CLOMR: \$6500 *LOMR: \$8,000	Permit contacts will be determined based on floodplain impacts.	Permit will be determined based on floodplain impacts.
 SCDHEC- OCRM	Coastal Zone Consistency (CZC) and NPDES Coverage for Construction Activities	90 days	\$100 / per disturbed acre	Chris Stout; (843) 953-0691	The CZC and NPDES Coverage for Construction Activities will be submitted together.
 Charleston County	Site Plan Permit Package (SWWPP and Erosion Control Drawings)	90 days	Refer to SCDHEC permit fee of \$100 / disturbed acres	<a href="mailto:stormwater@charlestoncounty.org">stormwater@charlestoncounty.org</a> , 843-202-7639	Erosion Control & Encroachment Drawings with Technical Specifications will be included with the On-Site Storm Water Pollution Prevention Plan (OS-SWPPP).
 City of Charleston	*Site Plan Permit Package (SWWPP and Erosion Control Drawings) *Tree Ordinance	90 days	\$40 fee plus possible plan review fee which is 50% of valuation of project	<a href="mailto:permits@charleston-sc.gov">permits@charleston-sc.gov</a>	In addition to the land disturbance permit Removal of trees within an OCRM Critical Line Buffer are regulated as outlined in Section 54-347.1 and 54-348 of the City of Charleston Zoning Ordinance.
 South Carolina Department of Transportation	Encroachment Permit	30 Days	No Fees	<a href="#">SCDOT EPPS</a>	The application and site plans will be submitted online through the SCDOT EPPS website. It is recommended to call SCDOT prior to the online submission in order to verify site plan requirements (843-740-1655).



# USACE IP - Wetland Mitigation



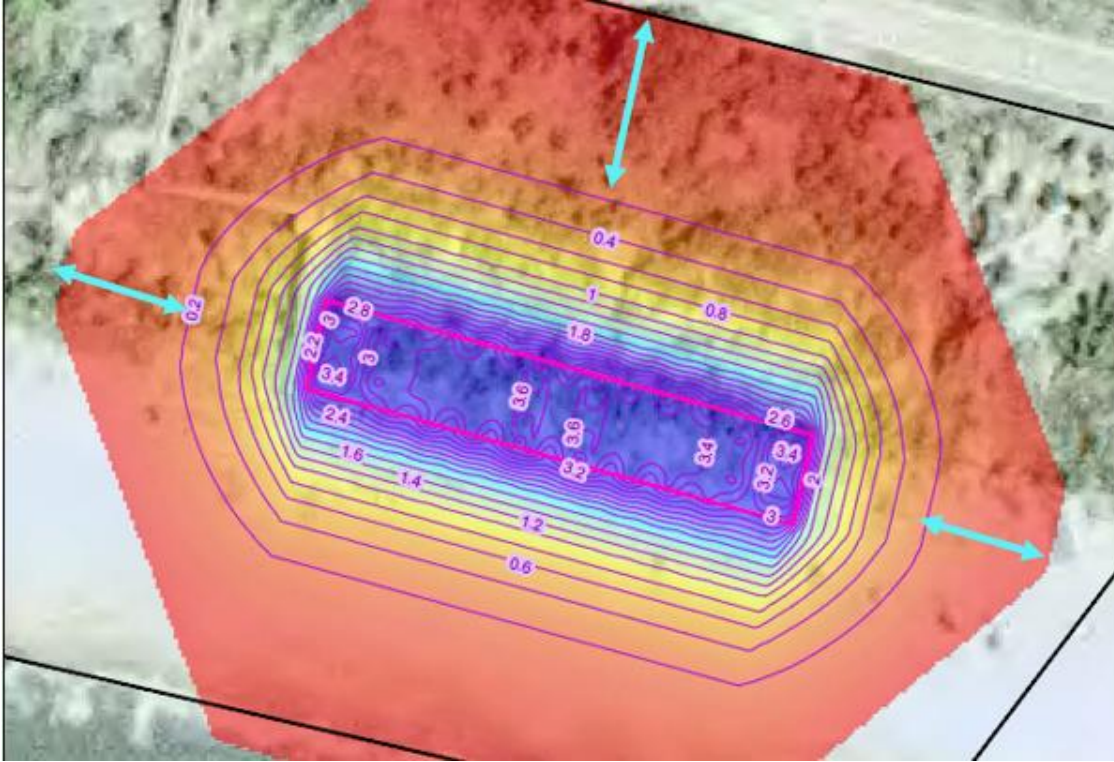
Required Wetland Mitigation Credit Worksheet						
FACTOR	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6
Lost Type	Type A	Type A	Type A	Type A	Type C	Type A
Priority Category	Tertiary	Tertiary	Tertiary	Tertiary	Tertiary	Tertiary
Existing Condition	Fully Functional	Fully Functional	Fully Functional	Fully Functional	Very Impaired	Fully Functional
Duration	Over 10 Years	Over 10 Years	Over 10 Years	Over 10 Years	Over 10 Years	Over 10 Years
Dominant Impact	Fill	Fill	Dredge	Fill	Dredge	Fill
Cumulative Impact	1.0 - 2.99 Acres	1.0 - 2.99 Acres	1.0 - 2.99 Acres	< 0.25 Acre	3.0 - 9.99 Acres	< 0.25 Acre
Sum of Factors	11.5	11.5	11	11.1	6.3	11.1
Impacted Area	1.22	.46	.84	0.07	3.62	0.05
R x AA=	14.03	5.29	9.24	0.777	22.806	0.555

Required Wetland Mitigation Credits =  $\Sigma (R \times A) =$

**52.698**



## 2-D Sub-Surface Modeling



- Identify any potential groundwater impacts to surrounding neighborhoods.
- Guide the wetland design to promote infiltration and surface/subsurface interaction.
- Allow the team to more effectively convey how we are slowing, storing and infiltrating water.





# Ecological Engineering Design – Groundwater 2-D Modeling

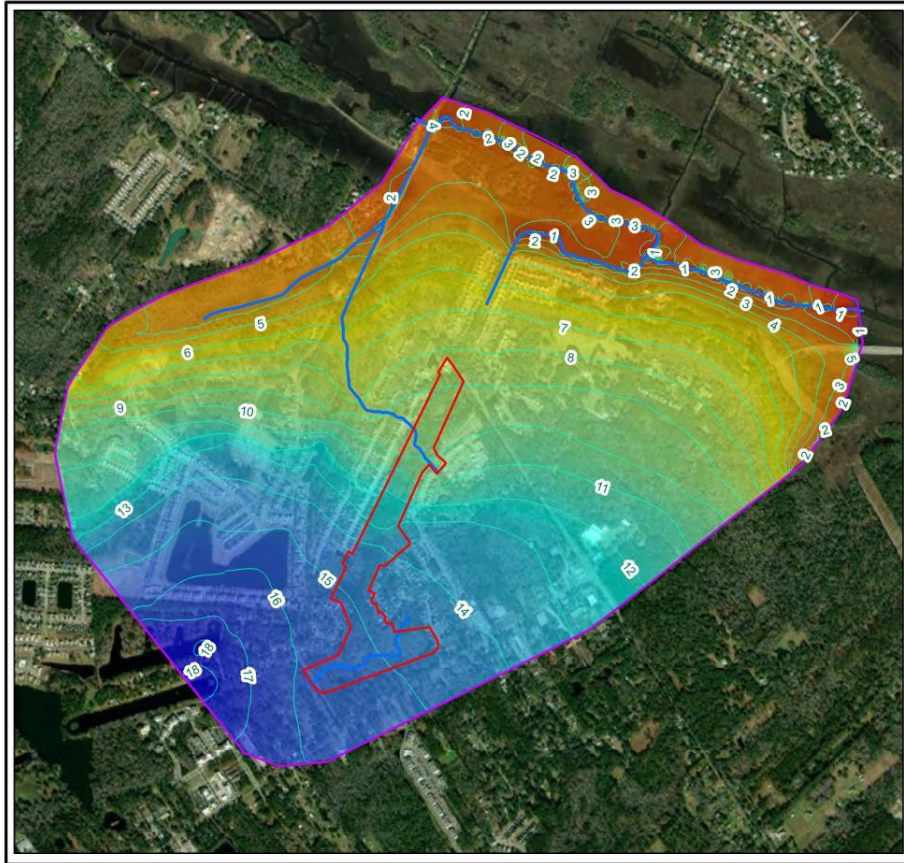


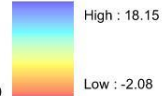
Figure 11: Calibrated Model Groundwater Equipotential Map

Barberry Woods Site  
Johns Island, South Carolina

## Legend

- Subject Site
- MODFLOW Model Extent
- Modeled Stream
- Groundwater Equipotential Contour (C.I. = 1 ft)

## Groundwater Elevation (ft amsl)



0 750 1,500 3,000  
Feet



ECS Project No. 49-12243

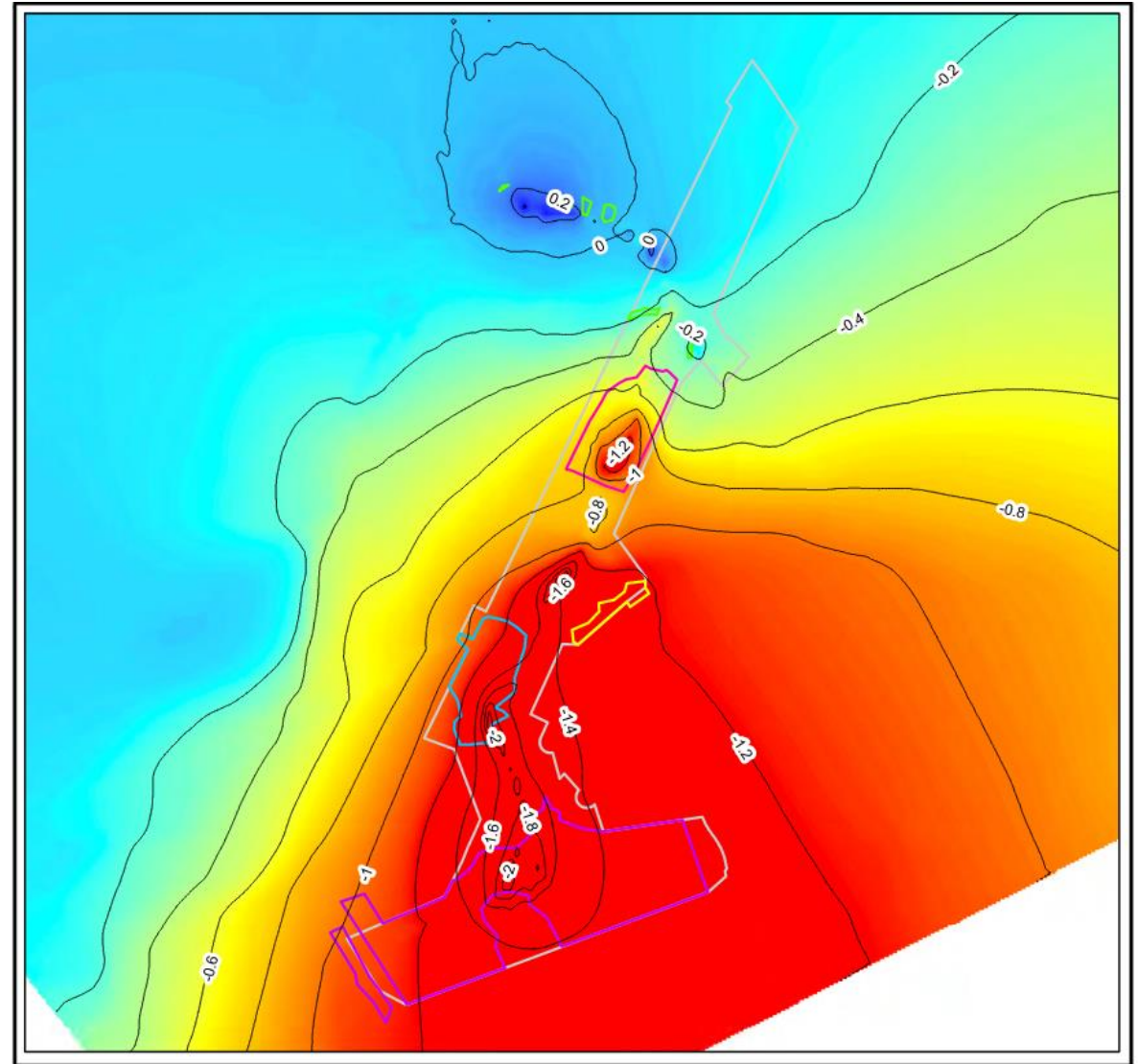


Figure 3: PS1-Predicted Groundwater Level Change from Existing Conditions



# Ecological Engineering Design



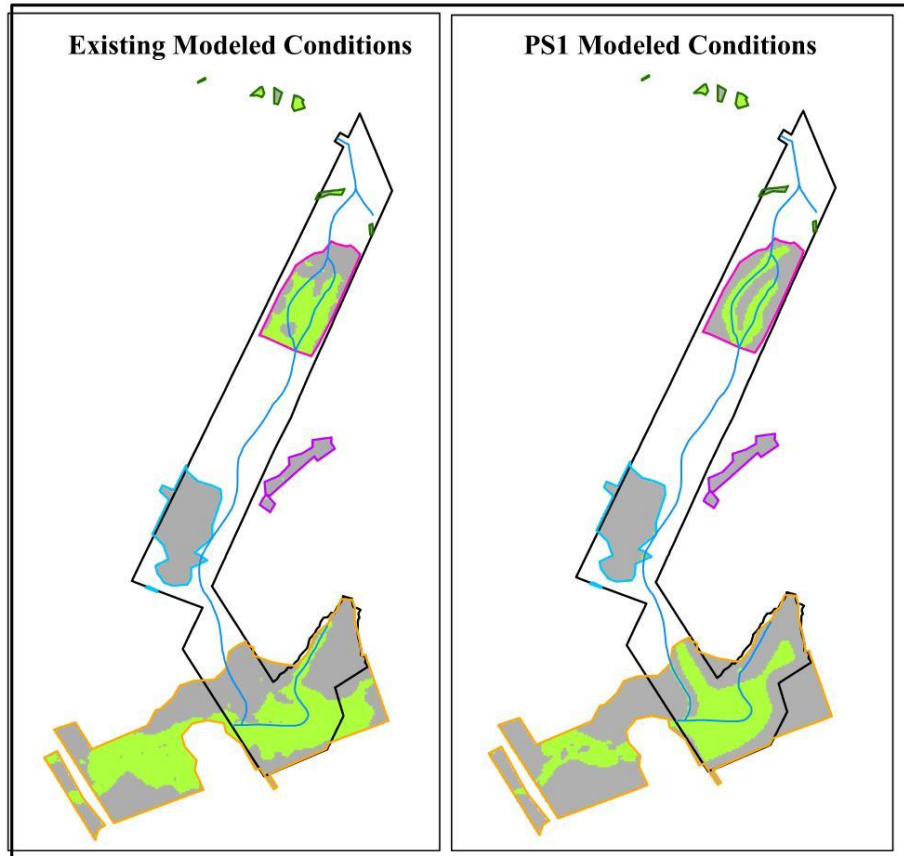
ECS Project No. 49-12243  
May 13, 2021

PS2-predicted groundwater flooding was predicted to occur at undeveloped areas where seasonal flooding may already be occurring and at areas in the immediate vicinity of existing surface water features. Of the 82 land parcels where ECS was asked to evaluate the potential for 2-year storm event groundwater flooding, flooding was predicted at four of the 82 parcels. Of these four parcels, one parcel (parcel 3120000300 at 2975 Split Hickory Court) appears to contain a residential structure. Flooding is predicted at the northern and eastern margins of this parcel but not at the location of the parcel's structure. It is important to note that surface water flooding was also predicted at the northern margin and adjoining the eastern margin of this parcel. The three remaining parcels where some degree of flooding was predicted (parcels 3131400159, 3120000091, and 3120000263) do not appear to contain structures, based on Charleston land parcel records.

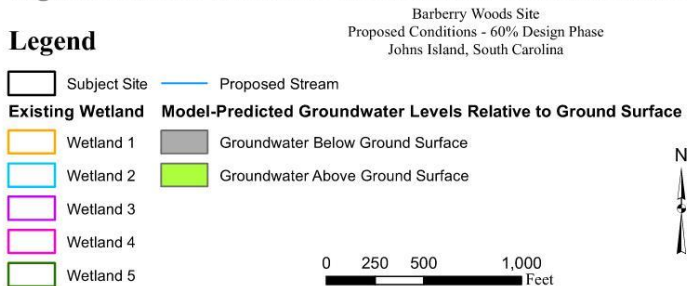




# Ecological Engineering Design



**Figure 5: Model-Predicted Groundwater Levels Relative to Ground Surface**



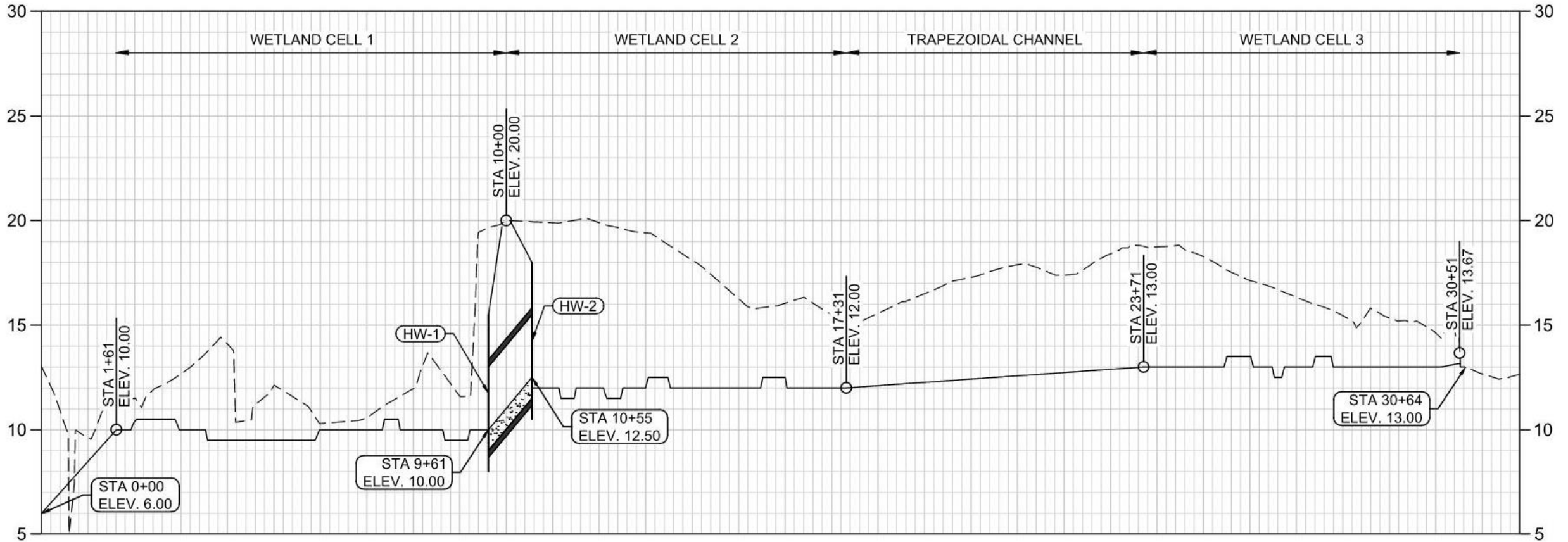
**Table 1: Summary of Predictive Simulation PS1 Impacts to Wetlands.**

Wetland Group	PS1 Groundwater Level Change from Existing Conditions <sup>a</sup> (feet)	PS1 Wetland Area where Groundwater Level Exceeds Ground Surface (% change from existing conditions in parentheses)
Wetland 1	-0.56 to -0.99	30.4% (-14.0%)
Wetland 2	-0.83 to -2.02	0.7% (+0.3%)
Wetland 3	-1.55 to -2.01	0.0% (-1.6%)
Wetland 4	-0.70 to -3.24	40.6% (-14.6%)
Wetland 5	-0.15 to -0.72 <sup>b</sup>	40.3% (-17.1%)

<sup>a</sup>Negative values indicate a decline in groundwater levels from existing conditions.

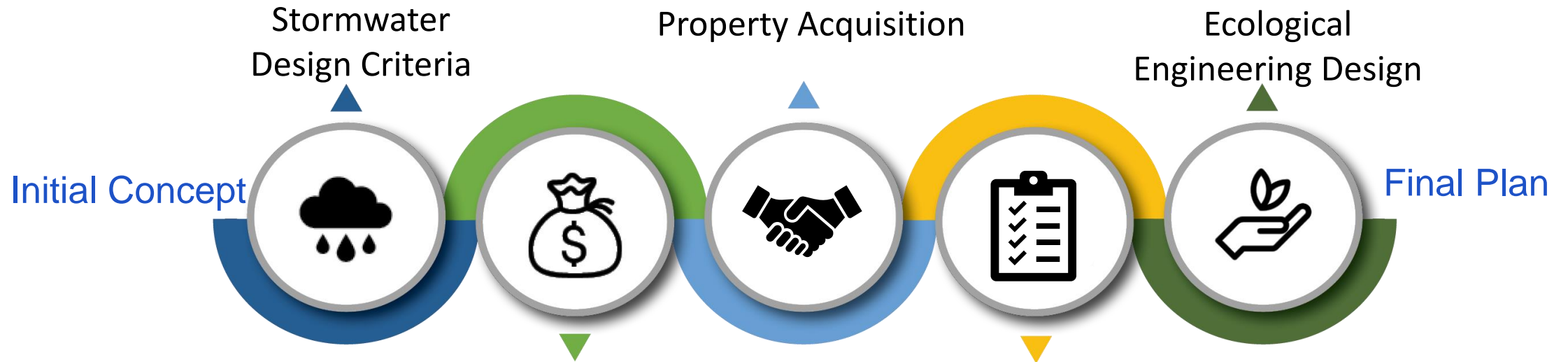


# Final Design – Flow Schematic Profile





# Project Development Curve



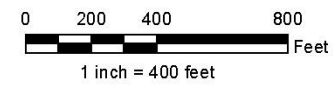
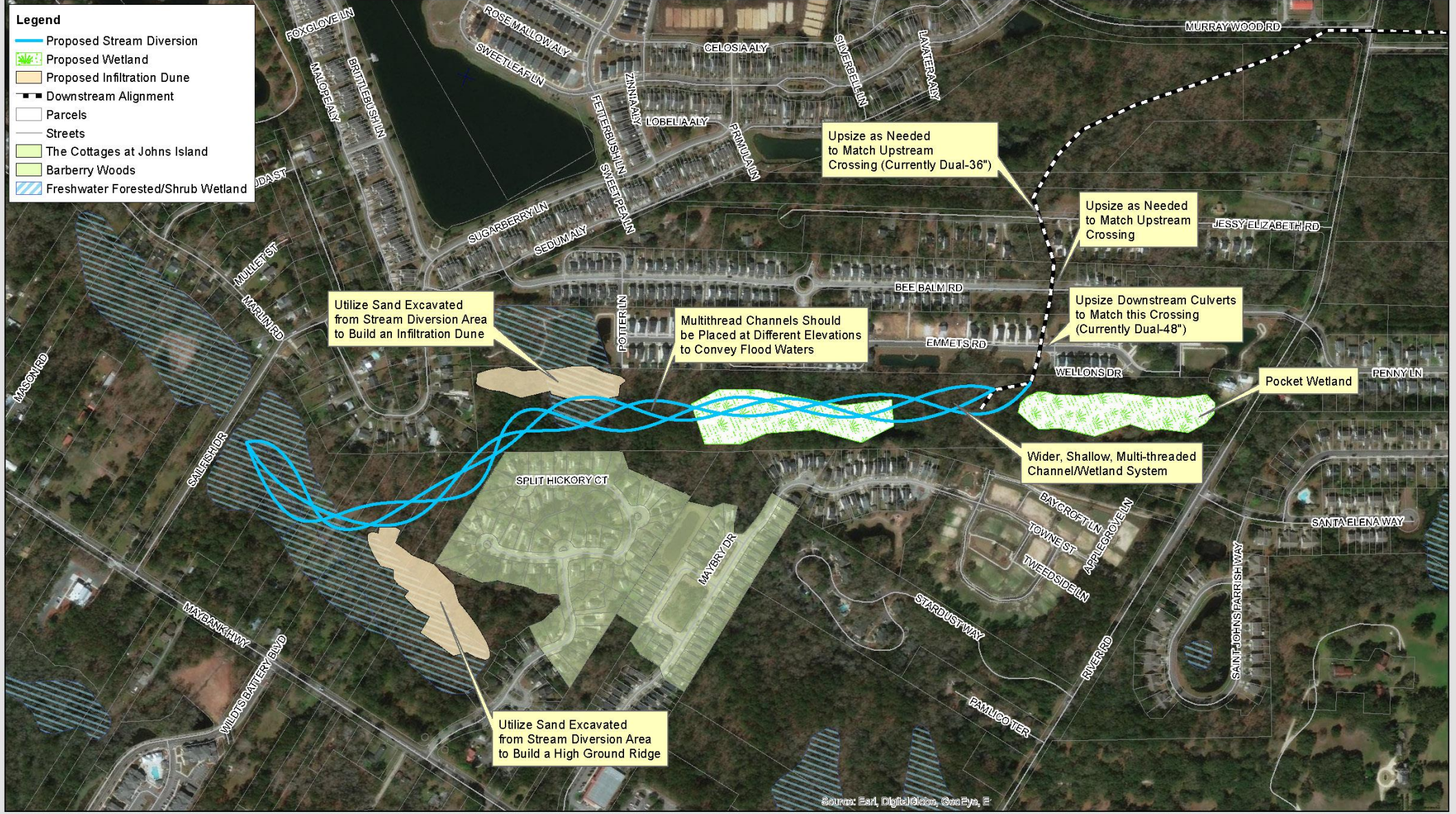
Initial Concept



Final Design



# Concept Plan

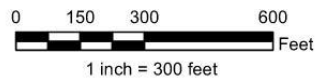


## Barberry Woods Drainage Project WKD Proposal





# Final Design



## Barbary Woods Drainage Project Proposed Overview



# Questions?

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