DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, MOBILE DISTRICT
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

REPLY TO
ATTENTION OF:

CESAM-RD-SA
Public Notice Number SAM-2010-00536-LET **March 7, 2012**

JOINT PUBLIC NOTICE
U.S. ARMY CORPS OF ENGINEERS
AND
STATE OF ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

AFTER-THE-FACT PERMIT REQUEST TO RETAIN 2.78 ACRE OF WETLAND FILL AND 2,167 LINEAR FEET OF STREAM IMPACTS ASSOCIATED WITH THE RENOVATION OF AN EXISTING 18 HOLE GOLF COURSE ON CLEAR CREEK AND ITS TRIBUTARIES IN MOBILE, MOBILE COUNTY, ALABAMA.

TO WHOM IT MAY CONCERN:

This District has received an application for a Department of the Army permit pursuant to Section 404 of the Clean Water Act (33 USC 1344). This public notice is being distributed to all known interested persons to assist in developing facts on which a decision by the Corps can be based. Please communicate this information to interested parties.

APPLICANT: SunBelt Golf Corporation
167 Sunbelt Parkway
Birmingham, Alabama 36211

AGENT: BioResources, LLC
2124 Moores Mill Road, Suite 210
Auburn, Alabama 36830

LOCATION OF WORK: Magnolia Grove Golf Course – The Falls Course is located south of Moffett Road (U.S. 98) at 7001 Magnolia Grove Parkway in Mobile, Alabama. More specifically, the project area encompasses approximately 250 acres located within Sections 32 and 33 of Township 3 South, Range 2 West at latitude 30.744º North and longitude 88.190º West in Mobile County, Alabama.

WATERWAY: Clear Creek and multiple wetlands and tributaries to Clear Creek within Mobile County, Alabama. The project is located in the Mobile-Tensaw watershed (8-digit HUC 03160204).

PROJECT PURPOSE: The overall purpose of the project is to renovate an existing twenty-year-old 18-hole golf course to improve course conditions thereby improving individual and tournament use of the facility. The applicant provided the following information regarding purpose and need

of the project: "The applicant has renovated Magnolia Grove – The Falls Course, an 18-hole golf course that is approximately 20 years old. Magnolia Grove is part of the Robert Trent Jones Golf Trail, a popular golfing destination for the Southeast. At one time this course was listed by *Golf Digest* as one of the top 5 public courses in the United States. The popularity of this course has declined in recent years due to conditions beyond the control of course managers. Renovation of this course will return it to national prominence and bring national golfing tournaments to the region and tax revenue to the city of Mobile. The Falls course was constructed in 1991. Over the years, vegetation encroached onto the course and severely restricted visibility and the field of play. Hurricanes and extreme rain events washed out culverts and damaged crossings. Development on adjacent property resulted in sediment deposition in the ponds and water hazards on the course. As a result of this degradation, usage of this course has declined in recent years. The remodeling of this course is intended to correct these deficiencies, provide a more appealing field of play, and attract more golfers."

PROPOSED WORK: The applicant proposes to retain 2.78 acres of wetland fill and impoundment impacts, a 0.15 acre wetland excavation impact, and 2,167 linear feet of stream piping, armoring, fill, and impoundment impacts associated with the renovation of the Magnolia Grove – The Falls 18-hole golf course. Stream piping and armoring impacts area primarily associated with re-configuration of the fairways or renovated golf cart paths.

When the applicant began renovation of The Falls Course in 2010 they had impacted approximately 3.44 acres of jurisdictional wetlands and 2,265 linear feet of stream channel (see Table 1 and Table 2). Since that time the applicant has implemented the removal of fill material to restore 0.51 acre of wetland impacts and has removed 98 linear feet of stream piping that existed prior to 2010 thereby re-establishing 98 linear feet of stream channel within The Falls course.

Table 1. Construction Impacts to Jurisdictional Wetlands.

Wetland Site	Impact Type	Impact Map	Impact Size (acres)
Wetland 2	Fill	6B	0.09
Wetland 2	Fill	6B	0.06
Wetland 3	Fill	6B	0.16
Wetland 4	Fill	6C	0.24
Wetland 4	Fill	6C	0.23
Wetland 4	Fill	6C	0.48
Wetland 4	Fill	6D	0.09
Wetland 5	Fill	6D	0.09
Wetland 5	Fill	6D	0.07
Wetland 6	Fill	6E	0.29
Wetland 9	Pond 1 - Fill	6F	0.20
Wetland 9	Pond 2 - Fill	6F	0.01

Wetland 9	Pond 1 –Impounded	6F	0.34
Wetland 9	Pond 2 - Impounded	6F	0.57
Wetland 11	Fill	6F	0.05
Wetland 12	Fill	6G	0.13
Wetland 12	Fill	6G	0.11
Wetland 12	Cleared and Graded	6G	0.08
Wetland 12	Excavated	6G	0.15 [1]
TOTAL			3.44

1- Area is not included in the mitigation calculations.

Table 2. Construction Impacts to Jurisdictional Streams.

Site	Impact Type	Impact Map	Impact Length (feet)
Stream 2	Pipe	6B	69
Stream 2	Pipe	6B	155
Stream 2	Armored	6B	118
Stream 3	Pipe	6B	226
Stream 4	Pipe	6C	270
Stream 4	Pipe	6C	233
Stream 5	Pipe	6C	190
Stream 6	Pipe	6D	123
Stream 9	Pipe	6D	78
Stream 9	Pipe	6D	92
Stream 12	Fill	6F	66
Stream 12	Impounded	6F	209
Stream 12	Impounded	6F	246
Stream 13	Impounded	6F	86
Stream 14	Impounded	6F	8
Stream 15	Impounded	6F	96
TOTAL			2,265

An existing 0.043 acre detention pond north of the fairway for Hole 7 was renovated. Aerial photography from 1997 indicates the pond had an approximately 0.30 acre surface area at that time; however offsite land use changes and resulting sediment deposition since the original golf course construction had resulted in severe damage to the detention pond and surrounding streams which had resulted in a reduction of the pond's surface area to 0.043 acre. Increased stormwater

discharge from adjacent developed properties had exceeded the pond's capacity and the detention pond was reconfigured to provide increased capacity which will increase stormwater detention time as well as increasing sediment retention. Renovation of this detention pond resulted in impacts to Wetland 9 and Streams 13, 14, and 15. A second 0.34 acre detention pond was constructed above the renovated pond in Wetland 9 and on Stream 12 to provide additional capacity. Both ponds also provide wet detention that allows nutrients from the golf course and surrounding sites to be processed by phytoplankton and rooted vegetation rather than proceeding downstream.

Clear Creek (Stream 1) crosses the fairways for Holes 8 and 10 immediately below the dam of the existing Miller's Park Lake. A concrete spillway serves as the overflow structure for the dam. Over the years, water leaving this structure had caused significant erosion to the south bank of Clear Creek. In recent years regular maintenance was required to control bank erosion associated with the swift water. Excavation of Wetland 12 and uplands along Stream 1 below the impoundment is intended to create a pool that will dissipate the energy of water coming off the spillway. The 0.53 acre (0.15 acres of wetland and 0.38 acres of upland) excavated area creates a pool of calm water that effectively reduces the velocity of water coming off the spillway and leaving the site, thereby reducing the severe stream bank erosion condition that existed previously.

AVOIDANCE & MINIMIZATION: The applicant has provided the following information regarding avoidance and minimization of impacts to aquatic resources. During site planning and design, efforts were made to avoid and minimize impacts. However, total avoidance of impacts would nearly eliminate the applicant's ability to re-develop the site as proposed, because portions of the site would have insufficient vehicle access and/or limited field of play. Additionally, construction and modification of impoundments was necessary for stormwater detention. The original master plan for this site would have resulted in impacts to approximately 3.53 acres of wetland and 2,417 linear feet of stream. After delineation of jurisdictional waters was completed in July 2010, it was determined that the actual renovation impacts to aquatic resources had been 3.44 acres of wetland and 2,265 linear feet of stream. At this time the decision was made to re-evaluate and modify the site renovation design. This revised design resulted in avoidance of one planned wetland impact and one planned stream impact, and additional minimization of impacts was achieved through the restoration of three existing piped stream crossings and the removal of fill from two prior converted wetlands. Overall, the impacts have been minimized to a total of 2.93 acres of wetland (17% reduction) and 2,167 linear feet of stream (10% reduction) (see Table 3).

Table 3. Summary of minimization of impacts.

Master Plan	Stream Impacts (feet)	Number of Streams Impacted	Wetland Impacts (acres)	Number of Wetlands Impacted
April 2010	2,417	18	3.53	19
July 2010	2,167 (includes removal of 98 linear ft of piping existing prior to 2010)	15	2.93 (includes 0.15 acre of wetland excavation)	13
MINIMIZATION:	250	3	0.60	6

Further minimization of impacts was not practicable as the space and geometric requirements for the project features resulted in some unavoidable impacts in order to fulfill the project purpose and need. The Corps has not verified the adequacy of the applicants' avoidance and minimization statements at this time.

MITIGATION: As mitigation for unavoidable impacts to 2.78 acres of low quality bottomland hardwood forested wetlands, which has been rounded up to 2.8 acres for ease of calculation, the applicant proposes to purchase 50% of the required credits at an approved mitigation bank. The remaining 50% of required credits will consist of on-site preservation of high quality wetlands. For the purposes of using the Ratio Method to calculate required mitigation 1 acre is equal to 1 credit.

The applicant proposes to purchase the 50% of bottomland hardwood wetland bank credits, or 1.4 credits, from the Alabama Port Mitigation Bank (APMB) in the Mobile Bay watershed (HUC 03160205). With the application of the APMB ratio of 1:2 for impacts to low quality wetlands and the application of a 1.12 proximity factor multiplier because APMB is not in the same 8-digit HUC watershed as the impact site; this would result in the applicant purchasing a total of 3.2 wetland credits from APMB.

The applicant proposes to meet the remaining 50% of their wetland mitigation requirements with on-site preservation of high quality wetlands along Clear Creek. The Ratio Method has established Base Ratios for mitigation actions being implemented. In this instance, impacts to low quality wetlands would require a 1:7 ratio for mitigating through wetland preservation. Therefore, preservation mitigation for 50% of the impacts (1.4 acres) would result in the preservation of 9.8 acres of high quality wetlands along Clear Creek.

As mitigation for unavoidable stream impacts, the applicant proposes to mitigate these impacts through in-stream and stream buffer mitigation on 1,100 linear feet of an unnamed tributary to Clear Creek on the Miller's Park property located southwest of the impact area. The number of stream mitigation credits required to compensate for impacts has been calculated using the USACE Mobile District's Standard Operating Procedure (SOP) for Compensatory Stream Mitigation Guidelines (Draft edition, May 2012) based on the 2,265 linear feet of actual project impacts calculated in July 2010. It has been determined that 8,734 stream mitigation credits would be required to compensate for the impacts. (see Table 5).

Table 5. Stream Mitigation Calculations.

Stream	Impact	Impact (feet)	M[a]	Mitigation Credits Required[b]
Stream 2	Pipe	69	4.03	278
Stream 2	Pipe	155	4.03	625
Stream 2	Armor	118	2.01	237
Stream 3	Pipe	226	4.03	911
Stream 4	Pipe	270	4.03	1,088
Stream 4	Pipe	233	4.03	939
Stream 5	Pipe	190	3.97	754

Stream 6	Pipe	123	3.45	424
Stream 9	Pipe	78	3.97	310
Stream 9	Pipe	92	3.97	365
Stream 12	Fill	66	4.26	281
Stream 12	Impounded	209	3.91	817
Stream 12	Impounded	246	3.91	963
Stream 13	Impounded	86	3.91	336
Stream 14	Impounded	8	3.91	31
Stream 15	Impounded	96	3.91	375
TOTAL		2,265		8,734

[a] M represents the Sum of Factors from the Adverse Impact Factors For Riverine Systems Worksheet.
[b] Mitigation Credits Required are calculated by multiplying M x linear feet of impact.

A Conceptual Mitigation Plan providing for the construction of a new floodplain at the existing level of the stream to create a new channel with proper pattern, profile and dimension (Priority 2 restoration) has been provided. The plan also provides for the restoration and preservation of 100 feet of hardwood forested buffer along each side of the 1,100 linear foot mitigation stream reach. It is anticipated that the proposed mitigation will generate the 8,734 credits required with a finalized plan will be submitted as soon as possible. However, if the planned mitigation fails to yield the required number of credits, the remainder will be purchased from an approved Stream Mitigation bank. The Corps has not verified the adequacy of the applicant's mitigation proposal at this time.

WATER QUALITY: The applicants have applied for certification from the State of Alabama in accordance with Section 401(a) (1) of the Clean Water Act, and upon completion of the required advertising, a determination relative to certification will be made by the Alabama Department of Environmental Management.

HISTORIC PROPERTIES: In accordance with Section 106 of the National Historic Preservation Act and Appendix C of 33 CFR 325, the undertaking defined in this notice is being considered for the potential to affect cultural and historic properties within the permit area. Although the extent of federal control and responsibility for these considerations are confined to the limits of the permit area for this project, the potential indirect effects that may occur to historic properties as a result of this undertaking is also being considered. In addition to the State Historic Preservation Officer (SHPO), we are seeking comment from the federally-recognized American Indian tribes, local historical societies, museums, universities, the U.S. Department of the Interior, National Park Service, Division of Archeological Services, and concerned citizens regarding the existence or the potential for existence of significant cultural and historic properties within the permit area. The National Register of Historic Places will be consulted for properties listed in or eligible for the National Register which are known to exist and would be affected by the proposed work. This review constitutes the full extent of cultural resources investigations unless comment to this notice is received documenting that significant sites or properties exist

which may be affected by this work, or that adequately documents that a potential exists for the location of significant sites or properties within the permit area. Additional notification is being furnished to the State Historic Preservation Officer via this Public Notice.

ENDANGERED SPECIES: Based on initial review of information provided in the project application and the U.S. Department of the Interior's list of Endangered and Threatened Wildlife and Plants, the Corps has preliminarily determined the proposed activities would have "No Effect" on Federally-listed species. Also, there is no listed critical habitat within the project area. Coordination of the project with the U. S. Fish and Wildlife Service is being initiated via this Public Notice.

This public notice is being distributed to all known interested persons in order to assist in developing facts on which a decision by the U.S. Army Corps of Engineers (Corps) can be based. For accuracy and completeness of the record, all data in support of or in opposition to the proposed work should be submitted in writing setting forth sufficient detail to furnish a clear understanding of the reasons for support or opposition. The decision whether to issue a permit will be based on an evaluation of the probable impact, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and use of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments.

All factors which may be relevant to the proposals will be considered, including the cumulative effects thereof: among those are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food production, and in general, the needs and welfare of the people.

The Corps is soliciting comments from the public; Federal, State, and local agencies and officials; Indian Tribes, and other interested parties in order to consider and evaluate the impacts of the proposed activities. Any comments received will be considered by the Corps to determine whether to issue, modify, condition or deny a permit for these proposals. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings shall state with particularity, the reasons for holding a public hearing.

Evaluation of the probable impacts involving deposits of dredged or fill material into waters of the United States will include the application of guidelines established by the Administrator of the U.S. Environmental Protection Agency.

Correspondence concerning this Public Notice should refer to **SAM-2010-0536-LET** and should be directed to:

District Commander, U.S. Army Engineer District, Mobile
Attention: Regulatory Division (RD-SA)
Post Office Box 2288
Mobile, Alabama 36628-0001

With a copy furnished to:

Alabama Department of Environmental Management
Mobile Branch – Coastal Section
4171 Commanders Drive
Mobile, Alabama 36615

Comments should be received **no later than 30 days** from the date of this Public Notice.

If you have any questions concerning this publication, you may contact the project manager via e-mail at leslie.e.turney@usace.army.mil or telephone number **(251) 694-3873**. Please refer to Public Notice Number SAM-2010-0536-LET.

For additional information about our Regulatory Program, please visit our web site at: **www.sam.usace.army.mil/Missions/Regulatory.aspx**, and please take a moment to complete our customer satisfaction survey while you're there. Your responses are appreciated and will allow us to improve our services.

MOBILE DISTRICT
U.S. Army Corps of Engineers

Enclosures

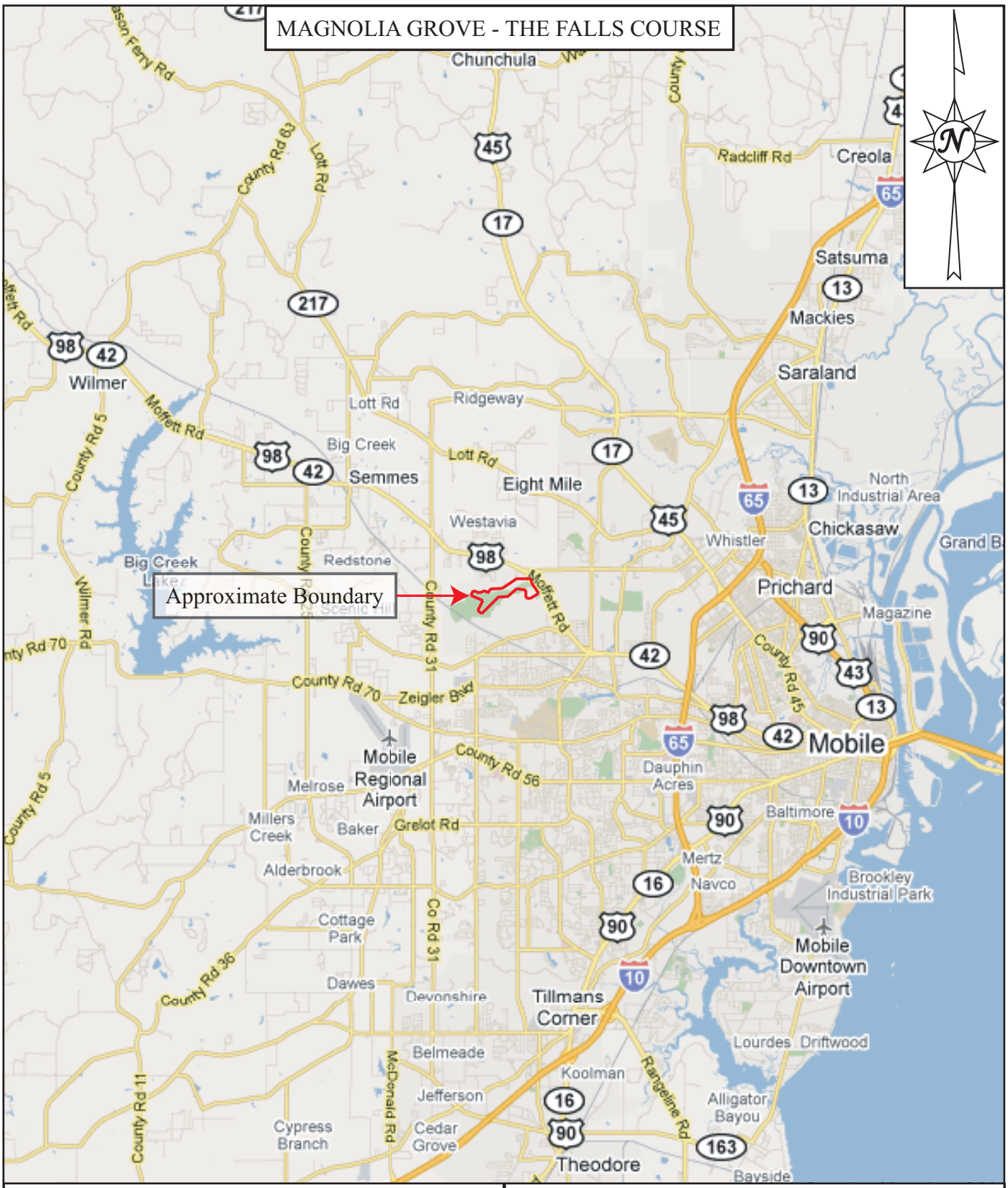


Figure 1: Vicinity Map
Magnolia Grove - The Falls Course
Mobile, Mobile County, Alabama
Source: 2010 Google Maps
BioResources Project No. WL10-173
Scale: 1” = 3.3 miles

BioResources, LLC

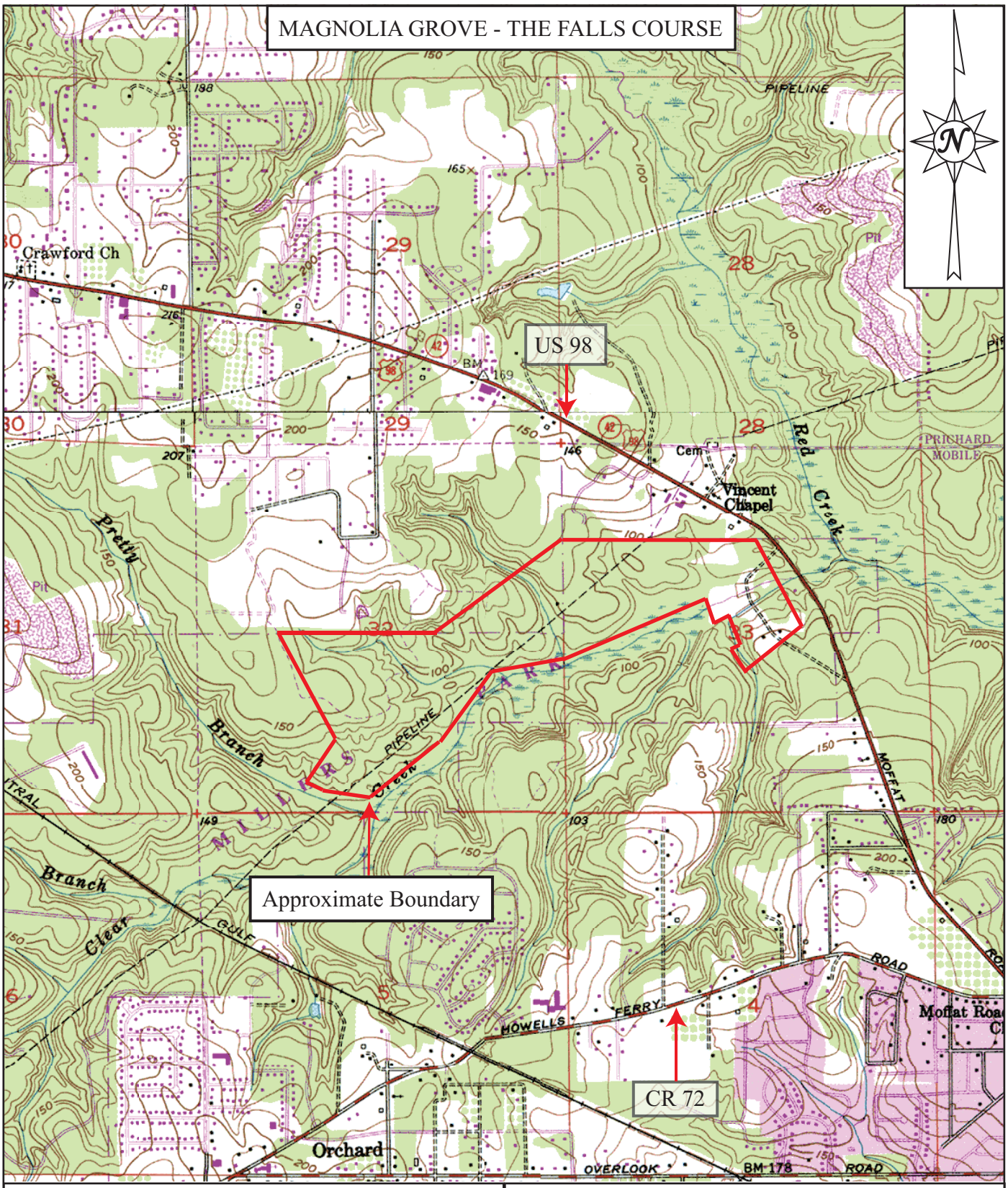
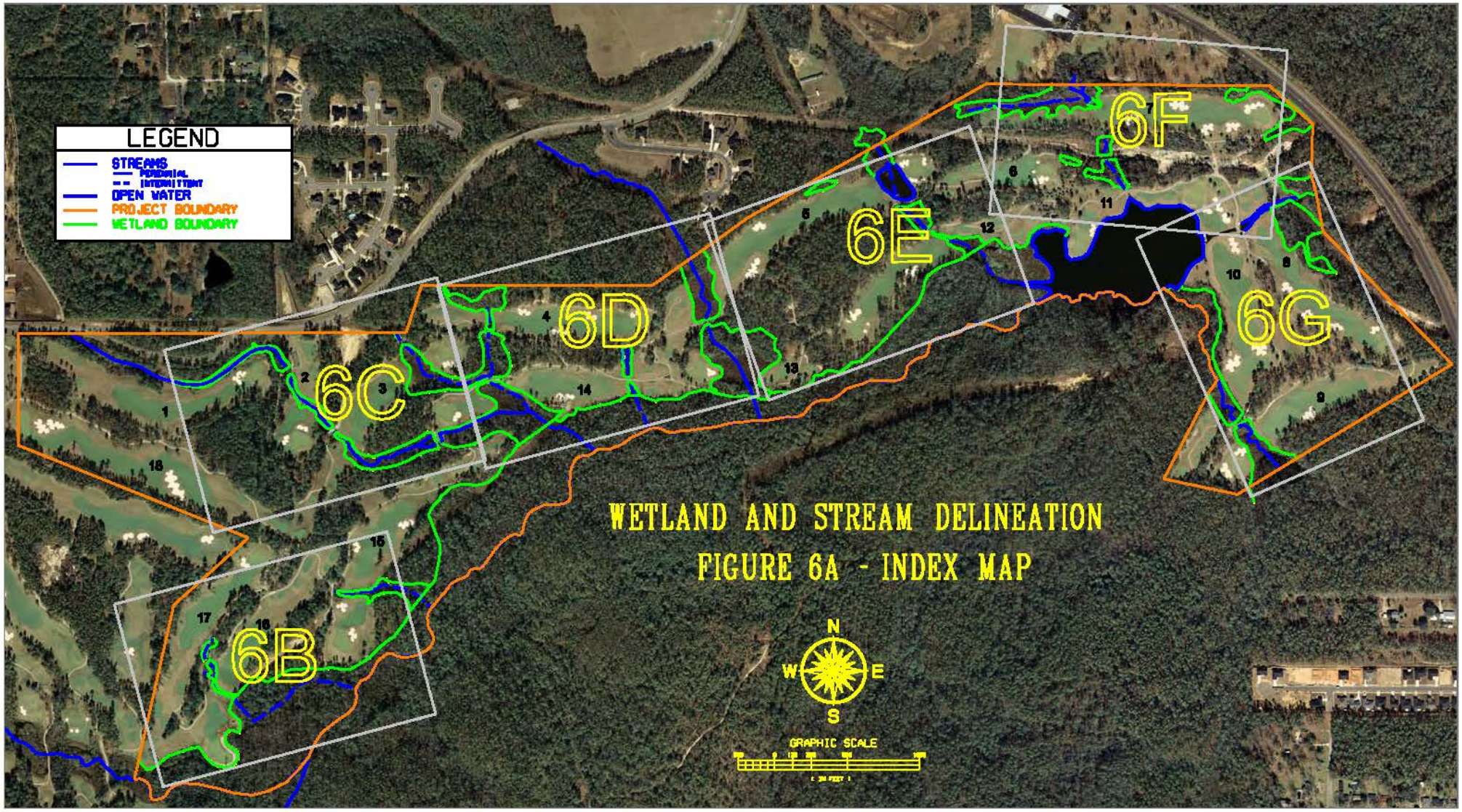


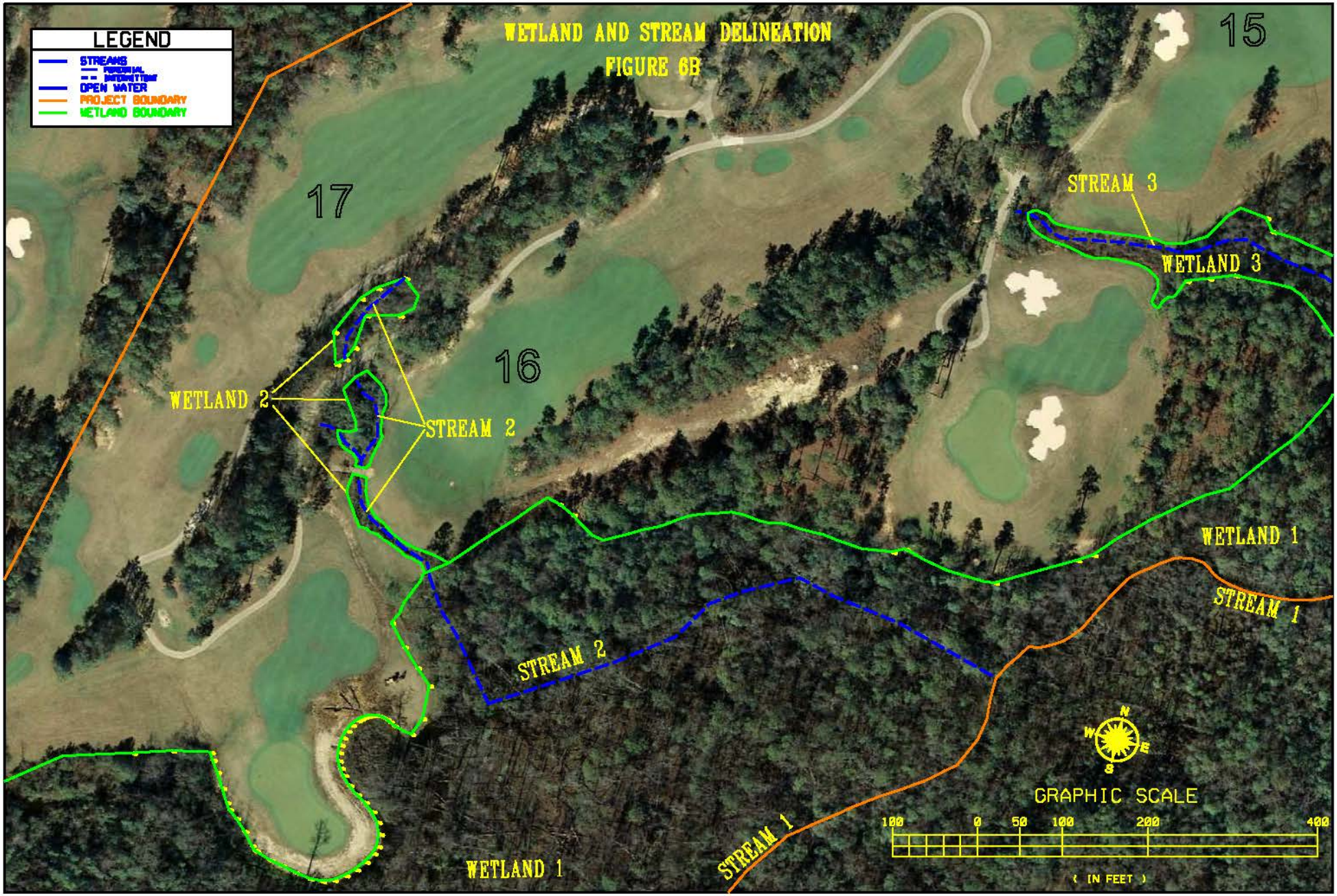
Figure 2: Site Location Map
Magnolia Grove - The Falls Course
Mobile, Mobile County, Alabama
Source: Spring Hill, AL U.S.G.S. 7.5' Quad Map
BioResources Project No. WL10-173
Scale: 1" = 2000'

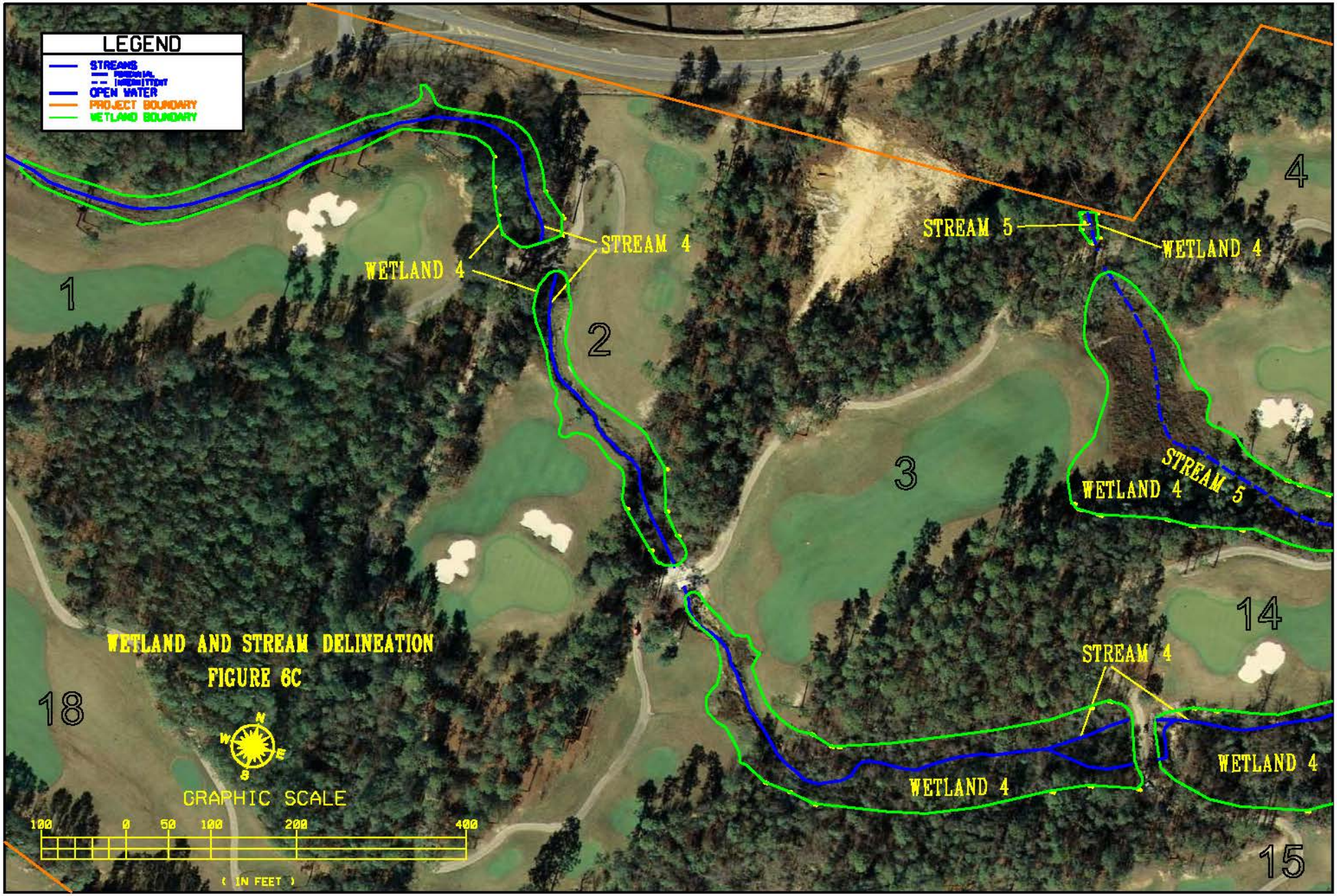
BioResources, LLC

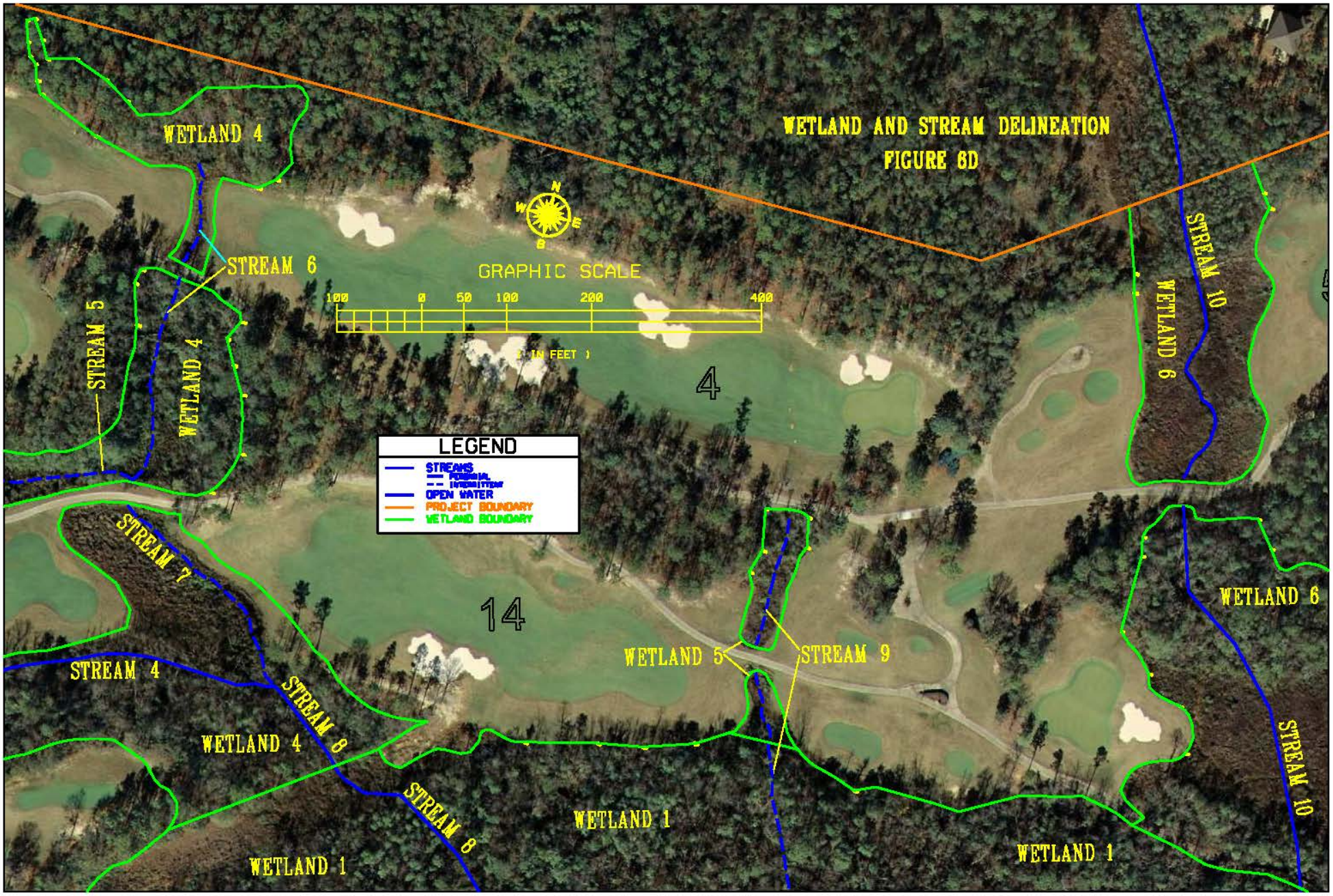


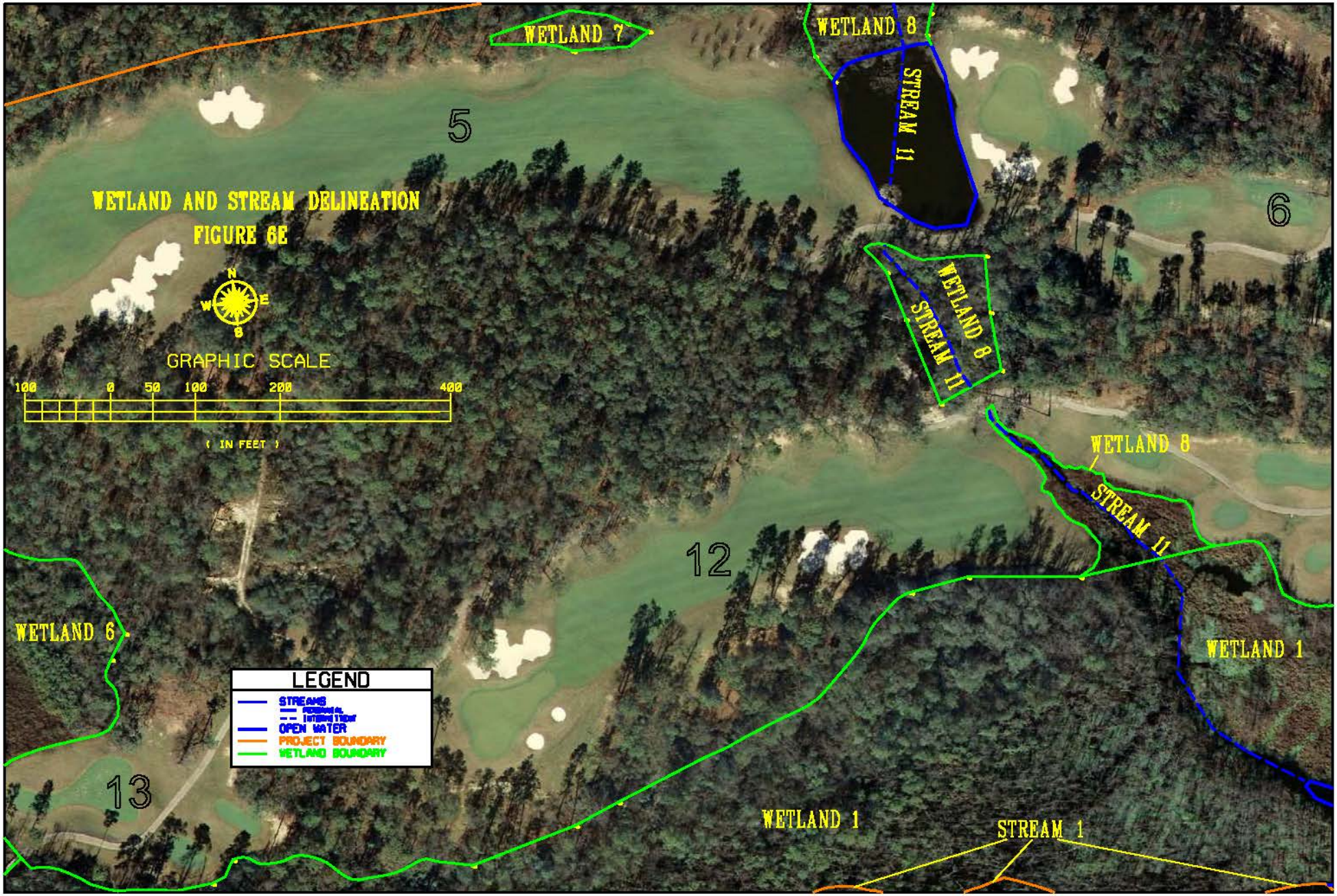
WETLAND AND STREAM DELINEATION

FIGURE 6A - INDEX MAP


WETLAND AND STREAM DELINEATION
FIGURE 6B
LEGEND
STREAMS
PERENNIAL
INTERMITTENT
OPEN WATER
PROJECT BOUNDARY
WETLAND BOUNDARY
15
17
16
STREAM 3
WETLAND 3
WETLAND 2
STREAM 2
WETLAND 1
STREAM 1
STREAM 2
STREAM 1
WETLAND 1
N
W
E
S
GRAPHIC SCALE
100
0
50
100
200
400
(IN FEET)


LEGEND
STREAMS
PERENNIAL
INTERMITTENT
OPEN WATER
PROJECT BOUNDARY
WETLAND BOUNDARY
WETLAND AND STREAM DELINEATION
FIGURE 6C
STREAM 4
WETLAND 4
STREAM 5
WETLAND 4
STREAM 5
WETLAND 4
STREAM 4
WETLAND 4
WETLAND 4
1
2
3
4
14
15
18
N
W
E
S
GRAPHIC SCALE
100
0
50
100
200
400
(IN FEET)


WETLAND AND STREAM DELINEATION
FIGURE 6D
WETLAND 4
STREAM 6
STREAM 5
WETLAND 4
GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
4
LEGEND
STREAMS
PERENNIAL
INTERMITTENT
OPEN WATER
PROJECT BOUNDARY
WETLAND BOUNDARY
STREAM 10
WETLAND 6
STREAM 7
14
WETLAND 6
WETLAND 5
STREAM 9
STREAM 4
STREAM 8
WETLAND 4
STREAM 8
WETLAND 1
STREAM 10
WETLAND 1
WETLAND 1


WETLAND AND STREAM DELINEATION
FIGURE 6E
WETLAND 7
WETLAND 8
STREAM 11
5
6
12
13
WETLAND 8
STREAM 11
WETLAND 8
STREAM 11
WETLAND 6
WETLAND 1
WETLAND 1
STREAM 1
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S
W
GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
LEGEND
STREAMS
PERENNIAL
INTERMITTENT
OPEN WATER
PROJECT BOUNDARY
WETLAND BOUNDARY

WETLAND AND STREAM DELINEATION
FIGURE 6F
LEGEND
STREAMS
OPEN WATER
PROJECT BOUNDARY
WETLAND BOUNDARY
GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
N
W
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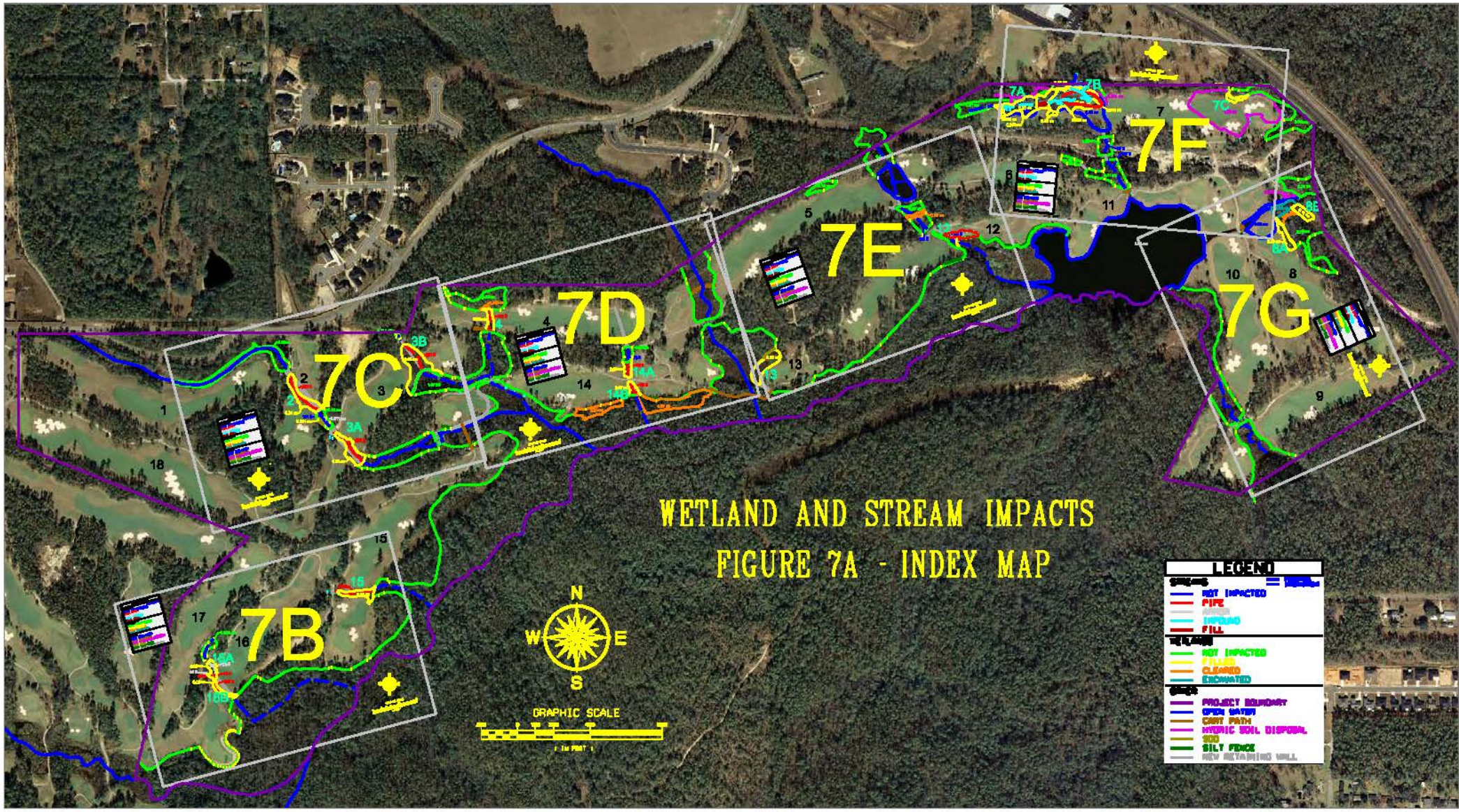
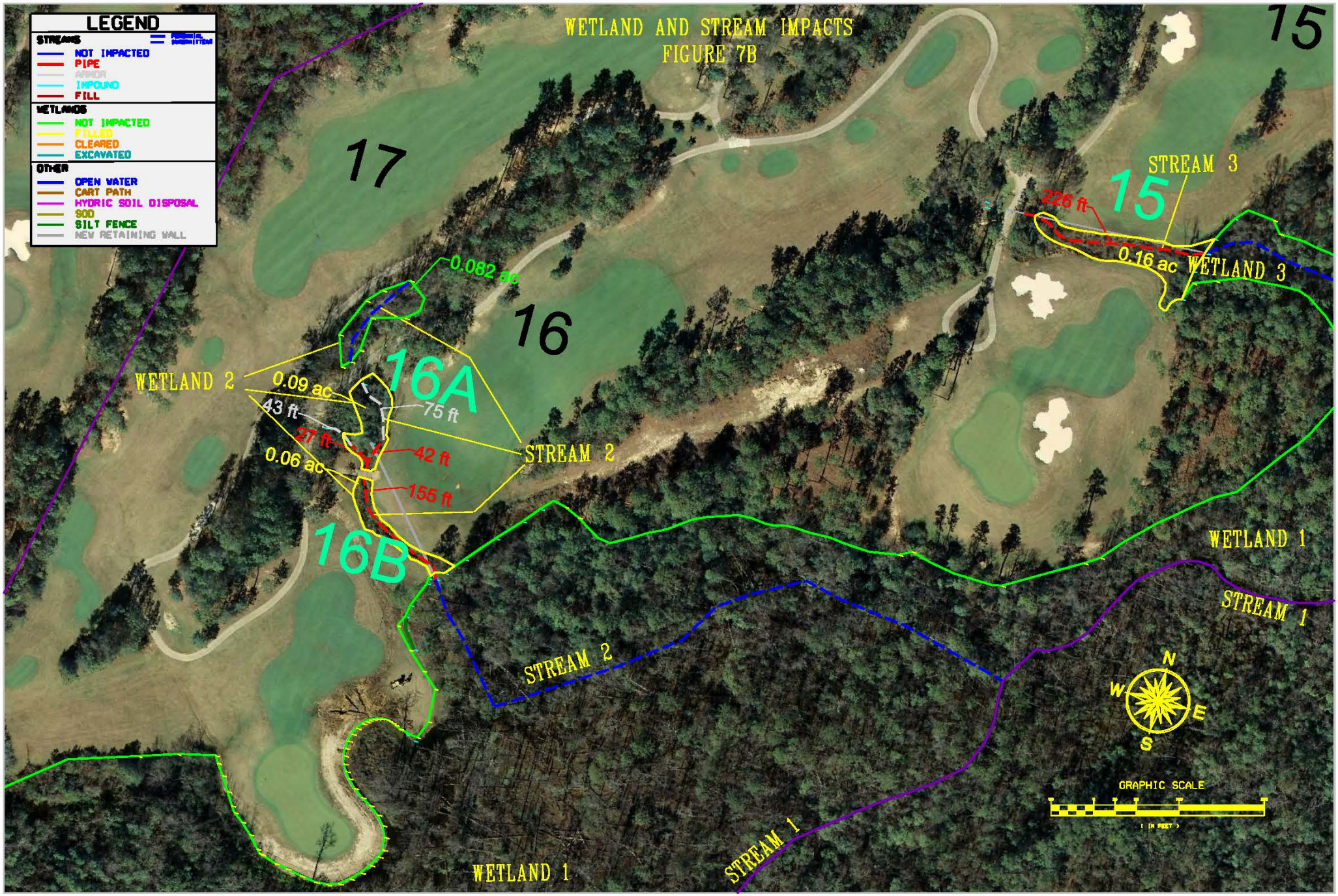
STREAM 13
STREAM 14
STREAM 15
WETLAND 9
STREAM 12
WETLAND 11
WETLAND 11
7
WETLAND 10
STREAM 16
6
WETLAND 12
8
STREAM 1
11
10

WETLAND AND STREAM DELINEATION
FIGURE 6G
GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
WETLAND 12
WETLAND 12
STREAM 1
8
9
10
STREAM 17
WETLAND 13
STREAM 17
STREAM 17
WETLAND 13
LEGEND
STREAMS
OPEN WATER
PROJECT BOUNDARY
WETLAND BOUNDARY


7B
7C
7D
7E
7F
7G
WETLAND AND STREAM IMPACTS
FIGURE 7A - INDEX MAP
N
W
E
S
GRAPHIC SCALE
LEGEND
NOT IMPACTED
PIPE
FILL
NOT IMPACTED
FILLED
CLEARED
EXCAVATED
PROJECT BOUNDARY
OPEN WATER
CART PATH
HYDRIC SOIL DISPOSAL
SOD
SILT FENCE
NEW RETAINING WALL


WETLAND AND STREAM IMPACTS
FIGURE 7B
LEGEND
STREAMS
NOT IMPACTED
PIPE
ARMOR
IMPOUND
FILL
WETLANDS
NOT IMPACTED
FILLED
CLEARED
EXCAVATED
OTHER
OPEN WATER
CART PATH
HYDRIC SOIL DISPOSAL
SOD
SILT FENCE
NEW RETAINING WALL
17
16
15
16A
16B
15
STREAM 3
226 ft
0.16 ac
WETLAND 3
0.082 ac
WETLAND 2
0.09 ac
43 ft
75 ft
27 ft
42 ft
0.06 ac
155 ft
STREAM 2
WETLAND 1
STREAM 1
STREAM 2
STREAM 1
WETLAND 1
N
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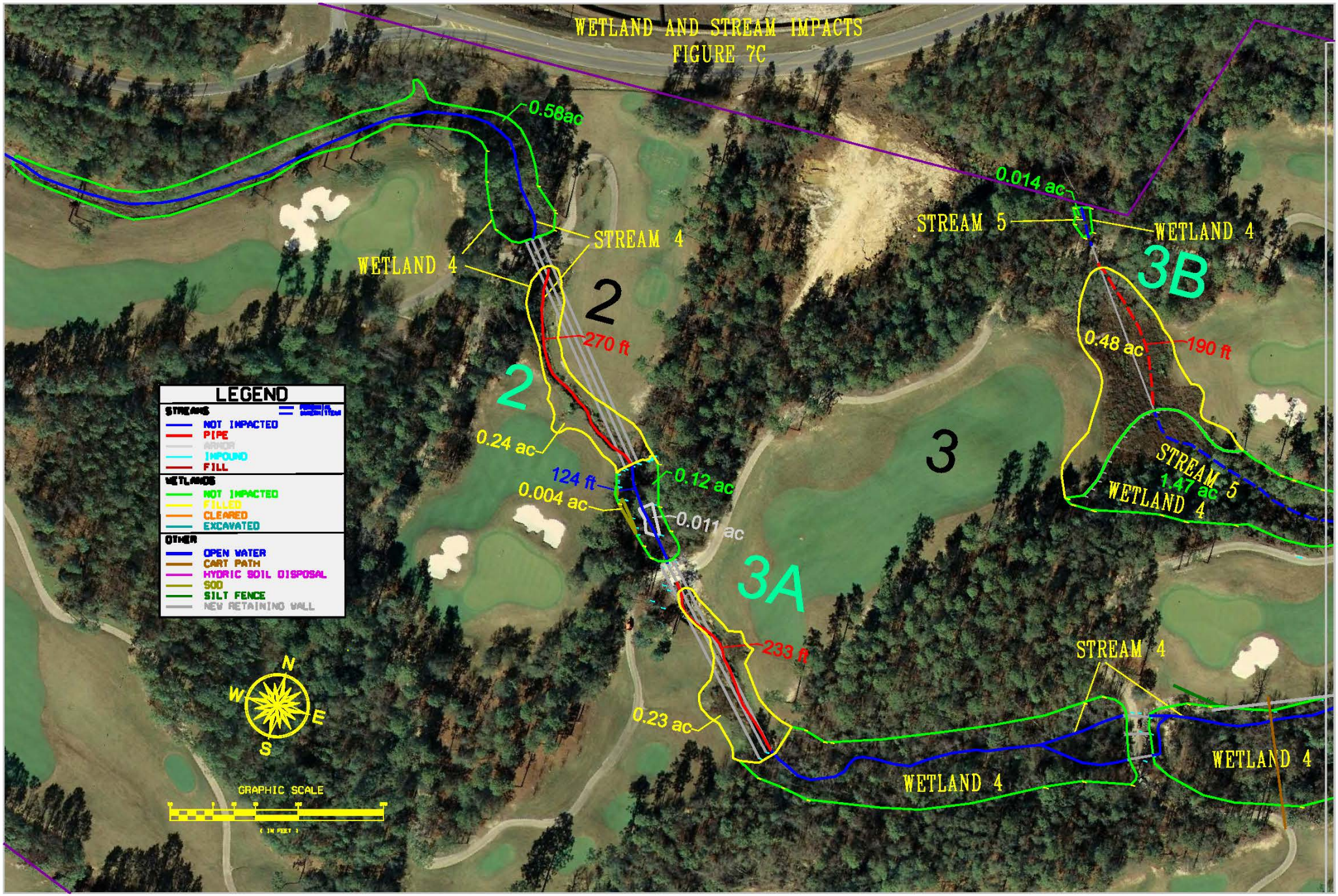
GRAPHIC SCALE
(IN FEET)


WETLAND AND STREAM IMPACTS
FIGURE 7C
0.58ac
WETLAND 4
STREAM 4
2
270 ft
2
0.24 ac
124 ft
0.004 ac
0.12 ac
0.011 ac
3A
233 ft
0.23 ac
0.014 ac
STREAM 5
WETLAND 4
3B
0.48 ac
190 ft
3
STREAM 5
1.47 ac
WETLAND 4
STREAM 4
WETLAND 4
WETLAND 4
LEGEND
STREAMS
NOT IMPACTED
PIPE
IMPOUND
FILL
WETLANDS
NOT IMPACTED
FILLED
CLEARED
EXCAVATED
OTHER
OPEN WATER
CART PATH
HYDRIC SOIL DISPOSAL
SOD
SILT FENCE
NEW RETAINING WALL
N
W
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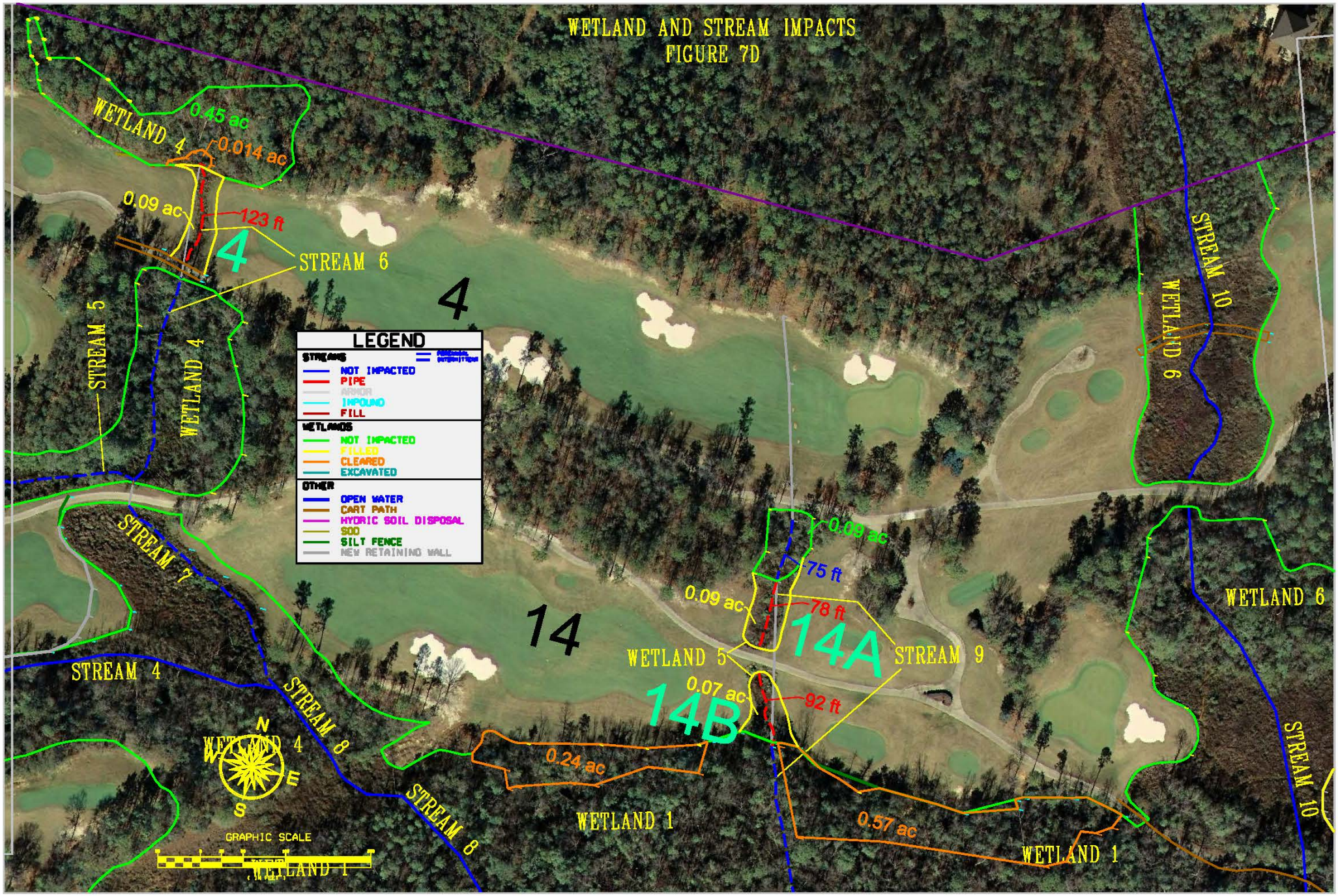
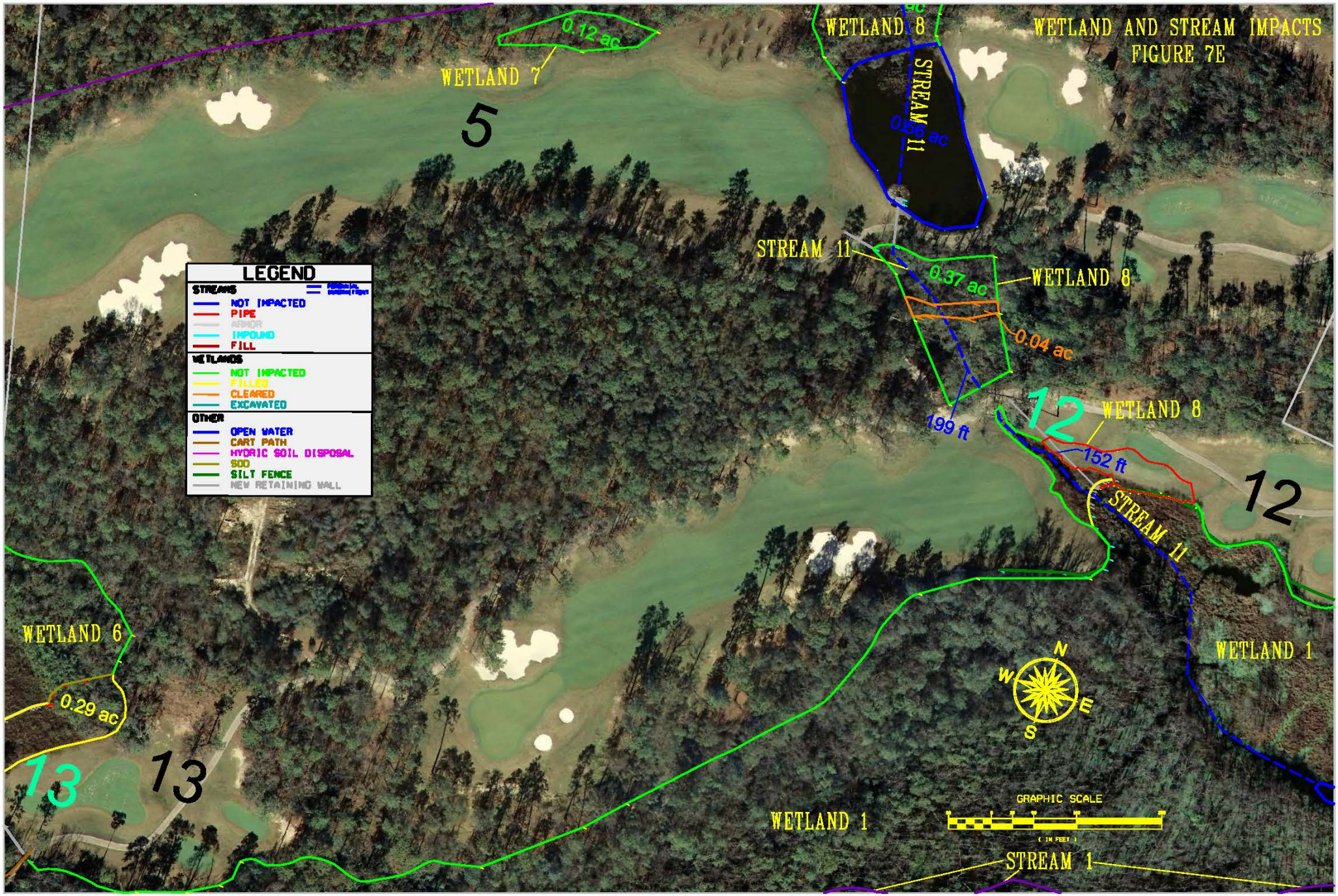
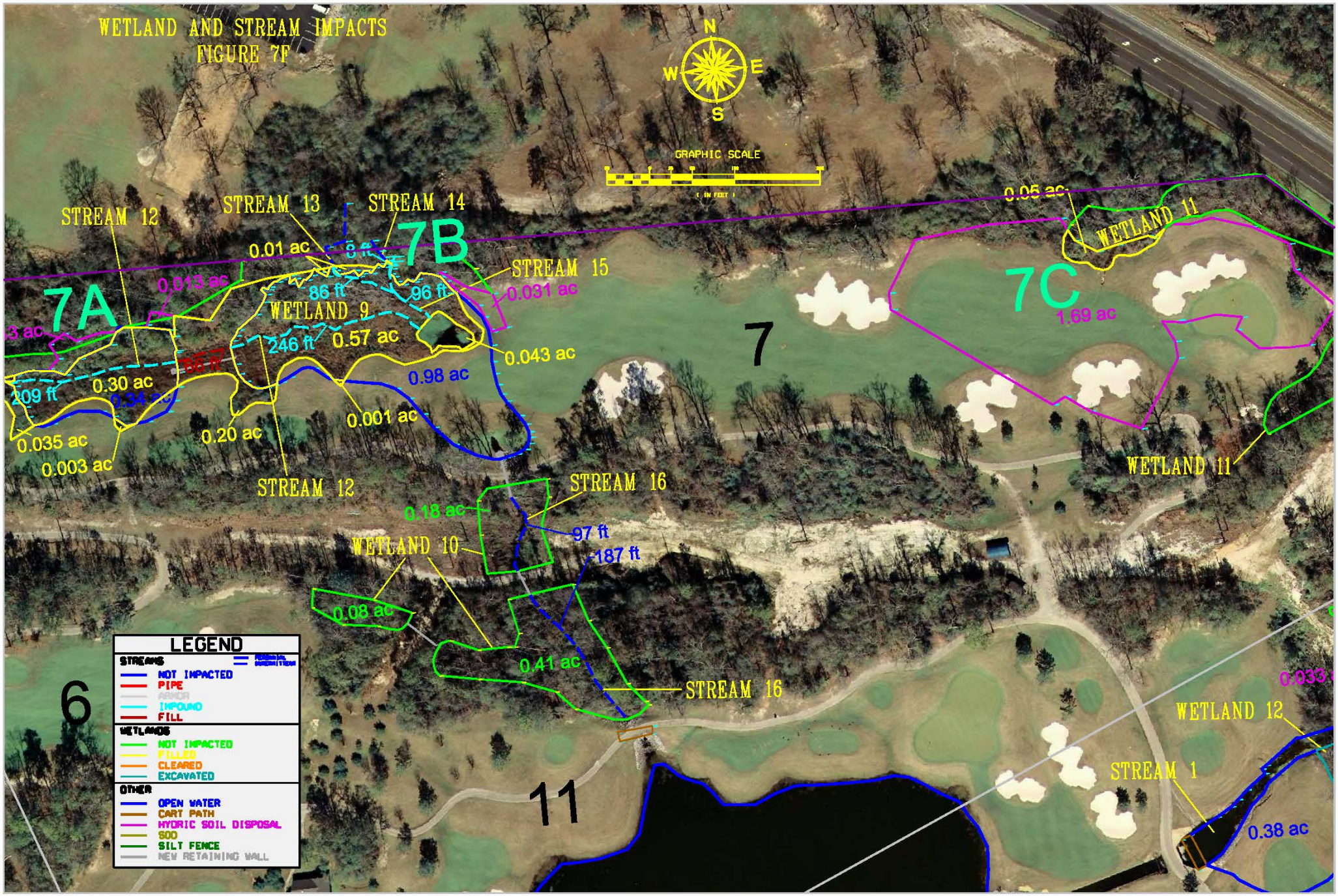
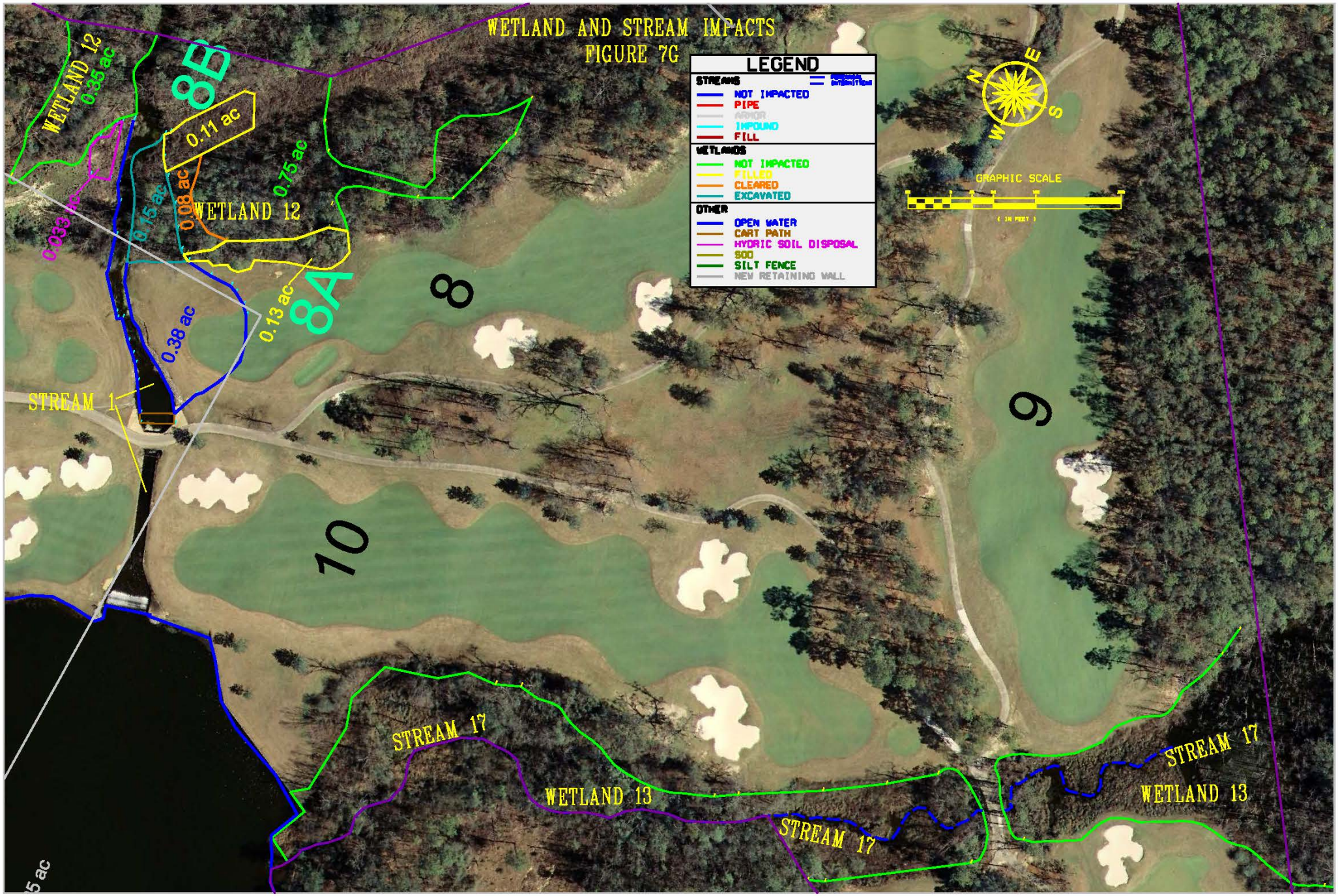
S
GRAPHIC SCALE
(IN FEET)


WETLAND AND STREAM IMPACTS
FIGURE 7D
WETLAND 4
0.45 ac
0.014 ac
0.09 ac
123 ft
4
STREAM 6
STREAM 5
WETLAND 4
4
LEGEND
STREAMS
NOT IMPACTED
PIPE
IMPOUND
FILL
WETLANDS
NOT IMPACTED
FILLED
CLEARED
EXCAVATED
OTHER
OPEN WATER
CART PATH
HYDRIC SOIL DISPOSAL
SOD
SILT FENCE
NEW RETAINING WALL
STREAM 7
STREAM 4
STREAM 8
WETLAND 4
N
W
E
S
GRAPHIC SCALE
WETLAND 1
STREAM 8
14
0.09 ac
75 ft
0.09 ac
78 ft
14A
WETLAND 5
STREAM 9
0.07 ac
92 ft
14B
0.24 ac
WETLAND 1
0.57 ac
WETLAND 1
STREAM 10
WETLAND 6
WETLAND 6
STREAM 10


WETLAND AND STREAM IMPACTS
FIGURE 7E
WETLAND 7
0.12 ac
5
WETLAND 8
STREAM 11
0.36 ac
STREAM 11
0.37 ac
WETLAND 8
0.04 ac
199 ft
12
WETLAND 8
152 ft
STREAM 11
12
WETLAND 6
0.29 ac
13
13
WETLAND 1
WETLAND 1
STREAM 1
LEGEND
STREAMS
NOT IMPACTED
PIPE
ARMOR
IMPOUND
FILL
WETLANDS
NOT IMPACTED
FILLED
CLEARED
EXCAVATED
OTHER
OPEN WATER
CART PATH
HYDRIC SOIL DISPOSAL
SOD
SILT FENCE
NEW RETAINING WALL
N
W
E
S
GRAPHIC SCALE
(IN FEET)


WETLAND AND STREAM IMPACTS
FIGURE 7F
N
W
E
S
GRAPHIC SCALE
(IN FEET)
STREAM 12
STREAM 13
STREAM 14
7B
0.01 ac
0.013 ac
7A
86 ft
96 ft
WETLAND 9
246 ft
0.57 ac
STREAM 15
0.031 ac
0.043 ac
0.98 ac
0.30 ac
209 ft
0.035 ac
0.003 ac
0.20 ac
0.001 ac
STREAM 12
7
0.05 ac
WETLAND 11
7C
1.69 ac
WETLAND 11
STREAM 16
0.18 ac
97 ft
187 ft
WETLAND 10
0.08 ac
0.41 ac
STREAM 16
6
11
WETLAND 12
STREAM 1
0.38 ac
LEGEND
STREAMS
NOT IMPACTED
PIPE
ARMOR
IMPOUND
FILL
WETLANDS
NOT IMPACTED
FILLED
CLEARED
EXCAVATED
OTHER
OPEN WATER
CART PATH
HYDRIC SOIL DISPOSAL
SOD
SILT FENCE
NEW RETAINING WALL


WETLAND AND STREAM IMPACTS
FIGURE 7G
LEGEND
STREAMS
NOT IMPACTED
PIPE
ARMOR
IMPOUND
FILL
WETLANDS
NOT IMPACTED
FILLED
CLEARED
EXCAVATED
OTHER
OPEN WATER
CART PATH
HYDRIC SOIL DISPOSAL
SOD
SILT FENCE
NEW RETAINING WALL
GRAPHIC SCALE
(IN FEET)
N
E
S
W
WETLAND 12
0.35 ac
8E
0.11 ac
0.75 ac
0.08 ac
0.15 ac
0.033 ac
WETLAND 12
0.13 ac
8A
0.38 ac
8
STREAM 1
10
9
STREAM 17
WETLAND 13
STREAM 17
STREAM 17
WETLAND 13

CONCEPTUAL STREAM MITIGATION PLAN
MAGNOLIA GROVE STREAM MITIGATION SITE
MOBILE, MOBILE COUNTY, ALABAMA
SECTION 6, TOWNSHIP 4 SOUTH, RANGE 2 WEST

1. INTRODUCTION

In order to mitigate impacts to jurisdictional streams associated with the U.S. Army Corps of Engineers (USACE) permit for the Magnolia Grove – The Falls Course site (pending), SunBelt Golf Corporation of Birmingham, Alabama has directed BioResources, LLC and HydroEngineering Solutions, LLC to develop this Mitigation Plan for their Magnolia Grove Stream Mitigation Site.

This Mitigation Plan details the generation of 8,847 stream credits through riparian buffer restoration and Priority 2 In-Stream Channel Restoration. The applicant wishes to apply these credits toward the 8,734 credits required for the permit.

2. SITE DESCRIPTION

2.1 Site Location

The Clear Creek Mitigation Site is located in Section 6, Township 4 South, Range 2 West in Mobile, Alabama. The site is located approximately at latitude 30.7285º North and longitude 88.1263º West. The area is depicted on the Spring Hill, Alabama Quadrangle, United States Geological Survey Topographic Map (7.5-minute series). The site is within the Mobile Bay watershed (HUC 03160205). A Vicinity Map (Figure 1) and a Site Location Map (Figure 2) are included in Appendix A.

2.2 Habitat Description

The Clear Creek Mitigation Site is situated in a stream valley between sandy rolling hills, typical of the Southern Pine Hills district of the East Gulf Coastal Plain Physiographic Province. An unnamed perennial tributary to Clear Creek flows generally from west to east through the site. The stream banks and valley bottom are lined by a narrow band of hardwood trees. Chinese privet (*Ligustrum sinense*) and Chinese tallowtree (*Triadica sebiferum*) occur in the disturbed portion of the site. A sanitary sewer line runs along the south side of the stream; 20 feet has been added to the buffer on the south side of the stream to account for the sewer line right-of-way (ROW). Along the lower one-third of the stream, the channel has migrated into the sewer line and the stream now flows around the exposed manhole risers.

3. STREAM MITIGATION

3.1 Mitigation Objective

SunBelt Golf Corporation of Birmingham, Alabama proposes to establish riparian buffers along the stream corridor and to conduct Priority 2 In-Stream Restoration on the stream to mitigate impacts to jurisdictional streams associated with the renovation of Magnolia Grove - The Falls Course. The in-channel restoration work will entail the construction of a new floodplain at the existing level and will create a new channel with proper pattern, profile, and dimension at the existing level.

3.2 Site Selection

The number of credits required to compensate for unavoidable stream impacts was calculated from the "USACE Adverse Impacts Worksheet" (Appendix B), included with the Individual Permit Application. This calculation indicated that 8,734 stream credits are required for the Magnolia Grove – The Falls Course site. We determined that on-site, in-kind mitigation was the best practicable alternative. Several streams occur on the site and were candidates for In-Stream and Riparian Buffer Mitigation. This unnamed tributary to Clear Creek was chosen as the most suitable location for mitigation as the creek channel has migrated onto the sanitary sewer ROW and downcut substantially to expose the sewer line and manhole risers. The proposed channel restoration will create a new floodplain and stable channel at the current elevation and will move the stream away from the sewer ROW. The new channel will have Riparian Buffer Zones along both banks. The riparian buffer zones will be designed according to the USACE's "2012 Compensatory Stream Mitigation Standard Operating Procedure and Guidelines (SOP)".

3.3 Site Protection Instrument

The restoration site and buffer zones will be protected in a restrictive covenant according to requirements in the SOP. The applicant is currently preparing a Declaration of Restrictive Covenants for the property and will forward it to the USACE once it is completed. It is anticipated that this document will adhere to the USACE model.

3.4 Baseline Information

3.4.1 Restoration Reach

Data were collected in 2010 and 2011 to determine the condition of the proposed mitigation area and to establish a baseline from which to monitor mitigation progress. The unnamed stream channel was surveyed to develop a longitudinal profile and numerous cross sections were shot to determine the existing entrenchment ratio, bankful height, and floodprone area.

According to aerial photography and topographic maps, the drainage area of this stream just above the confluence with Clear Creek is 0.42 square miles. The stream is incised (entrenchment ratio is 1.23) and has very little sinuosity (1.02). The channel banks are almost vertical with little vegetation and are highly erodible. Due to the degraded condition of the

stream it is difficult to distinguish bankfull indicators. A classification of this stream was achieved by using regional curves for determining bankful discharge; the Rosgen stream classification is G5c.

Basic water quality data (temperature, dissolved oxygen, turbidity, and pH) will be collected at two sites on the stream, one near the terminus with Clear Creek and one above the work site. Photographs and diagrams of the existing condition at the restoration site are located in Appendices C and D.

3.4.2 Reference Reach

Stone Branch, a tributary to Clear Creek, will be used as a reference reach to develop the proper pattern, profile, and dimension for the new stream channel. Stone Branch is a relatively undisturbed first order stream on the Miller's Park site that also flows into Clear Creek. It has a similar sized watershed, 0.55 square miles. Stone Branch was surveyed during the same time period as the restoration site. The reference reach has a Rosgen stream classification of E5c.

Basic water quality data (temperature, dissolved oxygen, turbidity, and pH) will be collected at two sites on the stream, one near the terminus with Clear Creek and one above the golf course. Photographs and diagrams of the reference reach are located in Appendices C and D.

3.4.3 Riparian Buffer Zone

Prior to construction, six buffer data points will be established within the area designated for the riparian buffer zones. At each data point, vegetative data will be collected within a twenty-five foot radius. Data collected for the overstory includes species composition, diameter at breast height (DBH), and height according to the SOP. Qualitative descriptions of dominant vegetation in the midstory, understory, woody vine, and herb strata will also be recorded.

These data points will provide baseline information and serve as permanent monitoring points through the monitoring period of this restoration project.

3.5 Determination of Required Credits

The number of credits required to compensate for unavoidable stream impacts was calculated from the USACE "Adverse Impact Factors for Riverine Systems Worksheet" (2012 SOP) (Appendix B). This calculation indicated that 8,734 stream credits are required for the renovations at Magnolia Grove- The Falls Course site. Multiple segments on the restoration stream were established to evaluate the potential to generate in-stream and riparian mitigation credits. Slope calculations for riparian buffer width and vegetative data collection were conducted in these segments.

3.5.1 In-Stream Restoration Credits

In-stream restoration involves the construction of a new stream channel that provides functions and values consistent with those of a stable natural stream. In order to estimate the number of credits that may be generated a Stream Channel/Streambank Restoration and Relocation Worksheet was completed for the restoration reach (Appendix E). The in-stream restoration will generate 5,883 stream credits, approximately sixty-six percent of the overall credits. The Stream Mitigation Strategy Map (Appendix A) illustrates where the restoration will be conducted.

3.5.2 Riparian Restoration Credits

Riparian mitigation consists of the preservation, enhancement, or restoration of riparian forest in order to provide functions necessary for stable streams. The slopes adjacent to the stream were calculated in 50-foot increments beginning at the stream bank. These calculations were performed at 100-foot intervals along the stream using detailed topographic data provided by Precision Surveying of Auburn, Alabama. Slopes were then averaged to obtain a mean degree of slope for calculating minimum buffer widths (MBW) according to the USACE's 2012 SOP. Lengths, widths, and mitigation types for the buffer segments are presented in Table 1. A Stream Mitigation Strategy Map is included in Appendix A.

Table 1. Riparian Buffer Segments

Buffer Segment	Length (feet)	Side of Stream	Minimum Width (feet)	Mitigation Type
Segment 1	1,100	North	108 (2xMBW)	Restoration
		South[1]	136 (2xMBW + 20')	Restoration

[1] 20 feet was added to the south side buffer to accommodate the sewer line ROW.

Riparian Buffer Restoration and Preservation Worksheets were completed for the proposed buffer segments and are included in Appendix E. These buffer segments are expected to generate 2,964 credits (Table 2), approximately thirty-four percent of the overall credits.

Table 2. Summary of Mitigation Credits Generated by Riparian Buffer Restoration

Buffer Segment	Length (feet)	Credits per Linear Foot	Mitigation Credits Generated[1]
Segment 1	1,100	2.695	2,964

[1] Mitigation Credits Generated is calculated by multiplying credits/lf x the length of stream in that segment.

3.6 Mitigation Work Plan

3.6.1 In-Stream Restoration Work Plan

Starting near the confluence with Clear Creek a new floodplain and channel will be constructed at the existing elevation. The new channel will mimic the pattern, profile, and dimensions of the reference reach located on Stone Branch (Appendix F). Material excavated from the new channel and floodplain will be stockpiled and used to fill the scoured areas of the existing channel. Immediately following construction, the new floodplain and channel banks will be planted with desirable native vegetation.

3.6.2 Riparian Buffer Zone Work Plan

The in-channel stream restoration will disturb the smallest area possible in order to complete the task. Following completion of the in-channel restoration the disturbed area will be planted with

desirable native vegetation. Mitigation activities outside the newly disturbed area will include the removal of invasive species and the establishment of desirable native species within the rest of the riparian buffer zone.

Chinese privet and Chinese tallowtree, invasive exotic species, occur in both the wetland and upland areas of the riparian buffer zone. These woody invasives will be removed by chemical and mechanical techniques. Chemical removal will consist of the judicial use of approved herbicides. Mechanical techniques will consist of hand removal or the use of mulching equipment. Exotic species removal will begin in the fall of 2013, and follow–up treatments will be conducted as needed. Scientific names of plants referred to in this section may be found in Appendix B.

After the initial removal of exotic species, desirable native species will be planted (during the appropriate season). It is anticipated that this planting will occur during the winter of 2014. Table 3 list species that may be included. Potential plantings were selected based on wildlife habitat value and the appropriateness for this riparian forest. Plantings are subject to availability; if it becomes necessary to plant species that do not occur on this list, the USACE will be consulted. The planting rate will be approximately 400 trees/shrubs per acre in the disturbed construction zones and approximately 100 trees/shrubs per acre in the rest of the riparian buffer zone.

Table 3. Potential Tree Plantings.

Common Name	Scientific Name
American Sycamore	*Platanus occidentalis*
Black Willow	*Salix nigra*
Boxelder	*Acer negundo*
Cherrybark Oak	*Quercus falcata var. pagodaefolia*
Common Persimmon	*Diospyros virginiana*
Eastern Redbud	*Cercis canadensis*
Flowering Dogwood	*Cornus florida*
Green Ash	*Fraxinus pennsylvanica*
Live Oak	*Quercus virginiana*
Loblolly Pine	*Pinus taeda*
Post Oak	*Quercus stellata*
Red Maple	*Acer rubrum*
River Birch	*Betula nigra*
Southern Red Oak	*Quercus falcata var. falcata*
Swamp Chestnut Oak	*Quercus michauxii*
Swamp Tupelo	*Nyssa sylvatica var. biflora*
Tag Alder	*Alnus serrulata*
Tuliptree	*Liriodendron tulipifera*
Water Oak	*Quercus nigra*
Wax Myrtle	*Myrica cerifera*
Wild Black Cherry	*Prunus serotina*

Erosion control measures on the project site are to be implemented per ADEM BMP Plan / AL SWCC Erosion Control Handbook. The primary sources of water to the mitigation area include rainfall to the watershed and groundwater seepage.

Upon approval of this plan, work will begin immediately. Table 4 (below) provides a summary of anticipated tasks and timing. Additional management activities will be conducted if necessary.

Table 4. Expected Mitigation Timeline.

Season, Year	Task
Summer 2013	Submittal of detailed Mitigation Plan
Summer/Fall 2013	Conduct In-Channel Stream Restoration
Fall 2013	Removal of exotic species
Winter 2014	First Monitoring and Report
Winter 2014	Tree Planting
Spring 2014	Evaluation of efficacy of exotic species removal Herbicide treatment (if necessary) Monitoring and Report
Fall 2014	Replanting (if necessary) Monitoring and Report
Spring 2015	Monitoring and Report
Fall 2015	Monitoring and Report
Spring 2016	Monitoring and Report
Fall 2016	Monitoring and Report
Spring 2017	Monitoring and Report
Fall 2017	Monitoring and Report
Spring 2018	Monitoring and Report
Fall 2018	Monitoring and Report
Spring 2019	Monitoring and Report

3.7 Maintenance

Following completion of a monitoring report, maintenance will be performed as needed to ensure continued control of exotic species and desired vegetation density. This may include application of specific herbicides, replanting woody species, and other techniques as required to achieve the performance standards (below).

3.8 Monitoring

Monitoring will comply with the Stream Mitigation Monitoring Requirements in Appendix D of the 2012 SOP. Monitoring of the Clear Creek Mitigation Site will be performed by a qualified biologist and will occur for at least five years following implementation of mitigation work. The timeframe for monitoring may be extended as recommended by USACE if performance

standards are not being met. Monitoring Reports will be submitted to the USACE project manager in electronic format following each annual monitoring event.

Stream channel monitoring will include annual inspections of each restored reach for parameters which indicate stable pattern, profile and dimension as well as deviations from stable conditions. Cross-sectional areas will represent, to the extent possible, typical pattern, profile and dimension for the restored reach. Basic water quality data (temperature, dissolved oxygen, turbidity, and pH) will be reported for all in-stream monitoring points. Following each of the first two bankfull rain events, channel stability will be visually assessed; immediate action will be taken if channel integrity is compromised.

All riparian buffer segments will be monitored biannually for the first two years to ensure that restoration efforts are trending toward the final success criteria. After the first two years, if restoration efforts are trending toward the final success criteria then monitoring can be conducted on an annual basis until the final success criteria are achieved; otherwise, monitoring will continue to occur biannually. Information collected while monitoring Riparian Buffer Zone and Wetland Mitigation data points will include species composition, diameter at breast height, and height for overstory vegetation, survival and height for planted vegetation, and percent cover of exotic vegetation within a 25 foot radius. Other pertinent observations will be included. The six buffer data points described in Section 3.4.3 will be used for monitoring. Photographs of the buffer data points and stream channel will provide additional documentation of mitigation progress.

3.9 Performance Standards

Successful mitigation will be indicated according to SOP guidelines. For monitoring purposes, these include photographic evidence of no substantial aggradation, degradation, or bank erosion of the stream channel. In addition, success will be indicated according to the performance standards outlined in Table 5 (below).

Table 5. Performance Standards.

Item	Parameter	Performance Standard
Overstory Vegetation	Height	Increase in mean over 5 year period.
	Diameter at Breast Height	Increase in mean over 5 year period.
	% Occurence	No Standard (used to identify problem areas).
Midstory Vegetation	Qualitative Description of Dominance	No Standard (used to identify problem areas).
Planted Vegetation	Survival	75% survival @ year 3 65% survival @ year 4 55% survival @ year 5
	Height	Minimum 10% increase over 5 year period.
Exotics Vegetation	% Cover	Less than 10% cover at 3 years. Less than 1% cover at 5 years.

3.10 Long-Term Management Plan

SunBelt Golf Corporation will be responsible for successful implementation of the mitigation plan, including financing the proposed work and long-term management. The objectives of long-term management are a successful native plant community and dynamic but stable stream channel. Long-term management may require control of problem exotic species via manual or chemical removal when necessary to maintain the native plant population, in addition to addressing problems that may occur in overstory trees (e.g. serious wind damage, disease infestation, etc.) that would require maintenance.

3.11 Adaptive Management

Potential scenarios requiring adaptive management include failure to remove exotic species or failure to establish native woody vegetation. Either situation would necessitate reevaluation of the mitigation techniques employed, with subsequent modification of the implemented plan by a qualified biologist and coordination with USACE. In the event that beaver (*Castor canadensis*) activity results in destruction of plantings, the beaver will be removed and vegetation re-established. Less likely situations that could affect the outcome of the mitigation activity include unforeseen changes in weather (e.g. sustained drought, wind damage to trees) or neighboring land use (e.g. intensive urban development resulting in increased runoff) that cause degradation to the stream channel or the vegetative community. In that case, the SunBelt Golf Corporation will take responsibility for re-evaluating and implementing the mitigation plan to achieve the performance standards, including coordinating with the USACE and extending the timeline for mitigation maintenance and monitoring.

If the property is sold, the purchasing party must agree to maintain the mitigation area according to the restrictive covenant and the compensatory mitigation plan.

Appendix A

FIGURES

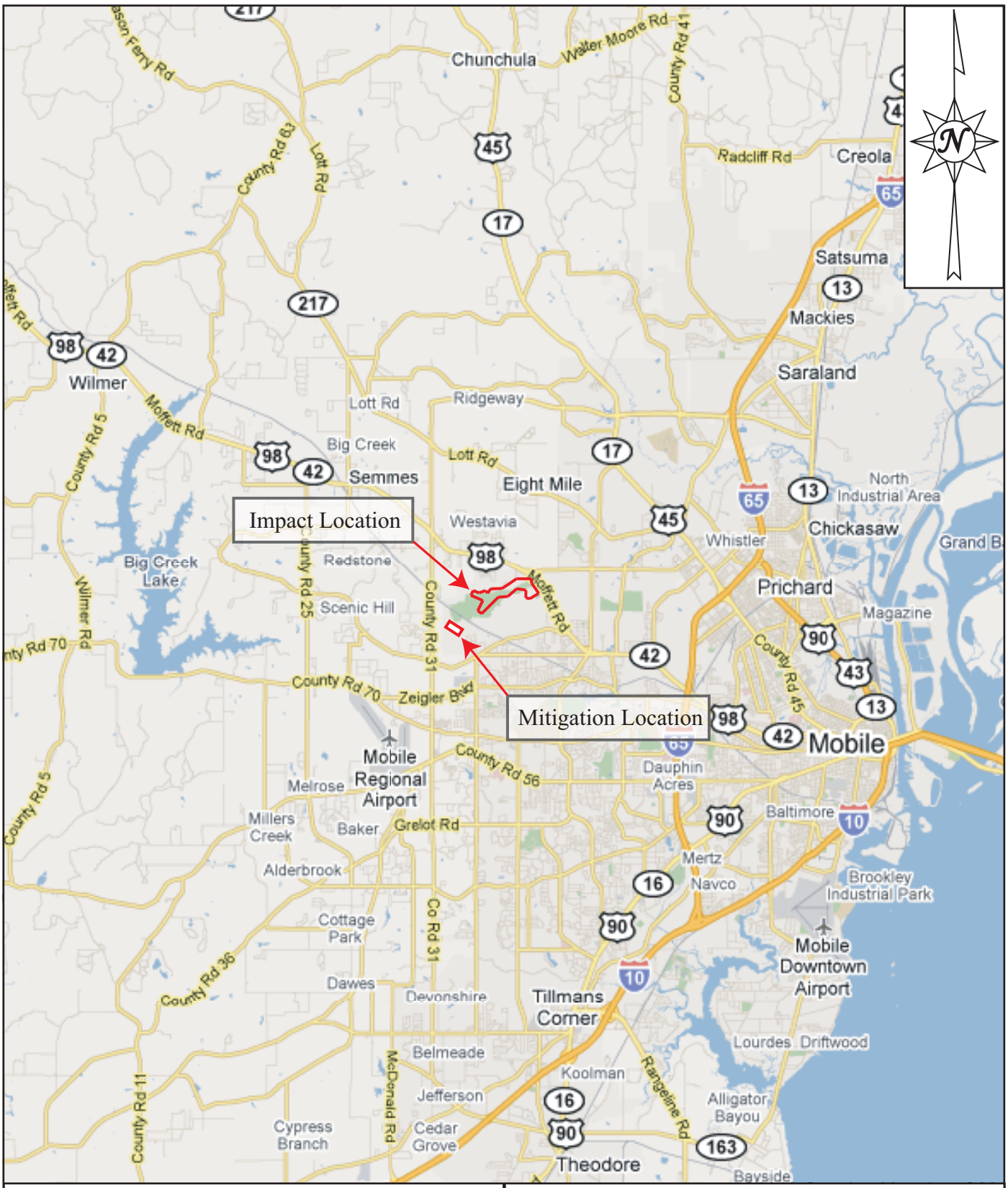


Figure 1: Vicinity Map
Magnolia Grove Stream Mitigation Site
Mobile, Mobile County, Alabama
Source: 2010 Google Maps
BioResources Project No. WL10-173
Scale: 1" = 3.3 miles

BioResources, LLC

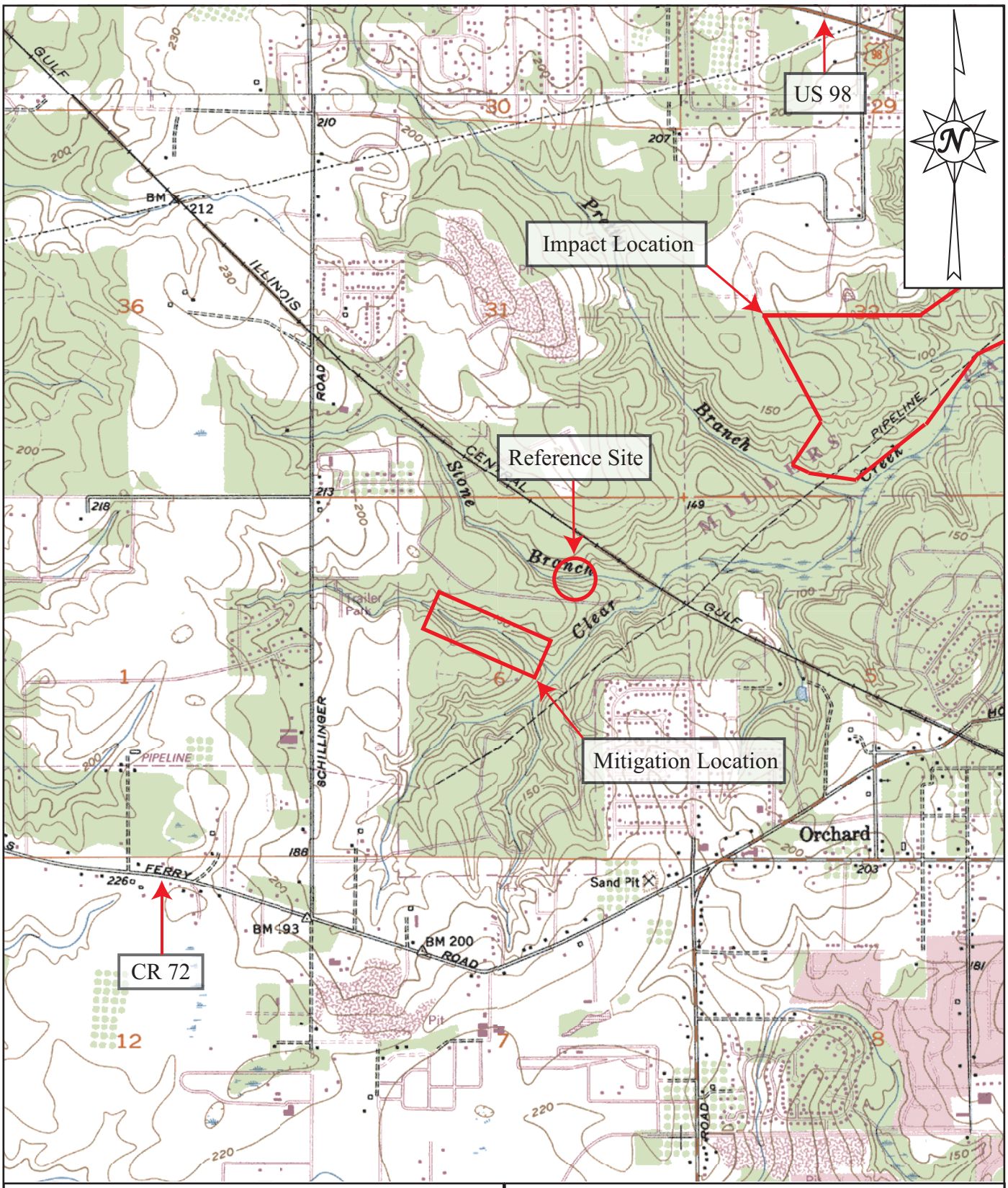


Figure 2: Site Location Map
Magnolia Grove Stream Mitigation Site
Mobile, Mobile County, Alabama
Source: Spring Hill, AL U.S.G.S. 7.5' Quad Map
BioResources Project No. WL10-173
Scale: 1" = 2000'

BioResources, LLC

Figure 3: Aerial Photography
Magnolia Grove Stream Mitigation Site
Mobile, Mobile County, Alabama
Source: 2010 Google Earth
BioResources Project No. WL10-173
Scale: 1” = 1000’

Bio Resources, LLC

Appendix B

ADVERSE IMPACTS

WORKSHEETS

MAGNOLIA GROVE – THE FALLS COURSE
ADVERSE IMPACT FACTORS FOR RIVERINE SYSTEMS WORKSHEET

Priority Area	Tertiary 0.1			Secondary 0.4			Primary 0.8		
Existing Condition	Unstable 0.1			Partially Unstable 0.8			Stable 1.6		
Duration	Temporary 0.05			Recurrent 0.1			Permanent 0.3		
Dominant Impact	Shade/ Clear 0.05	Utility Crossing 0.15	Below Grade Culvert 0.3	Armor 0.5	Detention /Weir 0.75	Morpho-logic Change 1.5	Impound-ment (dam) 2.0	Pipe >100' 2.2	Fill 2.5
Scaling Factor	<100' 0	100'-200' 0.05	201-500' 0.1	501-1000' 0.2	>1000 Linear Feet (LF) 0.1 for each 500 LF of impact example: scaling factor for 5,280 LF of impacts = 1.1, max score=2				
Stream Type Impacted	Ephemeral 0.3			Intermittent 1.0			Perennial 1.15		

Factor	Hole 2 Pipe	Hole 3A Pipe	Hole 3B Pipe	Hole 4 Pipe	Hole 7A Impounded
Priority Area	0.1	0.1	0.1	0.1	0.1
Existing Condition	0.8	0.8	0.8	0.8	0.8
Duration	0.3	0.3	0.3	0.3	0.3
Dominant Impact	2.2	2.2	2.2	2.2	2.0
Scaling Factor	0.1	0.1	0.05	0.05	0.2
Sum of Factors A =	3.50	3.50	3.45	3.45	3.40
Stream Type B =	1.15	1.15	1.15	1.0	1.15
Credits / Lf A x B = C	4.03	4.03	3.97	3.45	3.91
Linear Feet of Stream Impacted in Reach LF =	270	233	190	123	645
Mitigation Credits Required LF x C	1,088	939	754	424	2,522

Total Mitigation Credits Required = 5,727

MAGNOLIA GROVE – THE FALLS COURSE

ADVERSE IMPACT FACTORS FOR RIVERINE SYSTEMS WORKSHEET

Priority Area	Tertiary 0.1			Secondary 0.4			Primary 0.8		
Existing Condition	Unstable 0.1			Partially Unstable 0.8			Stable 1.6		
Duration	Temporary 0.05			Recurrent 0.1			Permanent 0.3		
Dominant Impact	Shade/ Clear 0.05	Utility Crossing 0.15	Below Grade Culvert 0.3	Armor 0.5	Detention /Weir 0.75	Morpho-logic Change 1.5	Impound-ment (dam) 2.0	Pipe >100' 2.2	Fill 2.5
Scaling Factor	<100' 0	100'-200' 0.05	201-500' 0.1	501-1000' 0.2	>1000 Linear Feet (LF) 0.1 for each 500 LF of impact example: scaling factor for 5,280 LF of impacts = 1.1, max score=2				
Stream Type Impacted	Ephemeral 0.3			Intermittent 1.0			Perennial 1.15		

Factor	Hole 7B Fill	Hole 14 A&B Pipe	Hole 15 Pipe	Hole 16 A&B Pipe	Hole 16 Armor
Priority Area	0.1	0.1	0.1	0.1	0.1
Existing Condition	0.8	0.8	0.8	0.8	0.8
Duration	0.3	0.3	0.3	0.3	0.3
Dominant Impact	2.5	2.2	2.2	2.2	0.5
Scaling Factor	0	0.05	0.1	0.1	0.05
Sum of Factors A =	3.70	3.45	3.50	3.50	1.75
Stream Type B =	1.15	1.15	1.15	1.15	1.15
Credits / Lf A x B = C	4.26	3.97	4.03	4.03	2.01
Linear Feet of Stream Impacted in Reach LF =	66	170	226	224	118
Mitigation Credits Required LF x C	281	675	911	903	237

Total Mitigation Credits Required = 3,007

Appendix C

STREAM

CLASSIFICATION

DATA:

CURRENT CONDITIONS

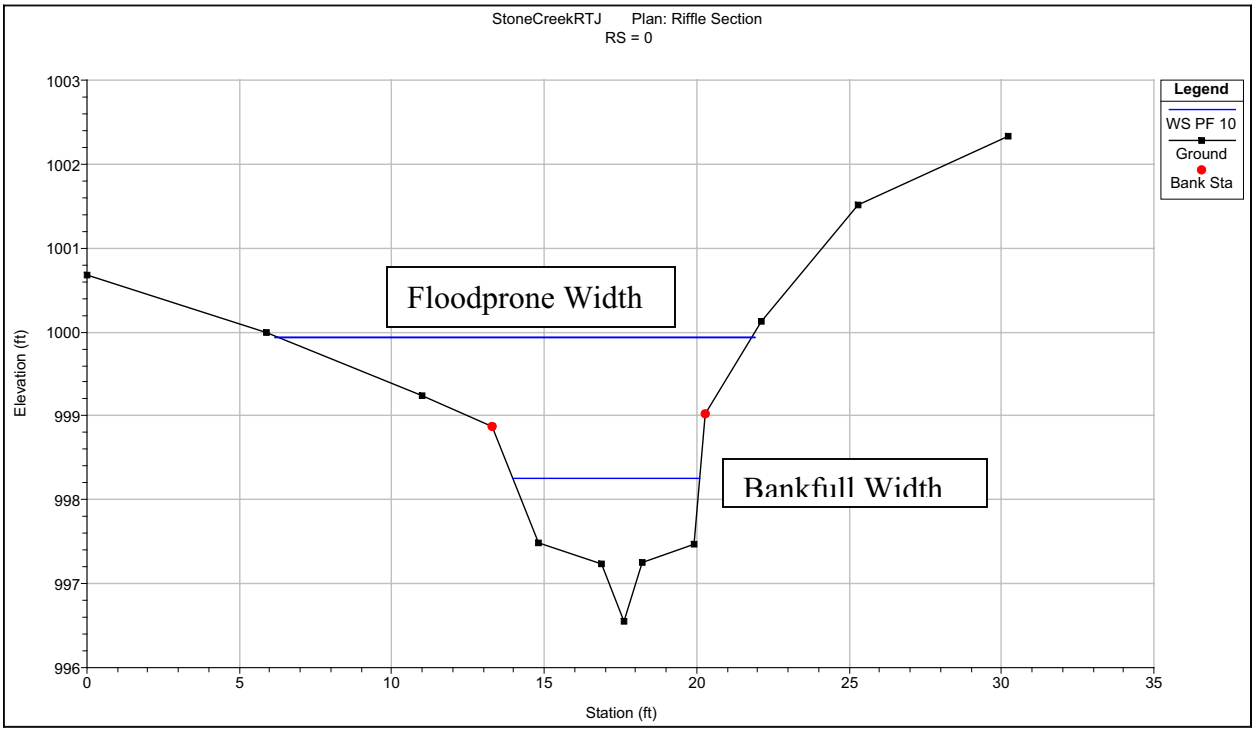


Figure 2. Plot of riffle cross-section indicating bankfull width and floodprone width

Drainage Area = 0.55 sq mi
Bankfull Width = 6.1 ft
Bankfull Area = 5.6 ft^2
Bankfull Depth = 0.92 ft
Floodprone Width = 15.7 ft
Entrenchment Ratio = 2.57
Width to Depth = 6.63
Sinuosity = 119.7 ft / 83.5 ft = 1.43
Slope = 0.011 ft/ft
Stream Bed Material = Silty Sand
Classification = E5

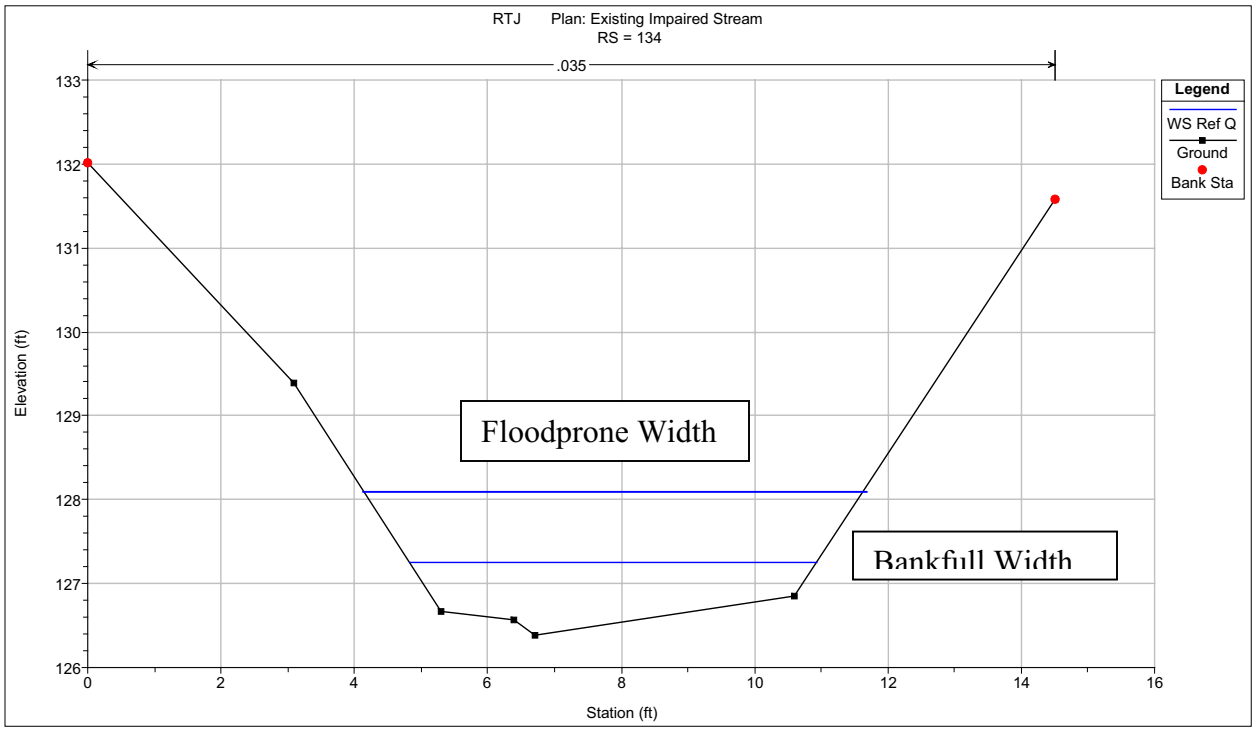


Figure 2. Plot of riffle cross-section indicating bankfull width and floodprone width

Drainage Area = 0.42 sq mi
Bankfull Width = 6.1 ft
Bankfull Area = 3.6 ft^2
Bankfull Depth = 0.59 ft
Floodprone Width = 7.5 ft
Entrenchment Ratio = 1.23
Width to Depth = 10.33
Sinuosity = 1500 ft / 1475 ft = 1.02
Slope = 0.0063 ft/ft
Stream Bed Material = Sand
Classification = G5c

Appendix E

STREAM CHANNEL

AND

BUFFER ZONE

WORKSHEETS

Magnolia Grove - IN-STREAM WORK
STREAM CHANNEL/STREAMBANK RESTORATION AND RELOCATION WORKSHEET

Priority Area	Tertiary 0.05		Secondary 0.2		Primary 0.4	
* Existing Condition	Unstable 0.4			Partially Unstable 0.05		
Net Benefit	Stream Relocation 0.1		Stream Channel Restoration/ Stream Bank Stabilization			
			• Enhancement 2.0		Restoration 4.5	
* BEHI Index	Low 0.2		Medium 0.3		High 0.4	
Instream Habitat	>5 cover types 0.35	5 cover types 0.25		4 cover types 0.15		3 cover types 0.1
Timing of Mitigation	Before 0.15		During 0.05		After 0	
Stream Type	Ephemeral 0.2	Intermittent 1.0	Perennial <15' 1.15	Perennial 15-30' 1.20	Perennial 30-50' 1.25	Perennial >50' 1.3

* Stream Enhancement Project Only

Factors	Stream Reach Benefit	Stream Reach Benefit	Stream Reach Benefit	Stream Reach Benefit	Stream Reach Benefit	Stream Reach Benefit
Priority Area	0.05					
Existing Condition						
Net Benefit	4.5					
Bank Stability						
In-stream Habitat	0.1					
Timing of Mitigation	0					
Sum Factors A =	4.65	0.00	0.00	0.00	0.00	0.00
Stream Type B =	1.15					
Credits / LFt A x B = C	5.348	0.00	0.00	0.00	0.00	0.00
Stream Length in Reach (don't count each bank separately) LF =	1,100					
Credits / Reach LF x C = D	5,883	0	0	0	0	0
Mitigation Factor Use (MF) = 0.5 or 1.0	1.0					
Total Credits Generated MF x D = TC	5,883	0	0	0	0	0

Total Channel Restoration/Relocation Credits Generated = 5,883

Magnolia Grove

RIPARIAN BUFFER RESTORATION, ENHANCEMENT, AND PRESERVATION WORKSHEET

Priority Area	Tertiary 0.05	Secondary 0.2	Primary 0.4
Net Benefit (for each side of stream)	Riparian Restoration, Enhancement and Preservation Factors (select values from Table1) (MBW = Minimum Buffer Width = 50' + 2' / 1% slope)		
System Protection Credit	Condition: MBW restored or protected on both streambanks To calculate: (Net Benefit Stream Side A + Net Benefit Stream Side B) / 2		
Timing of Mitigation	Before 0.15	During 0.05	After 0
Stream Type	Ephemeral 0.9	Intermittent 1.0	Perennial 1.1

Factors		Stream Reach 1	Stream Reach 2	Stream Reach 3	Stream Reach 4	Stream Reach 5	Stream Reach 6
Priority Area		0.05					
Net Benefit	Stream Side A	0.8					
	Stream Side B	0.8					
System Protection Credit Condition Met (Buffer on both sides)		0.8					
Timing of Mitigation (None for primarily Preservation)	Stream Side A	0					
	Stream Side B	0					
Sum Factors	A =	2.45	0.00	0.00	0.00	0.00	0.00
Stream Type	B =	1.1					
Credits / LF	A x B = C	2.695	0.000	0.000	0.000	0.000	0.000
Linear Feet of Stream Buffer (don't count each bank separately)	LF =	1,100					
Credits / Reach	LF x C =D	2,964	0	0	0	0	0
Mitigation Factor	Use (MF) = 0.5 or 1.0	1.0					
Total Credits Generated	D x MF = TC	2,964	0	0	0	0	0

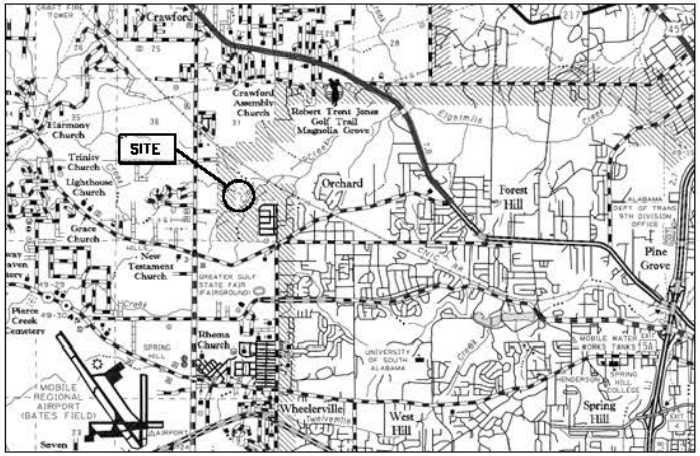
Total Riparian Restoration Credits Generated = __2,964__

Appendix F

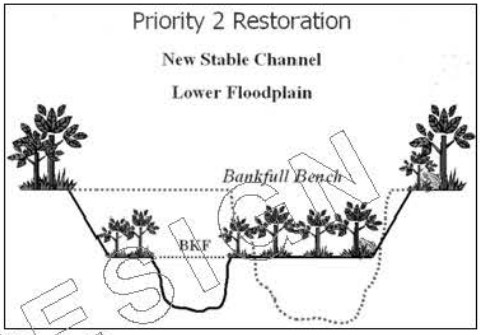
PRELIMINARY STREAM RESTORATION DESIGN

VICINITY MAP

NTS

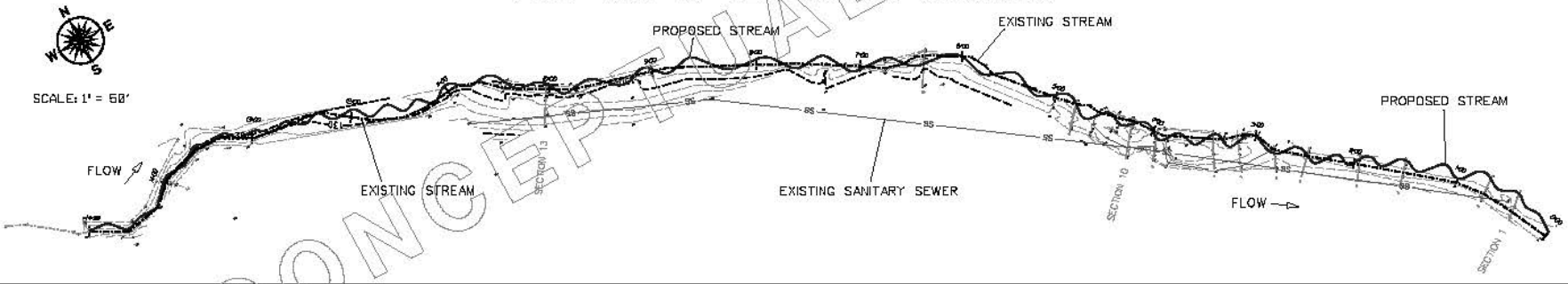


PROPOSED RESTORATION STRATEGY



SOURCE:
Shi, B.A. G.L. Grabow, K.B. Hill, J. Hilgy, M.A. Harman, S.D. Jennings and D.E. Wise. 2003. Stream Restoration: A Natural Channel Design Handbook. NC Stream Restoration Institute, NC State University. 128 pp.

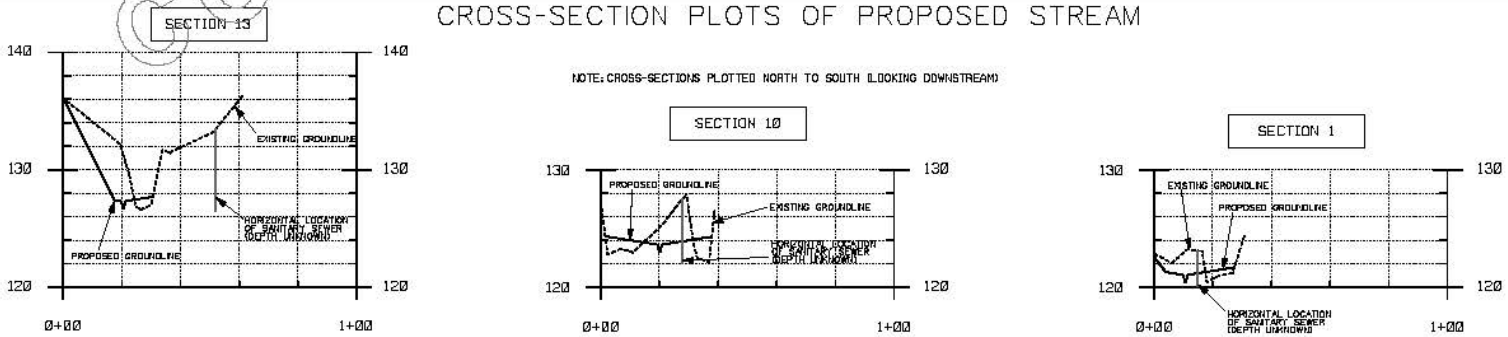
PLAN VIEW OF NEW STREAM ALIGNMENT



CROSS-SECTION PLOTS OF PROPOSED STREAM

SCALE:
H: 1' = 20'
V: 1' = 5'

NOTE: CROSS-SECTIONS PLOTTED NORTH TO SOUTH (LOOKING DOWNSTREAM)



CONCEPTUAL DESIGN

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MAGNOLIA GROVE MITIGATION PROJECT

CONCEPTUAL STREAM RESTORATION

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FEBRUARY 2011

AS SHOWN